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CORRECTIVE MEASURES IMPLEMENTATION PLAN SOLID WASTE MANAGEMENT UNIT 196 (SWMU 196) ZONE H CNC CHARLESTON SC

10/11/2005

CH2M HILL

CORRECTIVE MEASURES IMPLEMENTATION PLAN

SWMU 196. Zone H

Charleston Naval Complex
North Charleston, South Carolina

SUBMITTED TO
U.S. Navy Southern Division
Naval Facilities Engineering Command

CH2M-Jones

October 2005

Contract N62467-99-C-0960

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October 11, 2005

Mr. David Scaturo
South Carolina Department of Health and
Environmental Control
Bureau of Land and Waste Management
2600 Bull Street
Columbia, SC 29201

Re: Corrective Measures Implementation Plan (Revision 0) – SWMU 196, Zone H

Dear Mr. Scaturo:

Enclosed please find two copies of the Corrective Measures Implementation Plan (Revision 0) for SWMU 196 in Zone H of the Charleston Naval Complex (CNC). This report has been prepared pursuant to agreements by the CNC BRAC Cleanup Team for completing the RCRA Corrective Action process.

Please contact me at 352/335-5877, ext. 2280, if you have any questions or comments.

Sincerely,

CH2M HILL

Dean Williamson, P.E.

cc: Dann Spariosu/USEPA, w/att
Rob Harrell/Navy, w/att
Gary Foster/CH2M HILL, w/att

CORRECTIVE MEASURES IMPLEMENTATION PLAN

SWMU 196, Zone H

Charleston Naval Complex
North Charleston, South Carolina

SUBMITTED TO
U.S. Navy Southern Division
Naval Facilities Engineering Command

PREPARED BY
CH2M-Jones

October 2005

Revision 0
Contract N62467-99-C-0960
258814.ZH.EX.16

Certification Page for the Phase I Corrective Measures Implementation Plan (Revision 0) — SWMU 196, Zone H

I, Dean Williamson, certify that this report has been prepared under my direct supervision. The data and information are, to the best of my knowledge, accurate and correct, and the report has been prepared in accordance with current standards of practice for engineering.

South Carolina

P.E. No. 21428

Dean Williamson, P.E.

10/6/2005

Date

Contents

Contents, Continued

Acronyms and Abbreviations

AOC	Area of Concern
BCT	BRAC Cleanup Team
BRAC	Base Realignment and Closure Act
CA	Corrective Action
CMIP	Corrective Measures Implementation Plan
CNC	Charleston Naval Complex
COC	chemical of concern
CSAP	Comprehensive Sampling and Analysis Plan
DCB	dichlorobenzene
DNAPL	dense non-aqueous phase liquid
DO	dissolved oxygen
DQO	data quality objective
EDD	electronic data deliverable
EnSafe	EnSafe Inc.
EPA	U.S. Environmental Protection Agency
ESDLOQCM	*Environmental Services Division Laboratory Operations and Quality Control Manual*
ESDSOPQAM	*Environmental Services Division Standard Operating Procedures and Quality Assurance Manual*
HDPE	high-density polyethylene
HSP	Health and Safety Plan
IDW	investigation-derived waste
IM	interim measure
LUC	land use control
LUCMP	Land Use Control Management Plan

Acronyms and Abbreviations, Continued

µg/L	micrograms per liter
mg/L	milligrams per liter
MCS	media cleanup standard
MCL	maximum contaminant level
NAPL	non-aqueous phase liquid
NAVBASE	Naval Base
O&M	operation and maintenance
OSWER	Office of Solid Waste and Emergency Response
PAH	polycyclic aromatic hydrocarbon
PCE	tetrachloroethene
PPE	personal protective equipment
QA	quality assurance
QC	quality control
RAO	remedial action objective
RBC	risk-based concentration
RCRA	Resources Conservation and Recovery Act
RFI	RCRA Facility Investigation
RGO	remedial goal option
SCDHEC	South Carolina Department of Health and Environmental Control
SOP	standard operating procedure
SOW	Statement of Work
SWMU	Solid Waste Management Unit
SVE	soil vapor extraction
TCE	trichloroethene
VOC	volatile organic compound
ZVI	zero-valent iron

SECTION 1.0

Introduction and Purpose

1.0 Introduction and Purpose

In 1993, Naval Base (NAVBASE) Charleston was added to the list of bases scheduled for closure as part of the Defense Base Realignment and Closure (BRAC) Act, which regulates closure and transition of property to the community. The Charleston Naval Complex (CNC) was formed as a result of the dis-establishment of the Charleston Naval Shipyard and NAVBASE on April 1, 1996.

CNC Corrective Action (CA) activities are being conducted under the Resource Conservation and Recovery Act (RCRA); the South Carolina Department of Health and Environmental Control (SCDHEC) is the lead agency for CA activities at the site. All RCRA CA activities are performed in accordance with the Final Permit (Permit No. SC0 170 022 560). In April 2000, CH2M-Jones was awarded a contract to provide environmental investigation and remediation services at the CNC.

An Interim Measure (IM) to treat contaminated groundwater was previously implemented at Solid Waste Management Unit (SWMU) 196, as summarized in Section 1.2 of this report. This Corrective Measures Implementation Plan (CMIP) presents the technical approach for implementing additional corrective measures for groundwater at SWMU 196. These corrective measures were selected in the *CMS Report for SWMU 196, Zone H, Revision 1* (CH2M-Jones, 2004a). Additional information regarding SWMU 196, including history and description, site hydrogeology and the nature and extent of the groundwater contamination can be found in the CMS Report.

1.1 Summary of Corrective Action Objectives

The CMIP will utilize the CA alternative selected in the SWMU 196 CMS Report to remediate chemicals of concern (COCs) present in the surficial aquifer at SWMU 196. The selected alternative is In Situ Enhanced Biological Treatment with Land Use Controls (LUCs).

Nineteen chemicals were retained as COCs in the CMS for shallow groundwater at SWMU 196, as listed in Table 1-1. Of these nineteen chemicals, only five were detective above their respective target cleanup levels. These five chemicals are benzene, chlorobenzene, 1,2-dichlorobenzene (DCB), 1,3-DCB, and 1,4-DCB.

Based on the rationale presented in Section 4.1 of the CMS Work Plan (CH2M-Jones, 2003), no surface or subsurface soil COCs were identified for soil within SMWU 196. No deep groundwater, surface water, or sediment COCs were identified in the CMS.

The location of SWMU 196 within Zone H is shown in **Figure 1-1**, and an aerial view of the SWMU 196 area is presented in **Figure 1-2**.

The Remedial Action Objectives (RAOs) identified in the CMS Report for SWMU 196 groundwater are the following:

1) Prevent ingestion and direct/dermal contact with groundwater having unacceptable carcinogenic or non-carcinogenic risk,

2) Restore the aquifer to beneficial use, and

3) Control offsite migration of the COC plume in groundwater to preclude unacceptable impacts to ecological receptors in Shipyard Creek.

Prior to developing media cleanup standards (MCSs), SWMU 196 was divided into two separate areas. Each area was assigned different MCSs, based on the specific Remedial Goal Options (RGOs) for that area. These areas, labeled Areas A and B, are depicted in **Figure 1-3**. Area A includes the portion of the area of groundwater contamination at which MCSs are assigned to be protective of human health. This area includes the upland portion of the site on which Building 1838 is located, as well as the area around and behind the building where volatile organic compound (VOC)-impacted groundwater has been identified.

Area B is designated in order to protect surface water quality in Shipyard Creek. This area includes the lower-elevation area east of Building 1838 within the tidally impacted boundaries of the creek beneath which VOC-impacted groundwater has been identified. Because this area is within the creek boundaries, it is expected that no future drinking water wells will be installed in this area.

For COCs within Area A, MCSs were selected from the U.S. Environmental Protection Agency (EPA) Region III risk-based concentration (RBC) tables (EPA, 2000) and established drinking water maximum contaminant levels (MCLs). For COCs within Area B, MCSs are based on chronic aquatic saltwater criteria. Table 2-2 of the CMS Report presented a summary of potential MCSs identified for the various COCs, and is presented herein as **Table 1-1**.

Meeting these MCSs after remediation is considered to be an acceptable demonstration that the RAOs and RGOs have been met.

1.2 Summary of Interim Measures Conducted

The RCRA Facility Investigation (RFI) for soil and groundwater at SWMU 196 revealed the presence of high concentrations of chlorobenzene and DCBs in shallow groundwater, as was previously mentioned. Concentrations were reported at up to 15 milligrams per liter (mg/L) for chlorobenzene and 13 mg/L of 1,2-DCB during the RFI. These values are approximately 0.3 and 8 percent, respectively, of the maximum solubility of chlorobenzene and 1,2-DCB in water. In general, a contaminant concentration in groundwater greater than 1 percent of its solubility is considered an indicator for the potential presence of non-aqueous phase liquid (NAPL), which suggests the possibility that 1,2-DCB might have been present in the shallow aquifer as a dense non-aqueous phase liquid (DNAPL).

The BRAC Cleanup Team (BCT) was consulted, and it was decided by the team to implement an IM with the objective of significantly reducing the levels of these constituents in the groundwater in SWMU 196. To achieve this objective, several technologies were evaluated. They included chemical oxidation with Fenton's Reagent (via two different delivery mechanisms), chemical oxidation with potassium permanganate, and chemical reduction with zero-valent iron (ZVI). Chemical oxidation with Fenton's Reagent was determined to be the most appropriate technology to achieve the desired objective.

The IM using Fenton's Reagent was implemented at SWMU 196 to reduce possible DNAPL to the extent practical, and was performed in two phases. The objective of Phase I was to delineate the vertical and horizontal extent of chlorobenzene and DCB source areas in groundwater at SWMU 196. The objective of Phase II was to remediate the source areas at SWMU 196, as defined by Phase I, using in situ chemical oxidation with Fenton's Reagent.

The Phase I injection was implemented in November of 2001, followed by Phase II in February 2002. A final application of Fenton's Reagent was conducted in July 2002. Results of baseline and post-injection groundwater monitoring indicated that total chlorobenzenes concentrations had been decreased by up to 82 percent. Subsequent monitoring events showed rebound chlorobenzene concentrations in selected wells, changing the overall reduction of chlorobenzene concentrations from 82 percent to approximately 57 percent.

The IM with Fenton's Reagent was successful at reducing dissolved chlorobenzene and DCB concentrations in site groundwater in the central portion of the grid, but following

treatment, the chlorobenzene and DCB concentrations rebounded to approximately pretreatment levels at some areas of the site. The complete results of the IM were documented in Section 6.0 of the CMS Report.

1.3 Description of Corrective Measures Selected

The *CMS Report for SWMU 196, Zone H, Revision 1* (CH2M-Jones, 2004a) evaluated applicable remedial alternative technologies for addressing the remediation of groundwater at SWMU 196. The selected remedy uses natural aerobic biodegradation processes for reducing concentrations of the chlorobenzenes. A key aspect of this remedial approach is the mechanism used for delivery of oxygen to the shallow aquifer. Various methods are available to achieve this delivery of oxygen. For the purpose of evaluating the various corrective action alternatives, the CMS assumed the use of ISOGEN equipment as a representative technology for delivering oxygen to the shallow aquifer. However, other equipment, such as standard air sparging equipment, can also effectively be used to provide oxygen to the shallow aquifer, and will be used for this CA.

Because of its common and successful usage at various sites, air sparging is expected to be adequate for providing oxygen to the subsurface and can be effectively implemented at SWMU 196 using many of the existing injector wells previously used for delivery of Fenton's reagent during the source area treatment IM, since many of these injectors remain in place. Because of the availability of these injectors at the site, an air sparging approach is planned for the initial implementation of this alternative.

This remedial alternative will be implemented in a phased approach. During Phase I, air sparging will be implemented at a number of injection locations within and behind Building 1838 (the main building at the site) and the system will be operated for approximately 6 to 9 months to assess the responsiveness of the aquifer and native microbes to this remedial approach. Additional sparging locations will then be brought online during the second phase as needed to expand the system to address the remaining plume, or to modify the approach for delivering oxygen to the shallow aquifer as dictated by site conditions observed during Phase I.

TABLE 1-1
Chemicals of Concern for Areas A and B
Phase I Corrective Measures Implementation Plan, SWMU 196, Zone H, Charleston Naval Complex

	Area A					Area B	
COC	MCS Value (µg/L)	Range Reported (µg/L) Minimum	Range Reported (µg/L) Maximum	Groundwater Status (December 2002)	Basis for MCS	Aquatic Saltwater Chronic (µg/L)	Chronic Saltwater Criteria Accounting for Mixing of Groundwater with Surface Water[a]
Acetone	1,830	10U	2,500 U	Not Detected	RBC for HI of 3	NA	NA
Cadmium	5	3.1J	3.1J	Only well sampled	MCL	NA	NA
Carbon Disulfide	3,000	5 U	2,500 U	Not Detected	RBC for HI of 3	NA	NA
2-Chlorophenol	90	12.8	12.8	Only well sampled	RBC for HI of 3	19.7	900,000
1,2-Dichlorobenzene	600	1.3	34,800	6 of 15 wells exceed MCL	MCL	29	6,000,000
1,3-Dichlorobenzene	600	5	1,490	3 of 17 wells exceed MCL	MCL	20	6,000,000
1,4-Dichlorobenzene	75	5	2,590	10 of 17 wells exceed MCL	MCL	5	750,000
1,2,4-Trichlorobenzene	70	5 U	2,500 U	Not Detected	MCL	109	700,000
Benzene	5	5 U	2,610	5 of 17 wells exceed MCL	MCL	105	50,000
Chlorobenzene	100	5 U	22,400	10 of 17 wells exceed MCL	MCL	815	1,000,000
Chloroform	80	5 U	2,500 U	Not Detected	MCL	NA	NA
1,2-Dichloroethene	70	5 U	2,500 U	Not Detected	MCL	NA	NA
Dibromochloromethane	80	5 U	2,500 U	Not Detected	MCL	2,560	800,000
Methylene Chloride	5	5 U	2,500 U	2 of 17 wells exceed MCL	MCL	24	50,000
Naphthalene	0.2	0.97 J		Only well sampled	MCL	45	2,000
PCE	5	5 U	2,500 U	2 of 17 wells exceed MCL	MCL	37	50,000
Toluene	1,000	5 U	2,500 U	Not Detected	MCL	NA	NA

TABLE 1-1
Chemicals of Concern for Areas A and B
Phase I Corrective Measures Implementation Plan, SWMU 196, Zone H, Charleston Naval Complex

	Area A					Area B	
COC	MCS Value (µg/L)	Range Reported (µg/L) Minimum	Range Reported (µg/L) Maximum	Groundwater Status (December 2002)	Basis for MCS	Aquatic Saltwater Chronic (µg/L)	Chronic Saltwater Criteria Accounting for Mixing of Groundwater with Surface Water[a]
TCE	5	5 U	2,500 U	1 of 17 wells exceed criteria	MCL	NA	NA
Vinyl Chloride	2	1 J	5,000 U	1 of 17 wells exceed criteria	MCL	NA	NA

[a] Aquatic Saltwater Chronic Criteria accounting for flux of groundwater with surface water at Shipyard Creek (approximately 0.01%).

COC Chemical of concern
HI Hazard index
J Indicates an estimated value. One or more quality control (QC) parameters were outside the control limits or the value was detected below the laboratory's quantification limit.
MCL Maximum contaminant level
MCS Media cleanup standard
NA Not applicable/not available
PCE Tetrachloroethene
RBC Risk-based concentration
TCE Trichloroethene
U Indicates that the concentration was not detected.
µg/L Microgram per liter

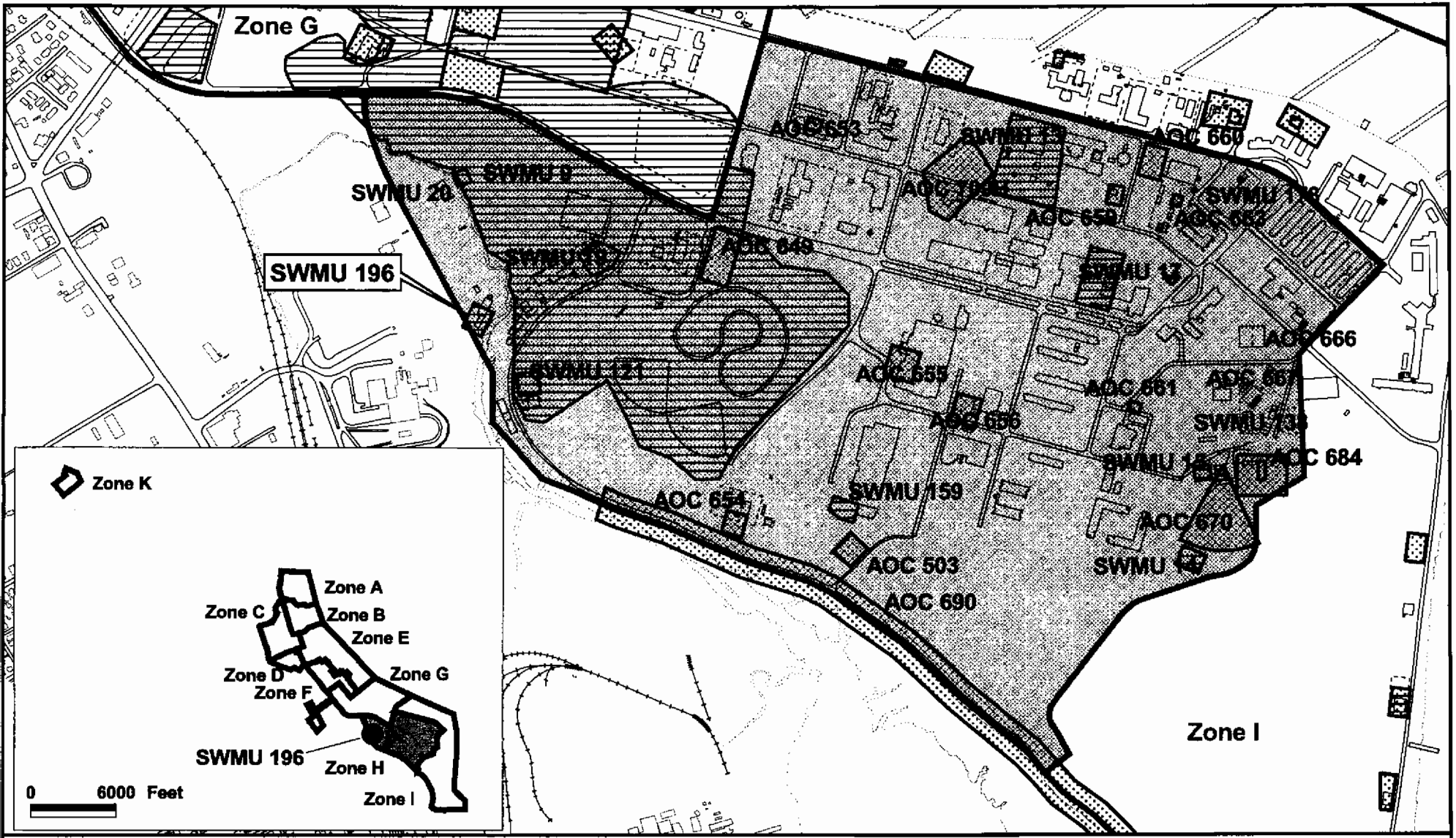

Figure 1-1
Location of SWMU 196
Zone H
Charleston Naval Complex

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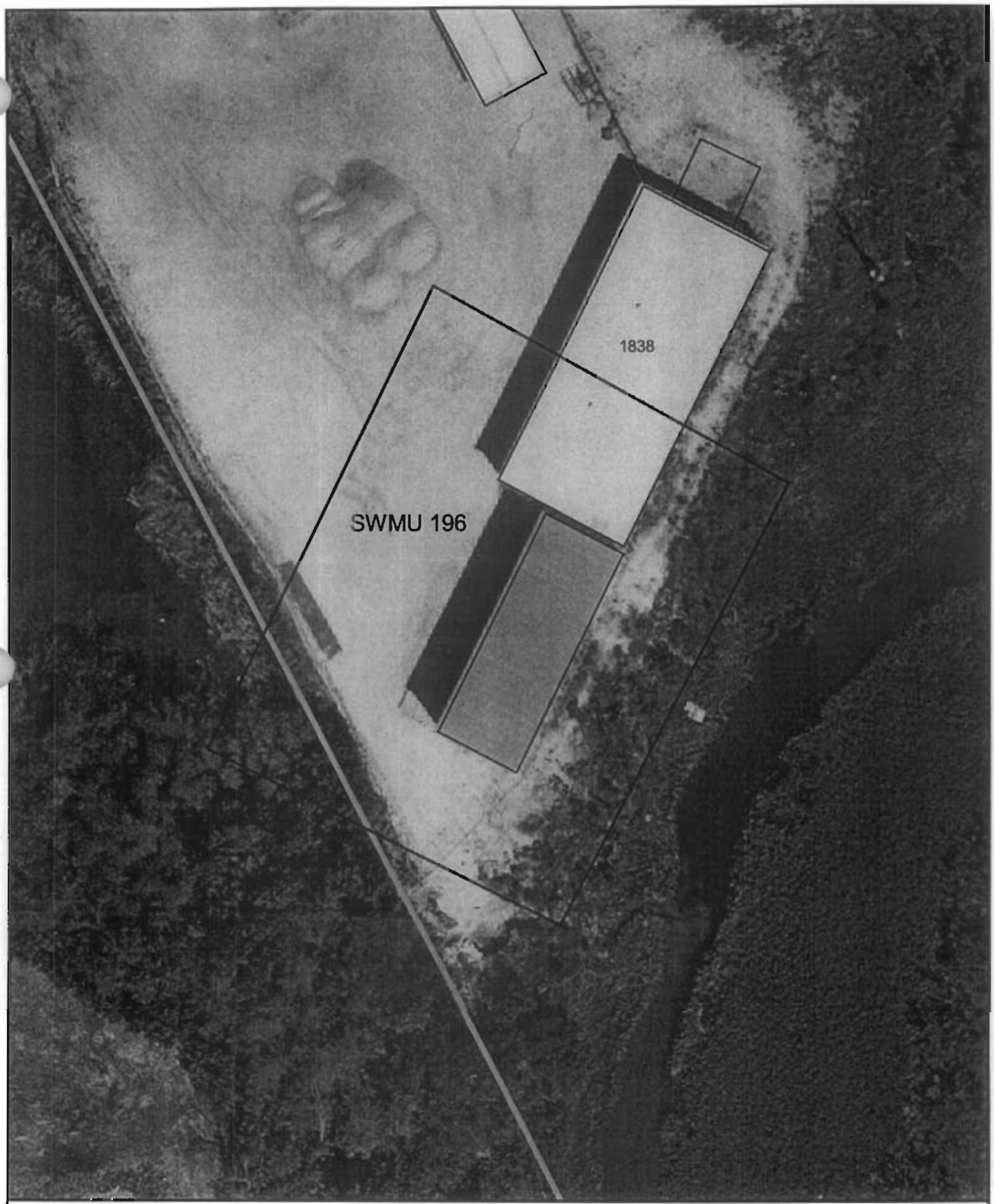
File Path: C:\18gis\Projects\Zone_H\Swmu_196\Apra\swmu_196.apr, Date: 06 May 2002 10:40, User: AHOLECEK, Figure 1-1 - Figure 1-1 Location of SWMU 196



SWMU Boundary
Buildings
Zone Boundary

N

0 30 60 Feet

Figure 1-2
Aerial Photograph
SWMU 196, Zone H

CH2MHILL

NOTE: Aerial Photo Date is 1997
NOTE: Original figure created in color

Area B MCS
Area A MCS

N

0 40 80 Feet

1 inch = 57.6465 feet

Figure 1-3
Area A and B MCS
SWMU 196
Charleston Naval Complex

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File Path: c:\18gis\projects\zone_N\swmu_196\aprs\cms final.apr, Date: 30 May 2003 9:47, User: PFAVARA, EGIS: Charleston Naval Complex - Figure 2-1 Area A and B MCS

SECTION 2.0

Corrective Measures Implementation

2.0 Corrective Measures Implementation

The selected remedy for SWMU 196 groundwater consists of in situ enhanced biodegradation via a biosparging system using up to 19 existing injector wells, coupled with a soil vapor extraction (SVE) system using four existing vapor recovery wells. The mechanical equipment needed to provide air for injection (e.g., blower, compressor, valves, controls, etc.) will be housed in a self-contained unit delivered to the work site by a subcontractor, and connected to the existing injectors and vapor recovery wells by CH2M HILL-Jones personnel. Additional information on the system design specifications and installation methods is provided below.

2.1 Biosparging/ SVE System Design and Installation

2.1.1 Design

Detailed system design specifications and drawings for the biosparging/SVE system design are presented in the *Scope of Services for Fabrication and Delivery of a Package Biosparging and Soil Vapor Extraction System for SWMU 196, Charleston Naval Complex, South Carolina* (CH2M-Jones, 2004b), a copy of which is presented in **Appendix A**.

The system technical requirements include using biosparging to increase DO concentrations in groundwater to promote aerobic biodegradation of the CBs and DCBs. An SVE system will be operated in conjunction with the biosparging system to mitigate the potential for contaminant vapor accumulation beneath Building 1838. Emissions from the SVE system will be discharged directly to the atmosphere since they will be below SCDHEC standards.

The biosparging system and the SVE system will be skid-mounted and contained within a weatherproof enclosure. The selected subcontractor will be responsible for the fabrication of a package system, integrated testing of the biosparging/SVE unit, and delivery of the unit to the SWMU 196 site.

The equipment for the system required includes the following:

- One biosparging blower with inlet air filter, inlet silencer, and outlet silencer
- One heat exchanger
- One moisture separator

- One SVE blower with inlet air filter and outlet silencer
- All interconnecting piping and valves shown on the drawings and as in the Statement of Work (SOW)
- SVE system discharge stack to be higher than nearby Building 1838
- Instrumentation and controls as shown on the drawings and in SOW
- System enclosure

2.1.2 Installation

The first phase (Phase I) will be installed using existing sparge and soil vapor recovery points inside and outside of the north building (Area A). Existing injectors which will be connected to the system for sparging are shown on **Figure 2-1**. SVE wells which will be connected to the system include V1, V6, V8, and V11. Sparge points at the southern open shed area (Area B) will be added in Phase II, pending system performance in Phase I. **Figure 2-2** shows the Phase I biosparge monitoring locations.

After the package system has been located on site, CH2M-Jones personnel will connect the desired sparge/SVE points to the system using aboveground high-density polyethylene (HDPE) pipe, fittings, flow meters, temperature gauges, and vacuum gauges as described in the design specifications/drawings.

2.2 Corrective Measures Implementation Approach

The CMI will be conducted by the CH2M-Jones team under the supervision of the Navy and the guidance of SCDHEC. Project management procedures for operations, data collection, and safety are described in **Section 3.0** of this CMIP.

2.2.1 Biosparge System Procurement, Delivery, Installation, and Setup

CH2M-Jones has prepared a bid package with drawings to solicit bids from qualified vendors for construction, delivery and setup of the biosparge/SVE system. **Appendix A** contains copies of these materials. The vendor will be selected based on their detailed cost proposal describing their proposed equipment, prices, references, and ability to meet project schedule.

The subcontracted vendor will supply all labor, equipment, supplies, materials, and all else necessary to perform the scope of services requested, along with an estimated time of completion. All work will be completed in compliance with applicable federal, state and local regulations, and in accordance with standard industry practice.

The vendor will provide manufacturer's cut sheets and drawings to CH2M-Jones for review and approval prior to construction. After construction but prior to delivery, the vendor will conduct factory performance tests to ensure the system performs to specifications and does not leak. The system will be wrapped in a weather-resistant cocoon for shipment to the site.

The package system shall be delivered to the site pre-wired, pre-ducted, pre-piped, and otherwise pre-assembled and ready to run. The vendor will level the system, and connect suction and discharge piping. If the system requires 230 Volt/ 3 Phase or other special power requirements, it will be provided to the site by the local utility company through CH2M-Jones.

The final vendor payment will not be made until CH2M-Jones has conducted startup tests to verify that the equipment meets the performance requirements when installed on site. The vendor will perform any repairs necessary to meet performance requirements.

2.2.2 Biosparge System Operation and Maintenance

The selected vendor will provide a fully operational package biosparge/SVE system to the site, complete with spare parts, manufacturer's warranty information for service, and an Operation & Maintenance (O&M) Manual for the system. The vendor will also provide the warranty for the system upon delivery.

The O&M Manual will provide detailed procedures for system safety, startup, operations, shutdown, routine maintenance, and troubleshooting. The manual will also include a list of equipment manufacturers, the manufacturer's recommended procedures, cut sheets and part numbers, and the manufacturer's contact telephone numbers.

The system will be operated and maintained by CH2M-Jones personnel, with assistance from vendors as required. The periodic maintenance will be performed at interval specified by the manufacturer and in the O&M Manual.

Periodic checks of system pressures, flow rates, and temperatures will be conducted to ensure that the system is operating as specified. Both performance monitoring of the system and environmental monitoring will be performed by CH2M-Jones personnel, as described in **Section 2.4** of this CMIP.

2.3 Land Use Controls

LUCs will be implemented to limit the future use of the site to control or eliminate exposure pathways to COCs at the site. LUCs will be implemented to limit the future use of the site to control or eliminate exposure pathways to COCs at the site and to ensure the integrity and

effectiveness of the remedy. With regard to real property, a LUC refers to any restriction or control that limits the use of, and/or exposure to, a portion of the property, including water resources, arising from the need to protect human health and the environment. The LUCs will be primarily regarded as a component of corrective actions that apply technologies that reduce toxicity, mobility, volume, and mass of the source of contamination.

The term LUC encompasses "institutional controls," which are defined as real estate restrictions, deed notifications, governmental permitting, zoning laws and other "legal" restrictions to protect human health and the environment. Institutional controls are non-engineered mechanisms used for ensuring compliance with necessary land use limitations.

LUCs also include restrictions on access (access controls), whether achieved by means of engineered barriers (e.g., fence or concrete pad), affirmative measures to achieve the desired restrictions (e.g., night lighting of an area), and prohibitive directives (e.g., restrictions on certain types of wells for the duration of the CA).

Considered altogether, the LUCs for a facility will provide a tool for directing how the property should be used in order to maintain the level of protectiveness that one or more CAs were designed to achieve. Periodic inspections will be conducted to ensure the long-term integrity of the remedy and the effectiveness of the LUCs.

LUCs will be implemented at the site for the following reasons:

- Restricting human contact with groundwater contaminated with organic and inorganic constituents,
- Controlling soil disturbance activities (e.g., construction activities) such that any such activities do not cause unacceptable exposure of human or ecological receptors to contaminants, and
- Prohibiting residential development of the site, until all impacted media have been remediated to levels acceptable for unrestricted land use.

The LUCs will be developed and implemented in accordance with the site-specific Land Use Control Management Plan (LUCMP) agreed to by the Navy and SCDHEC. Periodic visual inspections and reviews will be conducted for the purpose of verifying that all necessary LUCs have been implemented and are being properly maintained. An annual report will be prepared and forwarded to the SCDHEC, signed by the Navy, certifying the continued retention of all LUCs implemented at SWMU 196. Additionally, the recommendation for implementing LUCs will be incorporated into the RCRA Part B Permit for the CNC.

2.4 Performance Sampling and Analysis

2.4.1 System Performance Sampling

To monitor the effectiveness of the air sparging system for increasing the dissolved oxygen (DO) content of site groundwater, periodic measurements of DO will be made at selected existing wells. The data will be used to optimize the biosparging process. The flow rate and pressures for sparge injectors will also be periodically monitored.

VOC samples will also be collected monthly for the first six months from existing wells H196GW004, H196GW005, H196GW013, H009GW020, and FGELGW015 for lab analysis by SW846 methods, as described in **Section 2.7**.

2.5 Waste Management and Disposal

The investigation–derived waste (IDW) that is expected to be generated as part of this investigation may include pavement debris, soil/sediment, well purge water, equipment decontamination wastes, and used personal protective equipment (PPE). As it is generated, the IDW will be containerized in labeled 55-gallon drums and characterized in accordance with South Carolina Hazardous Waste Management Regulations (SCDHEC R.61-79.261). Filled containers will be transported to the less than 90-day storage facility located at Building 1824. After analytical results have been received and reviewed, the containers will be transported to a permitted and licensed facility for proper treatment/disposal.

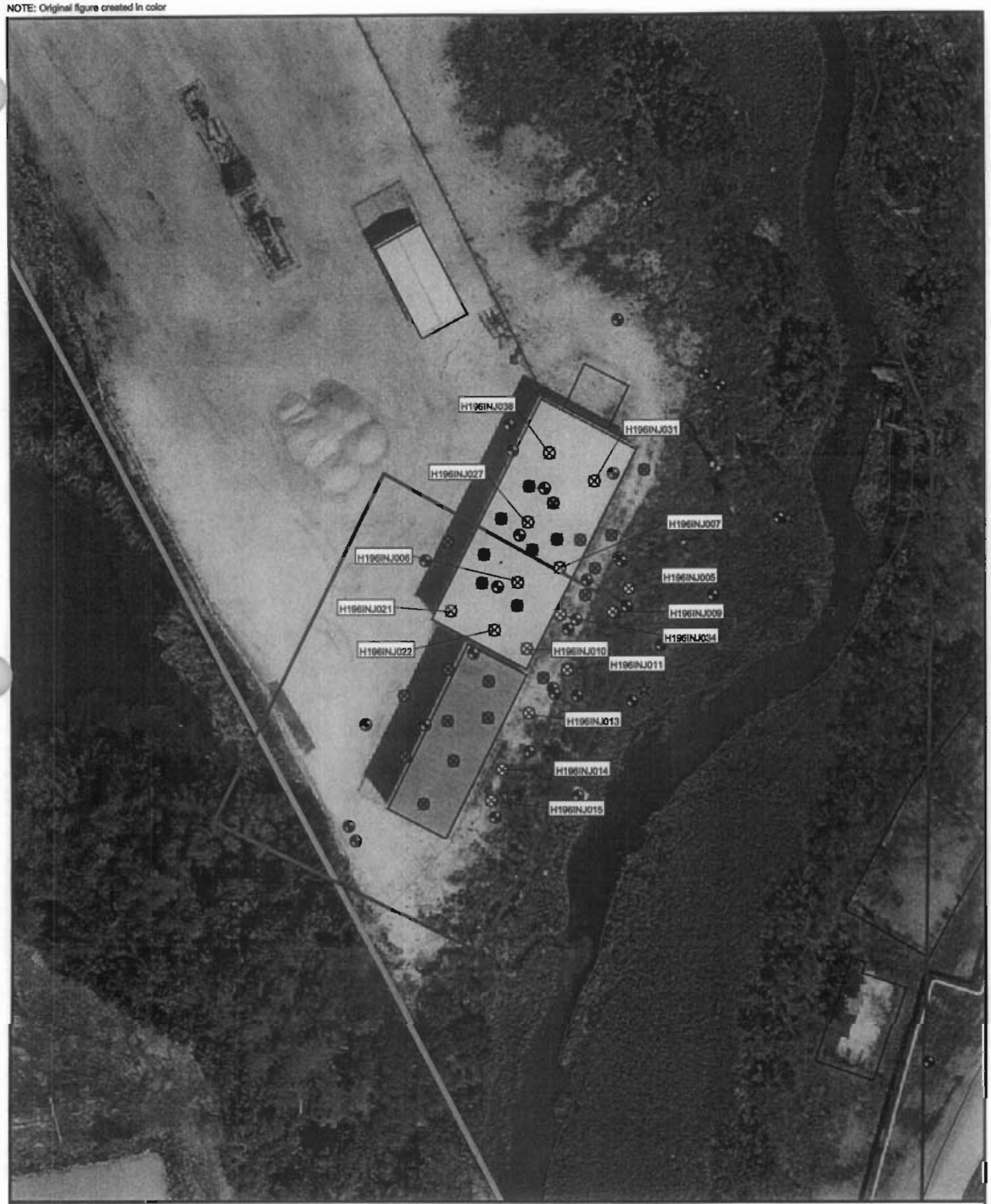
2.6 Sample Handling and Chain-of-Custody

Sample collection procedures and site conditions at the time of sampling will be documented in a field logbook by the field team leader. Samples will be collected in prepared containers supplied by the lab vendor, using preprinted chain-of-custody logsheets and coolers for transport of the samples. Samples will be iced as appropriate and transported by the sampling team to the lab for analysis, maintaining the chain-of-custody at all times after sampling occurs and until the analysis is complete. Sample handling procedures will adhere to the standard procedures described in the approved Comprehensive Sampling and Analysis Plan (CSAP) portion of the CNC *RCRA Facility Investigation (RFI) Work Plan* (EnSafe/Allen & Hoshall, 1994).

2.7 Analysis of Samples

The samples will be delivered to a subcontracted laboratory for chemical analysis of COCs by EPA SW-846 methods and/or standard operating procedures (SOPs) for screening methods to achieve EPA Level II Data Quality Objectives (DQO). The subcontracted lab will meet the EPA Level II DQO criteria specified in the approved CNC CSAP (EnSafe, 1996). Sample analysis will be performed in accordance with the guidance in EPA's *Test Methods for Evaluating Solid Waste, SW-846, Revision 4* (EPA, 1996), Office of Solid Waste and Emergency Response (OSWER), and in the EPA *Environmental Services Division Laboratory Operations and Quality Control Manual* (ESDLOQCM) (1997).

NOTE: Aerial Photo Date is 1997
NOTE: Original figure created in color



N

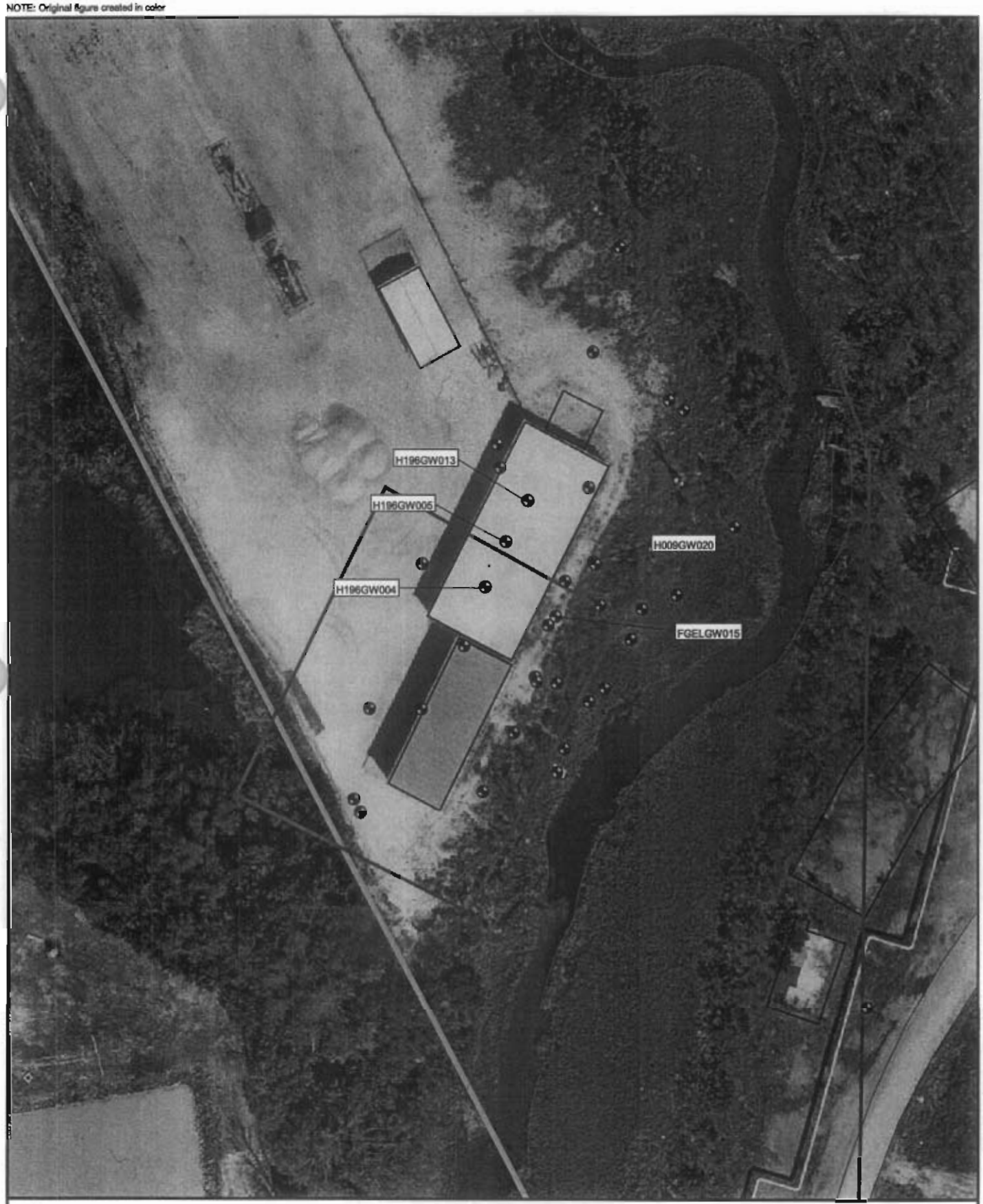
0 40 80 Feet

1 inch = 55.2217 feet

Figure 2-1
Phase I Biosparging Locations
SWMU 196, Zone H
Charleston Naval Complex

File Path: c:\18gis\cnc\cno-egis.spr, Date: 03 Oct 2005 17:25, User: DWILLIAM, EGIS: Charleston Naval Complex - Figure 2-1 Phase I Biosparging Locations

NOTE: Aerial Photo Date is 1997
NOTE: Original figure created in color



Abandoned
Active

N

0 50 100 Feet

1 inch = 62.4035 feet

Figure 2-2
Phase 1 Biosparge Monitoring Locations
SWMU 196, Zone H
Charleston Naval Complex

File Path: c:\18gis\cnc\cnc-egis.apr, Date: 05 Oct 2005 10:15, User: DWILLIAM, EGIS: Charleston Naval Complex - Figure 2-2 Phase 1 Biosparge Monitoring Locations

SECTION 3.0

Project Management

3.0 Project Management

The CMIP will be conducted by the CH2M-Jones team under the supervision of the Navy and the guidance of SCDHEC. CH2M-Jones will be responsible for procuring, coordinating and supervising all subcontractor labor necessary to complete the work, such as drilling, surveying, and laboratory analysis of samples. As members of the BCT, the Navy and SCDHEC both have review and approval authority for all plans and reports generated in support of this CMI. The CH2M-Jones Engineer of Record for this RFI will be Dean Williamson, P.E. The primary point of contact for the CMI field work and reporting will be Darryl Gates. The various project management requirements for successful completion of this work are discussed in more detail below.

3.1 Quality Assurance Requirements

The fieldwork and laboratory work conducted as part of the SWMU 196 CMIP will be performed in accordance with the requirements of the approved RFI CSAP (EnSafe, 1996) and the EPA ESDSOPQAM (1996).

The overall DQOs for the RFI are EPA Level III DQO for contaminant identification and quantification. The required field and QA/QC samples will be collected as required by the CSAP. Subcontractor data will be validated by the CH2M-Jones Project Chemist prior to final interpretation and submittal.

3.2 Data Management Requirements

The CMI field data documentation procedures and laboratory data deliverables will be in accordance with the approved CSAP and the ESDSOPQAM. Field documentation includes site photographs, field sampling logbooks, sample shipping chain of custody forms, soil boring logs, well construction forms and diagrams. Lab documentation includes raw data, instrument calibration logs, sample custody forms, validation summary reports, and final data deliverables.

3.3 Reporting Requirements

After completion of the field work, lab analysis of samples, and screening of analytical results, the Phase I information will be used to refine the Phase II CMI approach for the

source area treatment by biosparging, and a Phase II CMIP will be prepared and submitted. The Phase I results will be presented as an appendix to the Phase II Work Plan.

After completion of the Phase II biosparging CMI field activities, a CMI Report (Revision 0) will be prepared and submitted to the BCT for review and comment. BCT comments will be addressed in writing, and revised document pages or a complete Revision 1 CMI Report will be prepared and submitted for review, as required.

3.4 Health and Safety Requirements

CH2M-Jones places significant emphasis on the health and safety of our personnel, subcontractors, and the local community. All field work completed as part of this CMIP will be performed in accordance with the CH2M-Jones Site-Specific Health and Safety Plan (HSP) (CH2M-Jones, 2000). Personnel working at the site will be required to comply with EPA Level D PPE requirements, as specified in the HSP.

Once all personnel have arrived at the site as part of the mobilization for this CMI, a project briefing and health and safety orientation meeting will be held; daily "tailgate" safety meetings will be conducted to address any site specific issue encountered during work.

SECTION 4.0

Project Schedule

4.0 Project Schedule

The fieldwork to bid, design, construct, deliver, install and test the biosparging system for the Phase I CMI is targeted to occur in mid-2005, with an approximate duration of approximately 90 days. The system will operate for six to nine months with periodic monitoring of system performance and adjacent surface water/sediment quality.

The laboratory turnaround schedule for producing data reports is expected to be approximately four weeks from time of sampling. Data quality review, flagging of data, and data validation are expected to require approximately two weeks after receipt of the electronic data deliverable (EDD) from the lab.

Data analysis, system performance review, and the Phase II CMIP preparation are expected to require approximately 30 days following receipt of final validated data, placing an approximate submittal date for the Phase II CMIP in November 2005.

SECTION 5.0

References

5.0 References

CH2M-Jones. 2000. *Site-Specific Health and Safety Plan*. Charleston Naval Complex.

CH2M-Jones. 2003. *Phase III RFI Report Addendum/IM Completion Report/Corrective Measures Study Work Plan, SWMU 196, Zone H*. Revision 1. June.

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EnSafe Inc./Allen & Hoshall. 1994. *Final Comprehensive RFI Work Plan*. May 31.

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U.S. Environmental Protection Agency. 1996. *Environmental Services Division Standard Operating Procedures and Quality Assurance Manual*. EPA, Region IV, Environmental Services Division.

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U.S. Environmental Protection Agency (EPA). 2000. Risk-based concentration tables. Region III. October.

Scope of Services for Fabrication and Delivery of a Package Biosparging and Soil Vapor Extraction System for SWMU 196, Charleston Naval Complex, South Carolina

November 2004

Contents

SECTION 1.0

Introduction

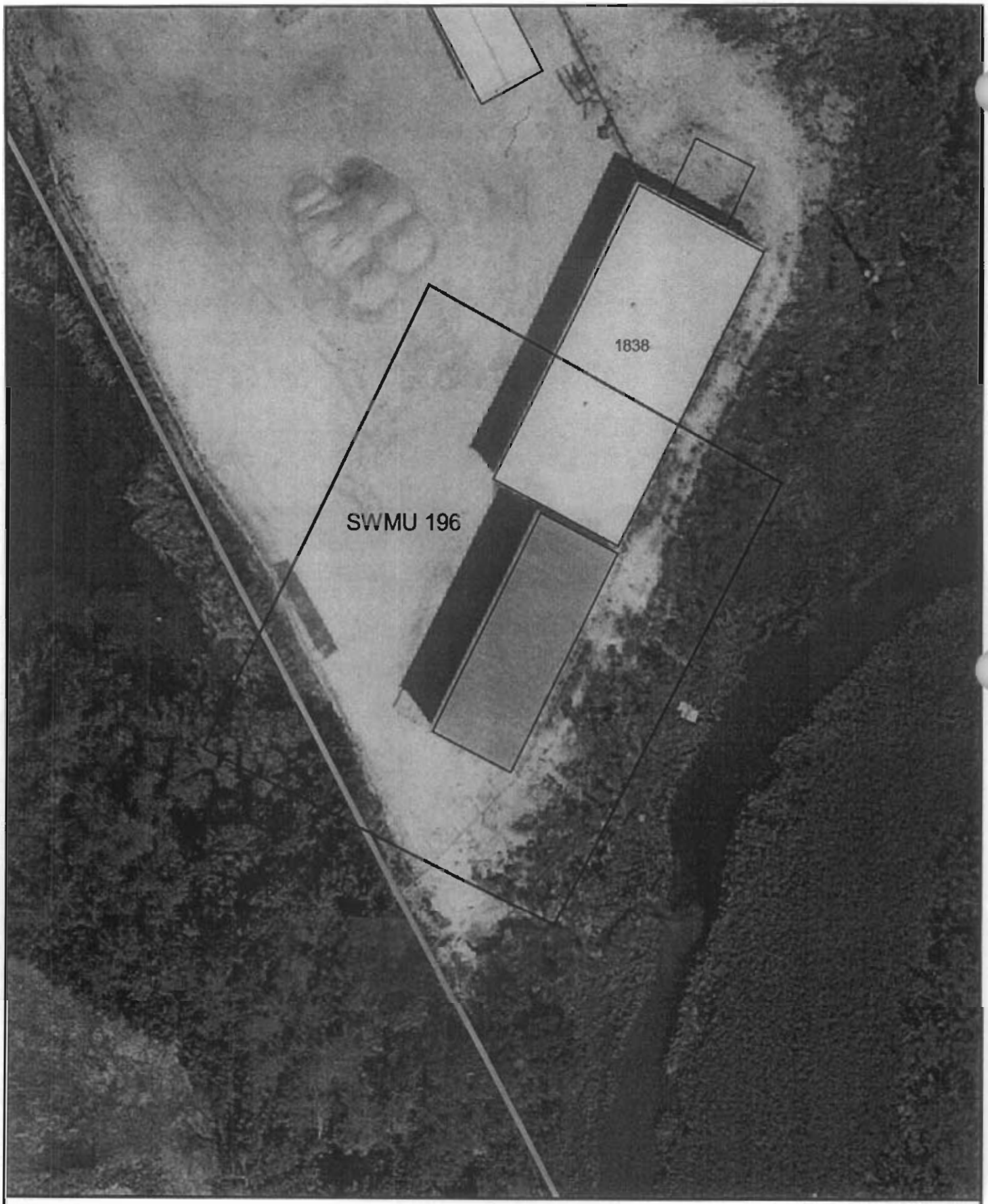
Solid Waste Management Unit 196 (SWMU 196) is located in the southern portion of the Charleston Naval Complex (CNC) and in the southern section of the former public works storage yard that includes Building 1838. **Figure 1** shows a site plan for SWMU 196. This area was formerly tidal marsh land and has been filled to its present elevation. The fill area drops off steeply to the southeast of (to the rear of) Building 1838 toward Shipyard Creek. In 1991, drums and cans containing solvents, paints, acid, and lubricant oil were found stored in the area. Also found were a potassium chromate tank and transformers. All contents were removed by 1993.

Previous soil and groundwater investigations at the site revealed the presence of significant concentrations of chlorobenzene (CB) and dichlorobenzenes (DCBs) in the shallow groundwater. Concentrations in several monitor wells are in excess of one-percent of the maximum solubility of the chemicals in water, indicating the possible presence of a dense non-aqueous phase liquid (DNAPL).

In addition, surface water sampling, through the use of a diffusion sampler, detected low concentrations of DCB in the surface water in Shipyard Creek, near SWMU 196, indicating that a complete migration pathway into Shipyard Creek from this SWMU is present.

An interim measure (IM) was completed at SWMU 196 using in-situ chemical oxidation (ISCO) with Fenton's reagent to reduce concentrations of CBs and DCBs at the site. Dissolved phase concentrations were reduced during application of the ISCO. However, following treatment, the CB and DCB concentrations rebounded approximately to pre-treatment levels in some areas at the site.

The remediation technology selected for this project is a biosparge system (BS) and soil vapor extraction (SVE) system. The remediation system will be installed, operated, and monitored to determine whether further clean up methods are required.



SWMU Boundary
Buildings
Zone Boundary

N

0 30 60 Feet

1 inch = 41.6667 feet

Figure 1-2
Aerial Photograph
SWMU 196, Zone H

CH2MHILL

Contents, continued

Attachments

SECTION 2.0

Overview of Scope of Work

This scope of services for SWMU 196 includes the following activities:

- Submittal of the following for CH2M HILL review and approval:
  - Project Schedule
  - Proposed equipment and detailed drawings (shop drawings and manufacturer's cut sheets)
  - Installation Instructions
  - Manufacturers' Warranty
  - Operation and Maintenance Manual
- Fabrication of a package BS/SVE system
- Integrated factory testing of BS and SVE process equipment
- Delivery of a fully-functional BS and SVE system

The process equipment to be supplied by the Subcontractor will be connected by Others to nineteen existing BS wells and four existing SVE wells.

Attachment A contains the process and instrumentation diagrams (Drawings) for the BS/SVE system. The section entitled Technical Requirements describes the work in detail and references the Drawings in **Attachment A**.

SECTION 3.0

Instructions to Bidders

Bidders must include the following technical submittals with their bid package:

- Payment Schedule Form
- Manufacturer's Data Sheets
- References

3.1 Payment Schedule Form

The Subcontractor shall adhere to and provide prices for equipment and labor as requested on the Payment Schedule Form. The form is organized so that the cost-effectiveness of the bids may be evaluated. No changes shall be made to the wording of the form and failure to provide appropriate defined prices may result in rejection of the bid. In the case of discrepancy between unit prices and totals, unit prices will prevail.

Additional materials or equipment required to complete the work as specified, although not specifically addressed, shall be included in the appropriate associated line item. Fully describe any necessary additional work included at the bottom of the Payment Schedule form. All blank spaces on the attached Payment Schedule must be filled in, preferably in blank ink.

3.2 Manufacturer's Data Sheets

Provide manufacturer's standard data sheets with the Bid for each major piece of equipment including, but not limited to, the following:

- BS blower
- Heat Exchanger
- SVE blower
- Moisture separator
- Main control panel components including process logic controller (PLC) and operator interface
- System enclosure (optional)

3.3 References

Provide a list of three references for similar projects completed within the past three years. Include a name and phone number for a technical contact, a brief description of the scope of work and system capacity, and the date of system startup.

SECTION 4.0

Basis of Award

The award will be made by CH2M HILL to the bidder that can meet the technical requirements, meet the project schedule, provides acceptable references, and submits the lowest responsible bid that, in CH2M HILL's sole and absolute judgment, will best serve the interest of the CNC.

SECTION 5.0

Technical Requirements

5.1 General

This section provides the technical specifications for fabrication, testing, and delivery of a fully-functional BS and SVE system for SWMU 196 at the CNC, South Carolina. The Subcontractor shall furnish all labor, equipment, materials, lower-tier Subcontractors, supplies, and all else necessary to completely perform the Scope of Services identified herein. The Drawings are provided in **Attachment A.**

All work shall be completed in compliance with current federal, state and local regulations and in accordance with standard industry practice. Like items of equipment specified herein shall be the end products of one manufacturer in order to achieve standardization for appearance, maintenance, and replacement.

5.1.1 Summary of Equipment

- One biosparging blower with inlet air filter, inlet silencer, and outlet silencer
- One heat exchanger
- One moisture separator
- One SVE blower with inlet air filter and outlet silencer
- All interconnecting piping and valves shown on the Drawings and as described herein
- SVE system discharge stack to be higher than nearby Building 1838
- Instrumentation and controls as shown on the Drawings and as described herein
- System enclosure (optional)

5.2 General System Information

- The BS system will be used to increase dissolved oxygen concentrations in groundwater at the site. Increased oxygen concentrations are needed to promote aerobic biodegradation of the CBs and DCBs.
- An SVE system will be operated in conjunction with the BS system to mitigate the potential for contaminant vapor accumulation beneath Bldg. 1838 and thus minimize the potential intrusion of vapors into Bldg. 1838.
- Emissions from the SVE system will be discharged directly to the atmosphere since they will be below South Caroline Department of Conservation (SCDEC) standards
- The BS and SVE systems shall be skid mounted. The option for containment within a weatherproof enclosure shall be provided

5.2.1 Service Conditions

- Location: SWMU 196, CNC, South Carolina.
- Ambient Air Temperature Range: minimum 39 degrees F, maximum 91 degrees F.
- Average soil temperature: 20 to 25 degrees Celsius.
- Relative Humidity: Up to 100 percent.
- Site Elevation: approximately 6 feet, mean sea level
- Equipment Duty: Continuous operation, indoor use
- Equipment Life: Up to 20 years with minimal periodic and annual maintenance.

5.3 Performance Requirements

The BS blower shall meet the following performance requirements when operating at the Service Conditions:

BS Blower	Requirement
Capacity of BS Blower Discharge	143 scfm at 9.5 psig [1 atm , 68°F, corrected for gas viscosity per ASTM D3195]

The heat exchanger shall meet the following performance requirements when operating at the Service Conditions:

BS System Heat Exchanger	Units	Requirement
Maximum Outlet Temperature	Degree F	140

If the BS blower alone can meet this performance requirement under the SERVICE CONDITIONS, and a heat exchanger is not necessary, Bidder may state this on the Payment Schedule and omit the heat exchanger requirements described herein. Note that the successful Bidder must be able to prove that the BS blower can meet this performance requirement in the FACTORY TESTING.

The SVE blower system shall meet the following performance requirements when operating at the Service Conditions:

SVE Blower	Requirement
Capacity of SVE Blower Intake	35 scfm at 53 inches H2O vacuum [1 atm, 68°F, corrected for gas viscosity per ASTM D3195]

5.4 Equipment Specifications

5.4.1 BS Blower

- Blower shall be oil-less, complete with accessories as described herein and shown on the Drawings (**Attachment A**). Blower shall be totally enclosed fan cooled (TEFC) electric motor-driven or approved equal. Inlet and discharge silencers shall be coupled as close as possible to the blower connections via flexible connectors. All components shall be mounted on a common mounting base.
- Mounting Base: A common mounting base shall be provided containing the blower, drive, drive motor, inlet and discharge silencers and miscellaneous hardware. Mounting base shall be fabricated steel, sufficiently rigid to maintain equipment alignment during shipping.
- Pressure Relief Valve: A pressure relief valve shall be provided and installed on or immediately downstream of the discharge silencer on the discharge piping. Opening pressure shall be adjustable and shall be factory set to 90 percent of the maximum rated pressure of the blower. The relief valve setting shall be at least sufficient to meet the PERFORMANCE REQUIREMENTS. The relief valve by-pass shall pass sufficient air volume to prevent damaging overload to the blower and drive.
- Inlet and outlet silencers: Provide inlet and outlet silencers to reduce noise level to below 85 decibels at 10 feet.
- Flexible Connectors: Provide flanged flexible connectors at the blower inlet and discharge connections to minimize nozzle loading and to isolate blower vibration. Flexible connectors shall be bellows type flexible couplings, Mercer, Style 500; Garlock, Style 204; or approved equal, with a single hypalon bellows. Flexible connectors shall be rated for the pressure and temperature at the blower discharge connection.

5.4.2 Moisture Separator

- The air/water separator shall be made of steel with a minimum 40-gallon liquid storage capacity and shall include a demister/particulate filter element. The moisture separator shall have a high-high level sensor that automatically shuts down the BS/SVE system if the liquid level in the separator is within ninety percent of its capacity before submerging the intake.
- The moisture separator shall be equipped with an automatic drain pump that is controlled by a high and low level sensor. The pump shall be sized for a maximum of 5 gallons per minute at 10 ft TDH.
- The moisture separator shall have a sight gauge to allow for visual verification of condensate levels.

5.4.3 SVE Blower

- Blower shall be complete with accessories as described herein and shown on the Drawings (**Attachment A**). Blower shall be TEFC electric motor-driven or approved equal. Discharge silencer shall be coupled as close as possible to the blower connection via flexible connection. All components shall be mounted on a common mounting base.
- Mounting Base: A common mounting base shall be provided containing the blower, drive, drive motor, discharge silencer, and miscellaneous hardware. Mounting base shall be fabricated steel, sufficiently rigid to maintain equipment alignment during shipping.
- Vacuum Relief Valve: A vacuum relief valve shall be provided and installed on or upstream of the moisture separator on the inlet piping. Opening vacuum shall be adjustable and shall be factory set to 90% of the maximum rated vacuum of the blower. The relief valve setting shall be at least sufficient to meet the PERFORMANCE REQUIREMENTS. The relief valve shall pass sufficient air volume to prevent damaging overload to the blower and drive.
- Outlet silencer: Provide outlet silencer to reduce noise level to below 85 decibels at 10 feet.
- Flexible Connectors: Provide flanged flexible connectors at the blower inlet and discharge connections to minimize nozzle loading and to isolate blower vibration. Flexible connectors shall bellows type flexible couplings, Mercer, Style 500; Garlock, Style 204; or approved equal, with a single hypalon bellows. Flexible connectors shall be rated for the pressure and temperature at the blower discharge connection.
- The SVE discharge stack shall be plumbed from the SVE blower discharge silencer and using galvanized steel piping and shall be equipped and fitted to be 20 feet in height from the ground surface so that the stack discharges above the Building 1838 roofline. Stack materials shall be supplied and shipped in five-foot sections. The SVE stack shall be plumbed up through the roof of the enclosure, if this option is chosen. Per local building codes, the Stack must be designed and installed for a sustained wind speed of 110 mph, with a 3-second gust to 130 mph.

5.4.4 Heat Exchanger

The heat exchanger shall be an air to air exchanger supplied with a TEFC cooling fan and motor or approved equal to meet the PERFORMANCE REQUIREMENTS.

5.4.5 Interconnecting Piping

- Use manufacturer's standard piping material that is compatible with the temperature and system conditions.
- Piping will be sized to achieve the pressure and flow specified.

5.5 Treatment System Connections

- The connection points of the main BS blower discharge line and the moisture separator inlet line shall be located on the same side of the skid/enclosure.
- The BS blower discharge port shall be connected to a 2-inch galvanized steel main line which leads to the air delivery manifold. The air delivery manifold shall be composed of 2-inch galvanized piping and fittings, and 1-inch galvanized piping, valves, and gauges for 19 BS field piping lines as indicated on the Drawings. A low headloss check valve must be installed between the BS blower and the manifold to prevent aquifer water from coming through the well lines and damaging the blower. Alternate layouts of the manifold may be presented for review and approval by CH2M HILL. Connections from the manifold to each air injection well will be made by Others.
  - The air delivery manifold shall be mounted on the exterior of the enclosure if this option is chosen. If there is to be no enclosure, the air delivery manifold shall be mounted on the BS skid and sufficiently supported.
  - Flow control valve on main BS blower discharge line shall be a gate valve.
  - Flow control valves on the 19 well lines shall be needle valves with a maximum Cv (flow coefficient) of 2.
- The inlet line to the moisture separator will be connected to a 2-inch Schedule 40 PVC SVE air extraction manifold. The air extraction manifold shall be composed of 2-inch schedule 40 PVC piping and fittings, and valves and gauges for 4 SVE field piping lines as indicated on the Drawings. Connections from the manifold to each air extraction well will be made by others.
  - Flow control valves on the 4 SVE well lines shall be globe valves with a maximum Cv (flow coefficient) of 35.

5.6 Control System

5.6.1 General

- The Process and Instrumentation Diagrams (**Attachment A**) and these specifications depict the minimum functional requirements of the BS/SVE control system. The Subcontractor shall provide all instrumentation and controls necessary to provide a safe and operable system. The specific control system proposed shall be subject to the review and approval of CH2M HILL.
- The Control System components shall be supplied for protected interior operation under the Service Conditions as follows:

Panel No.	Name	NEMA Rating
CP-1	BS/SVE Control Panel	12

- Panel: Skid/enclosure wall frame mounted type, containing all operator interface and local control devices, main circuit breaker, motor starters, circuit breakers, and control power transformer.

5.6.2 Operator Controls and Indicators

The following operator controls and indicators shall be provided and installed:

- System ON switch.
- HAND-OFF-AUTO selector switch for each motor.
- RUN indicating light for each motor.
- ALARM indicator lights for all alarm conditions.
- Elapsed time meter for each motor.
- RESET push button to reset alarms.

5.6.3 External Interfaces

None needed.

5.6.4 Instrumentation

Provide the following instruments and locate as shown on the Drawings in **Attachment A**:

- The following instrumentation is to be provided for the SVE system:
  - One airflow meter for each of the four (4) SVE well lines on the SVE manifold (0-10 scfm). An orifice-plate type, direct-read differential pressure. The orifice plate flow meter shall be Oripac Model 4150-P, or equal, with integral differential pressure gauge. The primary element shall be monolithic (single piece) constructed entirely of Grade 2 gray PVC or CPVC. Accuracy shall be a 1% or better.
  - Direct acting float switches with an enclosed mercury switch and integral cable or equal for moisture separator level sensing for pump and shutdown control. Intrinsic safety barriers shall be installed in-line between the level sensor in the moisture separator and the Control Panel.
  - One vacuum gauge for each of the four (4) SVE well lines on the SVE manifold (0-50 inches of water vacuum).
  - One vacuum gauge each for the SVE blower influent air stream upstream and downstream of the moisture separator (0-50 inches of water vacuum).
  - One temperature gauge for the SVE blower influent adjacent to the airflow indicator (0-100 degrees Fahrenheit).
  - One temperature gauge for the SVE blower effluent air stream (0-300 degrees Fahrenheit).

- One temperature gauge each of the four (4) SVE well lines on the SVE manifold (0-100 degrees Fahrenheit).
- One pressure gauge for SVE blower effluent air stream (0-50 inches of water).

- The following instrumentation shall be supplied for the BS system:
  - One airflow indicator for each of the (19) BS well lines (0-10 scfm). An orifice-plate type, direct-read differential pressure. The orifice plate flow meter shall be Oripac Model 4150-P, or equal, with integral differential pressure gauge. The primary element shall be monolithic (single piece) constructed entirely of Grade 2 gray PVC or CPVC. Accuracy shall be a 1% or better.
  - One pressure gauge each for BS blower effluent air stream upstream and downstream of the heat exchanger (0-20 psig).
  - One pressure gauge for each of the (19) BS well lines (0-20 psig).
  - One temperature gauge for the BS blower effluent air stream upstream of the heat exchanger (0-300 degrees Fahrenheit).
  - One temperature gauge and high temperature switch for the BS blower effluent air stream downstream of the heat exchanger (0-300 degrees Fahrenheit).
  - One vacuum gauge for the BS blower influent air stream (0-20 psig vacuum).
  - One temperature gauge and low temperature switch to measure ambient air temperature within the enclosure (0-200 degrees Fahrenheit). If the enclose option is not selected, these items are not required.

5.6.5 Functional Requirements

Complete automatic and manual operation of the BS/SVE system. Provide the following functions:

- In the HAND mode, the BS blower shall operate continuously. In the AUTO mode, with a permissive contact closure from the system ON switch and the SVE ON switch, the BS blower shall operate continuously. Without a permissive contact closure from the local control panel or the SVE blower, the BS blower shall not run. In the OFF mode, the BS blower shall not run. Provide timers to stagger the blower motor start after a power outage.
- In the HAND mode, the SVE blower shall operate continuously. In the AUTO mode, with a permissive contact closure from the system ON switch, the SVE blower shall operate continuously. Without a permissive contact closure from the local control panel, the SVE blower shall not run. In the OFF mode, the SVE blower shall not run. Provide timers to stagger the blower start after a power outage.
- In the HAND mode, the moisture separator pump shall operate continuously. In the AUTO mode, with a permissive contact closure from the system ON switch, the effluent pump shall start when the level in the moisture separator is HIGH and stop when the

level in the moisture separator is LOW. Without a permissive contact closure from the local control panel, the effluent pump shall not run. In the OFF mode, the effluent pump shall not run. Provide timers to stagger the effluent pump motor start after a power outage.

- Provide time delay relay to stagger motor start, 0 to 30 seconds.

5.6.6 Alarm Functions for All Equipment

- When any alarm occurs, alarm is sealed and will require an operator intervention to reset.
- When the SVE bower fails, shut down the BS blower.
- When moisture separator liquid level is HIGH-HIGH, shut down the SVE and BS blowers.
- When the ambient temperature is 32 degrees Fahrenheit or below, shut down SVE and BS blowers.
- When BS effluent air stream temperature (located downstream of the heat exchanger) is HIGH (pre-set at 140 degrees F), shut down BS blower.

5.6.7 Indications for All Equipment

- Total system on light
- SVE blower on light
- SVE blower run time meter
- BS blower on light
- BS blower run time meter
- Heat exchanger on light
- Heat exchanger run time meter
- Condensate pump on light
- Condensate pump run time meter
- BS blower fail alarm indication
- SVE blower fail alarm indication
- Moisture separator HIGH-HIGH level alarm indication
- BS blower effluent air stream temperature (located after heat exchanger) alarm indication
- Ambient air low temperature alarm indication.

5.7 Electrical System

- Ambient conditions at the site are not classified as hazardous. However, Subcontractor shall be responsible for provision of equipment that is compliant with the National Electric Code including instrumentation that is connected directly to the system process stream.
- Current power at the site is 122/40 single phase. 480 volt, 3-phase power can be brought to the site.
- 120V or 480V Main load center with individual circuit breakers for BS blower, SVE blower, and heat exchanger.
- Pre-wire all motors, valves and switches to the extent possible to the Control Panel.
- Identify all wiring with permanent labels at both ends, terminated with solderless lug, and terminated on numbered terminal blocks.
- Wire Type: stranded copper, THHN/THWN insulation.
- Minimum Wire Size: No. 12 AWG tin-plated copper.
- Color-coded (provide a wire color coding legend posted in a prominent location inside control panel access).
- Wiring shall be complete to internal terminal strips in the Control Panel.
- Conform to all federal, state, and local electrical codes.
- Raceway (conduits) shall be rigid steel conduits. Washers, bolts, nuts, and other fittings shall be galvanized steel. Final connections to all motors shall be flexible, liquid tight.

5.8 System Enclosure (optional)

Provide a weatherproof SYSTEM ENCLOSURE with the following as a minimum:

- Sufficient structural capability to contain all specified equipment.
- Sufficient structural capability to mount both the BS and SVE manifolds, and the SVE exhaust stack to the exterior.
- Dimensions allowing a minimum clearance of 24 inches on all sides of all equipment
- Meets all applicable building codes.
- Designed for a sustained wind speed of 110 mph, with a 3- second gust to 130 mph.
- Appropriately constructed walls, roof, and ceiling.
- Finished exterior. Provide a maintenance-free exterior coating with a minimum 2-year warranty.
- Provide doors shall be sized to allow easy removal of all equipment, individually.

- Provide a gravity backdraft intake damper located at the bottom of the wall and an exhaust fan at the top of the wall for ventilation of the enclosure. Locate the fan at the opposite end of the enclosure from the intake damper. The fan shall operate through an ON/OFF/AUTO switch. In the AUTO position fan control shall be via a wall-mounted thermostat set to energize the fan on a rise in space temperature above 85 degrees F (adjustable). Fans shall be 115V, 60-Hz, electrical supply with a totally enclosed motor. Provide fans with manufacturer's standard corrosion resistant coating. Fans shall provide a minimum of 10 air changes per hour.
- Provide Interior Illumination: At 36 inches above floor, 50 foot-candles minimum from incandescent luminaries.
- Light switch inside door for control of interior luminaries.
- One duplex receptacle near the door.
- Electrical circuits as required for all lights, receptacles, HVAC equipment and controls.
- All wiring shall be in conduit.
- The SYSTEM ENCLOSURE proposed shall be subject to the approval of the CONTRACTOR.
- Equipment Layout
  - The equipment (BS blower, SVE blower, moisture separator, effluent pump, control panel, and associated ancillary equipment and couplings) shall be bolted inside the enclosure. Equipment shall be arranged to allow access around the equipment for operation and maintenance.
  - The proposed equipment layout shall be subject to the approval of the CONTRACTOR.

5.9 Coatings

- Carbon steel and all other non-corrosion resistant pieces of equipment shall be prepared, primed, and finished coated in accordance with manufacturer's recommendations.
- Equipment shall be painted prior to arrival onsite. Paint shall appear neat, clean, and drip-free.

5.10 Extra Materials

Furnish one set of materials required for 1 year of operation and maintenance, including, but not limited to, the following:

- Three sets of BS and SVE blower inlet filters
- One package each of lubricants, if necessary, for each blower
- One complete set of spare fuses for the control panel

- One complete set of spare light bulbs for the control panel

5.11 Installation

- Provide a fully-functional self-contained unit to the site. The unit shall be pre-wired, pre-ducted, pre-piped, and otherwise pre-assembled to be fully-functional. Connection to CNC grid power and connection to BS and SVE wells will be performed by Others.
- Install all equipment in accordance with manufacturer's instructions and as shown on the Drawings.
  - Level bases by means of steel wedges (steel plates and steel shims). Wedge taper not greater than ¼-inch per foot. Accomplish wedging so that there is no change of level or springing of the baseplate when the anchor bolts are tightened.
  - After equipment has been set in position, aligned, and shimmed to the proper elevation. Connect suction and discharge piping to equipment without imposing strain to the equipment flanges.

5.12 Factory Tests

The Subcontractor shall factory test individual components prior to delivery to the site. The test should ensure that the treatment system meets the specifications and contains no leaks in the process piping. The primary intent of the factory testing is to ensure that the system controls are functioning as required.

One Performance Test each shall be conducted for the BS and SVE blower systems to show that the blower is producing the pressure/vacuum and airflow rate in PERFORMANCE REQUIREMENTS. The systems will be operated individually and as an integrated system for approximately one continuous hour. Pressure and airflow rate shall be monitored. System controls and interlocks will be tested.

All equipment described herein shall be inspected for proper level, proper alignment, proper flow output, proper operating temperatures, proper control, and proper connection by the manufacturer's representative. The Subcontractor shall be responsible for any repairs, if necessary, to ensure that the treatment system meets proper specifications. The Subcontractor shall provide all equipment necessary to perform tests in their factory.

The Subcontractor shall notify CH2M HILL seven days before operational testing so that CH2M HILL may send a representative to observe the testing. The Subcontractor is responsible for rectifying any problems with the system noted during the factory testing prior to delivery.

Note: Notification of the CH2M HILL seven days prior the factory tests is mandatory. Failure to do so will result in a $5,000 deduction from final payment.

5.13 Preparation for Shipment and Protection

Match-marked system components shall be reduced to minimum number of shipping subassemblies, with each supported and contained in a weather-resistant shipping cocoon. Loose accessories, fittings, gauges, and documents shall be consolidated in a sealed shipping carton and included as part of a shipment.

5.14 Startup Tests

Prior to Final Payment, CH2M HILL will perform startup tests to verify that the equipment meets the PERFORMANCE REQUIREMENTS on-site. These tests will include the following:

- SVE blower performance testing
- BS blower performance testing
- Heat exchanger performance testing
- Condensate pump performance testing

The Subcontractor shall be responsible for any repairs, if necessary, to ensure that the treatment system meets proper specifications.

SECTION 6.0

Project Schedule

The Subcontractor shall provide all resources necessary to complete this Scope of Services. The anticipated schedule for the work will require a maximum of eight weeks to manufacture and factory test the system and deliver to the field site at CNC, SC. Field installation will be provided by Others.

The Bidder is requested to state in their Proposal the estimated time to complete the work, including all submittals, and the estimated duration of equipment fabrication. This information shall be provided to CH2M HILL with the Proposal.

SECTION 7.0

General Requirements

7.1 General QA/QC Requirements

Reference Standards: Construction shall comply with the applicable provisions and recommendations of the following:

- National Electrical Manufacturers Association (NEMA)
- National Electric Code (NEC)
- Underwriters Laboratory (UL)

The quality of all equipment and materials shall be subject to the inspection and approval of CH2M HILL prior to shipment to the site as specified in **Section 5** and subject to the provisions of the Warranty as specified in **Section 8**.

7.2 Reliability

The remediation system reliability is of critical importance to CH2M HILL. CH2M HILL expects no components will fail during the first year of operation. Any component with an annual expected downtime of greater than 72 hours shall be provided with a parallel standby redundant component. The entire system and components selection shall be based on a maximum downtime of one week in one year.

Refurbished equipment may be provided. All refurbished equipment must meet all functional requirements and be warranted the same as new equipment.

7.3 Requests for Information

When information/direction is required, Subcontractor shall submit requests for information (RFI) in writing to CH2M HILL in order to document a specific problem, question or concern, and the answer or direction obtained in response to the RFI. The RFI shall include, at a minimum, a complete description of the problem/question/concern, a reasonable response date, and the Subcontractor's signature. CH2M HILL will answer and sign the RFI and return the RFI to the Subcontractor.

7.4 Changes in Scope/Technical Direction

CH2M HILL requires the Subcontractor to submit in writing (along with an estimate of the cost of the change) any notice of change in this scope of work prior to initiating the change. Any work performed by the Subcontractor outside the approved scope of work without CH2M HILL's prior written acceptance shall not be considered for compensation.

SECTION 8.0

Project Submittals

One copy each of the following submittals shall be sent to:

Mr. Dean Williamson
CH2M HILL
3011 SW Williston Road
Gainesville, Florida 32608
Fax: (352) 335-2959

Ms. Linda Colella
CH2M HILL
30044 Roan Drive
Evergreen, CO 80439
Fax: 720-286-9940

To expedite approval, legible copies of the submittals may also be faxed to the numbers listed above. Original hard copies must follow to the addresses above.

8.1 Shop Drawings and Data Sheets

Submit to CH2M HILL seven days after Subcontract is signed. Shop drawings shall be approved by CH2M HILL prior to system fabrication. The following manufacturer's cut sheets and specific information shall be submitted:

- Equipment layout drawing showing all equipment, drawn to scale. Include location, type, and size for all connections to the equipment, all temperature, flow, and pressure monitoring equipment, all valves, filters, and silencers, manifolds, and the control panel.
- Manufacturer's cut sheets for the SVE blower, including operating curve for the SVE blower.
- Manufacturer's cut sheets for the BS blower, including operating curve for the BS blower.
- Manufacturer's cut sheets for instrumentation including all temperature, flow and pressure monitoring equipment.
- Manufacturer's cut sheets for the primary components of the control panel including the PLC and operator interface
- Manufacturer's cut sheets for the moisture separator and condensate pump, including internal volume, storage capacity, and level control system.
- Manufacturer's cut sheets for the heat exchanger, including the cooling fan motor horsepower.
- Specifications for the enclosure, if this option is selected, including materials of construction and dimensions.

8.2 Warranty

Submit Warranty to CH2M HILL upon delivery of equipment to site. Minimum requirements for the Performance Warranty are specified below. Include all warranty information in Operation and Maintenance Manual.

- The Performance Warranty shall be for a period of 1 year from the date of final acceptance.
- The Performance Warranty shall cover all BS/SVE system components for defects in materials and workmanship.
- The Performance Warranty shall cover the BS/SVE system for failure to meet the PERFORMANCE REQUIREMENTS at the Service Conditions.
- The Subcontractor shall provide manufacturer's warranty for appropriate equipment.

Within one year after the date of final acceptance of the Work or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Subcontract documents, the Subcontractor shall make all needed repairs arising out of defective workmanship or materials, or both, which in the judgement of CH2M HILL shall become necessary during such period. If within ten (10) days after the mailing of a notice in writing to the Subcontractor or his agent, the Subcontractor shall neglect to make or undertake with due diligence to make the aforesaid repairs, CH2M HILL is hereby authorized to make such repairs at the Subcontractor's expense. In case of an emergency, the Subcontractor will be notified and shall correct and make repairs within the necessary time constraints. Failure of the Subcontractor to respond to the notification shall result in CH2M HILL making the necessary repairs at the Subcontractor's expense. This obligation shall survive termination of the Subcontract.

8.3 Operation and Maintenance Manual

Submit a complete Operations and Maintenance Manual. Submit an outline of the Manual for approval by CH2M HILL. Submit three copies of the Manual in hard copy and one in electronic format. Submit the Manual text in Microsoft Word™ and the as-built drawings in AutoCAD 2002 (or lower) or MicroStation V8 (or lower) format. Submit the Manual in a 3-ring binder format that contains tabbed dividers between the operations and maintenance requirements for each separate piece of equipment. Provide a Table of Contents for each section of material that is provided. Provide the following detailed information in the Manual.

- Detailed system operations safety precautions.
- Detailed procedures for system startup, normal operations, and shut down.
- Detailed procedures for performing routine, Manufacturer-recommended equipment maintenance and cleaning.
- Detailed procedures for troubleshooting common treatment system malfunctions.
- As-built drawings including electrical schematics and control logic.
- A list of equipment with corresponding equipment manufacturer name, address, and telephone numbers for maintenance/warranty issue.
- Approved catalog cut sheets for all equipment including manufacturer's installation and operation and maintenance procedures and recommendations.

    - List of special tools, materials, and supplies furnished with equipment for use prior to and during start up and for future maintenance.

- Schedule of recommended spare parts to maintain the equipment in service for a period of 10 years. Include current price information.

SECTION 9.0

Payment

Payment for all work and materials specified herein shall be on a not-to-exceed basis at the lump sum amounts stated on the Subcontractor's attached Payment Schedule form for work successfully completed.

Upon completion of all work under the Contract, Subcontractor shall notify the Contractor in writing that the work is complete and that final payment is appropriate. If the work has been completed to the extent of the Subcontract, the Contractor will accept the completed work and make payment of the final amount due.

Payment Schedule for
Site Remediation at SWMU 196
Charleston Naval Complex, Charleston, South Carolina

Bidder's Name:

Bidder shall provide **Lump Sum Prices** to provide the equipment specified below. Proposal should include all labor, equipment, materials, lower-tier subcontractors, and supplies necessary to complete the scope of work as specified herein. The quantities provided below are estimated. Payment will be for actual quantities of work.

	Description	Qty.	Units	Extended Total
1	Biosparge system materials and assembly labor including blower, heat exchanger, inlet air filter, inlet silencer, discharge silencer, and all interconnecting piping and valves as showing on the Drawings **(Drawings I-2 and I-4)**	1	Lump Sum	$_____
2	BS Manifold	1	Lump Sum	$_____
3	SVE system materials and assembly labor including blower, moisture separator, condensate pump, discharge silencer, inlet air filter, and all interconnecting piping and valves as showing on the Drawings **(Drawing I-3)**	1	Lump Sum	$_____
4	SVE Manifold	1	Lump Sum	$_____
5	Instrumentation and Control System equipment.	1	Lump Sum	$_____
6	Shipping and unloading on-site at CNC, SC	1	Lump Sum	$_____
TOTAL BID				$_____
Optional Enclosure		1	Lump Sum	$_____
Earliest Delivery Date (from Notice to Proceed) _____				

Describe any additional work included:

_____

_____

_____

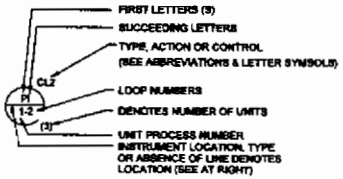
_____ _____

Signature Date

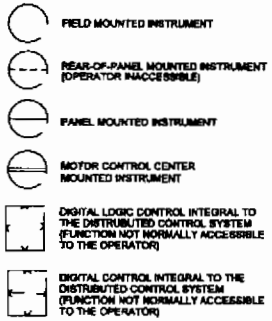
ATTACHMENT A

Drawings

INSTRUMENT IDENTIFICATION



INSTRUMENT LOCATION SYMBOL

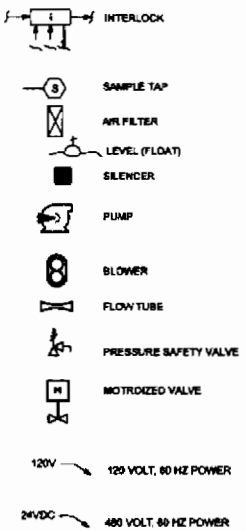


INSTRUMENT SOCIETY OF AMERICA TABLE (ISA)

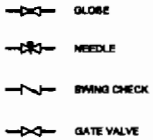
	FIRST LETTER (S)		SUCCEEDING LETTERS		
LETTER	PROCESS OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS (*)		ALARM		
B	BURNER FLAME		USERS CHOICE (*)	USERS CHOICE (*)	USERS CHOICE (*)
C	CONDUCTIVITY			CONTROL	
D	DENSITY (S.G)	DIFFERENTIAL			
E	VOLTAGE (EMF)		PRIMARY ELEMENT		
F	FLOW RATE	RATIO			
G	GAUGE		GLASS	GATE	
H	HAND (MANUAL)				HIGH
I	CURRENT		INDICATE		
J	POWER	SCAN			
K	TIME OR TIME SCHEDULE			CONTROL STATION	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOTION				MIDDLE
N	USERS CHOICE (*)		USERS CHOICE(*)	USERS CHOICE (*)	USERS CHOICE(*)
O	USERS CHOICE (*)		ORIFICE		
P	PRESSURE OR VACUUM		POINT (TEST CONNECTION)		
Q	QUANTITY OR EVENT(*)	INTEGRATE	INTEGRATE		
R			RECORD OR PRINT		
S	SPEED OR FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE (*)		MULTIFUNCTION (*)		
V	VISCOSITY			VALVE	
W	WEIGHT OR FORCE	WELL			
X	UNCLASSIFIED (*)		UNCLASSIFIED (*)	UNCLASSIFIED(*)	UNCLASSIFIED(*)
Y	USERS CHOICE (*)			RELAY OR COMPUTE(*)	
Z	POSITION			DRIVE, ACTUATE OR UNCLASSIFIED FINAL CONTROL ELEMENT	

(*) WHEN USED, EXPLANATION IS SHOWN ADJACENT TO INSTRUMENT SYMBOL. SEE ABBREVIATIONS AND LETTER SYMBOLS.

MISCELLANEOUS SYMBOLS



VALVE SYMBOLS

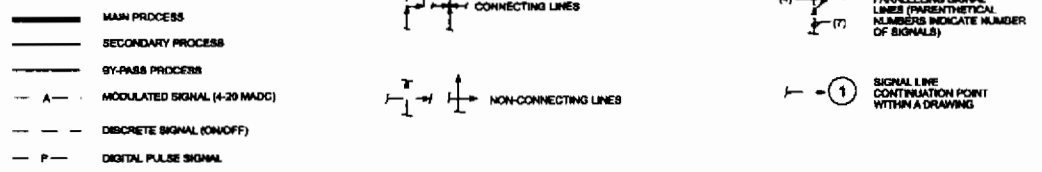


PRIMARY ELEMENT SYMBOLS

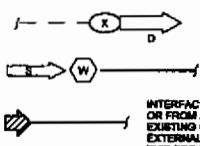
ABBREVIATIONS & LETTER SYMBOLS

AAH	ANALYZER ALARM HIGH
AAHH	ANALYZER ALARM HIGH HIGH
AE	ANALYZER ELEMENT
AIT	ANALYZER INDICATING TRANSMITTER
CP	CONTROL PANEL
FI	FLOW INDICATOR
FIT	FLOW INDICATING TRANSMITTER
HOA	HANDS OFF AUTO
HS	HAND SWITCH
HM	HOUR METER
LAHH	LEVEL ALARM HIGH HIGH
LSH	LEVEL SWITCH HIGH
LSHH	LEVEL SWITCH HIGH HIGH
LSL	LEVEL SWITCH LOW
OO	ON OFF
PI	PRESSURE INDICATOR
PIT	PRESSURE INDICATOR TRANSMITTER
QA	EVENT ALARM
QL	EVENT LIGHT
SS	START STOP
TAH	TEMPERATURE ALARM HIGH
TSH	TEMPERATURE SWITCH HIGH
TI	TEMPERATURE INDICATOR
TIT	TEMPERATURE INDICATING TRANSMITTER
VGAC	VAPOR-PHASE GRANULAR ACTIVATED CARBON

LINE LEGEND



INTERFACE SYMBOLS



SIGNAL INTERFACE

PROCESS INTERFACE

D DESTINATION DRAWING NO.

S SOURCE DRAWING NO.

W INTERFACE NO.

X INTERFACE LETTER

EQUIPMENT TAG NUMBERS

EQUIPMENT TYP SYMBOLS
P=PUMP
T=TANK
M=MECHANICAL EQUIPMENT
Y: LOOP NUMBER

X-Y

X
Y

GENERAL NOTES

1. THIS IS A STANDARD LEGEND SHEET. NOT ALL THE INFORMATION SHOWN MAY BE USED ON THE PROJECT.

DSGN	L. COLELLA						
DR	R. LOVELL						
CHK	T. PALAIA						
APVD	D. WILLIAMSON	NO.	DATE	REVISION	BY	APVD	

CH2MHILL

SWMU 196
BIOSPARGE / SVE REMEDIATION SYSTEM
CHARLESTON NAVAL COMPLEX, SC

PROCESS INSTRUMENTATION AND CONTROLS
BIOSPARGE / SVE SYSTEM
PROCESS AND INSTRUMENTATION DIAGRAMS

SHEET	1
DWG NO.	I-1
DATE	October 8, 2004
PROJ NO.	298914.ZH.EX.10

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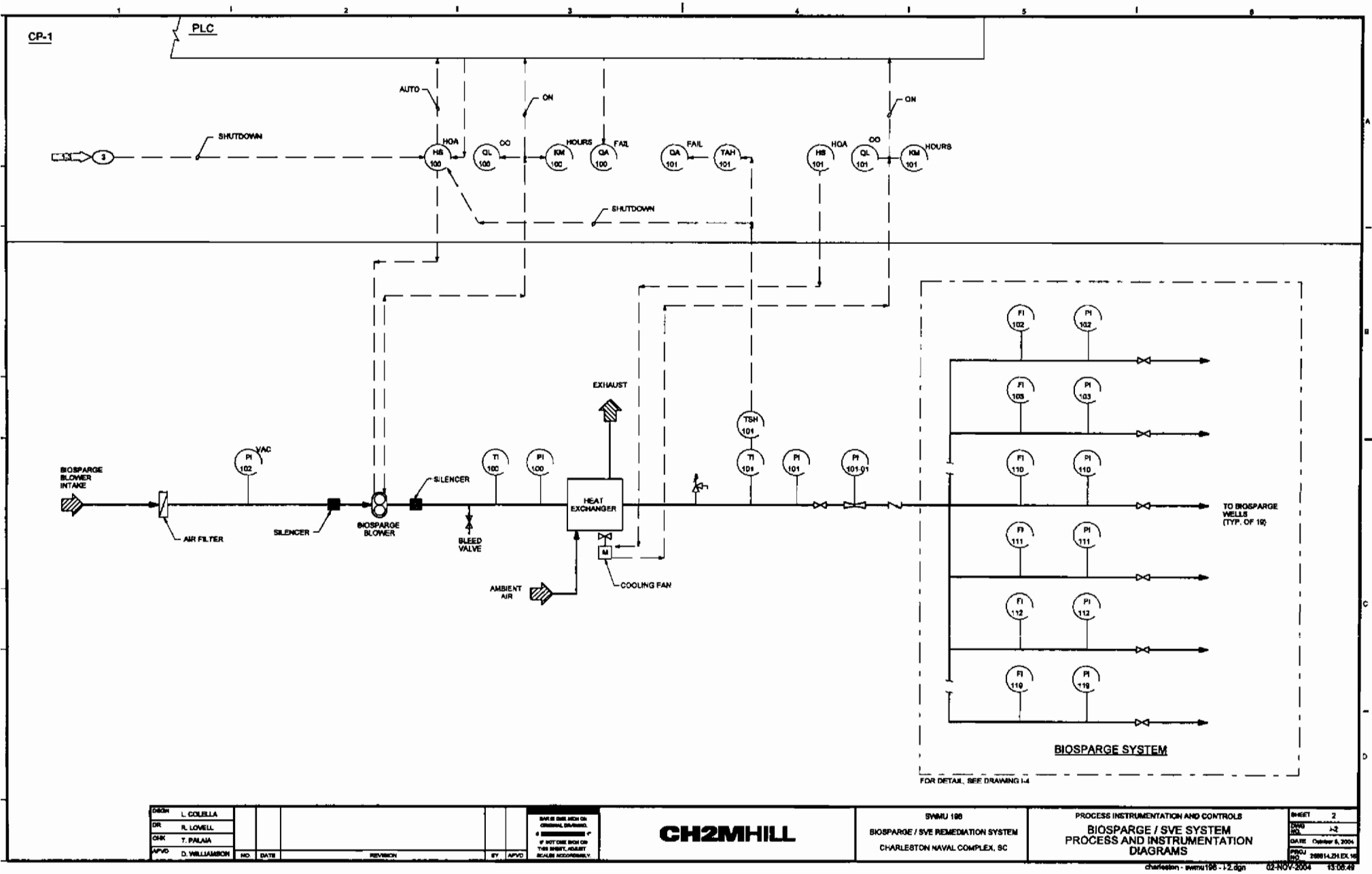

DESIGN	L. COLELLA						
DR	R. LOVELL						
CHK	T. PALAIA						
APVD	D. WILLIAMSON	NO.	DATE	REVISION	BY	APVD	

BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

CH2MHILL

SWMU 196
BIOSPARGE / SVE REMEDIATION SYSTEM
CHARLESTON NAVAL COMPLEX, SC

PROCESS INSTRUMENTATION AND CONTROLS
BIOSPARGE / SVE SYSTEM
PROCESS AND INSTRUMENTATION DIAGRAMS

SHEET 2
DWG NO. I-2
DATE October 5, 2004
PROJ NO. 268814.ZH.EX.16

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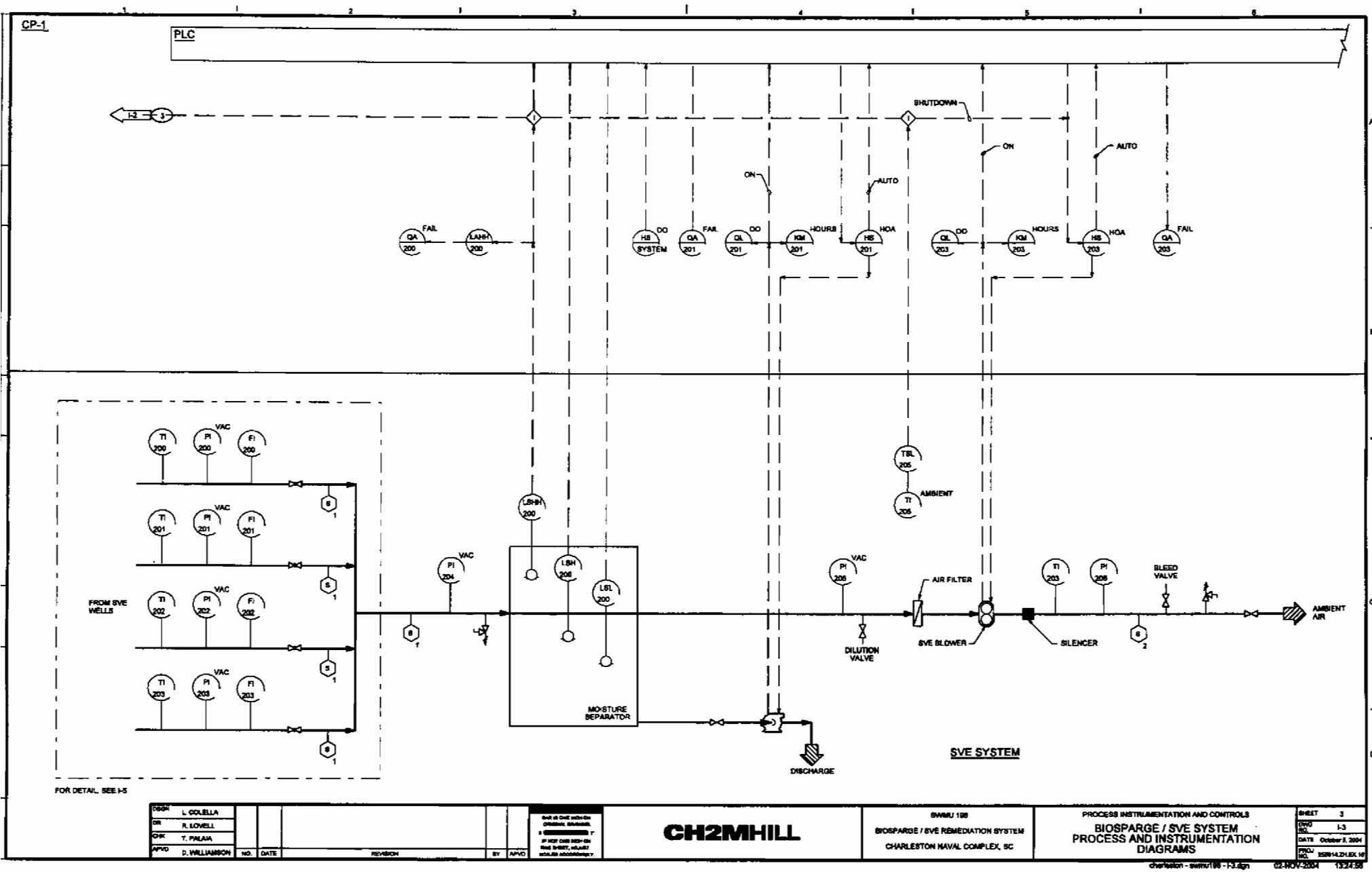

SVE SYSTEM

DSGN	L. COLELLA						
DR	R. LOVELL						
CHK	T. PALMA						
APVD	D. WILLIAMSON	NO.	DATE	REVISION	BY	APVD	

CH2MHILL

SWMU 186
BIOSPARGE / SVE REMEDIATION SYSTEM
CHARLESTON NAVAL COMPLEX, SC

PROCESS INSTRUMENTATION AND CONTROLS
BIOSPARGE / SVE SYSTEM
PROCESS AND INSTRUMENTATION DIAGRAMS

SHEET 3
DWG NO. I-3
DATE October 5, 2004
PROJ NO. 352814.ZH.LEX.10

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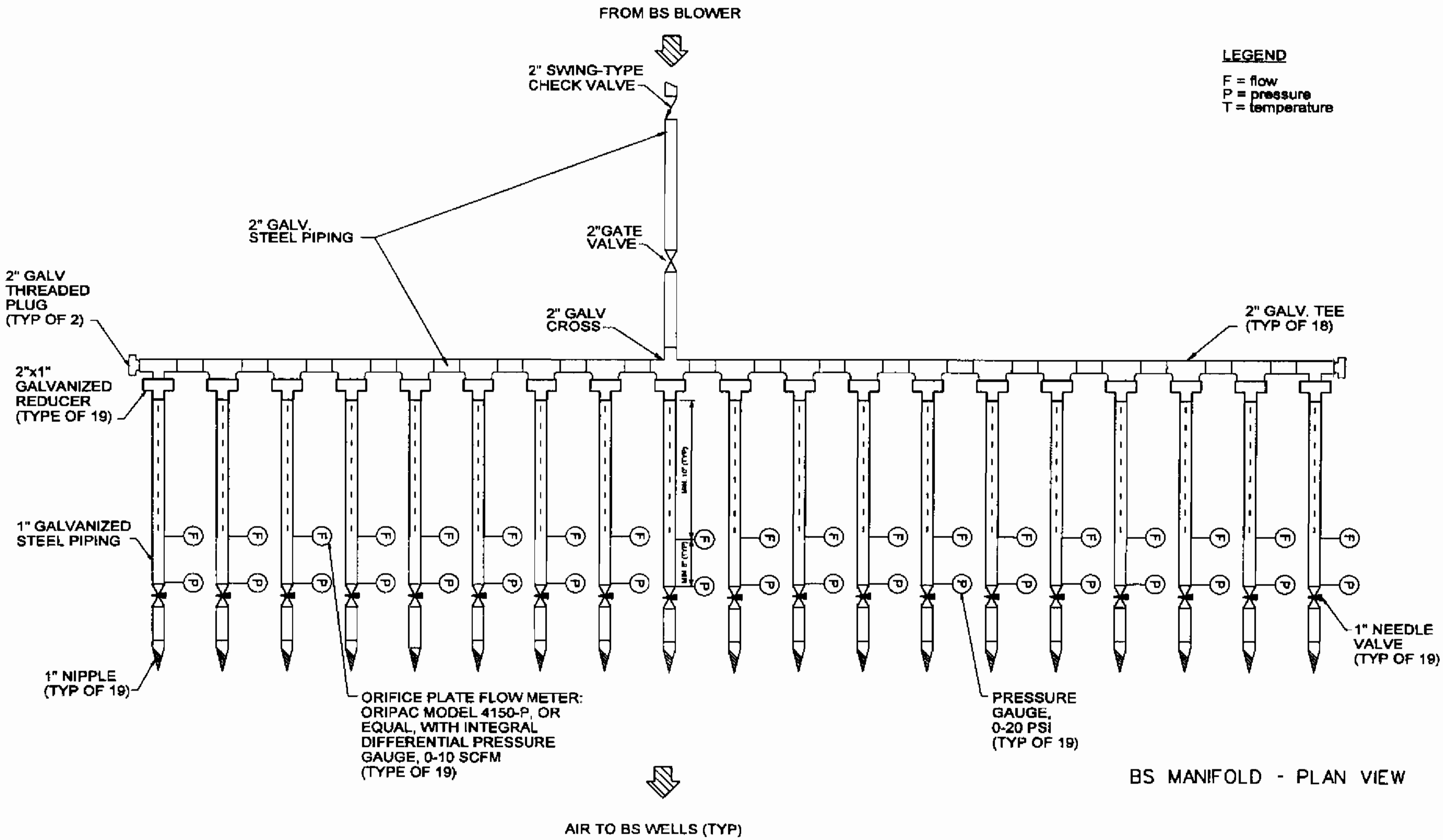

BS MANIFOLD - PLAN VIEW

DSGN	L. COLELLA	CH2MHILL	SWMU 196	PROCESS INSTRUMENTATION AND CONTROLS	SHEET 4
DR	R. LOVELL		BIOSPARGE / SVE REMEDIATION SYSTEM	BS MANIFOLD PLAN VIEW	DWG NO. I-4
CHK	T. PALAIA		CHARLESTON NAVAL COMPLEX, SC		DATE October 8, 2004
APVD	D. WILLIAMSON				PROJ NO. 258914.ZH.EX.16

NO | DATE | REVISION | BY | APVD

BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

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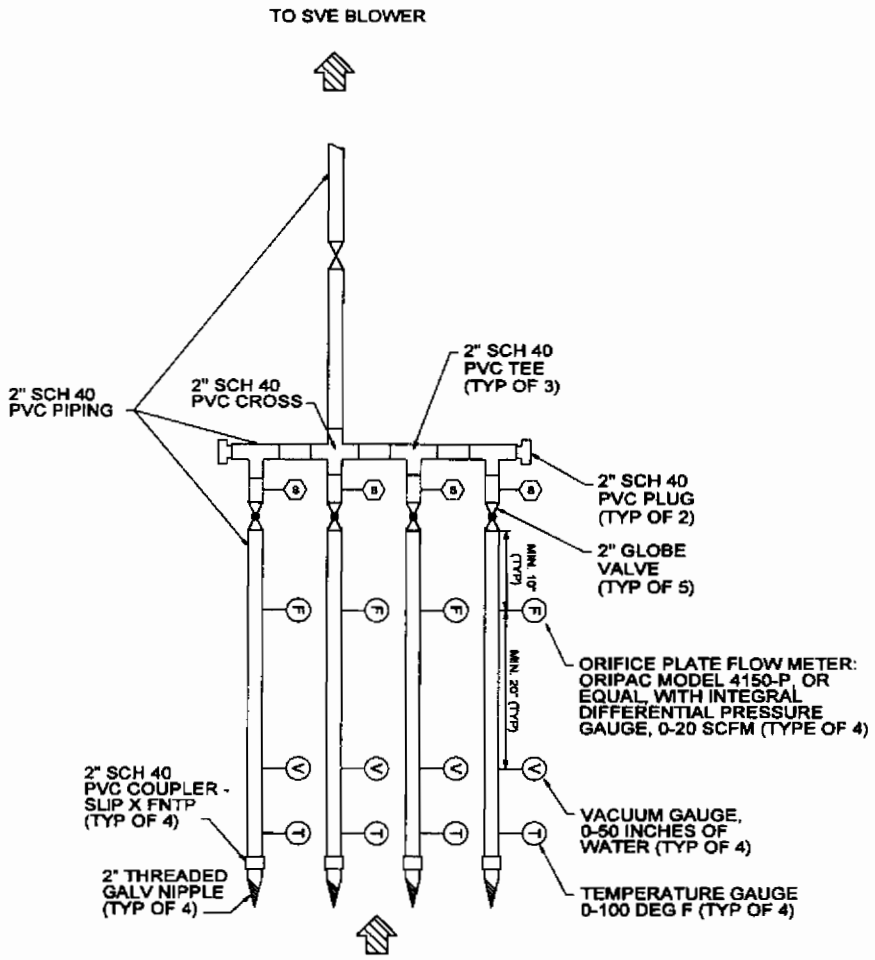


SVE MANIFOLD - PLAN VIEW

DSGN	L. COLELLA						CH2MHILL	SWMU 196 BIOSPARGE / SVE REMEDIATION SYSTEM CHARLESTON NAVAL COMPLEX, SC	PROCESS INSTRUMENTATION AND CONTROLS SVE MANIFOLD PLAN VIEW
DR	R. LOVELL								
CHK	T. PALAIA								
APVD	D. WILLIAMSON	NO.	DATE	REVISION	BY	APVD			

SHEET 6 | DWG NO. I-5 | DATE November 1, 2004 | PROJ NO. 338814.28.EX.14

charleston - swmu196 - I-5.dgn 12-NOV-2004 10:15:27

Bid List

Ted D. Miller Associates (rep. for Maple Leaf Environmental)
Contact: Gary Giroliman
2525Wadsworth Blvd, #300
Lakewood, CO 80227
303-989-7737 phone
303-989-8875 fax

H2Oil
Contact: Joe Rounds
P.O. Box 9028 (36 SE 9th St)
Bend, OR 97708 (97702)
541-382-7070 (phone)
541-382-2242 (fax)

Philip Environmental Services
Contact: Curt Fahnestock
P.O. Box 230
210 West Sand Bank Road
Columbia, IL 62236
(618) 281-1552 (phone)
(618) 407-5925 (fax)

King, Buck Technology
Mack Buck
2356 Moore Street, Suite 102
San Diego, California 92110
Tel: (619) 299-8431
Fax: (619) 299-8437

Carbonair Environmental
Contact: Mark Hansen
2731 Nevada Avenue North
New Hope, MN USA 55427-2806
800.526.4999 *Toll-free*
763.544.2154 *General*
763.544.2151 *Fax*

CH2M Hill

S V E W I T H A I R S P A R G E S Y S T E M

Submitted by Maple Leaf Environmental Equipment Ltd.
In co-operation with Gary Girolimon of TDMA

• November 1, 2004 •

Quote Number: 500098R0

CONTENTS

Introduction

Maple Leaf Environmental Equipment Ltd. has been given the opportunity to provide a quote for a SVE with Air Sparge System C/W controls mounted on a fully assembled treatment skid. The system is for remediation of a CH2M site. The equipment proposal we have provided in this document is based on our understanding of your requirements.

The following sections review the design of the system and detail the individual components. The information provided in this proposal may be modified prior to the construction of the equipment. If no modifications are required, the system will be built as specified, for the price quoted, within the delivery time specified.

We look forward to obtaining approval to begin fabrication of this system.

Submitted by:
Maple Leaf Environmental Equipment Ltd
1325 California Ave.,
P.O. Box 1517
Brockville, ON K6V 5Y6
Voice (613) 498-1876 Fax (613) 345-7633
E-mail info@maple-leaf.ca
WWW.MAPLE-LEAF.CA

Maple Leaf Environmental Equipment Ltd.

CORPORATE PROFILE

Maple Leaf Environmental Equipment Ltd. is a North American manufacturer and supplier of wastewater treatment equipment, groundwater/site remediation systems, drinking water treatment systems, and PLC based control panels.

Since 1992, MLE has supplied high quality treatment equipment to the Canadian, United States, and international markets.

With over 50 years of combined technical experience in petroleum/water separation, water treatment and project management, MLE staff continues to lead in the design and application of innovative new technologies in the environmental business.

MLE is also the exclusive Canadian distributor for QED Environmental Systems, Inc. groundwater sampling and remediation pumps, sample filters, interface meters and air strippers.

Technical Notes

Engineering Assumptions:

230V three-phase power available

CL 1 DIV 2 hazardous location for equipment

Ambient up to 90 degrees F

Altitude 5000 feet

Design Parameters:

CERTIFICATIONS:

Control panel to be UL certified

VACUUM EXTRACTION SYSTEM:

SVE system capacity – 28 SCFM at 22" WC

MLEE 55 G vapor liquid separator

AIR SPARGE SYSTEM:

Air sparge system compressor capacity – 136 SCFM @ 10 PSI

American Industrial mechanical air to air heat exchanger

SKID MODULE:

System mounted on 6'x 8' skid

CONTROL PANEL:

Relay based control system with control and alarm features

OPTIONS:

System mounted on 8'x 10' modified shipping container

Pricing & Equipment Description

VAPOR LIQUID SEPARATOR MODULE

Includes: **VLD-400, 55 G vapor liquid separator** with:

- Removable Top
- Epoxy coated exterior
- 1"sight glass
- High level alarm switch - *discrete input*
- Manual drain

REGENERATIVE SOIL VAPOR EXTRACTION BLOWER MODULE

Includes: **Rotron model EN404AR72ML regenerative blower** with 1 HP 230/3P EXP motor:

- *Discrete output*
- Performance at inlet of blower: 28 SCFM at 22" WC
- Expected inlet pressure losses through MLE system: 15" WC
- Noise rating: 74 dBA

Inlet piping to blower to contain:

- Vacuum gauge
- Solberg inlet filter/silencer
- Vacuum gauge
- Sample port
- Dilution valve with Solberg filter/silencer
- Vacuum relief valve
- PVC piping

Discharge piping from blower to contain:

- Discharge silencer
- Sample port
- Pressure gauge
- Temperature gauge
- Steel piping

ROTARY LOBE AIR SPARGE COMPRESSOR MODULE

Includes: **Sutorbilt 4H rotary lobe blower** with 15 HP 230/3P EXP motor:

- *Discrete output*
- Performance: 136 SCFM at 10 PSI
- Discharge temperature: 250F at an ambient of 90 F
- Noise rating: 88 dBA

Inlet piping to compressor to contain:

- Solberg inlet filter/silencer
- PVC piping

Discharge piping form compressor to contain:

- Pressure relief valve
- Air bleed valve with Solberg filter/silencer
- Check valve
- Pressure gauge
- Temperature gauge
- Steel piping

HEAT EXCHANGER MODULE

Includes: American Industrial Heat Transfer heat exchanger model ACA-3242-3XP with 1/3 HP 230/3P XP motor

- *Discrete output*
- Air flow: 136 SCFM
- Air pressure: 10 PSI
- Ambient air temperature: 90 F
- Inlet temperature: 250 F
- Discharge temperature: 120 F
- Pressure drop: .5 PSI
- Heat exchanger piped to exterior of enclosure for additional ventilation.

Discharge piping from heat exchanger to contain:

- Temperature gauge
- High temperature switch – discrete input
- Steel piping

REMEDIATION SKID

Built to NEC General Purpose standards, all wiring complete and all equipment pre-piped factory tested and mounted on skid

Includes: 6' x 8' skid with the following standard features:

- Open floor with joists
- Epoxy coated base
- Forklift pockets
- Bolt down tabs

Process skid to contain the following:

- Control panel
- Vacuum extraction system
- Air sparge system
- All influent, effluent, and drain lines plumbed to outer edge of skid

CONTROL SYSTEM

Includes: RELAY Series Relay Logic based control panel with the following standard features:

- UL certification
- NEMA 4 lockable panel enclosure
- Inner swing panel
- Primary circuit protection using fused main disconnect
- Surge and lightning protection for control system
- Main power block
- Branch circuit protection with circuit breakers for motors
- Motor starters with overload protection
- 120V/1P power transformer
- Branch circuit protection with circuit breakers for powered devices
- Relays for control logic
- 24 VDC IS power supply
- Intrisically safe barriers
- Wired and installed
- Factory tested prior to shipping

Outside cover of inner swing panel to contain the following:

- HOA switches with green run lights
- Red alarm indicator lights
- Alarm reset button
- Emergency stop button

OPERATION AND MAINTENANCE MANUAL

Includes: Operating instructions for all treatment system components
Copy of operating manual for each piece of equipment

Summary of system components
Summary of system operation principals
Summary of operation controls and failsafes
Summary of maintenance requirements for each piece of equipment

INPUT: DESCRIPTION	DISCRETE	IS	ALM
VLS high level alarm switch	1	1	1
Heat Exchanger High Temp Switch	1	1	1

OUTPUT: DESCRIPTION	MOTOR STARTER	HOA	RUN LIGHT
SVE blower motor	1 HP 230/3P	1	1
SPG compressor motor	15HP230/3P	1	1
SPG heat exchanger motor	.33 HP 230V/3P		

POWERED DEVICES
Control power

EQUIPMENT TOTAL **$ 17,842.00**

ESTIMATED FREIGHT TO ENGLEWOOD, CO, USA **$ 1,250.00**

Customer will be billed for actual shipping cost. Customer is responsible for off-loading of equipment at site.

TOTAL SYSTEM COST **$ 19,092.00**

OPTIONS:

REMEDIATION ENCLOSURE **$ 8,547.00**

Built to NEC Class 1 Div 2 standards, all wiring intrinsically safe and all equipment pre-piped factory tested and mounted in enclosure

Includes 8' x 10' modified shipping container with the following standard features:

- Exterior paint
- Lifting eyes on upper corners
- Plywood floor
- Insulated walls and ceiling
- Roll up man door
- Control panel mounted to exterior

Interior to be rated hazardous and to contain the following:

- Vacuum extraction system
- Air sparge system
- Lighting - *powered device*
- Ventilation fan with thermostat and hood – *discrete output*
- Heater with thermostat - *powered device*
- Passive vent louvers with hood
- All influent, effluent, and drain lines plumbed to outside of building

MLEE also provides rental units; please contact MLEE for further information.

MLEE will purchase back used equipment; please contact MLEE for further information.

INCLUDED

Detailed manuals
Shipping
Assembly drawings and instructions
Operating and maintenance manuals for all components

NOT INCLUDED

Electrical service and hook-up to system
Federal, State/Provincial, or Local taxes unless otherwise stated
Local approvals and certificates

Quote is valid for 60 days unless extended by MLE.

Maple Leaf Environmental Equipment
Authorization to Proceed

Please submit with your purchase order

PROJECT NAME: _____

CUSTOMER INFORMATION:

Purchase Order Number: _____

Sold To: _____

Contact Name: _____

Billing Address: _____

Tax ID Number: _____

Phone: _____

Fax: _____

E-mail: _____

Ship to Address: _____

Contact at site: _____

Phone: _____

PROJECT DOCUMENTATION:

Number of Submittals Required: _____ (*Two copies supplied,* additional copies $50.00 each)
Mailing Address for Submittal(s):

_____ _____ _____
_____ _____ _____
_____ _____ _____

Number of Manuals Required: _____ *(Two copies supplied, additional copies $100.00 each)*
Mailing Address for Manual(s):

_____ _____ _____
_____ _____ _____
_____ _____ _____

PAYMENT TERMS:

The delivery time for the equipment will depend on the option selected by the customer. If authorization to proceed with the order of components is given by the customer at the time of the purchase order, the equipment will be ready for shipment 8 – 10 weeks from the date of the order confirmation issued by MLEE (the order confirmation is subject to credit approval and receipt of fabrication deposit, if any). Any changes made during the submittal review process that alter the equipment ordered may require a change order from the customer and may result in additional costs and a possible change in the shipping date.

If authorization to order the equipment components is given with the approval of the submittal package by the customer, the equipment will be ready for shipment 8 - 10 weeks from the date of the approval of the technical submittal package.

All pricing is in $US, FOB factory and does not include any taxes, federal, state/provincial or local. Customs costs and duties are included in the quoted prices.

Payment terms – unless otherwise negotiated – would be:

Deposit with Purchase Order	- 30%
Payment due immediately upon notice of readiness to ship	- 60%
Net 30 from notice of readiness to ship	- 10%

The customer will be invoiced for the equipment from MLEE's notice of readiness to ship.

At the customer's request, storage of completed systems may be provided. MLEE will store equipment free of charge for 30 days from the notice of readiness to ship. If MLEE is requested to store equipment beyond 30 days, the customers will be invoiced in advance for all storage related fees.

Overdue accounts unpaid after 30 days of the above terms are subject to a finance charge of 1.5% per month (annual rate of 18%). If legal proceedings are instituted for collection of unpaid accounts, the customer is liable for all costs adjudged by the court, including court costs and reasonable attorneys fees.

WARRANTY:

Maple Leaf Environmental Equipment Ltd. warrants and guarantees products of its manufacture against defective workmanship or material for a period of one year from the date of shipment from the factory.

This warranty is expressly and strictly limited to replacing, without charge, any part or parts which prove to MLE's satisfaction upon examination, to have been defective and which have not been neglected, abused or misapplied, provided the buyer gives MLE Equipment, Ltd. immediate written notice upon discovery of any claimed defect.

MLE will also guarantee component parts manufactured by others to the extent of the guarantee made by the manufacturer of such equipment. In any case, guarantees on specific components will be extended a minimum of one year from date of shipment.

Warranty Exclusions:

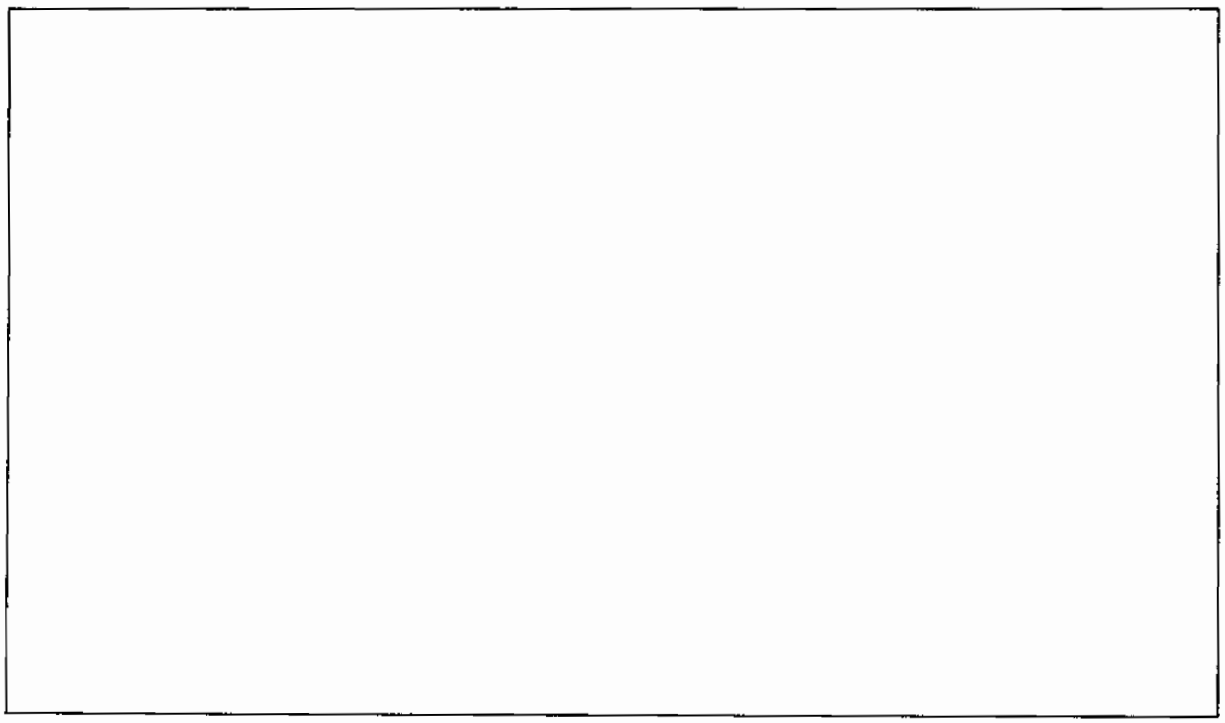
Warranty coverage does not include:

(A) Freight, labor, travel, and living expenses associated with parts replacement;
(B) Normal maintenance items such as lubrication, fan belts, and cleaning of the equipment.

In the event the customer, or any installation contractor employed by the customer, contracts outside Maple Leaf Environmental Equipment Ltd. for installation work or erection of quoted equipment, the customer shall assume full responsibility for said contract.

LAYOUT CONSTRAINTS:

Please sketch in any site constraints that our designers should consider when laying out your system. Please include desired locations for inlet and discharge lines as well as headers, walls, fence lines or boundary limitations that the system is required to fit within.



SITE POWER SUPPLY:

Voltage: _____ Phase: _____ Amps: _____

For 230v, 3ph power please indicate whether it is a "DELTA" or "Y" service.

☐ DELTA POWER (4 wire service with neutral, high leg, and two 120V legs)

☐ Y- POWER (3 wire service with ground, no 120V legs, 120V transformer is required)

ORDERING OF PARTS:

☐ Order Parts Immediately ☐ Order Parts After Submittal Approval

Note – Authorization to proceed will allow MLE to place orders for equipment and components of the system, based on the power supply information above and the description of the major system components in the referenced quote. Any changes to the major components or to the electrical supply made by the customer at a later date may require a change order and attract additional costs. The detailed design of the system will be confirmed with the customer in the detailed submittal package submitted by MLE when the specific configuration and layout will be developed with customer input.

MISCELLANEOUS INFORMATION:

The following is only applicable if equipment to be supplied by MLEE is skid mounted

Location of equipment (inside or outside): _____
Location of control panel (inside or outside): _____

CUSTOMER AUTHORIZATION:

I have read, understand and agree with the terms and conditions of this agreement as stated in the *Authorization to Proceed* document. I hereby authorize the order of my signature. I have also verified the listing and category information above for accuracy and completeness and understand that the order may not proceed unless the information provided is complete. I am authorized by my company to place this order.

Authorized Signature:_____ **Tilte:**_____ **Date**_____

500098R0	Dave Porter	TDMA
MLE Quote Number	MLE Contact Name	Representative

Maple Leaf Environmental Equipment Ltd. 1325 California Avenue, P.O. Box 1517, Brockville, ON K6V 5Y6
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