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FINAL ASSESSMENT REPORT DATED 6 MARCH 2000 FOR ZONE I SITE 36 BUILDING NS-26 WITH SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL REVIEW LETTER CNC CHARLESTON SC
03/31/2000
CH2M JONES LLC

D H E C

PROMOTE PROTECT PROSPER

2600 Bull Street
Columbia, SC 29201-1708

31 March 2000

Department of the Navy
Southern Division NFEC
P.O. Box 190010
North Charleston, SC 29419-9010
Attention: Mr. Gabriel Magwood

Re: Final Assessment Report dated 06 March 2000
Zone I/Site 36-Building NS26 (Site Identification # 00944)
Charleston Naval Complex/Charleston Naval Base
Charleston, SC
Charleston County

Dear Mr. Magwood:

The author has completed technical review of the referenced document. As submitted, the report provides a narrative and summary of previous assessment activities and analytical results from additional sampling conducted to establish the environmental fate of suspected contamination at the subject property. Analytical results provided indicate that concentrations of PAH and BTEX compound(s) were reported in soil and groundwater samples obtained at the subject site. The reported concentrations exceed the RBSL (Risk-Based Screening Levels, SCDHEC *Risk-Based Corrective Action for Petroleum Releases*, 5 January 1998), proposed RBC (Risk-Based Concentrations for Residential Soils, EPA Region III Risk-Based Concentrations Table, 12 April 1999) and established groundwater MCLs (maximum contaminant levels) and/or established health advisories. Available analytical data and applied interpretations appear to indicate that a reasonable delineation and characterization of the extent and severity of soil and groundwater contamination have been developed for the Building NS26 site. This information and data were then utilized to develop SSTL (site specific target levels) for CoC (contaminants of concern) in evidential discussion(s) for consideration of employing active remediation (groundwater) at the subject site.

With consideration to the above, the author concurs with the proposal for corrective actions at the referenced site. The facility should develop an appropriate CAP (corrective action plan), including proposed sampling and reporting schedule. A schedule for development of the requested CAP should be submitted to my attention by 30 April 2000. Should you have any questions please contact me at (803) 898-3559.

Sincerely,

Paul L. Bristol, Hydrogeologist
Groundwater Quality Section
Bureau of Water

cc: Trident District EQC

CORRECTIVE ACTION PLAN
FOR
SITE 36, BUILDING NS26, ZONE I

Site Identification # 00944

Charleston Naval Complex
Charleston, South Carolina

Submitted to:
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
Charleston, South Carolina 29406

Submitted by:
CH2M-JONES, LLC.
115 Perimeter Center Place NE
Suite 700
Atlanta, Georgia 30346-1278

Contract Number: N62467-99-C-0960

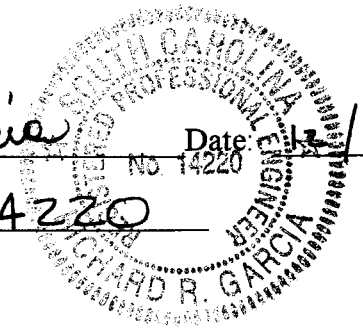
November 2000

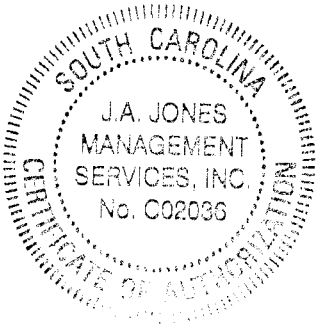
CERTIFICATION

I certify that the information contained in this report is true, and complete to the best of my knowledge, information, and belief.

Approved By: R. Garcia Date: 12/5/00

South Carolina Registration No. 14220





ACRONYMS

AFVR	Aggressive Fluid - Vapor Recovery
bls	below land surface
BTEX	benzene, toluene, ethylbenzene and xylenes
BRAC	Defense Base Realignment and Closure Act
CAP	Corrective Action Plan
CNC	Charleston Naval Complex
CoC	Chemical of Concern
DOT	Department of Transportation
EISOPQAM	Environmental Investigations Standard Operating Procedures and Quality Assurance Manual
EPA	Environmental Protection Agency
ft bls	feet below land surface
mg/kg	microgram per kilogram
mg/L	microgram per liter
OVA	Organic Vapor Analyzer
PAHs	Polyaromatic Hydrocarbons
QA	Quality Assurance
QC	Quality Control
RA	Rapid Assessment
RAR	Rapid Assessment Report
RBSL	Risk-Based Screening Level
SCDHEC	South Carolina Department of Health and Environmental Control
SOUTHDIV	Southern Division Naval Facilities Engineering Command
SSTL	Site-Specific Target Level
TTNUS	Tetra Tech NUS
UST	Underground Storage Tank

TABLE OF CONTENTS

Section **Page**

CERIFICATION ..... **ii**

ACRONYMS ..... **iii**

TABLE OF CONTENTS ..... **iv**

1.0 INTRODUCTION **1-1**
1.1 General Site Description 1-1
1.2 Site Background 1-1

2.0 RAPID ASSESSMENT SUMMARY **2-1**
2.1 Receptor Survey 2-1
2.2 Assessment Information 2-1
2.3 Fate and Transport Modeling 2-2
2.4 Exposure Pathway Analysis 2-3
2.5 Site-Specific Target Levels (SSTLs) 2-3

3.0 PROPOSED CORRECTIVE ACTION **3-1**
3.1 Soil Remediation 3-1
3.2 Groundwater Remediation 3-1

4.0 PROPOSED ACTION REMEDIATION **4-1**
4-1 Free Product Recovery System 4-1
4-2 Monitoring Well Installation 4-2
4-3 Surveying 4-2
4-4 Soil Boring Schedule 4-2
4-5 System Operation and Maintenance 4-2
4-6 Sampling and Analysis Plan 4-2
4-7 Reporting 4-3
4-8 Equipment Decontamination 4-3
4-9 Sample Handling 4-3
4-10 Quality Control (QC) 4-4
4-11 Field Quality Assurance / Quality Control (QA/QC) 4-4
4-12 Recordkeeping 4-5

5.0 PROPOSED INTRINSIC REMEDIATION **5-1**
5.1 Monitoring Well Installation 5-1
5.2 Surveying 5-1
5.3 Soil Boring Schedule 5-1
5.4 Monitoring Well Installation Plan 5-1
5.5 Sampling and Analysis Plan 5-1

5.6 Reporting 5-2

6.0 SITE MANAGEMENT AND BASE SUPPORT 6-1

7.0 REFERENCES 7-1

8.0 TABLES

1 GROUNDWATER ELEVATIONS
2 GROUNDWATER FIELD MEASUREMENTS
3 SUMMARY OF MOBILE LABORATORY SCREENING RESULTS FOR SOIL
4 SUMMARY OF MOBILE LABORATORY SCREENING RESULTS FOR GROUNDWATER
5 SUMMARY OF FIX-BASE LABORATORY RESULTS FOR CHEMICALS OF CONCERN IN SOIL
6 SUMMARY OF FIX-BASE LABORATORY RESULTS FOR CHEMICALS OF CONCERN IN GROUNDWATER
7 FATE AND TRANSPORT INPUT MODELS
8 EXPOSURE PATHWAY ASSESSMENT-CURRENT LAND USE
9 EXPOSURE PATHWAYASSESSMENT-FUTURE LAND USE

9.0 FIGURES

1 SITE LOCATION MAP
2 SITE VICINITY MAP
3 SITE MAP AND SAMPLING LOCATIONS
4 CROSS SECTION A-A' MAP
5 CROSS SECTION B-B' MAP
6 GROUNDWATER POTENTIOMETERIC MAP (SEPTEMBER 10, 1999)
7 AREAL EXTENT OF FREE PRODUCT (SEPTEMBER 10, 1999)
8 DISTRIBUTION OF CHEMICAL OF CONCERN IN SOIL MAP
9 DISTRIBUTION OF CHEMICAL OF CONCERN IN GROUNDWATER MAP
10 PROPOSED FREE PRODUCT RECOVERY WELL DIAMGRAM

APPENDIX A REMEDIAL EQUIPMENT – PASSIVE SKIMMER

1.0 INTRODUCTION

This Corrective Action Plan (CAP) has been prepared by CH2M-JONES, LLC. The plan is designed for Site 36, Building NS26, Zone I; located at the Charleston Naval Complex (CNC), Charleston, South Carolina. Site 36 contains the location of a former petroleum Underground Storage Tank (UST) system used to store used oil for the building. The South Carolina Department of Health and Environmental Control (SCDHEC) has designated this site as Identification Number: 00944.

This CAP provides a method for active remediation of the site by removing free petroleum product identified in the vicinity of the former UST basin; conducting soil and groundwater sampling to evaluate the active remediation of the site; and implementing intrinsic remediation and monitoring well abandonment as a corrective action in accordance with SCDHEC Corrective Action Guidance, June 1997. The CAP was developed using the information provided in the Rapid Assessment Report (RAR) for Site 36 prepared by Tetra Tech NUS, Inc. (TTNUS), dated March 2000. The applicable tables and figures from the RAR have been incorporated into this CAP.

1.1 General Site Description

The CNC is located in the city of North Charleston, on the west bank of the Cooper River in Charleston County, South Carolina (**Figure 1**). This installation consists of two major areas: an undeveloped dredge materials area on the east bank of the Cooper River on Daniel Island in Berkley County, and a developed area on the west bank of the Cooper River. The developed portion of the base is on the peninsula bounded on the west by the Ashley River and on the east by the Cooper River. The site is located within the developed portion of the base (**Figure 2**).

The area surrounding CNC is "mature urban", having long been developed with commercial, industrial, and residential land use. Commercial areas are primarily west of CNC; industrial areas are primarily to the north of the base along Shipyard Creek. A site vicinity map, which exhibits adjacent properties and structures, vicinity roads, current utilities, and vicinity surface drainage, is included as **Figure 2**.

1.2 Site Background

The CNC began operations in 1901, when the Navy acquired the property. In 1993, the CNC was added to the list of bases schedule for closure under the Defense Base Realignment and Closure Act (BRAC). BRAC regulates the closure of the base and transition of the property back to the community. With the scheduled closure of the base, environmental cleanup has proceeded to make the property available for redevelopment after closure.

Building NS26, a vehicle maintenance facility, was a part of the Navy's Shore Intermediate Activity Complex. UST NS26 was utilized to temporarily store used oil. The UST system was installed in 1958. UST NS26 was a 200-gallon steel tank located adjacent to Building NS26,

approximately 60 feet from the northeastern corner of the building and approximately 107 feet from Cooper River (**Figure 3**).

Between December 15, 1996 and January 8, 1997, UST NS26, accessible piping, and contaminated soil encountered during the UST and piping excavations were removed from the site. The UST and piping excavations were backfilled with clean soil. A SCDHEC UST Assessment Report was completed by SPORTENVDETCHASN in 1997. Soil sampling conducted in the tank and piping excavations indicated naphthalene concentrations exceeding the Risk-Based Screening Level (RBSL) established by SCDHEC (Risk-Based Corrective Action For Petroleum Release, January 5, 1998). Groundwater was not encountered in the excavations during the UST removal.

From June through September 1999, TTNUS completed a Rapid Assessment (RA) for Site 36. The information from the Rapid Assessment Report (RAR), prepared by TTNUS, dated March 2000, is summarized in **Section 2.0** of this report. The RAR was approved by SCDHEC on March 31, 2000.

2.0 RAPID ASSESSMENT SUMMARY

TTNUS completed a Rapid Assessment Report (RAR), dated March 2000, for Site 36, Building NS26, Zone I. The assessment information was used to develop this CAP. The information from the RAR is summarized in this section.

2.1 Receptor Survey

A receptor survey of the site vicinity was conducted by TTNUS personnel to identify potential receptors for petroleum hydrocarbon contamination. **Figure 2** depicts the public utilities located within 250 feet of the former UST study area. The receptor utilities located on or near the site include sanitary sewer, potable water, saltwater line, storm sewer, and electrical. Specific information concerning the depth of utilities below land surface is currently unavailable, however, utilities at this site generally are between 2 to 6 feet below land surface (ft bls).

A survey of groundwater users within a 7-mile radius of CNC was conducted by the South Carolina Water Resources Commission to ascertain the extent of any shallow groundwater usage. Results of the water use investigation revealed that no drinking water wells, which utilize the shallow aquifer, are located within a 4-mile radius of CNC. Irrigation wells are not identified within 1,000 feet of the site. Numerous monitoring wells are located within 1,000 feet of the site. The nearest surface water body to UST NS26 is Cooper River located approximately 107 feet to the north and northeast.

There are no city, county or state-zoning ordinances, the property (CNC) is currently owned by the federal government. Information concerning zoning ordinances was obtained from the SOUTHDIV Remedial Project Manager located at 2155 Eagle Drive, North Charleston, South Carolina 29406.

2.2 Assessment Information

From June through September 1999, TTNUS conducted field activities for the RA, which included the collection and sampling of sixteen (16) soil borings, installation of six (6) shallow monitoring wells, one (1) deep monitoring well, two (2) permanent piezometers, and one (1) temporary piezometer. One additional well (CNC36-680004) was previously installed onsite. Sample locations are shown on **Figure 3**. The soil and groundwater field and laboratory sampling data from the RA is summarized in **Tables 1** through **6**.

As reported in the RAR, the site lithology consists of fine to medium-grained sand from ground surface to approximately 5 feet below land surface (ft bls), underlain by dark gray silty, clayey sand to approximately 13 ft bls, and underlain by dark greenish gray silty clay with thin sand lenses to approximately 36 ft bls. Two geologic cross sections of the site are depicted in **Figures 4** and **5**. Groundwater levels ranged from 4 to 6 ft bls (**Table 1**). Based upon groundwater level measurements collected on September 10, 1999, surficial groundwater flow is to the north; a groundwater potentiometric map for this date is presented in **Figure 6**.

Free product was detected in piezometer CNC36-P03 with a thickness of 0.05 feet on September 10, 1999 and a thickness of 0.14 feet on October 20, 1999 (**Table 1**). A sheen was detected in CNC36-P01 on October 20, 1999 (**Table 1**). The areal extent of free product is depicted on **Figure 7**. For concentrations of wells containing free product, the maximum solubility in equilibrium with fuel oil was calculated using Raoult's Law. Fuel oil was chosen as a surrogate because the chemical composition of the waste oil in UST NS 26 is unknown. Calculated concentrations for benzene, toluene and naphthalene in equilibrium with free product exceeded their respective RBSLs (Appendix F, TTNUS, September 1999).

Based upon soil sampling conducted during the RA, naphthalene concentrations in two soil samples (CNC36-B05 and CNC36-B06) exceeded SCDHEC RBSL for sand-rich soils (**Table 5**). Benzene was not detected in CNC36-B06 above its method detection limit. However, the laboratory detection limit for benzene exceeded the RBSL for the soil sample from CNC36-B06; therefore, the soil concentration for benzene was presumed greater than RBSL. All other soil contaminant concentrations were below RBSL (**Table 5**). The distribution of Chemicals of Concern (CoC) in soil is presented in **Figure 8**.

In addition to the presence of free product and based upon groundwater sampling conducted during the RA, naphthalene concentrations in two groundwater samples (CNC36-M01 and CNC36-M04) exceeded SCDHEC RBSL (**Table 6**). All other groundwater contaminant concentrations were below RBSL or method detection limits. The distribution of CoC in groundwater is presented in **Figure 9**.

2.3 Fate and Transport Modeling

The aquifer characterization calculated by TTNUS and the fate and transport parameters determined by TTNUS during the RA are summarized in **Table 7**. The Domenico model was used to predict the distance at which the tip of the contaminant plume is attenuated to SCDHEC RBSLs in 10 and 20 years, respectively, without using degradation due to biological decay:

Time Period	COC	Estimated Time Traveled (feet)	Time Period Equilibrium Reached (years)
10 Years	Benzene	220	10
	Toluene	61	9
	Ethylbenzene	1	1
	Xylenes	1	1
	Naphthalene	99	> 10
20 Years	Benzene	230	10
	Toluene	61	9
	Ethylbenzene	1	1
	Xylenes	1	1
	Naphthalene	170	19.9

The Cooper River is approximately 107 feet from Site 36. Benzene and naphthalene are calculated to migrate distances greater than the distance of Cooper River from the site. Therefore, the Cooper River may be at risk from migration of the plume.

2.4 Exposure Pathway Analysis

In the RA, TTNUS evaluated the receptor characterizations of the potentially exposed populations in the vicinity of the site and identified the potentially complete exposure pathways for those receptors. Exposure pathway analysis for current land use and future land use is summarized in **Tables 8** and **9**.

2.5 Site-Specific Target Levels (SSTLs)

In the RA, TTNUS considered three future scenarios for the calculations of SSTLs: on-site construction workers exposure to subsurface soil, on-site construction worker exposure to groundwater, and groundwater flow into the Cooper River. The minimum SSTLs for the three scenarios were selected as this sites SSTL's for each CoC. The chart below summarizes the selected SSTLs and source concentrations:

Media of Concern	CoC	Units	Minimum SSTL[1, 2]	Maximum Source Concentrations[3, 4]	Exceed SSTL
Soil	Benzene	mg/kg	0.47	<1.6[5]	Yes
	Naphthalene	mg/kg	68	48	No
Groundwater	Benzene	mg/L	0.069	0.31	Yes
	Toluene	mg/L	5.38	4.65	No
	Ethylbenzene	mg/L	6.05	0.10	No
	Xylenes	mg/L	102.3	0.79	No
	Naphthalenes	mg/L	0.137	23.35	Yes

Note 1: the selected SSTLs for soil was the calculated soil leaching SSTLs protective of the on-Site construction worker.

Note 2: the selected SSTLs for groundwater was the determined groundwater SSTLs protective of Coopers River.

Note 3: the maximum source concentrations for soil were the highest contaminant concentrations based upon soil sampling completed during the RA.

Note 4: the maximum source concentrations for groundwater were the calculated groundwater concentrations based upon the presence of free product using Raoult's Law.

Note 5: denotes concentrations are below the laboratory reporting limit.

Contaminant concentrations in the groundwater and soil exceeded the minimum calculated SSTLs protective of a construction worker in a utility trench and the Cooper River. Therefore; the petroleum contamination detected at Site 36 may pose a threat to construction workers in nearby utilities and the Cooper River.

3.0 PROPOSED CORRECTIVE ACTION

This CAP provides a method for active remediation of the site by removing free petroleum product identified in the vicinity of the former UST NS26 basin; conducting soil and groundwater sampling to evaluate the active remediation of the site; and implementing intrinsic remediation and monitoring well abandonment as a corrective action in accordance with SCDHEC Corrective Action Guidance, June 1997. Based on the results of the RA, source removal of free petroleum product will be performed at this site to remove CoCs from groundwater and to reduce contaminant concentrations below SSTLs. At which time, intrinsic remediation will be implemented until contaminant concentrations decrease below RBSLs or action levels approved by SCHDEC. The proposed active remediation plan is described in **Section 4.0**, and the proposed intrinsic remediation plan is described in **Section 5.0**.

3.1 Soil Remediation

Field screening and analytical results of soil sampling in the RA did not indicate the presence of soil contamination from ground surface to approximately 4 ft bls (TTNUS, March 2000). As reported in the RAR, petroleum-contaminated soils were removed for disposal from the former UST NS26 basin and piping excavations during the tank closure activities in 1996 and 1997. During the RA, only limited soil contamination was detected in two soil samples near the top of the water table between 4 to 5 ft bls. The soil samples with CoCs were collected from 4 to 5 ft bls and were describe as "wet" in sampling field notes in the RAR (Appendix C, TTNUS, March 2000), which likely indicates a smear zone and groundwater contamination problems versus a soil contamination problem. Furthermore, only one CoC, benzene, exceeded any soil SSTLs. The maximum source concentration for benzene in soil was based upon the high laboratory detection limit in sampling results from CNC36-B06 (**Table 5**). All other soil contaminant concentrations were below SSTLs (see **Section 2.5**). The removal of free product and soil sampling from the unsaturated zone with lower laboratory detection limits will be completed as a part of this CAP to further evaluate the soil remediation at the site. Therefore, for the reasons stated above, no other soil remedial activities are scheduled for the CAP at this time.

3.2 Groundwater Remediation

Free product and groundwater contamination was identified in the vicinity of the former UST NS26 basin. Contaminant concentrations in groundwater exceeded the minimum calculated SSTLs protective of a construction worker in a utility trench and the Cooper River. The maximum source concentrations for groundwater were calculated based upon the presence of free product using Raoult's Law. Therefore, the active groundwater remediation of the site will include the removal free product identified in the vicinity of the former UST NS26 basin and groundwater sampling to evaluate the active remediation of the site.

The following document was used as a source for remedial design: United States Environmental Protection Agency (EPA), 1996, How to Effectively Recover Free Product at Leaking Underground Storage Tank Sites. Three approaches were considered for free product

recovery: passive removal/skimmer system, bioremediation (injection), and dual-phase vapor and groundwater recovery.

The volume of free product at this site is estimated at 5.95 cubic feet or 44.5 gallons using the following data obtained from the RAR: area of free product is approximately 425 square feet **(Figure 7)**, average thickness of free product over the affected area is 0.07 feet **(Table 1)**, and porosity (n) = 0.2 **(Table 7)**. Due to the limited affected area of free product, thin thickness of free product, and low volume of free product estimated at the site, the following remedial strategy was designed for Site 36.

Step 1: A passive removal/skimmer system will be implemented at the site to remove free product. A passive, floating skimmer with a product recovery filter canister is designed to remove free product down to a sheen or thickness of 0.01 feet thickness. Typically, the skimmer is lowered into the well until the midpoint of the skimmer is located at the fluid level in the well. Floating hydrocarbons (free product) enters the skimmer through the floating intake outer debris screen and then through an inner oileophilic hydrophobic screen, and down into a clear canister for storage. To empty the skimmer, the device is brought to the surface, and the canister is drained using the discharge valve at the skimmer base. A dedicated, free product bailer will be utilized to remove free product from the top of the wells in the target area if free product thickness is near or less than 0.01 feet or well diameter is less than 2.0 inches.

Step 2: If contaminate concentrations continue to remain above the minimum calculated SSTLs, enhanced bioremediation may be used to target specific locations to enhance the natural degradation of contaminates at the site. Bioremediation consist of the injection of naturally-occurring microbes with an affinity towards digesting specific contaminants and the injection of nutrients to support the microbes. Typically, the bioremediation mixture of microbes and nutrients is injected through well points that are installed into the contaminated zone using direct push technology.

Step 3: Other active removal methods may be employed if free product persist at the site, an 8-hour Aggressive Fluid – Vapor Recovery (AFVR) event or multiple events will be conducted to remove free product from the source area. The AFVR will consist of a vacuum truck utilized to extract fluid and vapor from target well points. The AFVR assembly will connect the vacuum hose to the top of the wellhead with the design such that liquid and vapor will be extracted from the top of the water column in the target well point.

4.0 PROPOSED ACTIVE REMEDIATION

Active remediation at the site will include removing free product identified in the vicinity of the former UST NS26 basin, and conducting soil and groundwater sampling to evaluate the active remediation of the site. A passive removal/skimmer system will be implemented at the site to remove free product. If free product persist in the former UST NS26 basin, an 8-hour Aggressive Fluid – Vapor Recovery (AFVR) event or multiple events will be conducted to remove free product from the source area. In addition, if free product continues to persist at the site and/or groundwater contaminant concentrations do not decrease, bioremediation may be used to target specific locations to enhance the natural degradation of the contamination at the site.

4.1 Free Product Recovery System

Free product will be removed using a passive removal/skimmer system. A passive, floating skimmer with a product recovery filter canister will be used for the removal of free product in recovery wells with free product thickness greater than 0.01 feet. A Product Recovery Canister (Model PRC-94) or an equivalent device for a 2-inch diameter well with a capacity of 0.25 liter or greater should be adequate for the conditions at the site assuming that product levels are greater than 0.01 feet in recovery wells (**Appendix A**). A minimum thickness of 0.01 feet is required for the Model PRC-94 and most passive skimmer devices. A dedicated, free product bailer will be utilized to remove free product from the top of the wells.

The proposed free product recovery well diagram is included as **Figure 10**. A monitoring well will be installed down-gradient from piezometer CNC36-PZ03. The two existing one inch piezometers (CNC36-PZ01 and CNC36-PZ03) and the newly installed monitoring well (CNC36-MW08), see section 4.2, will be utilized as the free product recovery wells, assuming free product is present in the wells (**Figure 7**). In the event that any other monitoring wells contain free product, they too will be utilized as free product recovery wells. Any free product and contaminated groundwater removed from the wells will be containerized in DOT-approved (Specification 7H) 55-gallon drums and disposed of at a later date pending fluid contents analysis. The drums will be secured in a location coordinated with site management and base support (**see Section 6.0**).

If AFVR is warranted for this site, all monitoring wells will be used as potential target wells. Any free product and contaminated groundwater from the AFVR event will be containerized in a tanker vehicle and disposed at an appropriate facility based upon fluid contents.

The former UST basin and its associated contaminant plume will be the target area if bioremediation is warranted at the site. An SCDHEC-approved bioremediation product will be utilized at the site. The bioremediation product will be delivered into the contaminated zone through injection points typically installed using direct push technology in a grid pattern over the target area.

SCDHEC will be contacted prior to the implementation of the different remedial approaches at the site, if AFVR and bioremediation is warranted at the site.

4.2 Monitoring Well Installation

One proposed monitoring well (CNC36-M08) will be installed at the site. The location of the proposed well is shown on **Figure 7**. This well will be installed to the same specifications as existing shallow monitoring wells. The wells will consist of 2-inch diameter polyvinyl chloride (PVC) well casing installed to a depth of 12 ft bls with a 0.01-inch slotted screened interval from 2 to 12 ft bls.

If any wells are unusable or new wells are warranted for any other reason, the wells will be installed to the same specification as existing monitoring wells unless site conditions change and warrant otherwise. The wells will be installed in accordance with South Carolina Well Standards and Regulations R.61-71. A utility locate will be completed prior to any well installation activities. Any necessary permits will be acquired prior to well installation activities.

4.3 Surveying

Surveying of any new well locations will be conducted as a part of this CAP.

4.4 Soil Boring Schedule

Once free product has been removed from the site, a minimum of two soil borings will collected at the site. One soil boring will be collected in the former UST NS26 basin, and one soil boring will be collected in the approximately location of CNC36-B06 (**Figure 3**). The soil borings will be sampled to the top of the water table. Soil samples will be collected at two foot intervals and screened for organic vapors. Soil samples will be collected at each boring location at the soil sample depth in the unsaturated zone with the highest organic vapor reading and submitted for laboratory analysis. If no organic vapors are detected, then soil samples will collected at each boring location at one foot above water table and submitted for laboratory analysis.

4.5 System Operation and Maintenance

System operation and maintenance will conducted every week for the first month, and a minimum of once per month thereafter. The actual frequency of site visits will depend on the free product removal rates. During scheduled site visits, free product will be removed by hand bailing. System operation and maintenance will include the measurement of free product levels in the recovery well (CNC36-M08), the estimate of free product amount removed from each recovery well, and the examination of the downgradient and nearby monitoring wells (CNC36-M01, CNC36-M02, CNC36-M03 and CNC36-M07D) for free product. In the event that any additional monitoring wells contain free product, they too will be utilized as free product recovery wells.

4.6 Sampling and Analysis Plan

During system operation and maintenance, groundwater samples will be collected at system start-up and semi-annually from all monitoring wells that do not contain a sheen or free product. Once free product has been removed from the site, groundwater samples will collected from all monitoring wells. The groundwater samples will be submitted to a certified laboratory for analysis of benzene, toluene, ethylbenzene and xylenes (BTEX) and naphthalene by EPA Method 8260, Polyaromatics Hydrocarbons (PAHs) by EPA Method 8270, and metals (lead, arsenic, barium, cadmium, total chromium, mercury, selenium, and silver) by EPA Method 6010B.

Groundwater level measurements will be collected from all monitoring wells prior to all groundwater sampling events. Measurements will be taken with an electrical water level indicator or interface probe if floating product is present. No groundwater samples will be collected if free product is measurable.

Three to six well volumes will be purged from each well prior to groundwater sampling. Field measurements of pH, groundwater temperature, specific conductance, dissolved oxygen, and turbidity will be taken during groundwater sampling events.

As specified in **Section 4.4**, two soil samples will be collected and submitted to a certified laboratory for analysis of BTEX and diesel range organics by EPA Method 8260, and PAHs by EPA Method 8270.

All sampling procedures will be conducted in accordance with EPA Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM), 1996. Any contaminated groundwater collected during the well sampling events will be containerized in DOT-approved (Specification 7H) 55-gallon drums and disposed of at a later date pending fluid contents analysis.

4.7 Reporting

Semi-annual monitoring reports will be submitted to SCDHEC. The reports will summarize and include copies of field and laboratory analytical data. Upon completion of active remediation, a Performance Evaluation Report will also be submitted to SCDHEC to summarizes the remediation activities, evaluate the soil and water quality data, and provide recommendations for the site.

4.8 Equipment Decontamination

All drilling equipment, augers, well casing and screens, and soil and groundwater sampling equipment involved in field sampling activities will be decontaminated according to the EPA EISOPQAM.

4.9 Sample Handling

Sample handling will be conducted in accordance to the following references: EPA EISOPQAM, Code of Federal Regulations 136, 1990, EPA Users Guide to Contract Laboratory Program, 1988, and the Comprehensive Sampling and Analysis Plan, 1996. The following forms will be completed for packing/shipping process: sample labels, chain-of-custody labels, appropriate labels applied to shipping coolers, and chain-of-custody forms.

4.10 Quality Control

In addition to periodic calibration of field equipment and the completions of the appropriate documentation, quality control (QC) samples will be collected during sampling events. QC samples may include field blanks, field duplicates, and trip blanks. Definitions of each can be found below as described by the EPA EISOPQAM:

- **Field Blank:** A sample collected using organic-free water, which has been run over/through sample collection equipment. These samples are used to determine if contaminants have been introduced by contact of the sample medium with sampling equipment. Equipment field blanks are often associated with collecting rinse blanks of equipment that has been field cleaned.

- **Field Duplicates:** Two or more samples collected from a common source. The purpose of a duplicate sample is to estimate the variability of a given characteristic or contamination associated with a population.

- **Trip Blank:** A sample, which is prepared prior to the sampling event in the actual container and is stored with the investigative samples throughout the sampling event. They are often packaged for shipment with the other samples and submitted for analysis. At no time after their preparation are trip blanks to be opened before they reach the laboratory. Trip blanks are used to determine if samples were contaminated during storage and/or transportation back to the laboratory (a measure of sample handling variability resulting in positive bias in contaminant concentration). If samples are to be shipped, trip blanks are to be provided with each shipment but not for each cooler.

4.11 Field Quality Assurance / Quality Control (QA/QC)

All sampling procedures will be conducted in accordance with EPA EISOPQAM. More information on field QC can be found in **Sections 4.8** through **4.10**.

QA/QC specifications for selected field measurements are summarized below.

Analysis	Control Parameter	Control Limit	Corrective Action
Air Monitoring	Check Calibration of OVA daily	Calibrate to manufactures specifications	Recalibrate. If unable to calibrate, replace.
pH of water	Continuing calibration check of pH 7.0 buffer	pH = 7.0	Recalibrate. If unable to calibrate, replace electrode.
Specific Conductance of water	Continuing calibration check of standard solution	> 1% of standard	Recalibrate.

4.12 Record keeping

In addition to required sampling documentation (see **Section 4.9**), standardized forms, log sheets and logbooks will be completed during all field activities.

5.0 PROPOSED INTRINSIC REMEDIATION

Upon completion of active remediation, if warranted, intrinsic remediation will be implemented until contaminant concentrations decrease below RBSLs or other action levels approved by SCHDEC. This CAP provides a method for implementing intrinsic remediation and monitoring well abandonment as a corrective action in accordance with SCDHEC Corrective Action Guidance, June 1997. The intrinsic remediation method may be modified based upon the results of active remediation.

5.1 Monitoring Well Installation

Assuming the existing wells are in good condition, no monitoring wells will be installed for the CAP. If any wells are unusable or new wells are warranted for any other reason, the wells will be installed to the same specification as existing monitoring wells unless site conditions change and warrant otherwise.

5.2 Surveying

No new monitoring wells are scheduled to be installed as a part of this CAP. Surveying of any new well locations will be conducted if warranted.

5.3 Soil Boring Schedule

For a description of soil boring installation scheduled for the CAP see **Section 4.4**. No other soil borings are scheduled for the CAP unless site conditions change and warrant otherwise.

5.4 Monitoring Well Abandonment

All monitoring wells will be abandoned upon receiving approval by SCDHEC. The wells will be abandoned following the South Carolina Well Standards and Regulations R.61-71. The well abandonment will include grouting wells, removing stick-ups and removing all guard posts. Any well casing and screen removed will be decontaminated and disposed of as general refuse.

5.5 Sampling and Analysis Plan

Groundwater samples will be collected semi-annually for a period of 18 months from monitoring wells CNC36-M01, CNC36-M02, CNC36-M03, and CNC36-M08. The groundwater samples will be submitted to a certified laboratory for analysis of BTEX and naphthalene by EPA Method 8260, PAHs by EPA Method 8270, and metals by EPA Method 6010B. The following parameters will also be considered for analysis in order to evaluate the effectiveness of intrinsic remediation: nitrate (NO^{-3}), sulfate (SO^{-4}), total and dissolved iron, methane (CH_4), and alkalinity.

Groundwater level measurements will be collected from all monitoring wells prior to all groundwater sampling events. Measurements will be taken with an electrical water level

indicator or interface probe if floating product is present. No groundwater samples will be collected if free product is measurable.

From three to six well volumes will be purged from each well prior to groundwater sampling. Field measurements of pH, groundwater temperature, specific conductance, dissolved oxygen, and turbidity will be taken during groundwater sampling events.

All sampling procedures will be conducted in accordance with EPA EISOPQAM. Any contaminated groundwater collected during the well sampling events will be containerized in DOT-approved (Specification 7H) 55-gallon drums and disposed of at a later date pending fluid contents analysis.

5.6 Reporting

Semi-annual monitoring reports will be submitted to SCDHEC. The reports will summarize and include copies of field and laboratory analytical data. Upon completion of 18 months of sampling, a Performance Evaluation Report will also be submitted to SCDHEC to summarizes the sampling activities, evaluate the soil and water quality data, and provide recommendations for the site.

6.0 SITE MANAGEMENT AND BASE SUPPORT

Throughout the investigation activities, work on the CNC will be coordinated through SOUTHDIV and SCDHEC.

The primary contacts for each are as follows:

1. SOUTHDIV point of contact
   Gabe Magwood
   Southern Division Engineering Command
   2155 Eagle Drive
   North Charleston, SC 29406
   (843) 820-7307

2. SOUTHDIV point of contact
   Tony Hunt
   Southern Division Engineering Command
   2155 Eagle Drive
   North Charleston, SC 29406
   (843) 820-7307

3. SCDHEC point of contact
   Chuck Williams
   South Carolina Department of Health and Environmental Control
   2600 Bull Street
   Columbia, SC 29201
   (843) 898-4339

7.0 REFERENCES

Comprehensive Sampling and Analysis Plan (Ensafe/Allen & Hoshall. July 1996).

South Carolina Department of Health and Environmental Control. 1997. Corrective Action Guidance.

SPORTENVDETCHASN. 1997. UST Assessment Report.

Tetra Tech NUS, Inc. March 2000. Rapid Assessment Report for Site 36, Building NS26, Zone I, Charleston, South Carolina.

United States Environmental Protection Agency. 1990. Code of Federal Regulations 136.

United States Environmental Protection Agency. 1996. EPA Environmental Investigations Standard Operating Procedures for Quality Assurance Manual.

United States Environmental Protection Agency. 1996. EPA Environmental Investigations Standard Operating Procedures for Quality Assurance Manual.

United States Environmental Protection Agency. 1988. EPA How to Effectively Recover Free Product at Leaking Underground Storage Tank Sites.

8.0 TABLES

TABLE 1

GROUNDWATER ELEVATIONS
SITE 36, BUILDING NS26
ZONE I, CHARLESTON NAVAL BASE COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Well #	Total Depth of Well (ft)	Top of Casing Elevation, ft (MSL)	Date Measured	Depth to Water, ft (BTOC)	Depth to Product, ft (BTOC)	Product Thickness (ft)	Groundwater Elevation† (MSL)
CNC36-M01	12.67	9.59	13-Aug-99	5.80	ND	ND	3.79
			10-Sep-99	5.81	ND	ND	3.78
CNC36-M02	12.93	9.41	10-Sep-99	5.67	ND	ND	3.74
CNC36-M03	12.80	8.90	10-Sep-99	5.05	ND	ND	3.85
CNC36-M04	12.95	9.96	10-Sep-99	5.94	ND	ND	4.02
CNC36-M05	13.04	9.94	10-Sep-99	5.86	ND	ND	4.08
CNC36-M06	13.02	8.68	10-Sep-99	3.51	ND	ND	5.17
CNC36-M07	35.92	9.39	10-Sep-99	7.62	ND	ND	1.77
CNC36-680004	13.84	9.22	10-Sep-99	5.46	ND	ND	3.76
CNC36-PO1*	11.55	9.63	10-Sep-99	5.75	ND	ND	3.88
			20-Oct-99	4.61	SHEEN		5.02
CNC36-P03*	11.81	9.66	10-Sep-99	5.67	5.62	0.05	4.03
			20-Oct-99	4.50	4.36	0.14	5.27

Notes:

MSL - Mean Sea Level

BTOC - Below Top of Casing

ND- Not Detected

ft - Feet

* Permanent Piezometer Well

† Corrected Depth to Water Measurements Based on Free Product Thickness

TABLE 3

SUMMARY OF MOBILE LABORATORY SCREENING RESULTS FOR SOIL
SITE 36, BUILDING NS26
ZONE I, CHARLESTON NAVAL BASE COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

SOIL BORING/ SAMPLE NO.	SAMPLE DATE	Benzene (ug/kg)	Toluene (ug/kg)	Ethylbenzene (ug/kg)	Xylenes (m&p) (ug/kg)	Xylenes (o) (ug/kg)	Naphthalene (ug/kg)	DRO (mg/kg)
RBSL [1]		5	1,622	1,260	42,471		210	
CNC36-B01 / 36SFB010304	17-Jun-99	ND	ND	ND	ND	ND	ND	ND
CNC36-B02 / 36SFB020506	17-Jun-99	ND	ND	ND	ND	1,342 (E)	4,440 (E)	424
CNC36-B03 / 36SFB030506	17-Jun-99	ND	ND	ND	ND	ND	ND	ND
CNC36-B04 / 36SFB040506	17-Jun-99	ND	ND	ND	ND	ND	ND	ND
CNC36-B05 / 36SFB050506	17-Jun-99	ND	ND	ND	ND	ND	198	491
CNC36-B06 / 36SFB060506	19-Jun-99	ND	ND	ND	ND	ND	192	ND
CNC36-B07 / 36SFB070506	19-Jun-99	ND	ND	70.2	38.4 (J)	16.2 (J)	114	ND
CNC36-B08 / 36SFB080607	19-Jun-99	ND	ND	ND	ND	ND	ND	ND
CNC36-B09 / 36SFB090304	19-Jun-99	ND	ND	ND	ND	ND	ND	ND
CNC36-B10 / 36SFB100405	19-Jun-99	ND	ND	ND	ND	ND	ND	ND
CNC36-B11 / 36SFB110506	21-Jun-99	ND	ND	ND	ND	ND	ND	ND
CNC36-B12 / 36SFB120405	21-Jun-99	ND	ND	ND	ND	ND	ND	ND
CNC36-B13 / 36SFB130304	26-Jul-99	ND	ND	ND	ND	ND	ND	ND
CNC36-B14 / 36SFB140304	26-Jul-99	ND	ND	ND	ND	ND	ND	ND
CNC36-B15 / 36SFB150304	26-Jul-99	ND	ND	ND	ND	ND	ND	ND
CNC36-B16 / 36SFB160304	26-Jul-99	ND	ND	ND	ND	ND	ND	ND

Notes:

Shaded cells indicate analyte concentrations that exceed the RBSL.

ND - not detected

mg/kg - milligrams per kilogram

ug/kg - micrograms per kilogram

[J] Indicates presence of analyte at a concentration less than the reporting limit and greater than the detection limit.

[E] Indicates presence of analyte at a concentration exceeding the GC/MS calibration parameters.

[1] RBSL - South Carolina Department of Health and Environmental Control Risk-Based Screening Levels for clay-rich soils, depth to groundwater less than 5 feet.

TABLE 5

SUMMARY OF FIXED-BASE LABORATORY ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN IN SOIL
SITE 36, BUILDING NS26
ZONE I, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA
PAGE 1 OF 2

Soil Boring / Sample No.	Sample Date	Benzene (ug/kg)	Toluene (ug/kg)	Ethyl-benzene (ug/kg)	Xylenes (total) (ug/kg)	Benzo(a) anthracene (ug/kg)	Benzo(b) fluoranthene (ug/kg)	Benzo(k) fluoranthene (ug/kg)	Chrysene (ug/kg)	Dibenzo(a,h) anthracene (ug/kg)	Naphthalene (ug/kg)
RBSL [1]		5	1,622	1,260	42,471	73,084	29,097	231,109	12,998	87,866	210
CNC36-B01 / 36SLB010304	22-Sep-99	< 6	< 6	< 6	< 6	< 400	< 400	< 400	< 400	< 400	< 6
CNC36-B0 / 36SLB010304D[2]	22-Sep-99	< 7	< 7	< 7	< 7	680	600	230 (J)	600	< 460	< 7
CNC36-B02 / 36SLB020405	21-Sep-99	< 7	< 7	< 7	< 7	< 430	220 (J)	< 430	< 430	< 430	< 7
CNC36-B03 / 36SLB030405	21-Sep-99	< 7	< 7	< 7	< 7	< 430	< 430	< 430	< 430	< 430	< 7
CNC36-B04 / 36SLB040304	23-Sep-99	<6	<6	<6	<6	< 400	< 400	< 400	< 400	< 400	<6
CNC36-B05 / 36SLB050405	21-Sep-99	< 8	< 8	< 8	< 8	< 460	< 460	< 460	< 460	< 460	4,582
†CNC36-B06 / 36SLB060304	24-Sep-99	<1,600	<1,600	<1,600	950 (J)	< 430	< 430	< 430	< 430	< 430	48,000
‡CNC36-B07 / 36SLB070304	23-Sep-99	<6	<6	<6	<6	< 430	< 430	< 430	< 430	< 430	<6

Notes:

All concentrations are in micrograms per kilogram (ug/kg).

Shaded cells indicate analyte concentrations that exceed the RBSL.

NA - Not Analyzed

[1] South Carolina Department of Health and Environmental Control Risk-Based Screening Levels for sandy soils; depth to groundwater less than 5 feet.

[2] Duplicate Sample

(J) Indicates the presence of an analyte at a concentration less than the reporting limit and greater than the detection limit.

† USEPA Method 8260 analysis was performed on 9/30/99; compound recovery for 3 of 4 surrogates was out of criteria and naphthalene concentration was out of calibration. The sample was on 9/30/99 and 10/2/99. The 10/2/99 analysis (results reported above) used a dilution factor of 330. This analysis was chosen because of improved surrogate recovery (4 of 4 within criteria)

‡ USEPA Method 8260 analysis was performed on 9/29/99 (reported above) and on 9/30/99. The additional analysis was performed because the surrogate compound recovery was out of crit 3 of 4 of the surrogates. The re-analysis results are believed to be less reliable because surrogate compound recovery was out of criteria by a greater margin than in the initial analysis.

TABLE 6

SUMMARY OF FIXED-BASE LABORATORY ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN IN GROUNDWATER
SITE 36, BUILDING NS26
ZONE I, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA
PAGE 1 OF 2

Monitoring Well/ Sample No.	Sample Date	Benzene (ug/L)	Ethyl-benzene (ug/L)	Toluene (ug/L)	Xylenes (total) (ug/L)	Naphthalene (ug/L)	Benzo(a) anthracene (ug/L)	Benzo(b) fluoranthene (ug/L)	Benzo(k) fluoranthene (ug/L)	Chrysene (ug/L)	Dibenzo(a,h) anthracene (ug/L)	MTBE (ug/L)
RBSL[1]		5	700	1,000	10,000	10 [2]	10 [2]	10 [2]	10 [2]	10 [2]	10 [2]	40
CNC36G-80 / 36GLG680004	13-Aug-99	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 5
CNC36M-01 / 36GLM0101	13-Aug-99	4 (J)	13	35	62	**110**	< 10	< 10	< 10	< 10	< 10	< 5
CNC36M-02 / 36GLM0201	13-Sep-99	< 5	<5	3 (J)	3 (J)	9	< 10	< 10	< 10	< 10	< 10	< 5
CNC36M-02 / 36GLM0201D[3]	13-Sep-99	< 5	< 5	< 5	< 5	6 (B)	< 10	< 10	< 10	< 10	< 10	< 5
CNC36M-03 / 36GLM0301	13-Sep-99	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 5
CNC36M-04 / 36GLM0401	10-Sep-99	< 5	4 (J)	< 5	6	**13 (B)**	< 10	< 10	< 10	< 10	< 10	< 5
CNC36M-05 / 36GLM0501	10-Sep-99	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 5
CNC36M-06 / 36GLM0601	13-Sep-99	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 5
CNC36M-07 / 36GLM0701	10-Sep-99	< 5	< 5	< 5	< 5	<5	< 10	< 10	< 10	< 10	< 10	<5

Notes:

All concentrations are in ug/L.

Shaded cells indicate analyte concentrations that exceed the RBSL.

NA - Not analyzed

[1] South Carolina Department of Health and Environmental Control Risk-Based Screening Levels for groundwater.

[2] The risk-based screening level for individual PAH CoC is 10 ug/L or 25 ug/L for total PAHs.

[3] Duplicate sample.

(B) Indicates the detection of analyte in laboratory method blank.

(J) Indicates presence of analyte at a concentration less than the reporting limit and greater than the detection limit.

TABLE 7

FATE AND TRANSPORT INPUT PARAMETERS
SITE 36, BUILDING NS26
ZONE I, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Parameter	Domenico Dilution/Attenuation Model[1]
Hydraulic Conductivity [m/sec]	2.45E-05
Hydraulic Gradient	0.0071
Porosity (effective)	0.2
Estimated Plume Length [ft]	NA
Soil Bulk Density[a] [kg/L]	1.2
Partition Coefficient [L/kg]	chemical specific
Fraction of Organic Carbon in soil [g/g]	2.84E-03
First Order Decay Rate [sec^{-1}]	0
Modeled Plume Length [ft]	NA
Modeled Plume Width [ft]	NA
Source Width[b] [m]	7.62
Source Thickness[b] [m]	0.91
Soluble Mass [kg]	Infinite[c]

Notes:

(1) - *South Carolina Risk-Based Corrective Action for Petroleum Releases,* South Carolina Department of Health and Environmental Control, 1998.

(a) - Determined from SCDHEC 1998, Tables C1 and C3

(b) - Site-specific data

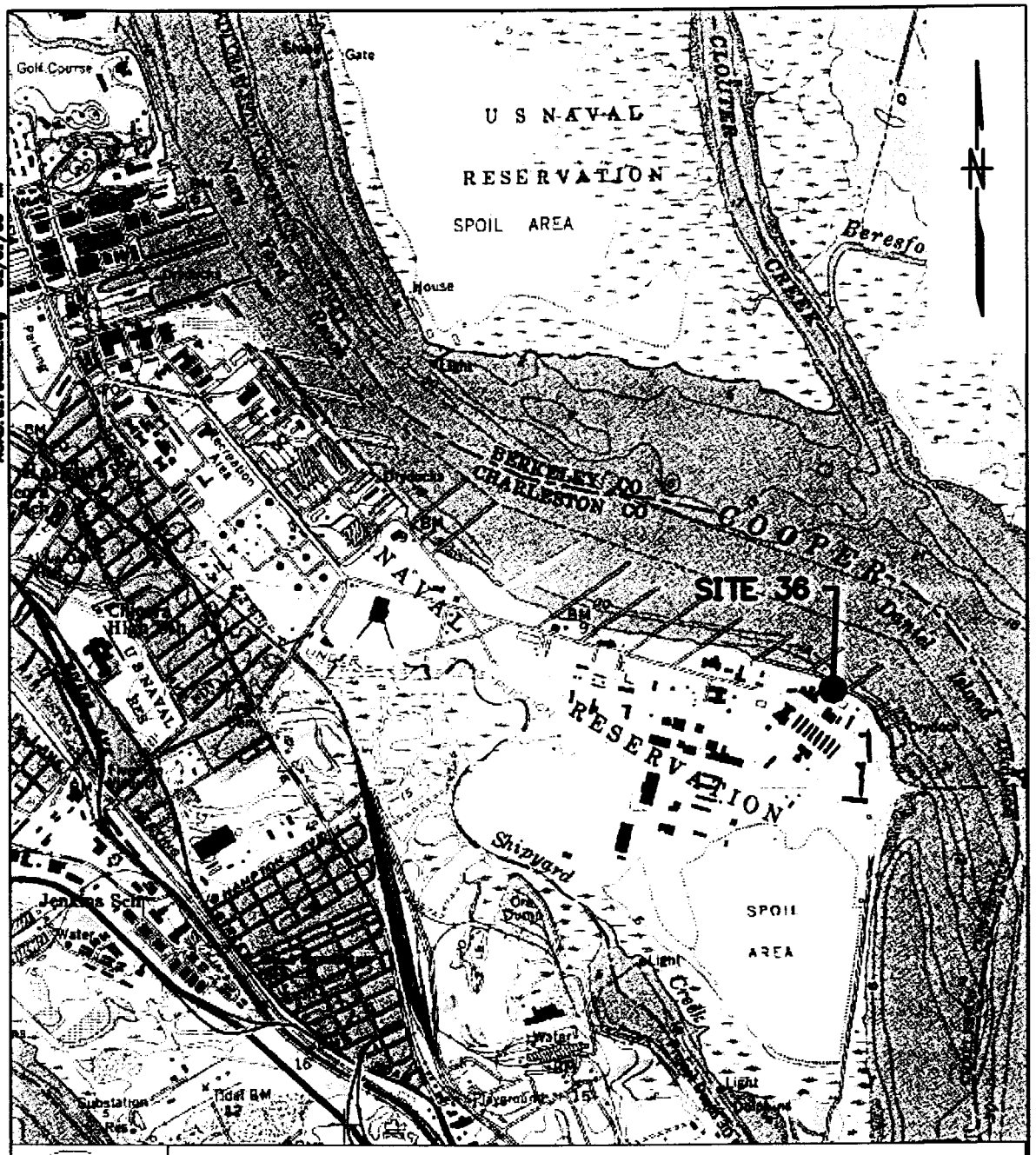
(c) - Assumption of the Domenico model

TABLE 9

EXPOSURE PATHWAY ASSESSMENT - FUTURE USE
SITE 36, BUILDING NS26
ZONE I, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Media	Exposure Route	Pathway Selected for Evaluation?	Exposure point or Reason for Non-Selection	Data Requirements (If pathway selected)
Air	Inhalation	No	Free product and groundwater plumes outside building location. No volatilization to enclosed space. No explosion hazard.	
	Explosion Hazard	No		
Groundwater	Ingestion	Yes	Future use of property expected to be industrial or commercial. Groundwater level within 6 feet of ground surface; therefore, construction worker exposure possible.	No additional data required.
	Dermal contact	Yes		
	Inhalation	Yes		
Surface Water	Ingestion	Yes	Cooper River located approx. 110 feet downgradient, possible plume migration to river.	No additional data required.
	Dermal contact	Yes		
	Inhalation	No		
Surficial Soil	Ingestion	No	No impacted surface soil, ground surface is paved.	
	Dermal contact	No		
	Inhalation	No		
Subsurface Soil	Ingestion	Yes	Future use of property expected to be industrial or commercial. Intrusive construction possible; therefore, construction worker exposure possible.	No additional data required.
	Dermal contact	Yes		
	Inhalation	Yes		
	Leaching to Groundwater	Yes		

9.0 FIGURES



DRAWN BY DATE: HJP 8/20/99		SITE LOCATION MAP SITE 36, BUILDING NS26 ZONE I, CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SC	CONTRACT NO. 0270
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED–AREA			APPROVED BY DATE
SCALE: AS NOTED			DRAWING NO. FIGURE 1 / REV. 0

FORM CADD NO. 2SEV_AV.DWG - REV 0 - 1/28/98

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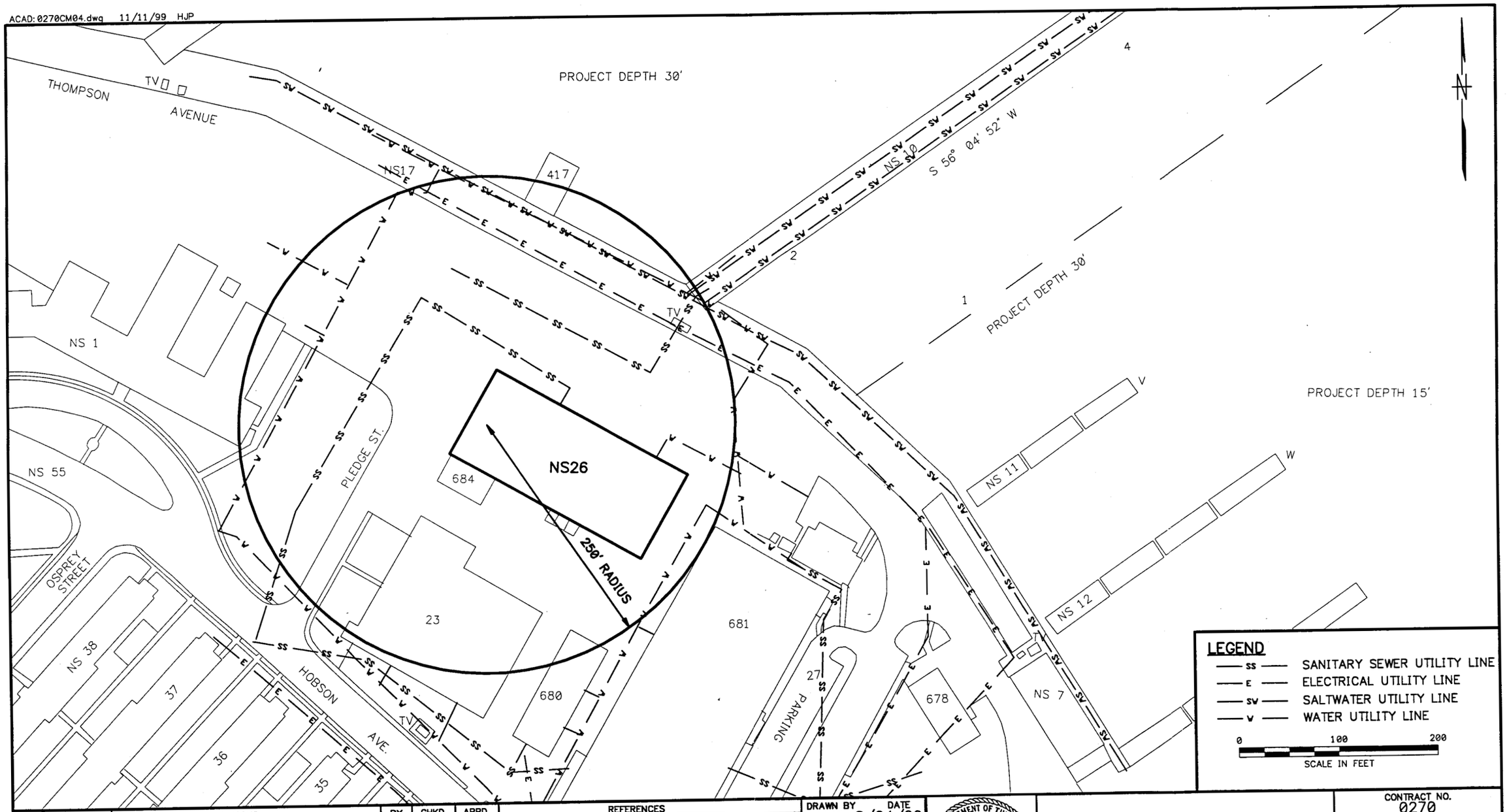


NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

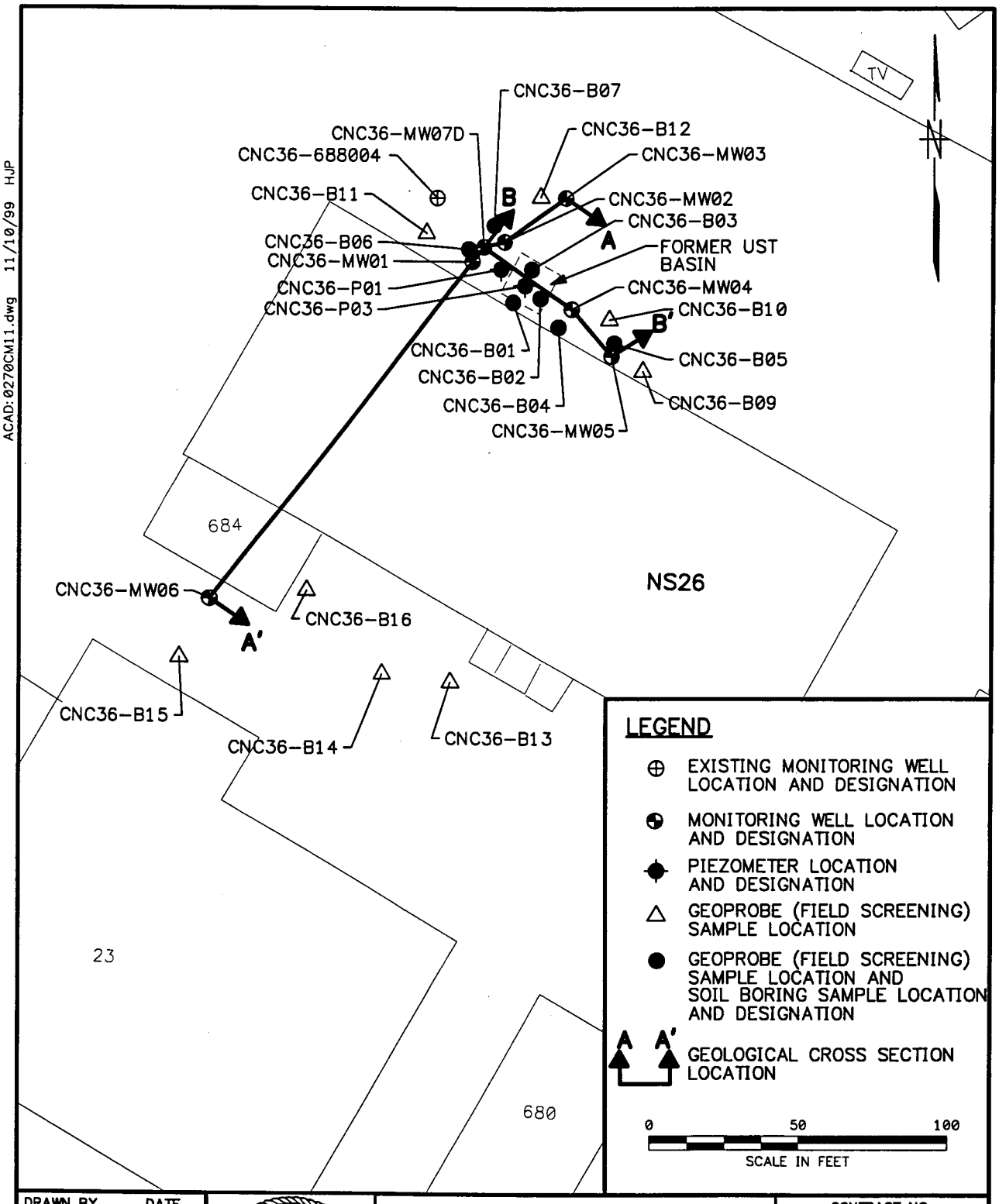
DRAWN BY HJP 8/24/99 DATE
CHECKED BY DATE
COST/SCHED–AREA
SCALE AS NOTED

DEPARTMENT OF THE NAVY · NAVAL FACILITIES ENGINEERING COMMAND · DIV FACILITIES ENGINEERING

SITE VICINITY MAP
SITE 36, BUILDING NS26
ZONE I, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0270
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 2
REV. 0

FORM CADD NO. SDIV_BH.DWG - REV 0 - 1/20/98



ACAD: 0270CM11.dwg 11/10/99 HJP

DRAWN BY HJP DATE 11/10/99	SITE MAP AND SAMPLE LOCATIONS SITE 36, BUILDING NS26 ZONE I, CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NO. 0270	
CHECKED BY DATE		APPROVED BY DATE	
COST/SCHED-AREA		APPROVED BY DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 3	REV. 0

FORM CADD NO. SDIV_AV.DWG - REV 0 - 1/20/98

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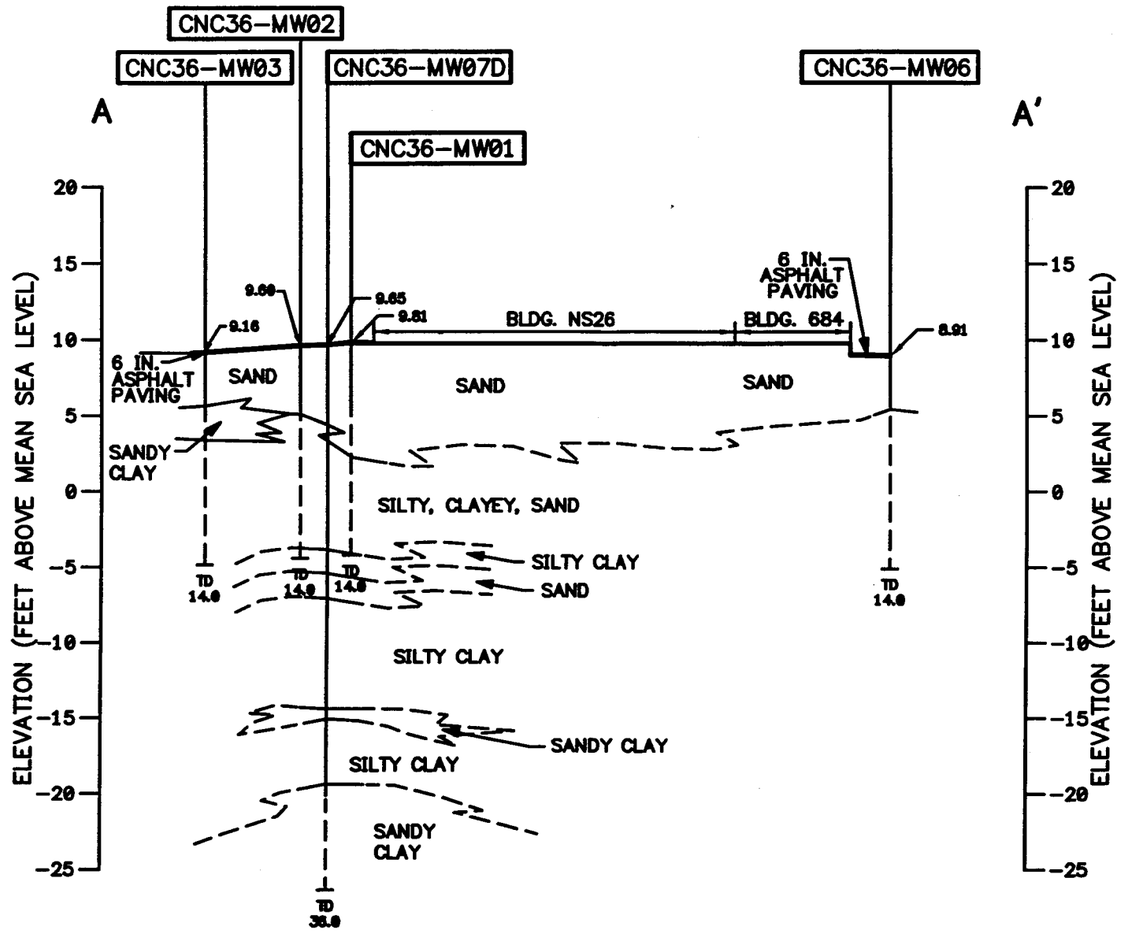


0 40 80
HORIZONTAL SCALE IN FEET

0 10 20
VERTICAL SCALE IN FEET

LEGEND:

MONITORING WELL OR BORING NUMBER — CNC36-MW03
GROUND SURFACE ELEVATION — 9.16
GROUND SURFACE
LITHOLOGIC CONTACT (INFERRED BETWEEN BORINGS)
TOTAL DEPTH OF WELL OR BORING (FT BGS) — TD 14.0

SAND: ORANGE,BROWN AND/OR GREEN; FINE- TO MEDIUM-GRAINED; LOOSE; TO LIGHTLY DENSE

SILTY, CLAYEY, SAND: DK GRAY; SOFT; LOW PLASTICITY

SANDY CLAY: DK BROWN; SOFT; SLIGHT PLASTICITY

SILTY CLAY: DARK BROWN; SOFT; LOW PLASTICITY

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY HJP DATE 11/11/99
CHECKED BY DATE
COST/SCHED--AREA
SCALE AS NOTED

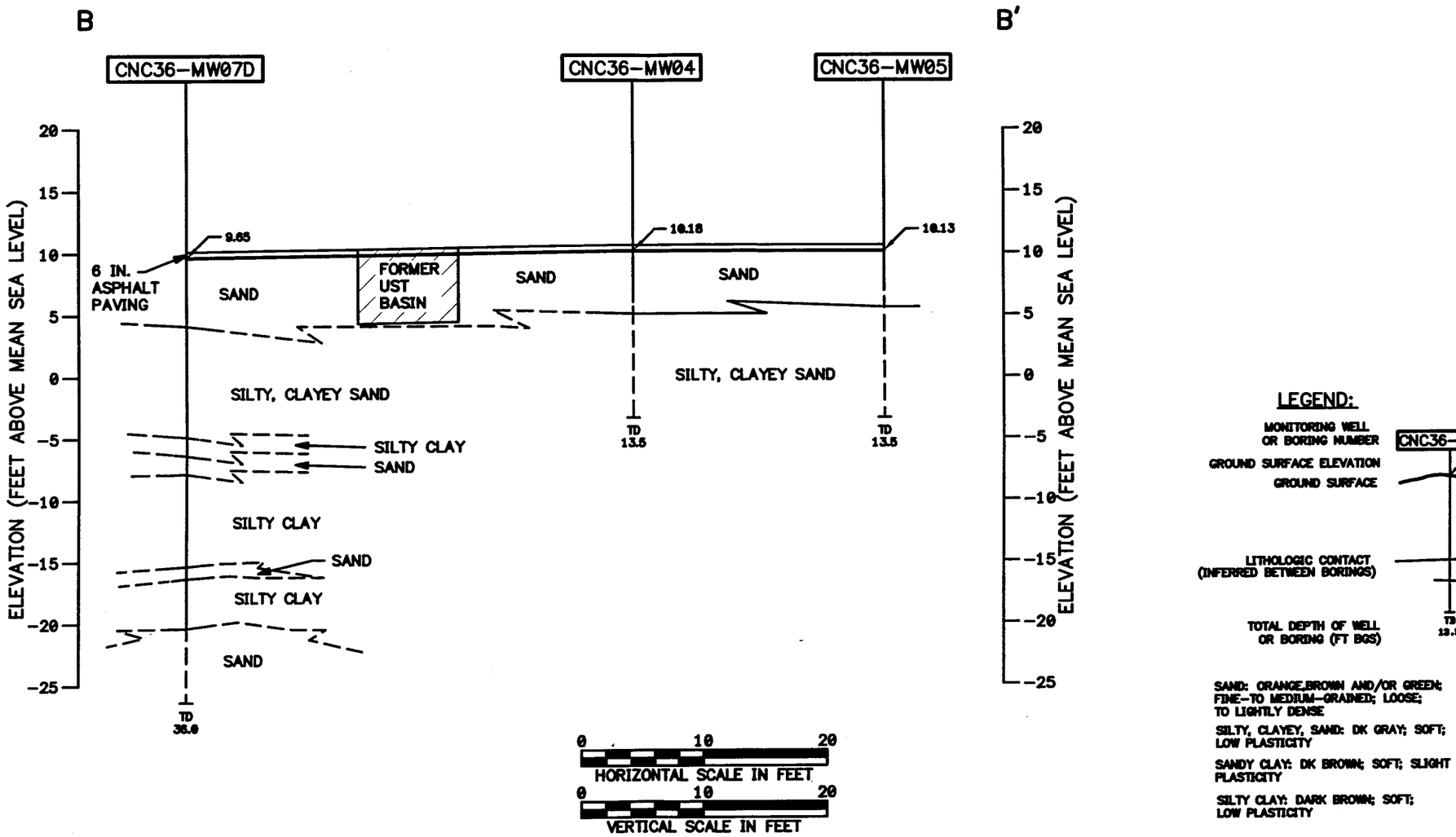
DEPARTMENT OF THE NAVY — SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND

GEOLOGIC CROSS SECTION A-A'
SITE 36, BUILDING NS26
ZONE I, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0270
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 4
REV. 0

FORM CADD NO. SIRV_SHEET - REV 0 - 1/28/98

ACAD: 0270GX02.dwg 01/31/00 MF



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

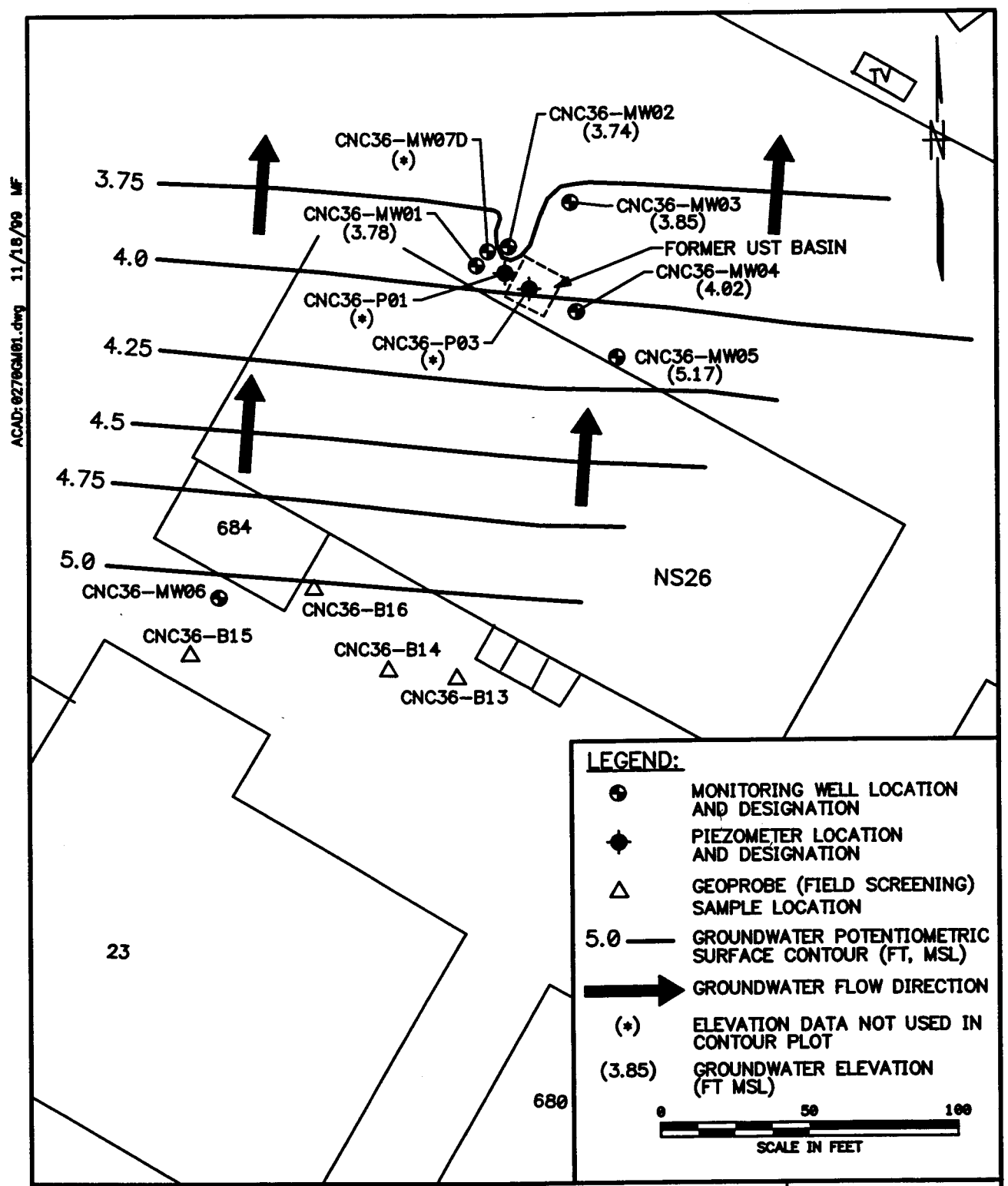
DRAWN BY HJP DATE 11/11/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND

GEOLOGIC CROSS SECTION B-B'
SITE 36, BUILDING NS26
ZONE I, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0270
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 5
REV. 0

FORM CADD NO. SHEV_SHJMG - REV 0 - 1/28/98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TV
CNC36-MW07D
(*)
CNC36-MW02
(3.74)
CNC36-MW03
(3.85)
CNC36-MW01
(3.78)
FORMER UST BASIN
CNC36-MW04
(4.02)
CNC36-P01
(*)
CNC36-P03
(*)
CNC36-MW05
(5.17)
3.75
4.0
4.25
4.5
4.75
5.0
684
NS26
CNC36-MW06
CNC36-B16
CNC36-B15
CNC36-B14
CNC36-B13
23
680
LEGEND:
MONITORING WELL LOCATION AND DESIGNATION
PIEZOMETER LOCATION AND DESIGNATION
GEOPROBE (FIELD SCREENING) SAMPLE LOCATION
5.0 GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (FT, MSL)
GROUNDWATER FLOW DIRECTION
(*) ELEVATION DATA NOT USED IN CONTOUR PLOT
(3.85) GROUNDWATER ELEVATION (FT MSL)
0
50
100
SCALE IN FEET
DRAWN BY DATE
HJP 11/10/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE
AS NOTED
DEPARTMENT OF THE NAVY
SOUTHERN DIV FACILITIES ENGINEERING COMMAND
GROUNDWATER POTENTIOMETRIC MAP
(SEPTEMBER 10, 1999)
SITE 36, BUILDING NS26
ZONE I, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA
CONTRACT NO.
0270
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO.
FIGURE 6
REV.
0
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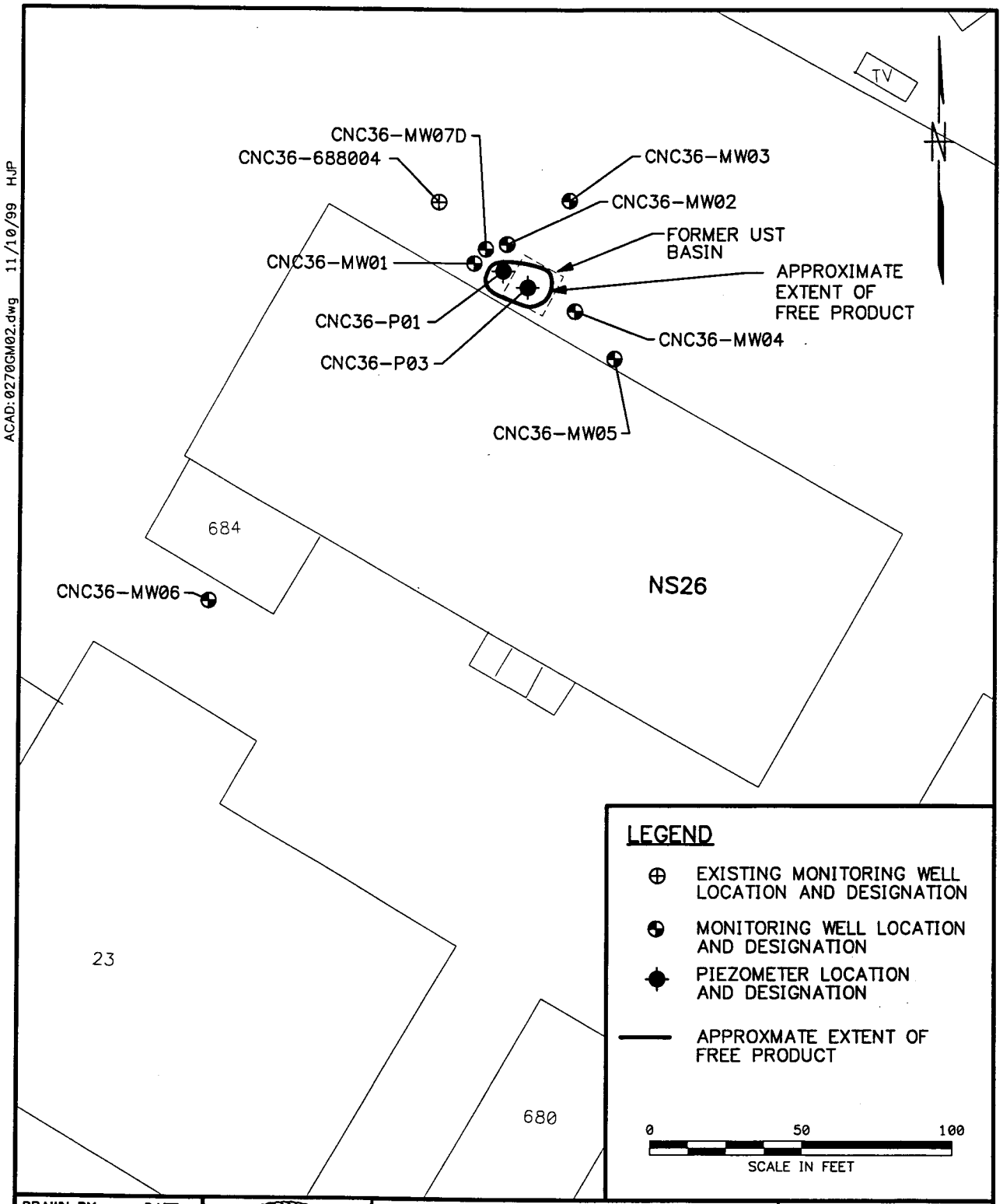
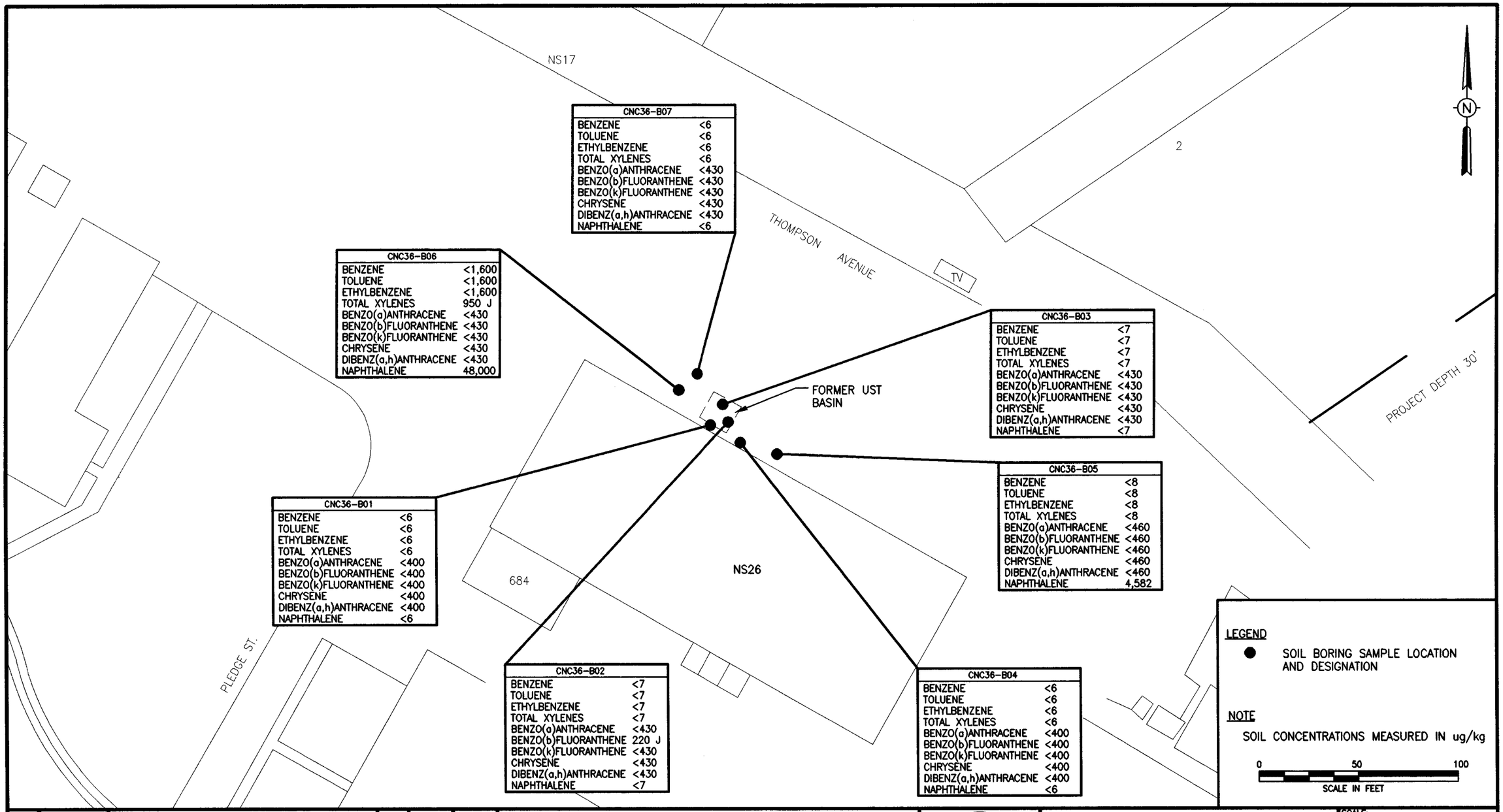


DRAWN BY HJP DATE 11/10/99	AREAL EXTENT OF FREE PRODUCT (SEPTEMBER 10, 1999) SITE 36, BUILDING NS26 ZONE I, CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NO. 0270
CHECKED BY DATE		APPROVED BY DATE
COST/SCHED-AREA		APPROVED BY DATE
SCALE AS NOTED		DRAWING NO. FIGURE 7 / REV. 0

DEPARTMENT OF THE NAVY ★ SOUTHERN DIV FACILITIES ENGINEERING COMMAND ★

FORM CADD NO. SDIV_AV.DWG - REV 0 - 1/20/98



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

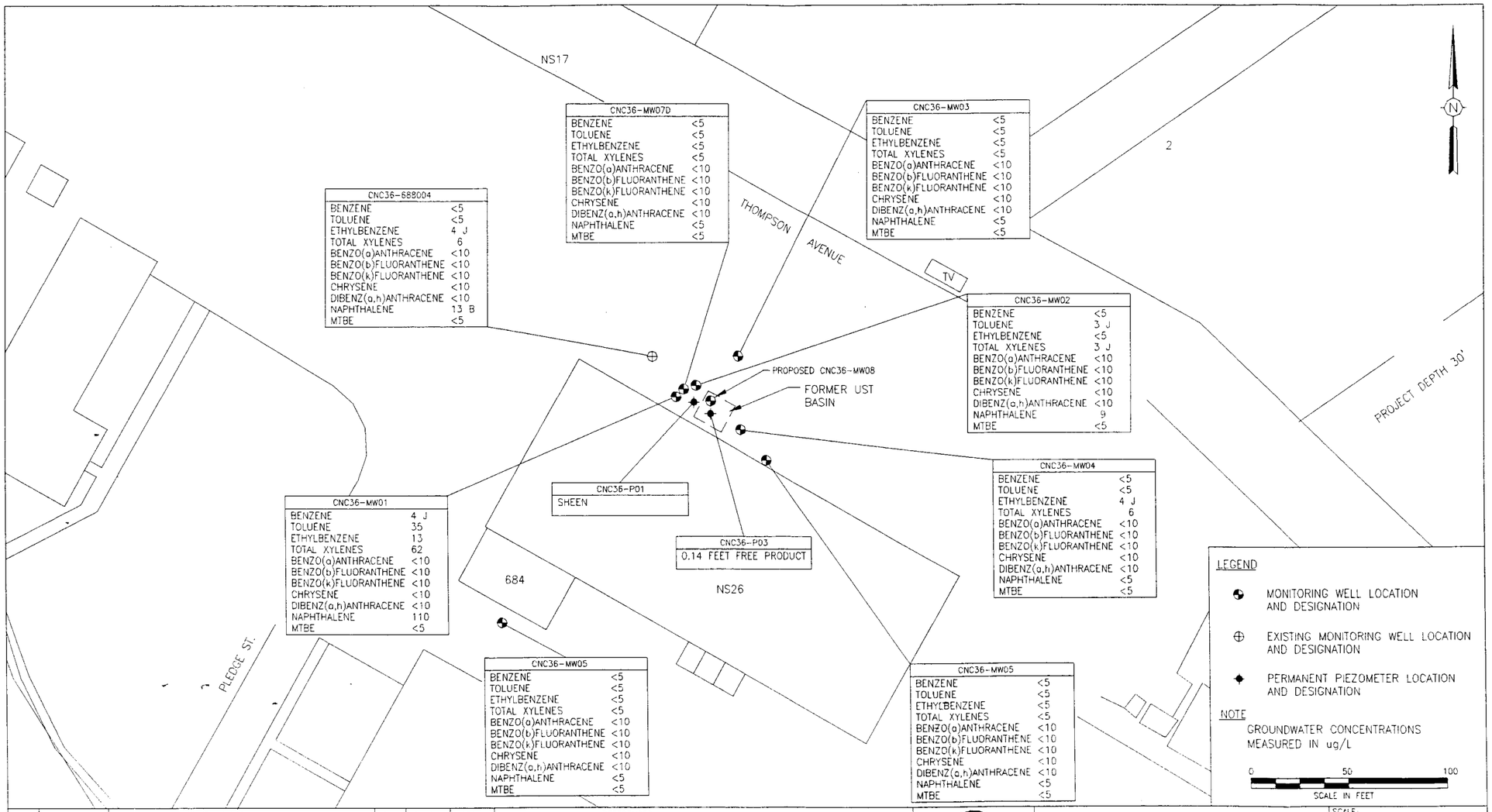
J.A. JONES

DISTRIBUTION OF CHEMICALS
OF CONCERN IN SOIL, JUNE 1999
SITE 36, BUILDING NS26
ZONE I, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

SCALE: AS NOTED

JOB NO. 093

DRAWING NO. FIGURE 8

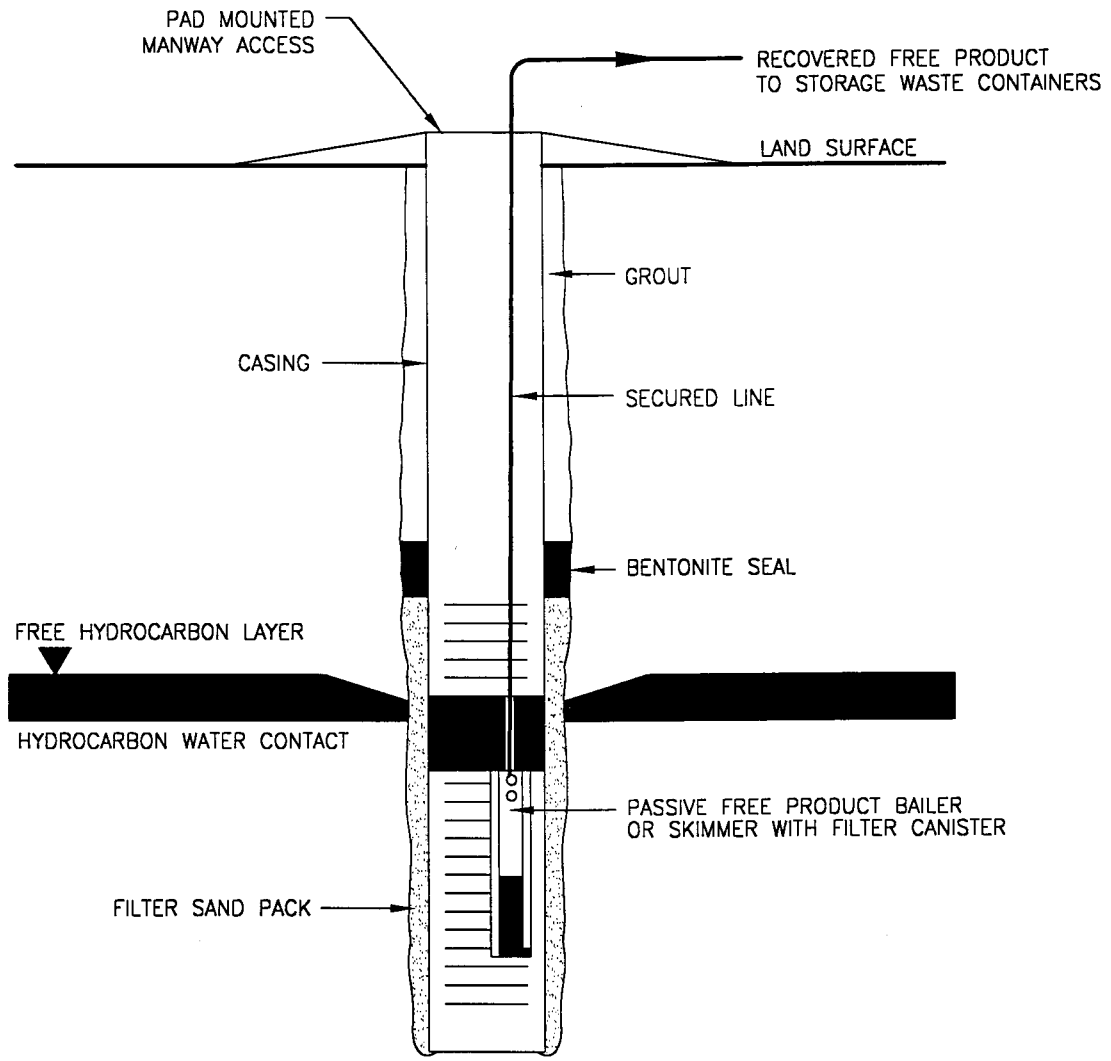


NO	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

J.A. JONES

DISTRIBUTION OF CHEMICALS OF CONCERN
IN GROUNDWATER, AUGUST-OCTOBER 1999
SITE 36, BUILDING NS26
ZONE I, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

SCALE: AS NOTED
JOB NO.: 093
DRAWING NO.: FIGURE 9



J.A. JONES

PROPOSED FREE PRODUCT RECOVERY WELL DIAGRAM
SITE 36, BUILDING NS26
ZONE 1, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

SCALE: NONE

JOB NO. 093

DRAWING NO. FIGURE 10

APPENDIX A

REMEDIAL EQUIPMENT – PASSIVE SKIMMER

MAIN MENU

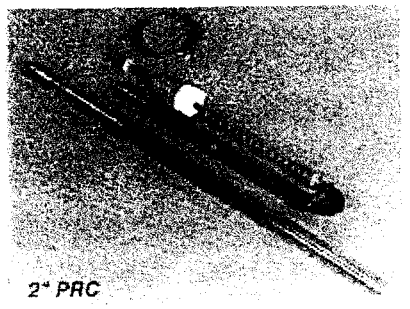
CATALOG INDEX BY ALPHABETICAL ORDER

CATALOG INDEX BY DEPARTMENT

For more info:
enviro@geneq.com

Hydrocarbon Recovery Canister

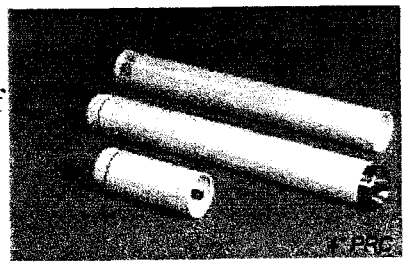
New, Revolutionary, Answer to your Hydrocarbon Recorvery Needs.


2" PRC

The PRC is a passive, floating skimmer device designed to separate and recover light hydrocarbons from the ground water. Incorporating Keck's original skimmer technology with a storage canister, the device will automatically collect floating product is evacuated from the device through a discharge valve at the bottom of the canister.

Featuring a hydrophobic filter buoy for product recovery without water, the PRC skimmer has a travel of 12" to compensate for water table fluctuation and well placement.

The PRC Recovery Canister is available for 2" or larger monitor wells. It requires no external means of power, is easily installed and can be installed at remote sites.


4" PRC

Specifications

- **Dimensions**
  - **Length :** 39"/99cm (4"/100mm canister), 50"/127cm (2"/50mm canister)
  - **O.D. :** 3.5"/90mm or 1.75"/44mm
  - **Weight :** 7 lbs./3.2kg (4"/100mm canister), 4 lbs./1.8kg (2"/50mm canister)
- **Recovery Canister Capacity**
  2"/50mm .5 liter transparent cylinder
  4"/100mm 1 liter standard, other capacities available; easily changed in the field.

CATALOG	DESCRIPTION
KEPRC4-000	**PRC-94 Canister for 4" well**
KEPRC2-000	**PRC-94 Canister for 2" well**