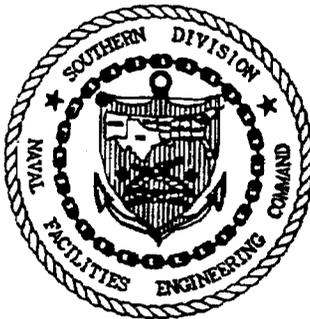
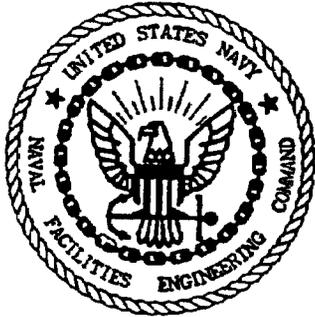


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CNC CHARLESTON
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SAMPLING AND ANALYSIS PLAN (SAP) UNDERGROUND STORAGE TANK NS-701 (UST
NS-701) CNC CHARLESTON SC
06/26/1997
ENVIRONMENTAL DETACHMENT CHARLESTON

Li 7.31.97
Lo 10.13.97

Letter 10.14 ✓



**SAMPLING AND
ANALYSIS PLAN**

**UST NS 701
(SCDHEC GWPD Site ID # 17663)
NAVAL BASE CHARLESTON
CHARLESTON SC**

RECEIVED
JUL 09 1997

Groundwater Assessment
and Development Section

Prepared for:

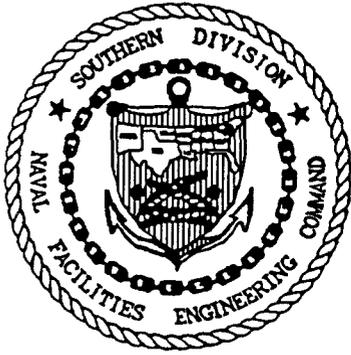
**DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON SC**



Prepared by:

**Supervisor of Shipbuilding, Conversion and Repair,
USN, (SUPSHIP) Portsmouth Va.,
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1899 North Hobson Ave.
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June 26, 1997



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 the 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 Requirements 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.

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ACRONYMS, ABBREVIATIONS AND SYMBOLS

bgs	below the ground surface
CFR	Code of Federal Regulations
CIA	Controlled Industrial Area
CSAP	Comprehensive Sampling and Analysis Plan
DET	Environmental Detachment Charleston
ft/day	feet per day
ft ² /day	square feet per day
gpm	gallons per minute
GWPD	Ground Water Protection Division
HSWA	Hazardous and Solid Waste Amendments
IDW	Investigation Derived Wastes
MSDS	Material Safety Data Sheet
NAVBASE	former Charleston Naval Base
PAH	Polynuclear Aromatic Hydrocarbons
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SAP	Sampling and Analysis Plan
SCDHEC	South Carolina Department of Health and Environmental Control
SOUTHDIV	Southern Division Naval Facilities Engineering Command
SSHSP	Site Specific Health and Safety Plan
SSL	Soil Screening Level
SWDA	Solid Waste Disposal Act
USEPA	U.S. Environmental Protection Agency
UST	Underground Storage Tanks

1.0 INTRODUCTION

1.1 GENERAL. A UST located beside the former Charleston Naval Base (NAVBASE) Building NS 701 (refer to Figures 2-1 and 2-2) was removed by Environmental Detachment Charleston (DET). Soil samples collected during removal of the UST indicated concentrations of polynuclear aromatic hydrocarbons (PAH's) in excess of RCRA Facility Investigation (RFI) soil screening levels (SSLs). 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 tank and evaluate the horizontal and vertical extent of the petroleum contamination detected. The field investigation will also determine whether contamination has entered the groundwater at the tank site. If groundwater has been contaminated, the extent of the contamination will be evaluated. The following report presents the site location and develops the rationale for the proposed field investigation.

1.2 USE OF RFI DATA. The former NAVBASE is the site of an ongoing RFI. UST NS 701 was formerly located 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 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) is occupied primarily by what was 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 UST supplied heating oil to Building NS 701, which is centrally located in the northern section of the NAVBASE on the southeast corner of Hobson Avenue and Turnbull Avenue. Building NS 701 served as housing for naval personnel and their families.

2.2 SITE HISTORY. The UST at Building NS 701 (Ground Water Protection Division (GWPD) Site Identification No. 17663) was a 280 gallon unregulated heating oil tank installed more than 20 years ago and used until April 1996. The tank was constructed of steel and was connected to Building NS 701 by two steel lines approximately 7' long each. Between 6 June 1996 and 10 June 1996, the UST was removed, drained, cleaned and cut up for recycling as scrap. The piping associated with this tank was also removed. Residual waste oil was pumped from the UST into a 55 gallon drum and recycled. There were no recorded releases while the tank was in service.

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 poorly confined or water table conditions within the Pleistocene deposits overlying the Ashley Formation. Transmissivities in the Pleistocene aquifer are generally less than 1,000 square feet per day (ft²/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).

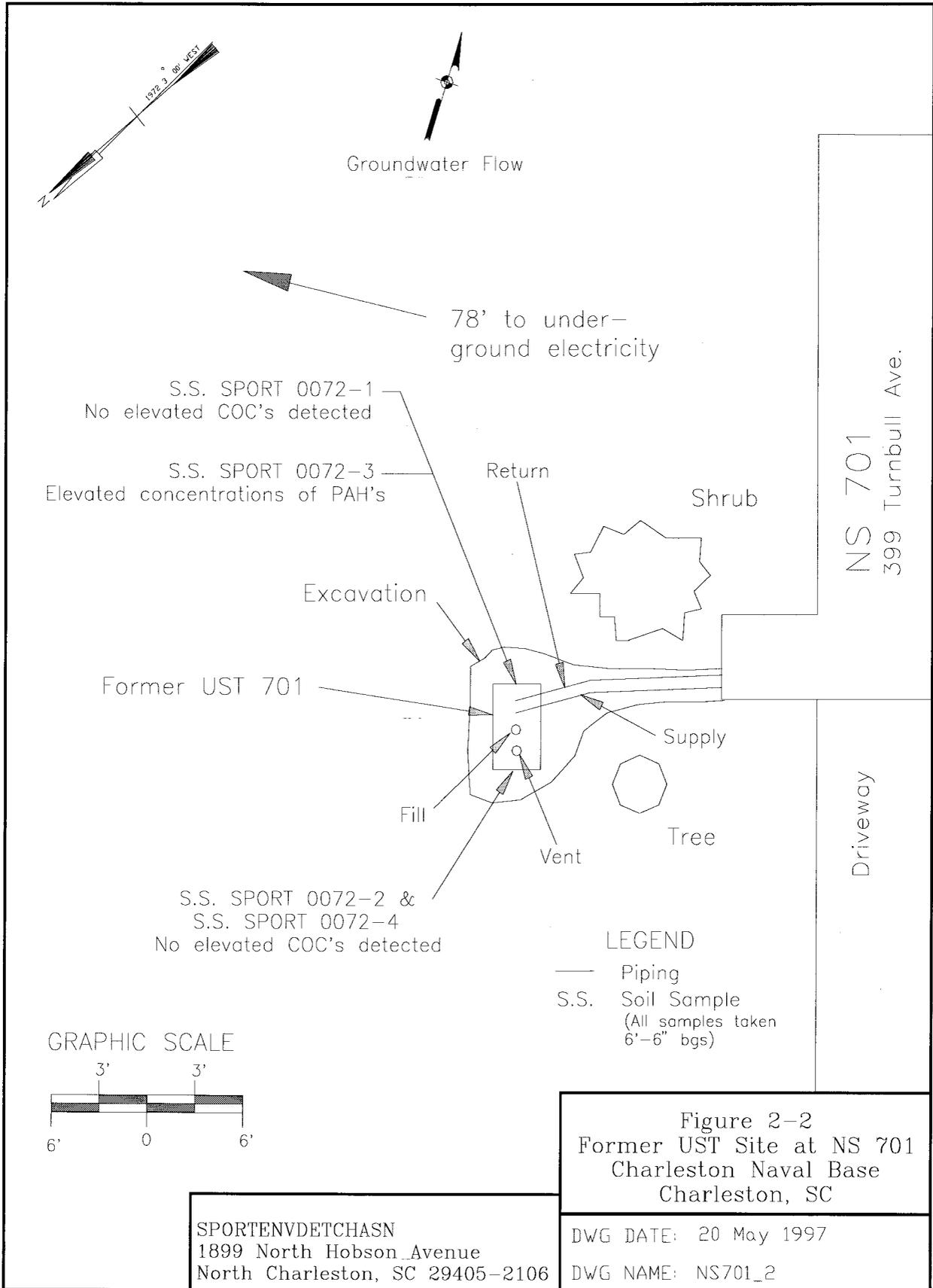
The Cooper Group is hydrogeologically significant mainly because of its low permeability. In most locales, its sandy, finely granular limestones produce little or no water and act as confining material that produces artesian conditions in the underlying Santee Limestone.

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 the 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 the NAVBASE. These waterways are tributaries of the Cooper River. Surface drainage over the remainder of the NAVBASE flows directly into the Cooper River, which discharges into Charleston Harbor.

The former NS 701 UST site is centrally located in the northern section of the NAVBASE approximately 1400 feet from the Cooper River 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 generally in a southeast direction. From the drilling logs for a nearby monitoring well, the depth to groundwater is estimated to be 12 to 13 feet bgs.





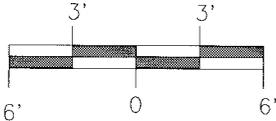
S.S. SPORT 0072-1
No elevated COC's detected

S.S. SPORT 0072-3
Elevated concentrations of PAH's

Former UST 701

S.S. SPORT 0072-2 &
S.S. SPORT 0072-4
No elevated COC's detected

GRAPHIC SCALE



LEGEND
 — Piping
 S.S. Soil Sample
 (All samples taken
 6'-6" bgs)

Figure 2-2
 Former UST Site at NS 701
 Charleston Naval Base
 Charleston, SC

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

DWG DATE: 20 May 1997
 DWG NAME: NS701_2

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 BACKGROUND

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 purpose of the field investigation is threefold. The first objective is to determine the horizontal and vertical extent of contamination at the site from PAH's. The second objective is to determine whether contamination has entered the groundwater at the tank site and assess the areal extent of the contaminant plume if one exists. The final objective is to collect site-specific background information required to prepare the contamination assessment report.

A minimum of 10 soil borings will be made, of which 1 will be completed as a temporary monitoring well (see Figure 4-1). The boring completed as a monitoring well will be advanced using a portable drill rig and soil samples will be collected using a split-spoon sampling device. Remaining soil borings will be advanced with a hand auger. In all soil borings, samples will be collected in 2-foot intervals until the water table is reached. Surficial soil samples will be collected from each of the 4 corners (approximately) of the excavation site. Water samples will be taken from the temporary monitoring well. All sampling will be performed in accordance with the RFI Comprehensive Sampling and Analysis Plan (CSAP). The monitoring well will be installed in accordance with South Carolina R. 61-71, *Well Standards and Regulations*. The proposed soil boring locations are shown in Figure 4-1. Actual locations of soil borings will be determined by the field team as more information is obtained about the contaminant plume during soil sampling.

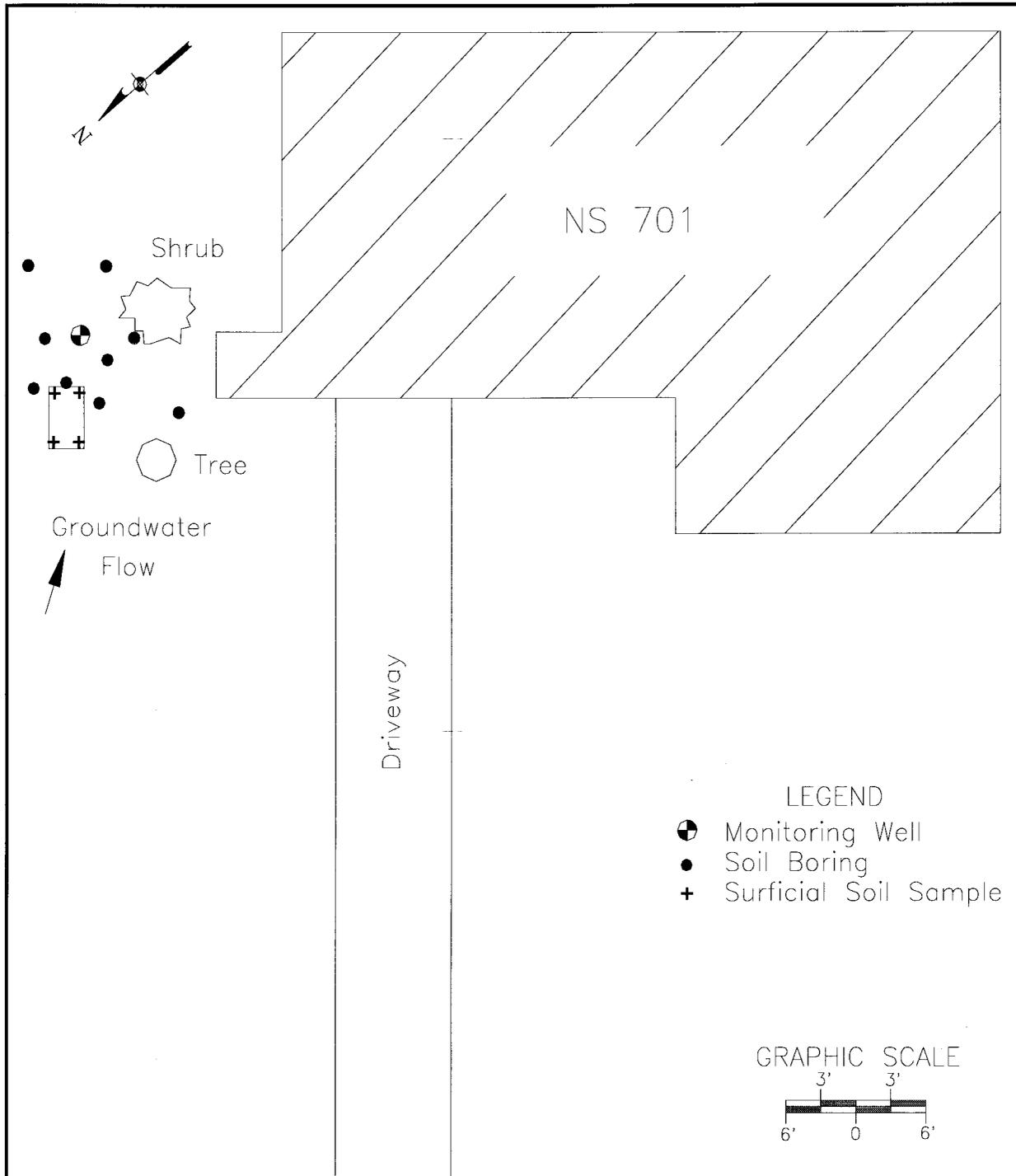
Where the initial 10 soil borings are not sufficient to define the extent of the plume, South Carolina Department of Health and Environmental Control (SCDHEC) will be notified that the sampling grid needs to be extended in those directions where the plume is undefined. Any additional soil borings will 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. The temporary monitoring well will be left in place pending groundwater sample results.

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.

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 site at Building NS 701. 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.



Turnbull Avenue

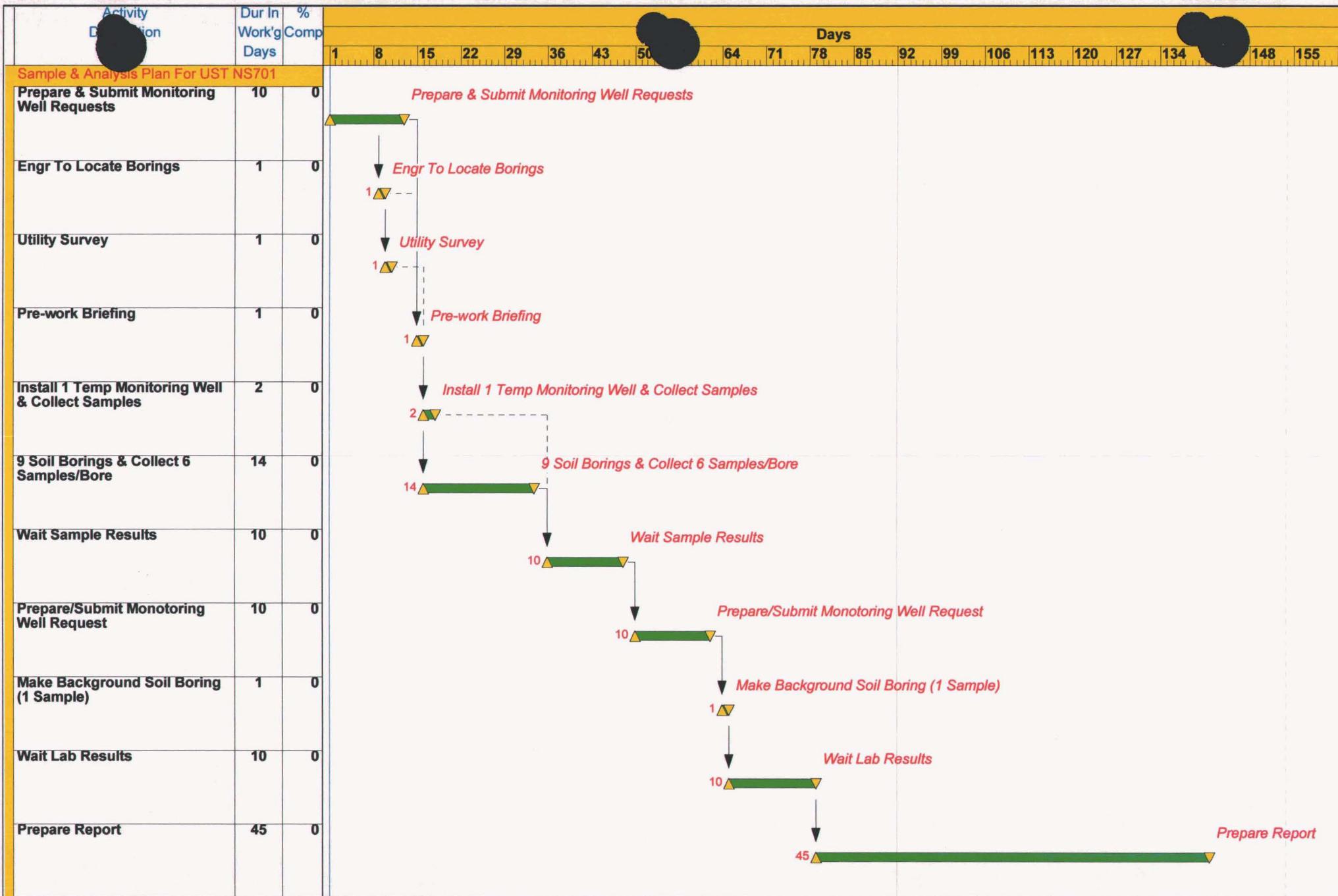
Figure 4-1
 Proposed Sample Map --
 UST NS 701
 Charleston Naval Base
 Charleston, SC

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

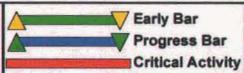
DWG DATE: 28 May 1997
 DWG NAME: NS701_3

5.0 SCHEDULE

A projected schedule to complete the SAP field investigation at the NS 701 site is approximately eleven weeks (see Figure 5-1). This includes mobilization, drilling, sampling, and demobilization. An Assessment Report for the site is scheduled for delivery within 45 days after completion of field investigation.



Project Start 01-APR-96
 Project Finish 23-AUG-96
 Data Date 01-APR-96
 Plot Date 26-JUN-97



Sample & Analysis Plan For UST NS701
Figure 5-1 Page 5-2
Environmental Detachment Charleston



REFERENCES

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

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 maybe 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 NavHospChasn 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 Material Safety Data Sheet (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.