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SAMPLING AND ANALYSIS PLAN (SAP) FOR QUARTERS B UNDERGROUND STORAGE  
TANKS B1 AND B2 (UST B1 AND B2) CNC CHARLESTON SC  
03/11/1998  
ENVIRONMENTAL DETACHMENT CHARLESTON



DEPARTMENT OF THE NAVY  
SOUTHERN DIVISION  
NAVAL FACILITIES ENGINEERING COMMAND  
P.O. BOX 190010  
2155 EAGLE DRIVE  
NORTH CHARLESTON, S.C. 29419-9010

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APR 23 1998  
Water Monitoring & Assessment  
Protection  
5090  
Code 1849  
21 Apr 1998

Mr. Paul Bristol  
South Carolina Department of Health  
And Environmental Control  
Ground-Water Protection Division  
2600 Bull Street  
Columbia, SC 29201

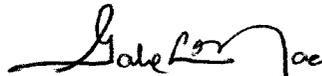
**SAMPLING AND ANALYSIS PLAN FOR ADDITIONAL ASSESSMENT  
AT UST SITES AT THE FORMER CHARLESTON NAVAL BASE**

Dear Mr. Bristol:

Attached is the Sampling and Analysis Plan (SAP) for additional assessment at UST site at Quarters B (B1 & B2) (SCDHEC GWPD SITE ID #00941) located at the former Naval Base, Charleston, SC. The Comprehensive Sampling and Analysis Plan (CSAP) previously submitted would be followed during the additional assessment.

If you have any questions regarding the SAP, feel free to contact me at (843) 820-7307.

Sincerely,

  
GABRIEL L. MAGWOOD  
Petroleum/UST Branch



# SAMPLING AND ANALYSIS PLAN

USTs B1 & B2 at Quarters B  
(SCDHEC GWPD SITE ID # 00941)

NAVAL BASE CHARLESTON  
CHARLESTON SC



Prepared for:

DEPARTMENT OF THE NAVY  
SOUTHERN DIVISION  
NAVAL FACILITIES ENGINEERING COMMAND  
CHARLESTON, S.C.

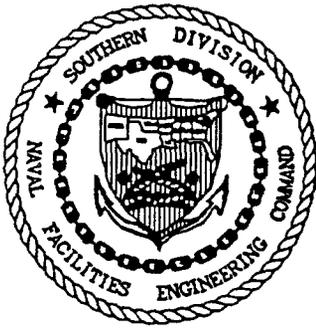
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APR 23 1998  
Water Monitoring, Assessment & Protection Division



Prepared by:

ENVIRONMENTAL DETACHMENT CHARLESTON  
1899 NORTH HOBSON AVE.  
NORTH CHARLESTON, S.C. 29405-2106

March 11, 1998



## FORWARD

Subtitle I of the Hazardous and Solid Waste Amendments (HSWA) of 1984 to the Solid Waste Disposal Act (SWDA) of 1965 established a national regulatory program for managing underground storage tanks (UST) containing hazardous materials, especially petroleum products. Hazardous wastes stored in USTs were already regulated under the Resource Conservation and Recovery Act (RCRA) of 1976, which was also an amendment to SWDA. Subtitle I requires that the U.S. Environmental Protection Agency (USEPA) promulgate UST regulations. The Program was designed to be administered by the individual States, who were allowed to develop more stringent standards, but not less stringent standards. Local governments were permitted to establish regulatory programs and standards that are more stringent, but not less stringent than either State or Federal regulations. The USEPA UST regulations are found in the Code of Federal Regulations, Title 40, Part 280 (40 CFR 280) (*Technical Standards and Corrective Action Requirement for Owners and Operators of Underground Storage Tanks*) and Title 40 CFR 281 (*Approval of State Underground Storage Tank Programs*). Title 40 CFR 281 was revised and published on September 23, 1988, and became effective December 22, 1988.

The Navy's UST program policy is to comply with all Federal, State, and local regulations pertaining to USTs. This plan was prepared to satisfy the requirements of South Carolina R.61-92, Part 280 (*Underground Storage Tank Control Regulations*), Section 280.65 to determine the extent and location of soils contaminated by a release from a UST system.

## Contents

1.0	INTRODUCTION	1-1
1.1	GENERAL	1-1
1.2	USE OF RFI DATA	1-1
2.0	BACKGROUND	2-1
2.1	SITE DESCRIPTION	2-1
2.2	SITE HISTORY	2-1
2.3	GEOLOGY	2-1
2.4	HYDROGEOLOGY	2-2
	2.4.1 Regional	2-2
	2.4.2 Site Specific	2-2
3.0	INVENTORY OF PROXIMATE POTABLE WATER WELLS	3-1
4.0	PROPOSED SAMPLING PLAN	4-1
4.1	FIELD INVESTIGATION	4-1
4.2	PREPARATION OF REPORTS	4-2
5.0	SCHEDULE	5-1

## Figures

2-1	QUARTERS B Location	2-3
2-2	QUARTERS B UST Site	2-4
2-3	QUARTERS B USTs 1 & 2	2-5
2-4	QUARTERS B UST Samples	2-6
4-1	Proposed Samples	4-3
5-1	Proposed Schedule	5-2

## ACRONYMS, ABBREVIATIONS AND SYMBOLS

AST	Above-ground Storage Tank
bgs	below the ground surface
CFR	Code of Federal Regulations
CHASP	Comprehensive Health and Safety Plan
CIA	Controlled Industrial Area
CSAP	Comprehensive Sampling and Analysis Plan
DET	Environmental Detachment Charleston
DL	Detection Level
USEPA	U.S. Environmental Protection Agency
ft/day	feet per day
ft <sup>2</sup> /day	square feet per day
gpm	gallons per minute
GWPD	Ground Water Protection Division
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSWA	Hazardous and Solid Waste Amendments
IDW	Investigative Derived Wastes
MSDS	Material Safety Data Sheet
NAVBASE	former Charleston Naval Base
ova	organic vapor analyzer
PAH	Polynuclear Aromatic Hydrocarbon
RBSL	Risk Based Screening Level
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SAP	Sampling and Analysis Plan
SCDHEC	South Carolina Department of Health and Environmental Control
SOPQAM	<i>Standard Operating Procedures and Quality Assurance Manual</i>
SOUTHDIV	Southern Division Naval Facilities Engineering Command
SSHSP	Site-Specific Health and Safety Plan
SWDA	Solid Waste Disposal Act
UST	Underground Storage Tanks

## 1.0 INTRODUCTION

**1.1 GENERAL.** Two USTs located beside the former Charleston Naval Base Quarters Building B was removed by Environmental Detachment Charleston (DET). A soil sample taken during UST removal contained matrix interferences which elevated detection levels (DL) for Polynuclear Aromatic Hydrocarbons (PAHs) above South Carolina Department of Health and Environmental Control (SCDHEC) Risk Based Screening Levels (RBSLs). The Sampling and Analysis Plan (SAP) outlines a field investigation and sampling program that will assess the source(s) of soil contamination at the site of the removed tanks, determine if contamination in fact exceeds RBSLs and evaluate the horizontal and vertical extent of the petroleum contamination detected. The field investigation will also determine if contamination has entered groundwater at the Quarters B UST site. The following report presents the site location and develops the rationale for the proposed field investigation.

**1.2 USE OF RFI DATA.** The former Charleston Naval Base is the site of an ongoing RCRA Facility Investigation (RFI); the former Quarters B UST site is in Zone B of the RFI. Data taken as part of the RFI, including geological information, hydrogeological information, well drilling logs and groundwater sampling data was used in the preparation of this SAP.

## 2.0 BACKGROUND

**2.1 SITE DESCRIPTION.** The former Charleston Naval Base (NAVBASE) is in the city of North Charleston, on the west bank of the Cooper River in Charleston County, South Carolina. The developed portion of the NAVBASE occupies the west bank of the Cooper River starting at a boundary 2300 feet upstream of Noisette Creek and ending at Shipyard Creek. The northern section of the NAVBASE (RFI Zones A, B, C and D) contains a mixture of warehouses, offices and former Navy housing areas. The central section of the NAVBASE (RFI Zones E and F) was occupied primarily by the controlled industrial area (CIA) of the former Naval shipyard and its associated offices and warehouses. The southern section of the NAVBASE (RFI Zones G, H and I) along the Cooper River is occupied by piers, barracks, training buildings, offices, storehouses and fuel tanks which formerly supported naval vessels homeported at Charleston. The north bank of Shipyard Creek in the southern part of the base is largely undeveloped and consists of recreational areas and a large dredge spoil area.

The removed USTs supplied fuel oil to Quarters B, which is located in the northern section of the NAVBASE at 200 Navy Way between Pine Road and the former NAVBASE golf course. Quarters B is former Navy housing and is unoccupied as of 31 October 1997. Viewed from Navy Way, the former UST locations are beside the chimney on the left side of the building.

**2.2 SITE HISTORY.** The USTs at Quarters B (SCDHEC Ground Water Protection Division (GWPD) Site Identification Number 00941) were 280 gallon (B1) and 550 gallon (B2) unregulated fuel oil tanks installed prior to 1976 and used until an unknown date. The tanks were constructed of steel and connected to Quarters B by copper supply and return lines. Between 14 November 1996 and 18 November 1996, the USTs were removed, drained, cleaned and cut up for recycling as scrap. The copper fuel piping and tank vent piping were removed at the same time.

There were no recorded releases while USTs B1 and B2 were in service. When UST B1 was removed, a 1/2" hole was found in its underside. Soil samples taken from the area surrounding UST B1 contained low concentrations of Xylene. Samples taken from the UST B2 excavation below the tank fill pipe and at UST B2's vent pipe outlet contained low concentrations of Fluoranthene. Sample SPORT0244-4 taken from the UST B2 supply piping run between UST B1 and the Quarters B foundation contained matrix interferences which elevated detection levels for PAHs above SCDHEC RBSLs (see Figure 2-4).

A new aboveground storage tank (AST) has been installed over the former UST B1 location. A sanitary sewer pipe runs through the site between the UST B1 and UST B2 locations.

**2.3 GEOLOGY.** Charleston South Carolina is located in the southern Atlantic Coastal Plain. The surficial geology of the region consists of the Quaternary-age sands, silts and clays of the Wando Formation. Below the Wando Formation are the Oligocene-age Ashley Formation and the Eocene-age Parkers Ferry and Harleyville Formations, known collectively as the Cooper Group. Below the Cooper Group is the Eocene-age Santee Limestone.

At the NAVBASE, the upper surface of the Ashley Formation is an erosional surface ranging from 35 feet to 77 feet below the ground surface (bgs). Overlaying the Ashley Formation is the Wando Formation which at the NAVBASE typically consists of upper and lower sand layers divided by a layer of "marsh clay". The surface contours of the NAVBASE area were extensively changed by fill operations during the base's life, particularly in the lower portion of the NAVBASE, which was originally tidal marsh.

## **2.4 HYDROGEOLOGY.**

**2.4.1 Regional.** (Excerpted from Ensafe/Allen & Hoshall, Draft Zone I RCRA Facility Investigation Report NAVBASE Charleston dated January 1996.) Groundwater occurs under water table or poorly confined conditions within the Pleistocene deposits overlying the Ashley Formation. Transmissivities in the Pleistocene aquifer are generally less than 1,000 square feet per day (ft<sup>2</sup>/day) and well yields are variable, ranging from 0 to 200 gallons per minute (gpm). This groundwater contains high concentrations of iron and is commonly acidic at shallow depth (Park, 1985).

The Cooper Group is hydrogeologically significant mainly because of its low permeability. In most locales, its sandy, finely granular limestones produce little or no water and act as confining material that produces artesian condition in the underlying Santee Limestone.

**2.4.2 Site Specific.** Typically, above the Ashley Formation at the entire NAVBASE are two sand layers divided by a clay layer described as "marsh clay" in the RFI Reports. The vertical hydraulic conductivity of the Ashley Formation beneath the NAVBASE is 0.0027 feet per day (ft/day), based on measurements taken during the Zone H RFI. The vertical hydraulic conductivity of the marsh clay layer is 0.001 ft/day, based on measurements taken during the Zone I RFI. The Ashley Formation acts as a lower confining layer, while the marsh clay functions as an aquitard separating the upper and lower sand layers. At the NAVBASE, rainwater absorbed into the ground will flow downward to the marsh clay and then flow toward a discharge point into a body of surface water.

Parts of the southern portion of NAVBASE are drained by Shipyard Creek while some northern areas are drained by Noisette Creek. The drainage basins of both waterways include areas other than NAVBASE. These waterways are tributaries of the Cooper River. Surface Drainage Over the remainder of NAVBASE flows directly into the Cooper River, which discharges into Charleston Harbor.

The former Quarters B UST site is located in the northern portion of the NAVBASE in Zone B. Based on potentiometric maps included in the final Zone B RFI Report dated November 21, 1996, groundwater beneath the UST location flows east toward the Cooper River. Because no groundwater was encountered during UST removal, the depth to groundwater is greater than 6' feet bgs.

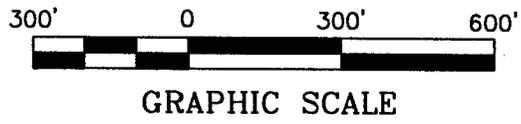
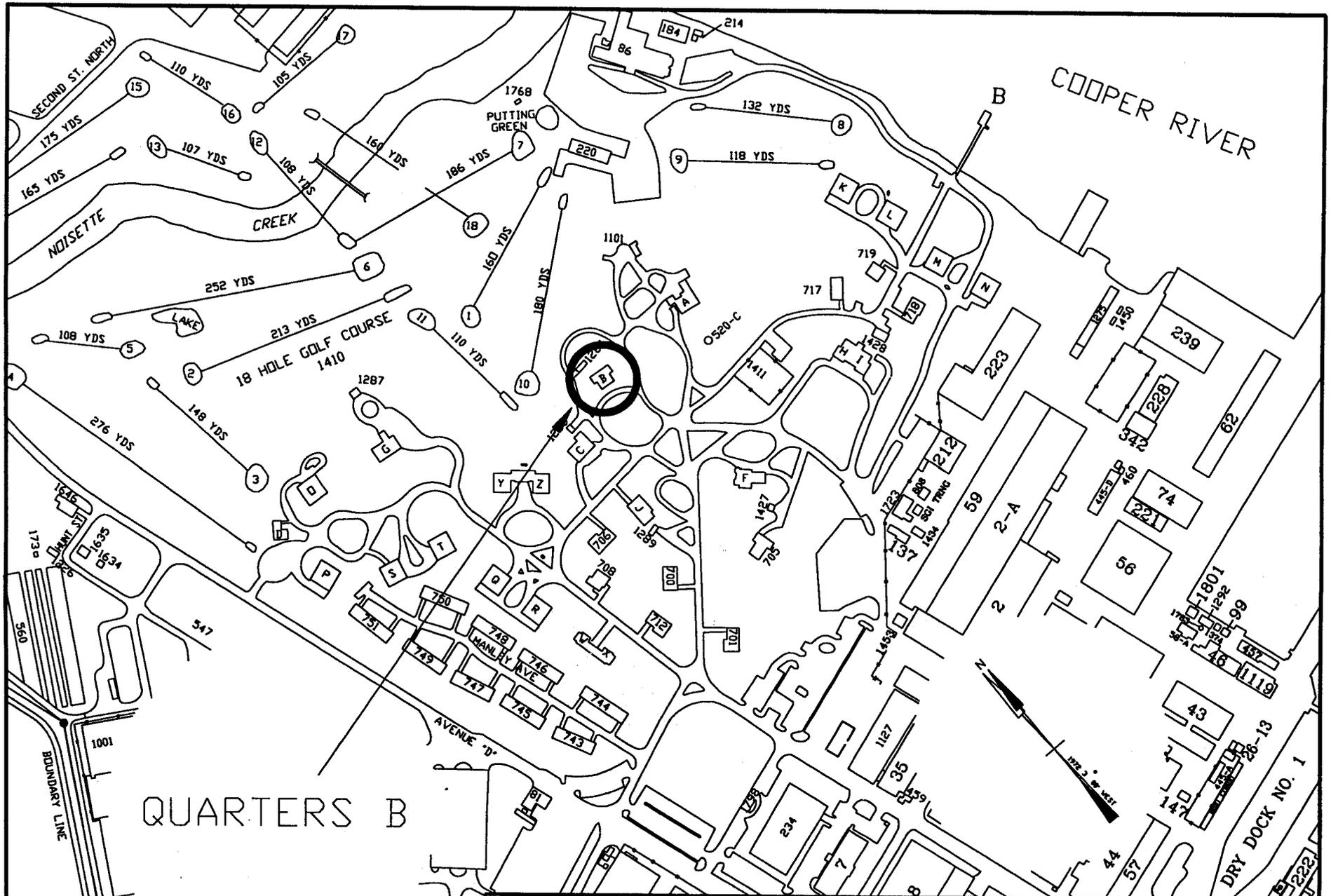


Figure 2-1  
 QUARTERS B LOCATION  
 Charleston Naval Base  
 Charleston, SC

SPORTENVDECHASN 1899 North Hobson Avenue North Charleston, SC 29405-2106	
DWG DATE: 3 NOV 97	DWG NAME: QTRSB_21

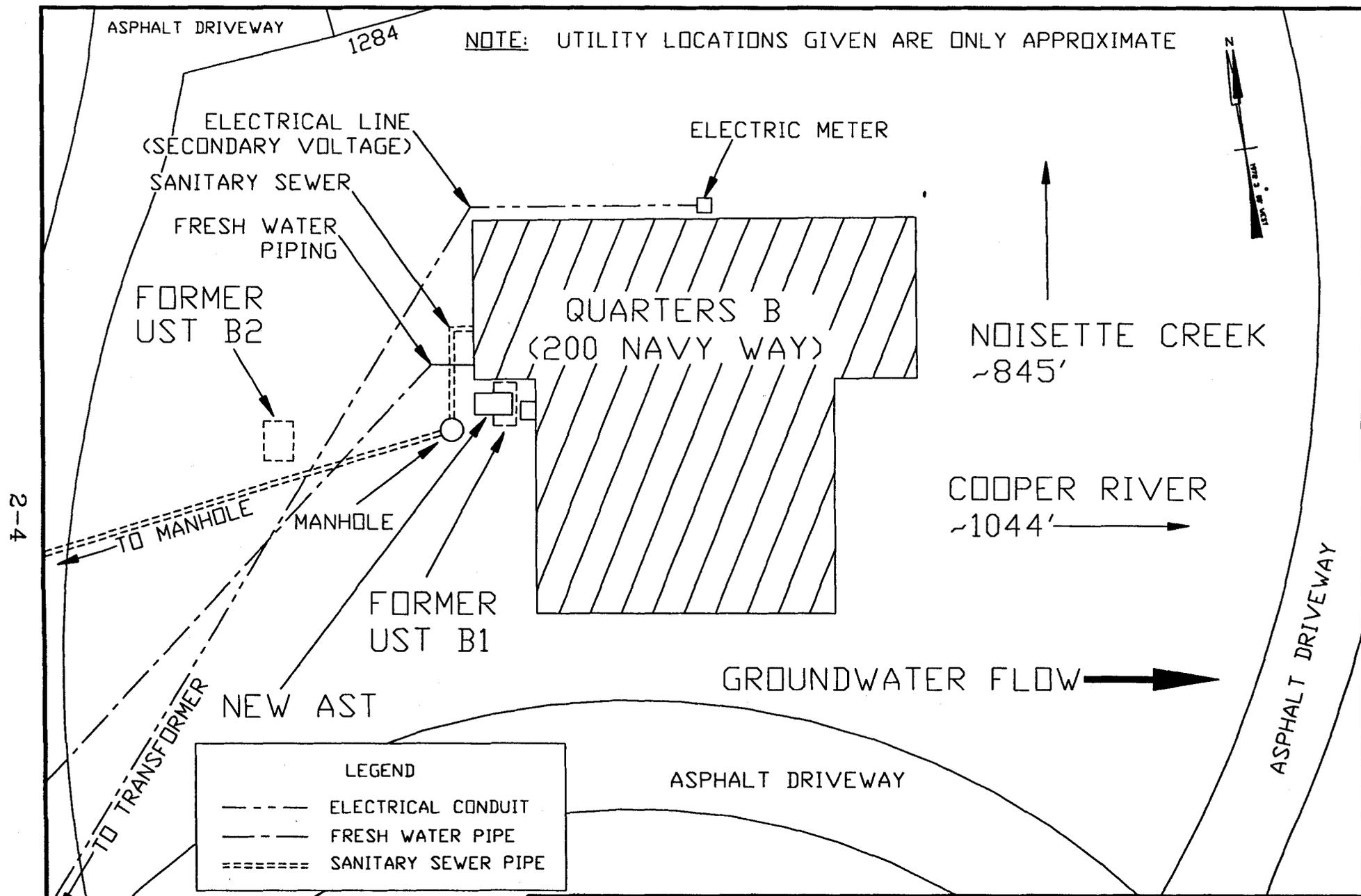


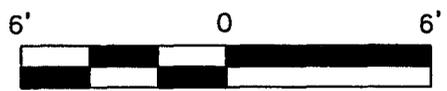
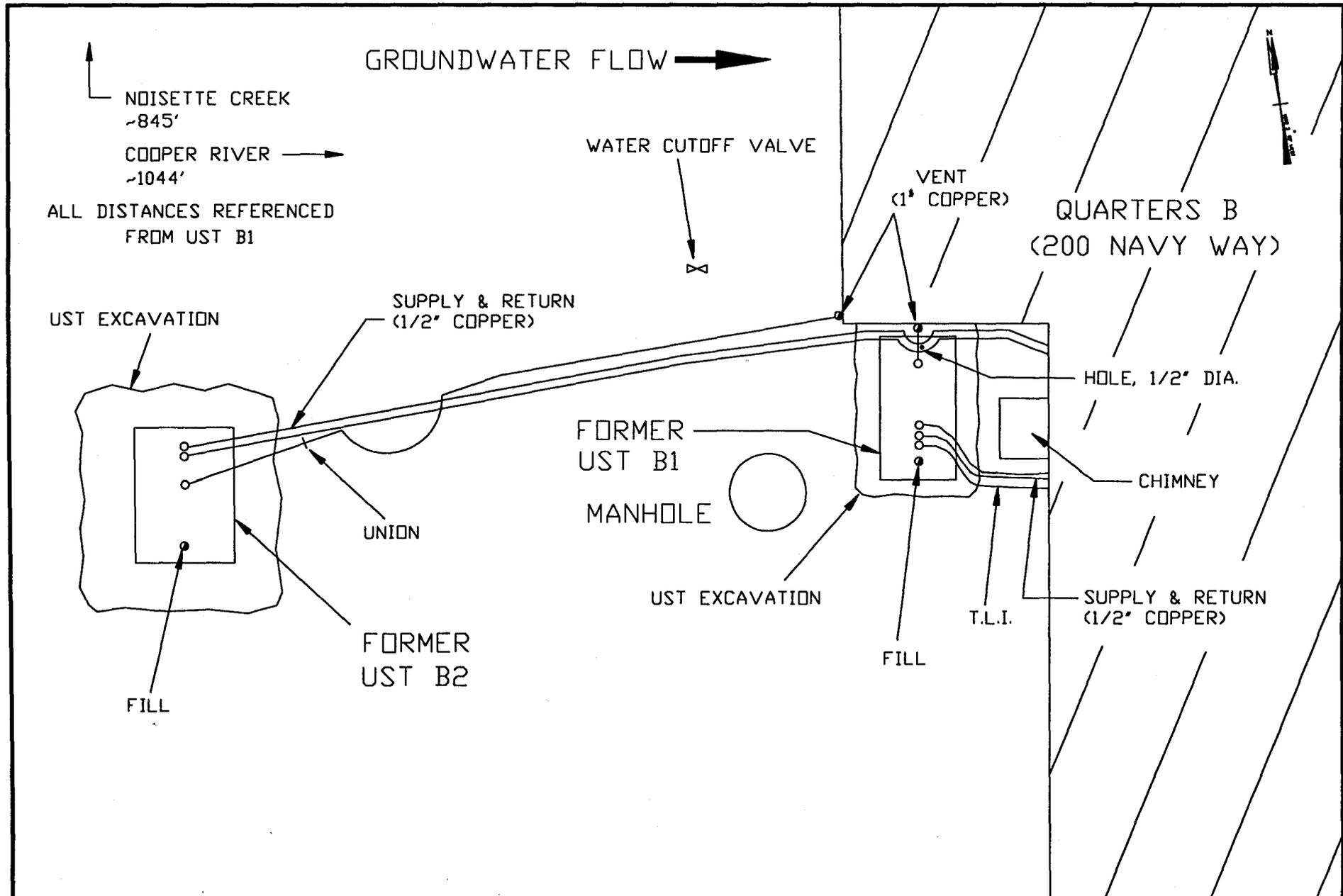
Figure 2-2  
 QUARTERS B UST Site  
 Charleston Naval Base  
 Charleston, SC

SPORTENVDETCHASN  
 1899 North Hobson Avenue  
 North Charleston, SC 29405-2106

DWG DATE: 11 MAR 98

DWG NAME: QTRSB\_22

2-5



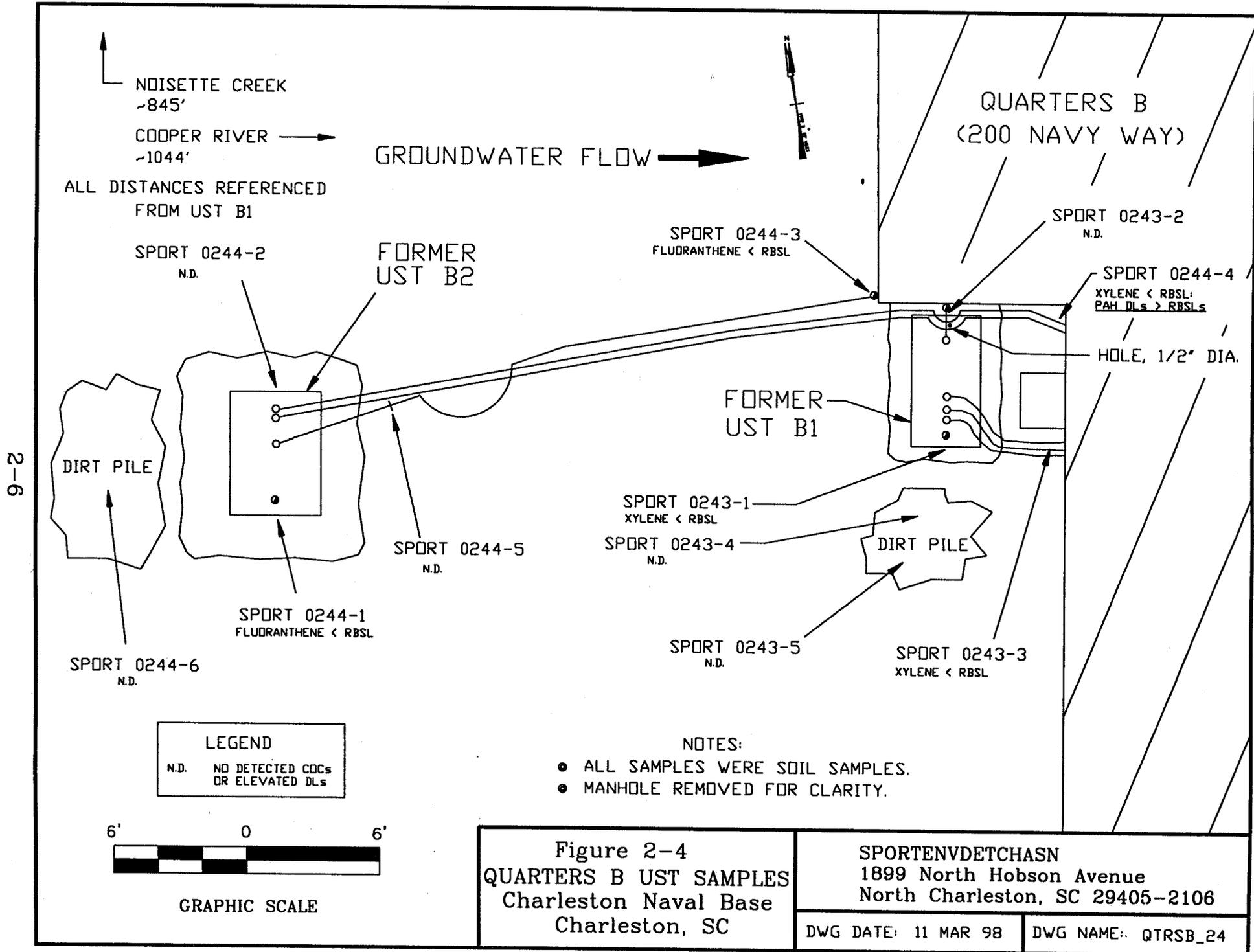
GRAPHIC SCALE

Figure 2-3  
 QUARTERS B USTs 1 & 2  
 Charleston Naval Base  
 Charleston, SC

SPORTENVDETHASN  
 1899 North Hobson Avenue  
 North Charleston, SC 29405-2106

DWG DATE: 3 NOV 97

DWG NAME: QTRSB\_23



2-6

### 3.0 INVENTORY OF PROXIMATE POTABLE WATER WELLS

There are no potable water wells on the NAVBASE. Groundwater in the surficial aquifer at the NAVBASE discharges into the Cooper River and its tributaries and so flows away from any potable water wells in residential areas nearby.

## 4.0 PROPOSED SAMPLING PLAN

**4.1 FIELD INVESTIGATION.** Prior to the beginning of the field investigation, a pre-work briefing will be held. All DET personnel associated with the investigation will review the scope of work in the SAP and the Site Specific Health and Safety Plan (SSHSP). Scheduling, logistics and special precautions will be discussed.

The field investigation has four objectives. The first objective is to determine whether contamination levels at the site exceed SCDHEC RBSLs. The second objective is to evaluate the horizontal and vertical extent of the petroleum soil contamination at the overall site. The third objective is to determine whether contamination has entered groundwater and determine the areal extent of the petroleum contaminant plume in groundwater if one exists. The final objective is to collect site-specific background information required to prepare the contamination assessment report.

Seven soil borings will be made, which will be used to determine the location for a temporary monitoring well. The proposed soil boring locations are shown in Figure 4-1. Actual locations of soil borings and monitoring well will be determined by the field team as more information is obtained about the contaminant plume during soil sampling. All sampling will be performed in accordance with the NAVBASE Charleston RFI Comprehensive Sampling and Analysis Plan (CSAP). All monitoring wells will be installed in accordance with South Carolina R. 61-71, *Well Standards and Regulations*.

Soil borings at the former UST B2 site will be made at the edge of the tank excavation and around a perimeter outside the suspected extent of contamination to determine the limits of contamination. Soil borings will be advanced with a hand auger. Soil samples will be collected in 2-foot intervals in each boring until the water table is reached. Field screening of soil samples will be performed using an organic vapor analyzer (ova) and the headspace method. Laboratory analysis will be performed on the sample from each boring with the greatest ova headspace analysis. Soil samples will be analyzed for PAHs and Benzene, Toluene, Ethylbenzene and Xylene plus Naphthalene (BTEX + Naphthalene).

Because this former UST site is located in a residential area and COCs were detected in both tank excavations (see figure 2-4), surficial soil samples will be collected outside the 4 corners (approximately of both backfilled tank excavations). Surficial soil samples will be analyzed for PAHs.

The temporary monitoring well will be advanced using a portable drill rig. After the wells have been developed, groundwater samples will be collected from each well for laboratory analysis. Groundwater samples will be analyzed for PAHs and BTEX + Naphthalene. Detailed information including lithologic descriptions, split-spoon samples, groundwater elevations and other pertinent data for each monitoring well will be presented in the Assessment Report. Soil will be classified in accordance with the Unified Soil Classification System.

Where the initial 7 soil borings are not sufficient to define the extent of soil and groundwater contamination, SCDHEC will be notified that the sampling grid needs to be extended in those directions where the plume is undefined. Any additional soil borings will be advanced using the same methods as the initial borings.

Once the extent of soil and groundwater contamination has been determined, a background soil boring will be made in nearby uncontaminated soil.

All wastes shall be disposed of in accordance with the Investigation Derived Waste (IDW) procedures included in Section 16 of the RFI CSAP.

**4.2 PREPARATION OF REPORTS.** After completion of the field investigation, an assessment report will be prepared and submitted to Southern Division Naval Facilities Engineering Command (SOUTHDIV) for review and approval. The report will discuss site background information, site conditions, findings and recommendations for the former UST B2 site at Quarters B. Recommendations will also be made as to the need for any follow-up investigations. Site location maps, locations of soil borings and soil contamination delineation maps will be included with the report.

4-3

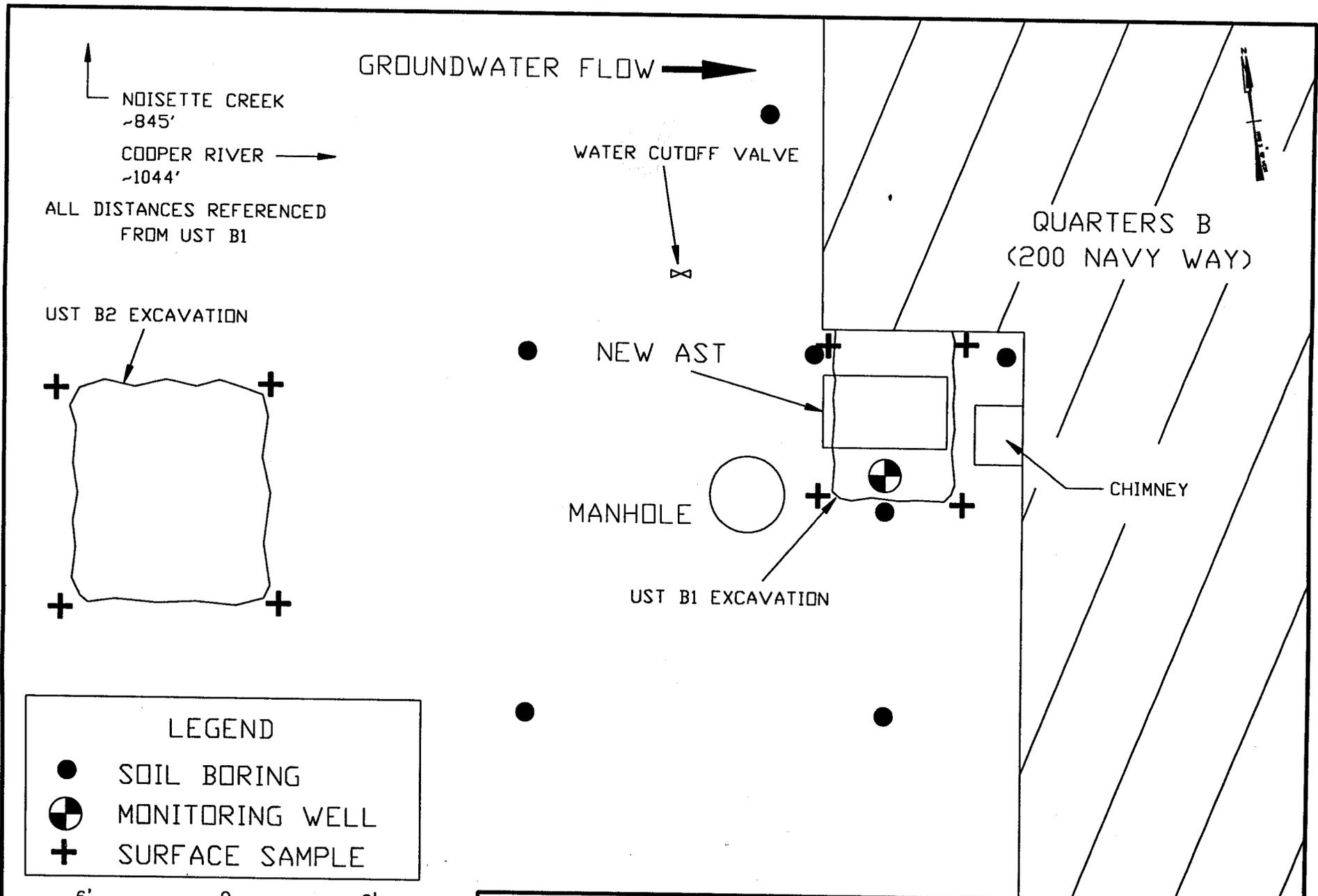


Figure 4-1  
 PROPOSED SAMPLES  
 Charleston Naval Base  
 Charleston, SC

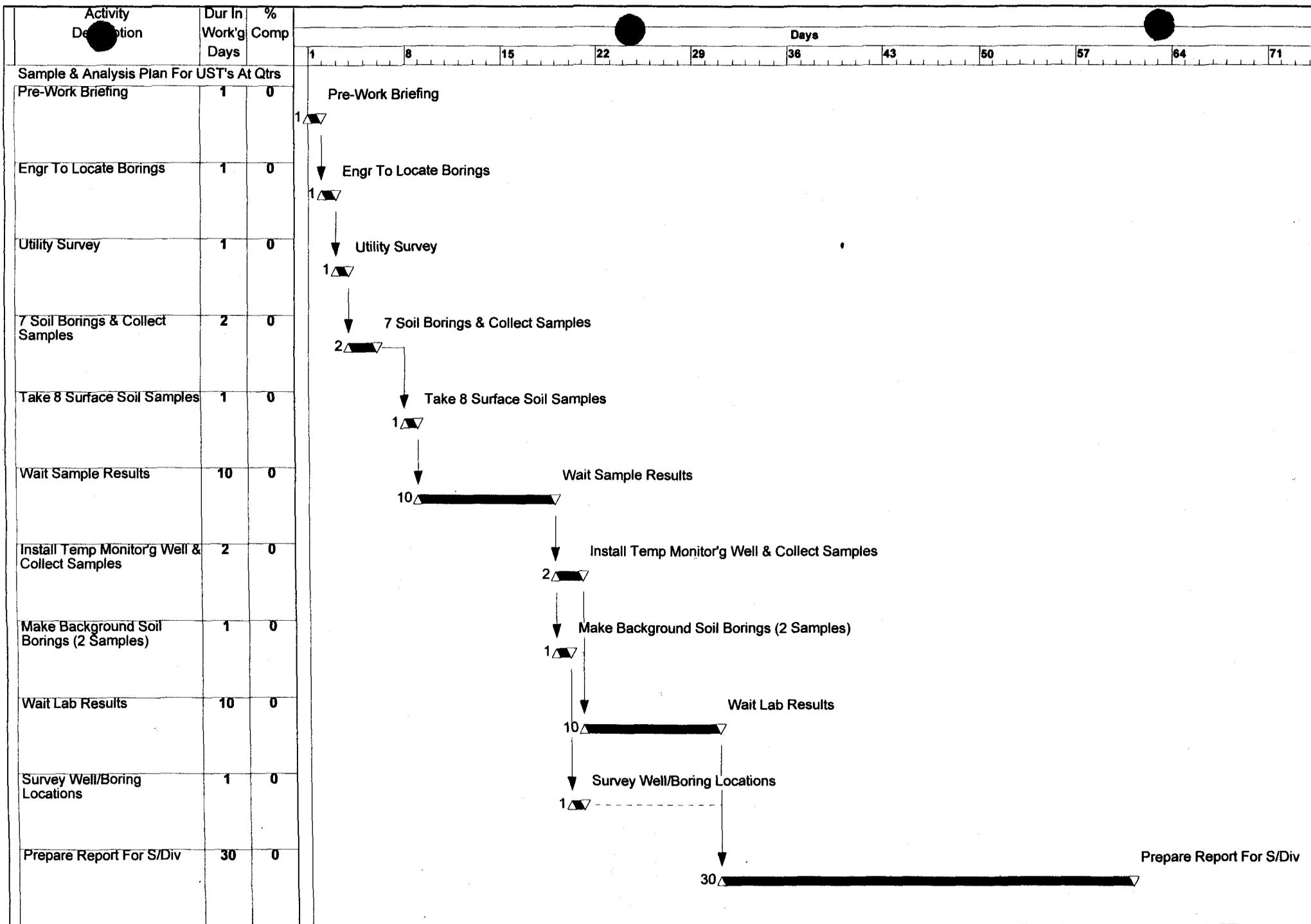
SPORTENVDETHASN  
 1899 North Hobson Avenue  
 North Charleston, SC 29405-2106

DWG DATE: 11 MAR 98

DWG NAME: QTRSB\_41

## 5.0 SCHEDULE

A projected schedule to complete the SAP field investigation at the UST B2 site is approximately 4 weeks (see Figure 5-1). This includes mobilization, drilling, sampling, surveying and demobilization. An Assessment Report for the site is scheduled for delivery to SOUTHDIV 30 days after completion of field investigation.



Project Start 01-APR-96  
 Project Finish 02-APR-98  
 Data Date 01-APR-96  
 Plot Date 12-MAR-98

Early Bar  
 Progress Bar  
 Critical Activity

Sample & Analysis Plan For UST At  
 Qtrs B  
 Figure 5-1  
 Environmental Detachment Charleston

Sheet 1 of 1



## REFERENCES

Ensafe/Allen & Hoshall, Final Comprehensive Sampling and Analysis Plan (CSAP) RCRA Facility Investigation dated August 30, 1994

Ensafe/Allen & Hoshall, Final RFI Report CTO-0029, Zone B dated November 21, 1996

Ensafe/Allen & Hoshall, Draft Zone I RCRA Facility Investigation Report NAVBASE Charleston dated January 1996

Ensafe/Allen & Hoshall, Final RCRA Facility Investigation Report for Zone H Naval Base Charleston dated July 5, 1996

SCDHEC Underground Storage Tank Assessment Guidelines for Permanent Closure, Change-in Owner and Change-in-Service dated June 1995

SCDHEC Risk-Based Corrective Action for Petroleum Releases

South Carolina R. 61-71 South Carolina Well Regulations and Standards

SUPSHIP Portsmouth Va., Environmental Detachment Charleston, Base Realignment and Closure Tank Management Plan

United States Environmental Protection Agency (USEPA) Environmental Services Division *Standard Operating Procedures and Quality Assurance Manual (SOPQAM)*

## **SITE SPECIFIC HEALTH AND SAFETY PLAN**

### **1.0 Purpose**

This plan provides supplemental site specific information and is to be used with the Detachment Comprehensive Health and Safety Plan.

### **2.0 Work Location**

Former petroleum oil underground storage tank locations.

### **3.0 Work Scope Brief (refer to the work document for full details)**

The work scope is to perform a sampling program that will evaluate the horizontal and vertical extent of petroleum contamination in soil and determine the extent of ground water contamination.

### **4.0 Hazards**

The primary health hazard is from petroleum oils which are a primary irritant. Dermatitis, a defatting of the skin, can result from continued skin contact. Some individuals develop hypersensitivity.

Safety hazards include the personal injury hazards of heavy equipment operation, and the dangers of underground and above ground utility installations.

### **5.0 Personal Protective Equipment**

Gloves and coveralls (either tyvek or cloth). If oil soaked soil is encountered, shoe covers or boots should be worn. At the employee's option an organic vapor respirator may be worn, although it is not required.

### **6.0 Special Personnel Training Qualifications**

Hazwoper training.

### **7.0 Occupational Safety and Health Precautions**

Prior to the start of work the area must be checked for the presence of above or below ground utilities, and they must be marked and secured by lockout tagout if they will be endangered. Follow the detachment policy and procedures for location and evaluation of these utilities.

Wash hands before eating or smoking.

If work requires entry into a confined space, contact the project engineer for additional instructions, as a confined space entry permit and gas testing may be required.

Work that involves sewage exposure (e.g. standing sewage liquid or broken sewer pipes), will require the use of workers who are in the NavHospChas C5 medical surveillance program. These workers shall avoid skin exposure by using appropriate protective equipment such as aprons, tyvek suits, boots, and latex or plastic gloves worn under heavier protective gloves. If splashing is a hazard, wear face shields over goggles. Sewage wetted clothing should be removed promptly and the person should then wash with soap and water. Wet clothing should be bagged and then washed separately with hot soap and water and one cup of bleach per wash load. Sewage contaminated equipment should be washed with soap, water, and bleach. Wash hands and face after any contact or sewage work and prior to eating, smoking or going home.

Sewage work also has a risk of fire, explosion, and oxygen deficiency due to the possibility of gases. Cutting of sewer pipes, or the repair of accidentally damaged pipes, should be done only after an assessment of the work by the team leader or project engineer. Typically, gas testing and the use of a confined space entry permit will be required.

### **8.0 Material safety data sheets**

A typical MSDS for fuel oil is included as part of the official folder.

### **9.0 Medical Surveillance**

Hazardous waste worker, (B27,711). This code refers to a NAVHOSPCHASN Medical Surveillance Classification