

N61165.AR.005612  
CNC CHARLESTON  
5090.3a

SAMPLING AND ANALYSIS PLAN (SAP) FOR UNDERGROUND STORAGE TANK NS200  
(UST NS200) CNC CHARLESTON SC  
05/19/1997  
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

Li 5.29.97  
Lo 7.16.97

5090  
Code 1849  
22 May 1997

**RECEIVED**

MAY 29 1997  
Groundwater Assessment  
and Development Section

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

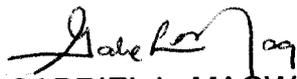
**SAMPLING AND ANALYSIS PLAN FOR ADDITIONAL ASSESSMENT  
AT UST NS200 (GWPD ID #17624)**

Dear Mr. Bristol:

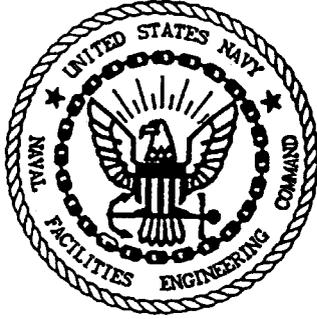
Attached is the Sampling and Analysis Plan (SAP) for additional assessment at UST NS200 (GWPD ID # 17624) located at the former Naval Base, Charleston, SC. The Comprehensive Sampling and Analysis Plan (CSAP) previously submitted will be followed during the additional assessment.

If you have any questions regarding the SAP feel free to contact me at (803)820-7307.

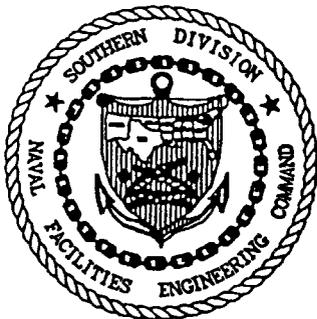
Sincerely,

  
GABRIEL L. MAGWOOD  
Petroleum/UST Branch

Li 5.29.97  
Lo 7.16.97



**SAMPLING AND  
ANALYSIS PLAN**  
**UST NS200 (GWPD 17624)**  
**NAVAL BASE CHARLESTON**  
**CHARLESTON SC**



**RECEIVED**

MAY 29 1997  
Groundwater Assessment  
and Development Section

Prepared for:

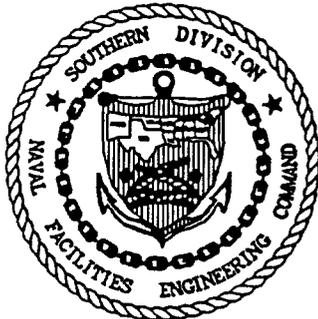
**DEPARTMENT OF THE NAVY**  
**SOUTHERN DIVISION**  
**NAVAL FACILITIES ENGINEERING COMMAND**  
**CHARLESTON SC**



Prepared by:

**Supervisor of Shipbuilding, Conversion and Repair,**  
**USN, (SUPSHIP) Portsmouth Va.,**  
**Environmental Detachment Charleston, S.C.**  
**1899 North Hobson Ave.**  
**North Charleston, SC 29405-2106**

May 19, 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 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	BACKGROUND	4-1
4.1	FIELD INVESTIGATION.	4-1
4.2	PREPARATION OF REPORTS	4-2
5.0	SCHEDULE	5-1

## Figures

2-1	UST at NS 200	2-3
2-2	Former UST site at NS 200	2-4
2-3	UST at NS 200	2-5
4-1	Proposed Sample Map	4-4
5-1	Proposed Schedule	5-2

## ACRONYMS, ABBREVIATIONS AND SYMBOLS

ACGIH	American Council of Governmental Industrial Hygienists
APS	Assistant Project Superintendent
bgs	below the ground surface
CFR	Code of Federal Regulations
CHASP	Comprehensive Health and Safety Plan
CRZ	Contamination Reduction Zone
CSAP	Comprehensive Sampling and Analysis Plan
CSO	Caretaker Site Office
DET	Environmental Detachment Charleston
DOT	Department of Transportation
USEPA	U.S. Environmental Protection Agency
ERT	Emergency Response Team
EZ	Exclusion Zone
ft <sup>2</sup> /day	square feet per day
gpm	gallons per minute
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSWA	Hazardous and Solid Waste Amendments
HW/HM	Hazardous Waste/Hazardous Material
IDLH	Immediately Dangerous to Life and Health
IDW	Investigative Derived Wastes
LEL	Lower Explosive Limit
mg/m <sup>3</sup>	Milligrams per Cubic Meter
MSDS	Material Safety Data Sheet
NAVBASE	former Charleston Naval Base
NIOSH	National Institute of Occupational Safety and Health
NOAA	National Oceanographic Atmospheric Administration
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
PPE	Personal Protective Equipment
PPM	Parts Per Million
RBC	Risk Based Concentration
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SAP	Sampling and Assessment Plan
SHSO	Site Health and Safety Officer
SOUTHDIV	Southern Division Naval Facilities Engineering Command
SSHSP	Site-Specific Health and Safety Plan
SSL	Soil Screening Level
SWDA	Solid Waste Disposal Act
SZ	Support Zone

TLV  
TOC  
TSDF  
UST

Threshold Limit Values  
Total Organic Carbon  
Treatment, Storage and Disposal Facility  
Underground Storage Tanks

## **1.0 INTRODUCTION**

**1.1 GENERAL.** During removal of a UST located beside the former Charleston Naval Base Building NS200 by Environmental Detachment Charleston (DET), evidence of leakage to surrounding soil through the open end of an abandoned, buried vent line was noted. Soil samples taken during removal contained Naphthalene and Cadmium in excess of RCRA Facility Investigation (RFI) soil screening levels (SSLs). The Sampling and Assessment 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 Charleston Naval Base is the site of an ongoing RCRA Facility Investigation (RFI); the former UST NS200 location is in Zone I 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 UST supplied fuel oil to Building NS200, which is located in the southern section of the NAVBASE along Hobson Avenue between Piers R and S. Building NS200 now serves as headquarters for the National Oceanographic Atmospheric Administration (NOAA) Coastal Service Center. NOAA has renamed NS200 as CSC Building 2. Viewed from Hobson Avenue, the former UST location was in an asphalt parking lot behind the watch tower on the right side of the building.

**2.2 SITE HISTORY.** The UST at Building NS200 (GWPD 17624) was a 1000 gallon unregulated fuel oil tank installed in 1953 and used until an unknown date. The tank was constructed of steel and was connected to Building NS200 by two 5/8" copper lines run through a 3" cast iron pipe used as a protective sleeve. Between 16 April 1996 and 29 April 1996, the UST was removed, drained, cleaned and cut up for recycling as scrap. The copper fuel lines were rinsed, capped and left in place.

There were no recorded releases while the tank was in service. However, during tank removal, a buried, abandoned ventilation line was found attached to the tank. This vent line was open to the subsurface and apparently discharged fuel oil into the surrounding soil whenever the tank was filled to the top. Petroleum contaminated soil was found throughout the excavation, and free product was observed floating on a puddle of water in the base of the excavation.

**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.**

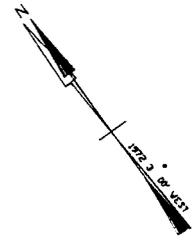
**2.4.1 Regional.** (Excerpted from Ensaf/Allen & Hoshall, Draft Zone I RCRA Facility Investigation Report NAVBASE Charleston dated January 1996.) Groundwater occurs under water table or poorly confined conditions within the Pleistocene deposits overlying the Ashley Formation. Transmissivities in the Pleistocene aquifer are generally less than 1,000 square feet per day (ft<sup>2</sup>/day) and well yield 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 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.

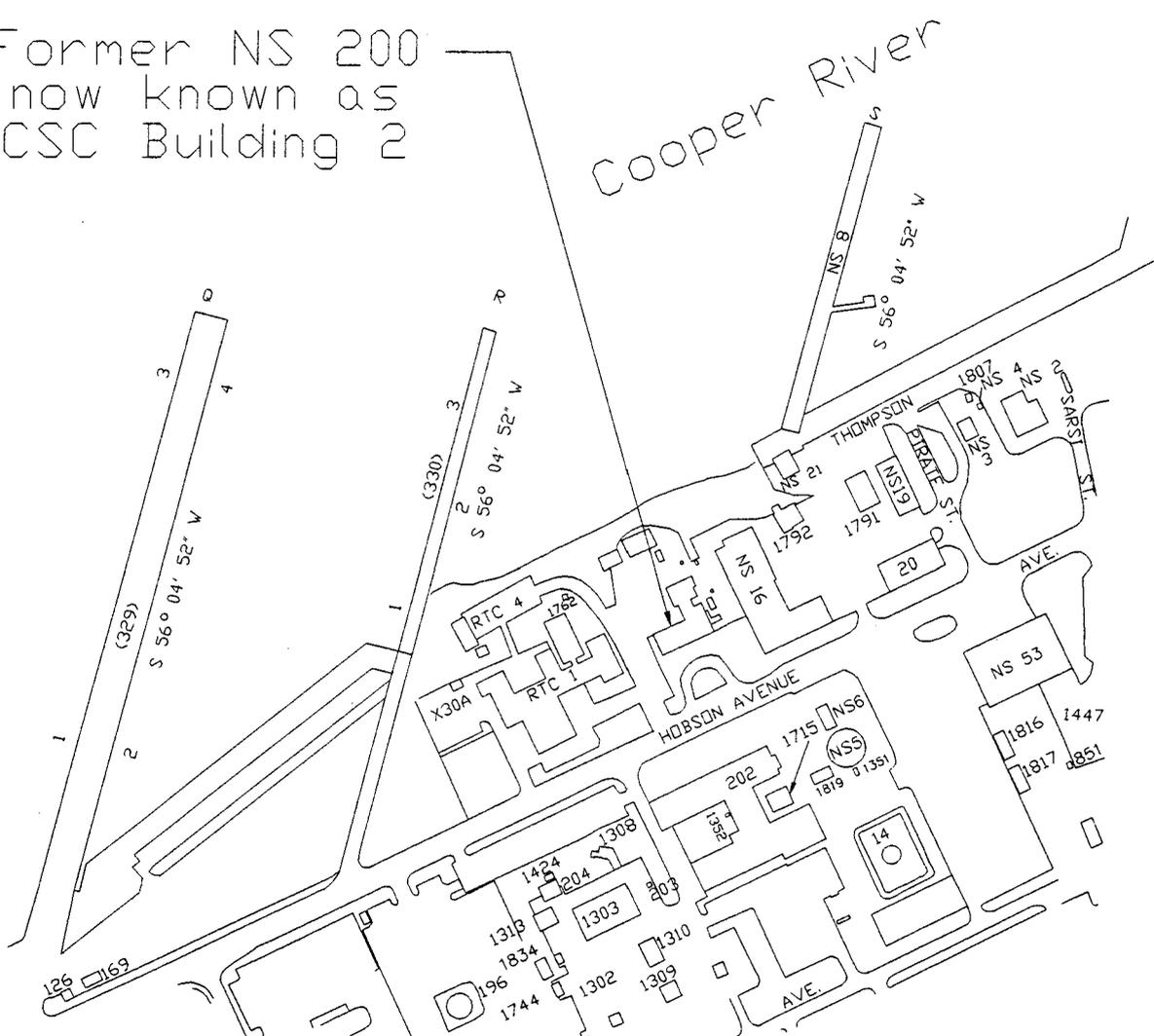
Parts of the southern portion of NAVBASE are drained by Shipyard Creek while some northern areas are drained by Noisette Creek. The drainage basins of both waterways include areas other than NAVBASE. These waterways are tributaries of the Cooper River. Surface Drainage Over the remainder of NAVBASE flows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

The former NS200 UST site is located in the southern portion of the NAVBASE along the Cooper River in Zone I. Based on potentiometric maps included in the final Zone H RFI Report dated July 5, 1996, groundwater beneath the UST location flows north-northeast toward the Cooper River. From drilling logs for nearby monitoring wells, the depth to groundwater is 5 to 6 feet bgs.



Former NS 200  
now known as  
CSC Building 2

Cooper River

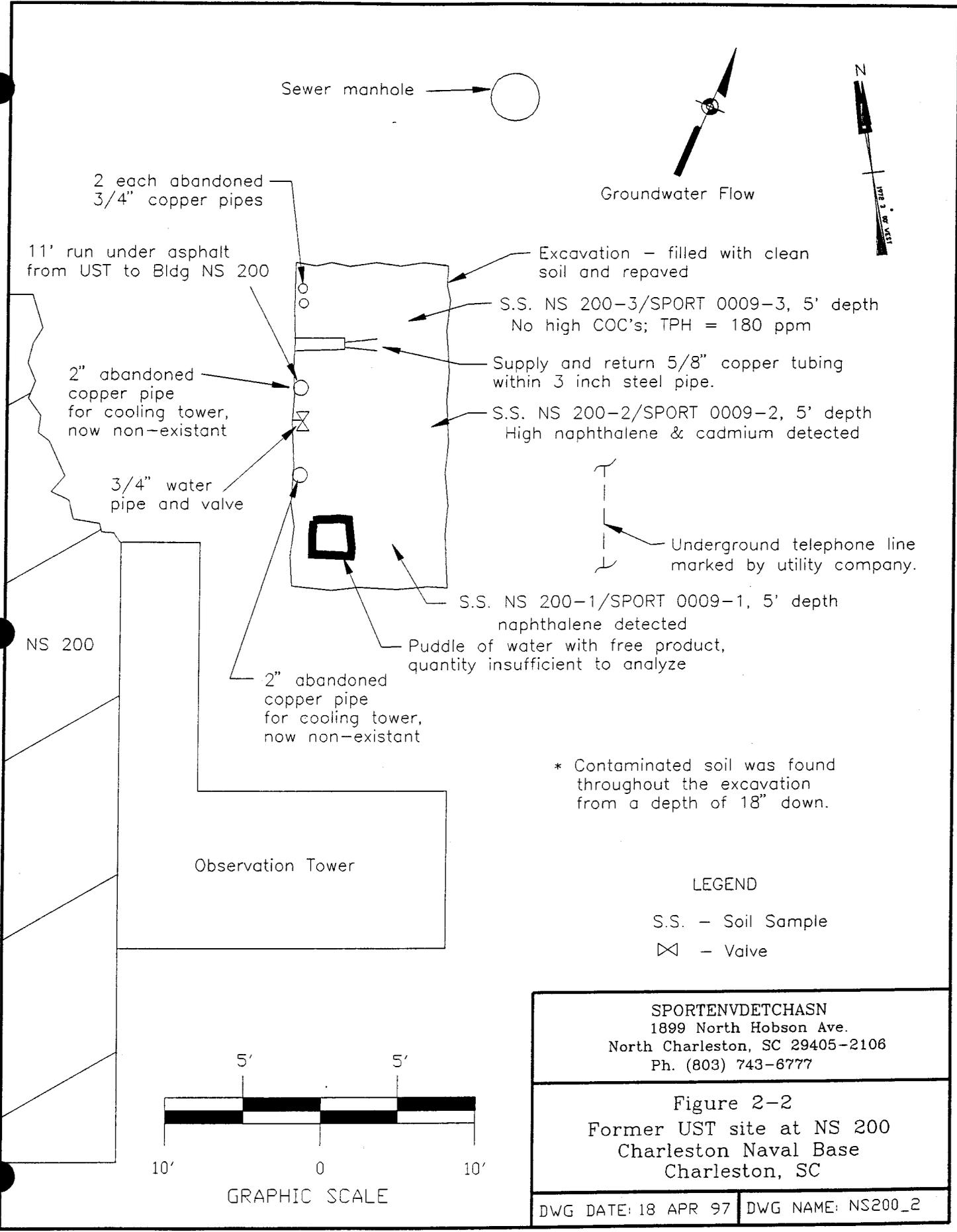


GRAPHIC SCALE

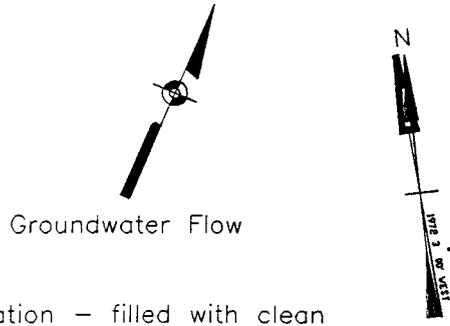
SPORTENVDETHASN  
1899 North Hobson Ave.  
North Charleston, SC 29405-2106  
Ph. (803) 743-6777

Figure 2-1  
UST at NS 200  
Charleston Naval Base  
Charleston, SC

DWG DATE: 20 MAY 96    DWG NAME: NS200\_1



Sewer manhole →



2 each abandoned 3/4" copper pipes

11' run under asphalt from UST to Bldg NS 200

2" abandoned copper pipe for cooling tower, now non-existent

3/4" water pipe and valve

NS 200

Observation Tower

2" abandoned copper pipe for cooling tower, now non-existent

Excavation - filled with clean soil and repaved

S.S. NS 200-3/SPORT 0009-3, 5' depth  
No high COC's; TPH = 180 ppm

Supply and return 5/8" copper tubing within 3 inch steel pipe.

S.S. NS 200-2/SPORT 0009-2, 5' depth  
High naphthalene & cadmium detected

Underground telephone line marked by utility company.

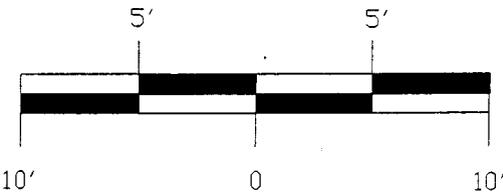
S.S. NS 200-1/SPORT 0009-1, 5' depth  
naphthalene detected

Puddle of water with free product, quantity insufficient to analyze

\* Contaminated soil was found throughout the excavation from a depth of 18" down.

LEGEND

- S.S. - Soil Sample
- ⊗ - Valve

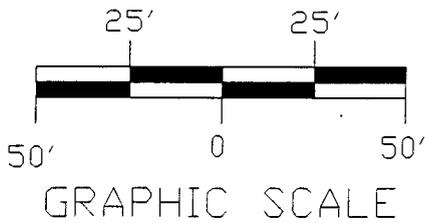
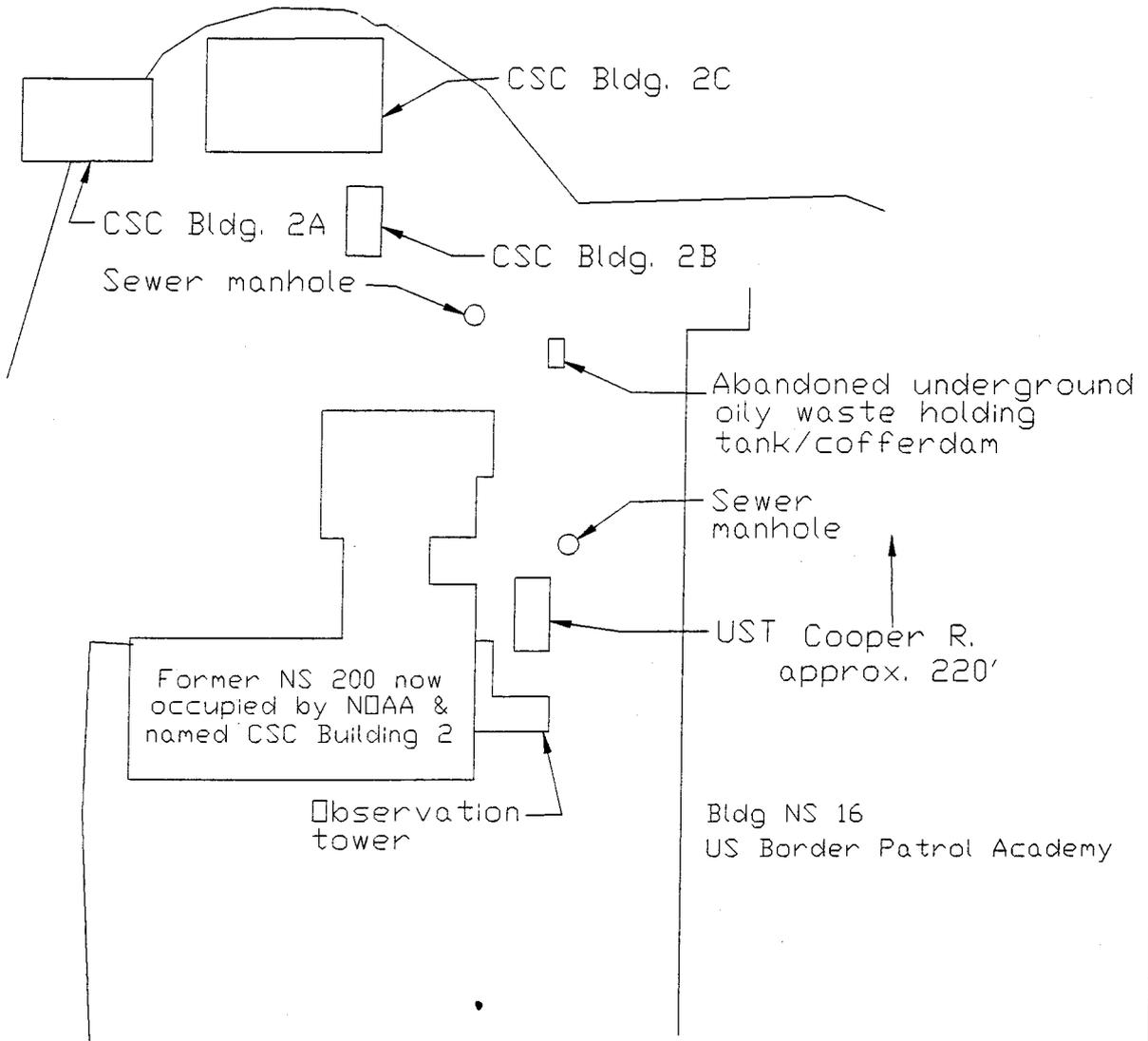


GRAPHIC SCALE

SPORTENVDETHASN 1899 North Hobson Ave. North Charleston, SC 29405-2106 Ph. (803) 743-6777	
Figure 2-2 Former UST site at NS 200 Charleston Naval Base Charleston, SC	
DWG DATE: 18 APR 97	DWG NAME: NS200_2



# Cooper River



SPORTENVDETHASN 1899 North Hobson Ave. North Charleston, SC 29405-2106 Ph. (803) 743-6777	
Figure 2-3 UST at NS 200 Charleston Naval Base Charleston, SC	
DWG DATE: 24 July 96	DWG NAME: NS200_4

### **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, 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 (SSHP). Scheduling, logistics and special precautions will be discussed.

The purpose of the field investigation is fourfold. The first objective is to evaluate the horizontal and vertical extent of the petroleum contamination, particularly Naphthalene, at the site. The second objective is to determine the horizontal and vertical extent of the cadmium metal contamination detected at the site. The third objective is to determine whether contamination has entered the groundwater at the tank site, assess the areal extent of the contaminant plume if one exists and install monitoring wells to detect plume movement off the site. The final objective is to collect site-specific background information required to prepare the contamination assessment report.

12 soil borings will be made, of which 3 will be completed as temporary monitoring wells (see Figure 4-1). The borings completed as monitoring wells 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. Water samples will be taken from all temporary monitoring wells. All sampling will be performed in accordance with the 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*. 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 12 soil borings are not sufficient to define the extent of the plume, 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.

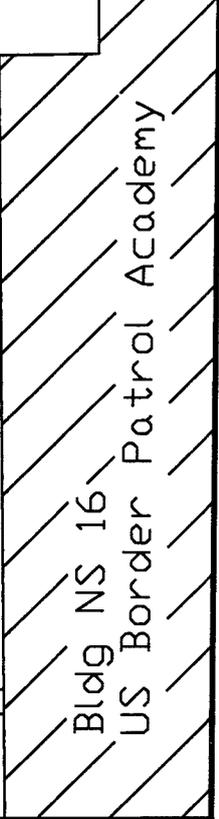
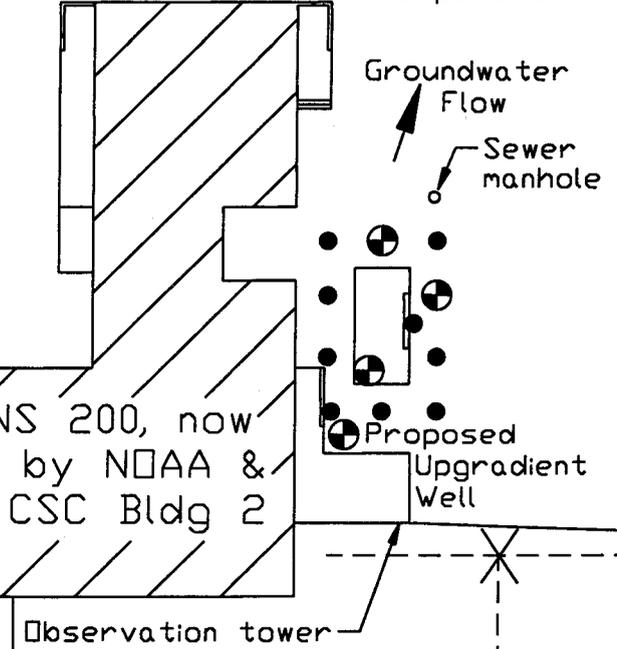
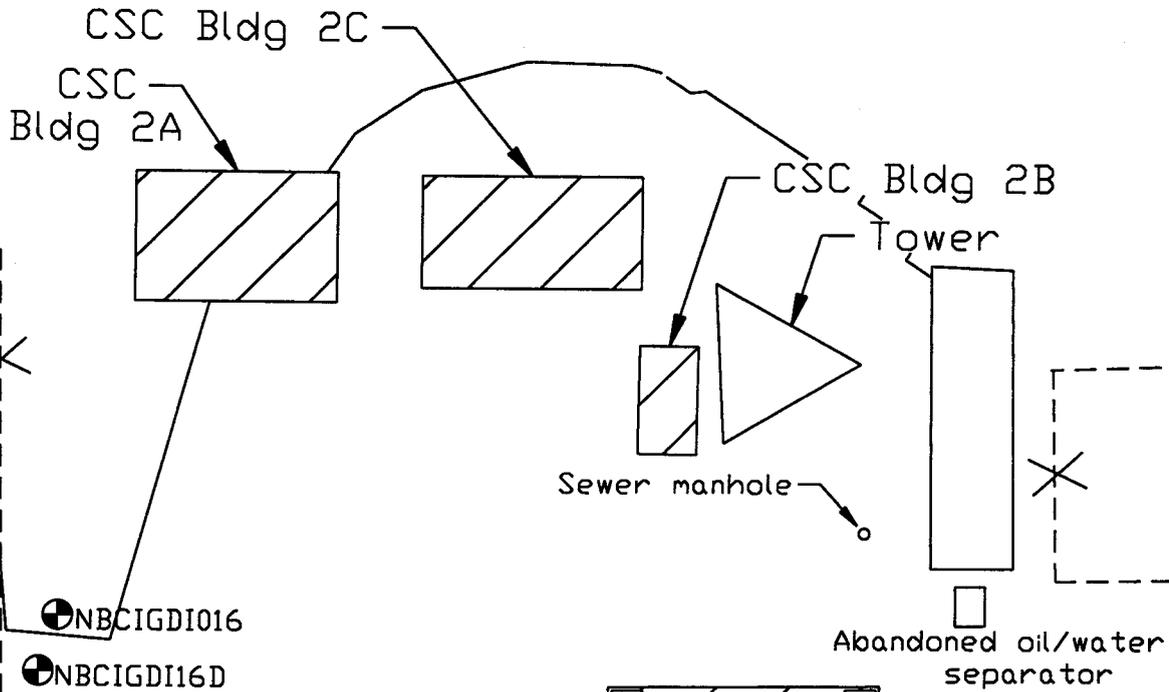
Once the extent of soil and groundwater contamination has been determined, a background soil boring will be made in nearby uncontaminated soil. A permanent monitoring well will be installed upgradient of the former UST site, one temporary monitoring well will be converted to a permanent downgradient monitoring well, and the remaining temporary monitoring wells will be abandoned.

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 NS200. 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.

# COOPER RIVER



- Legend**
- Monitoring Well (circle with a cross)
  - Soil Boring (solid circle)



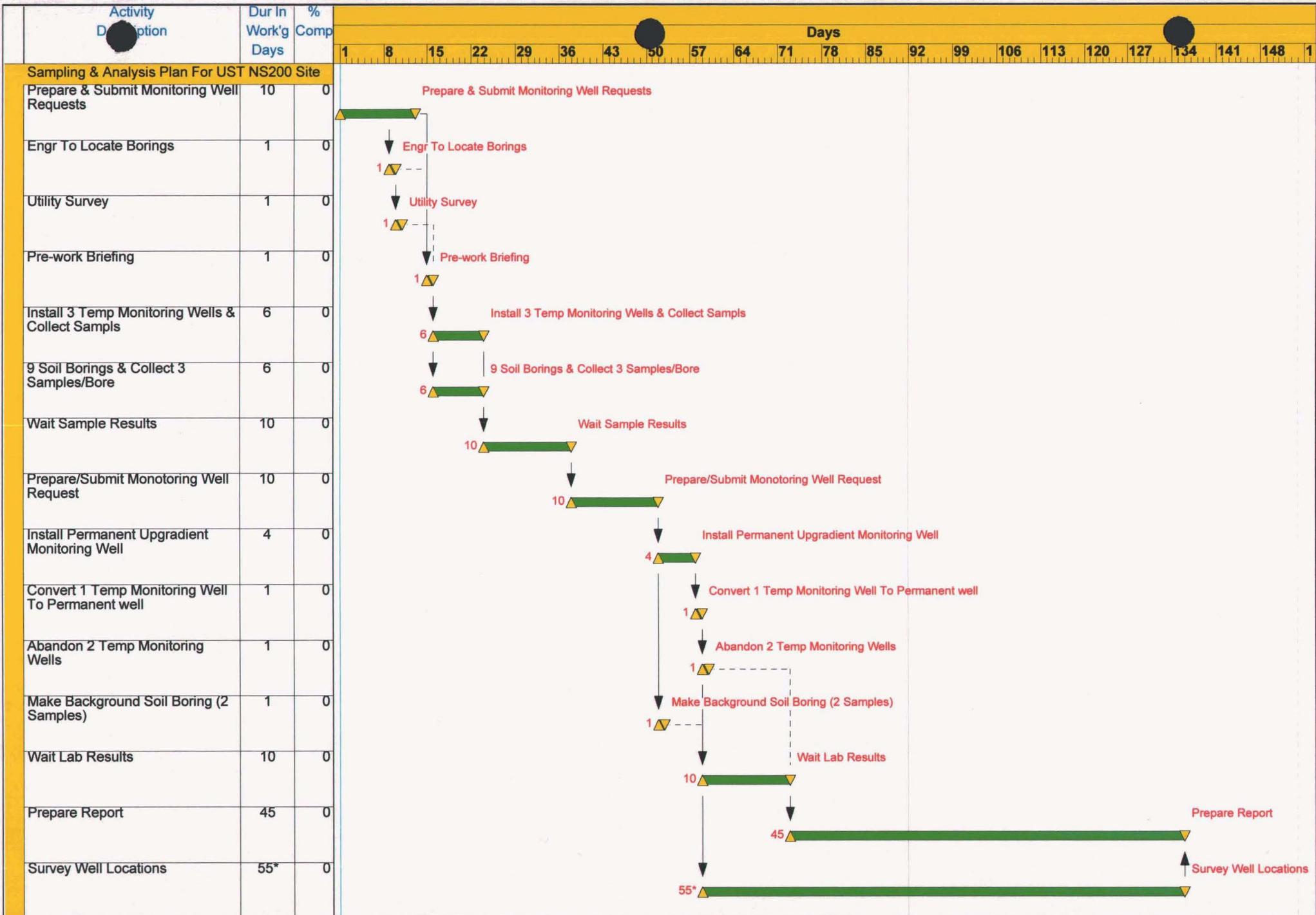
**SPORTENVDETHASN**  
1899 North Hobson Ave.  
North Charleston, SC 29405-2106  
Ph. (803) 743-6777

**Figure 4-1**  
**Proposed Sample Map-UST NS200**  
Charleston Naval Base  
Charleston, SC

DWG DATE: 09 May 97 | DWG NAME: NS200\_6

## **5.0 SCHEDULE**

A projected schedule to complete the SAP field investigation at the NS200 site is approximately ten weeks (see Figure 5-1). This includes mobilization, drilling, sampling, surveying and demobilization.. An Assessment Report for the site is scheduled for delivery to 45 days after completion of field investigation.



Project Start	01-APR-96		Early Bar
Project Finish	22-DEC-97		Progress Bar
Data Date	01-APR-96		Critical Activity
Plot Date	28-APR-97		

(c) Primavera Systems, Inc.

**Sampling & Analysis Plan For NS200**  
**Figure 5.1**  
**Environmental Detachment Chas.**



## 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 SAFETY AND HEALTH PLAN**  
**(Taken from UST NS200 Removal Work 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**

Heating oil underground storage tank removal.

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

Underground storage tanks containing fuel/waste oil are being removed.

**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. Quickest entry into the body is by ingestion, therefore do not siphon fuel.

Safety hazards include the personal injury hazards of heavy equipment operation (both contact with people and tripping into the excavation), the dangers of underground and above ground electrical wiring, and fire or explosion from work on confined spaces. Also for any excavations over 5 feet deep the danger of excavation wall collapse, entrapment, and suffocation from incorrect trenching and excavating. A ladder is required every 25' for an excavation of 5' or deeper.

**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.

**6.0 Confined Space Emergency Rescue Procedure**

The following is the requirements for entry into a confined space and the proper response action in case of an emergency.

- 6.1 Personnel at confined space entry sites will have the means to immediately contact a rescue organization (e.g. cellular phone, radio,...)
- 6.2 Personnel shall be instructed that no rescue attempt involving entry will be made until the rescue unit has been notified and assistance has arrived. Rescue by means of lifeline (where used) shall be made until assistance arrives.

6.3 For emergency rescue of personnel in confined spaces, call the North Charleston Fire Department at 911 or 745-1015. For medical care after rescue of personnel, use the same hospitals listed in the comprehensive safety and health plan, although they will probably have been called by the fire department.

### **7.0 Special Personnel Training Qualifications**

Hazard communication training module 4, fuels. Also for the personnel operating the excavation equipment, training in the trenching and excavation requirements of 1926.651 is required.

### **8.0 Occupational Safety and Health Precautions**

Prior to the start of work the area must be checked for the presence of above or below ground power, gas or water lines, and they must be marked and secured by lockout tagout if they will be endangered.

Close attention should be given to the procedural steps of the work document to prevent fire/explosion.

### **9.0 Material safety data sheets**

A typical MSDS for fuel oil is attached.

### **10.0 Medical Surveillance**

Hazardous waste worker, (B27,711). These codes refer to NAVHOSPCHASN Medical Surveillance Classifications.





**Amerada Hess Corporation  
1 Hess Plaza Woodbridge, NJ 07095**

From: Corporate S/H/F (908)750-7051 (phone)  
(908)750-6799 or -6105 or -6745 (fax)

Re: MATERIAL SAFETY DATA SHEET TRANSMITTAL

---

To: HECTOR ALVAREZ

Date: 3-13-95

From: PAUL BUCKNAM

Page 1 of 9

---

# AMERADA HESS CORPORATION

Material Safety Data Sheet

#2 FUEL OIL

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION (Rev. 09/94)

Amerada Hess Corporation  
 1 Hess Plaza  
 Woodbridge, NJ 07095

COMPANY CONTACT: Corporate Safety  
 TELEPHONE NUMBER: (908)750-6000

EMERGENCY TELEPHONE NUMBER  
 CHEMTREC (800)424-9300 24 hrs

PRODUCT NAME: #2 Fuel Oil  
 CHEMICAL NAME: N/A  
 CHEMICAL FAMILY: Petroleum Hydrocarbon  
 CHEMICAL FORMULA: N/A - complex mixture of hydrocarbons  
 MSDS IDENTIFICATION CODE/NUMBER: 0088

SYNONYMS: #2 Heating Oil  
 Off-road Diesel Fuel

See Section 16 for Glossary of terms and acronyms.

2. COMPOSITION/INFORMATION ON INGREDIENTS (Rev. 09/94)

INGREDIENT NAME	EXPOSURE LIMITS	CONCENTRATION PERCENT BY WEIGHT
#2 Fuel Oil CAS NUMBER: 68476-30-2	ACGIH TLV-TWA: 5 mg/m3 * OSHA PEL-TWA: 5 mg/m3 * OSHA PEL-TWA: 400 ppm* <sup>†</sup>	100.0
Naphthalene CAS NUMBER: 91-20-3	ACGIH TLV-TWA: 10 ppm ACGIH TLV-STEL: 15 ppm OSHA PEL-TWA: 10 ppm	< 0.1 to 2.0

\* - as Mineral Oil Mist, Severely Refined  
~~as - as Petroleum Distillate (naphtha)~~

#2 Fuel Oil is a petroleum fraction consisting of a complex mixture of petroleum hydrocarbons (C9 and higher).

3. HAZARDS IDENTIFICATION (Rev. 09/94)

\*\*\*\*\* EMERGENCY OVERVIEW \*\*\*\*\*

CAUTION

\* OSHA/NFPA COMBUSTIBLE LIQUID - SLIGHT TO MODERATE IRRITANT - EFFECTS THE CENTRAL NERVOUS SYSTEM - HARMFUL OR FATAL IF SWALLOWED - ASPIRATION HAZARD

\* Moderate fire hazard. Avoid breathing vapors or mists. May cause dizziness and drowsiness. May cause moderate eye irritation, skin irritation, defatting and/or dermatitis (rash). Long-term, repeated exposure may cause skin cancer.

\* If ingested, do NOT induce vomiting as this may cause chemical pneumonia (fluid in the lungs).

\*\*\*\*\*

POTENTIAL HEALTH EFFECTS

PRIMARY ROUTE(S) OF ENTRY

Eyes: No      Skin: Yes      Inhalation: Yes      Ingestion: Yes

EYES

SLIGHT TO MODERATE IRRITANT. Exposure to vapors, mists or fumes may cause slight to moderate eye irritation, redness, tearing and blurred vision.



## Material Safety Data Sheet

#2 FUEL OIL

## 3. HAZARDS IDENTIFICATION - Continued

SKIN

SLIGHT TO MODERATELY IRRITATING. This product is not considered to be more than a slight irritant under normal conditions of use. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed. Prolonged or repeated contact with the skin may cause defatting of the skin leading to redness, itching, inflammation, cracking, dermatitis (rash), and possible secondary infection.

High pressure skin injections are serious medical emergencies. The appearance of injury may be delayed for a few hours, but may cause tissue to become swollen, discolored and extremely painful; permanent damage or death may result without adequate medical treatment.

INGESTION

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, such as irritation, nausea, vomiting and diarrhea, and central nervous system effects similar to intoxication by ethyl alcohol. Acute symptoms of intoxication are most common, including excitation, restlessness, incoordination, euphoria, headache, dizziness, drowsiness, blurred vision, and fatigue. In more severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

INHALATION

Vapors may cause nose and throat irritation, anesthetic effects and central nervous system (CNS) depression. Inhalation may result in dizziness, drowsiness, headache, and other symptoms similar to those listed under "Ingestion".

Inhalation of high concentrations can cause rapid CNS depression, cardiac arrhythmia, unconsciousness, coma, and possibly death resulting from respiratory failure. Systemic effects to the liver, kidneys, central nervous system, and blood have been reported from large and/or repeated or prolonged exposures.

**WARNING:** The burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS/CARCINOGENICITY

This product is not expected to be a cancer hazard under normal conditions of use. Similar products produced skin cancer and skin tumors in laboratory animals following repeated applications. The significance to human exposure has not been determined - see Section 11, Toxicological Information.

This product is similar to DIESEL Fuel. IARC classifies whole diesel exhaust as probably carcinogenic (Group 2A) and NIOSH regards it as a potential cause of occupational lung cancer (tumorigen) based on animal studies and limited evidence in humans.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

Irritation from skin exposure may aggravate existing dermatitis (skin) conditions.

## 4. FIRST AID MEASURES (Rev. 02/94)

EYES

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

**Material Safety Data Sheet**

#2 FUEL OIL

**4. FIRST AID MEASURES - Continued****SKIN**

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops. High pressure injections are serious medical emergencies - seek immediate medical attention.

**INGESTION**

DO NOT INDUCE VOMITING BECAUSE OF DANGER OF BREATHING LIQUID INTO LUNGS. Seek immediate medical attention. Rinse mouth with water. Administer 1 to 2 glasses of water or milk to drink. Never administer liquids to an unconscious person.

If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Seek medical attention. Monitor for breathing difficulty.

**INHALATION**

Remove person to fresh air. If person is not breathing, ensure an open airway and administer CPR. If necessary, provide additional air or oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

**5. FIRE FIGHTING MEASURES (Rev. 09/94)****FLAMMABLE PROPERTIES**

FLASH POINT: 100°F PMCC (minimum)

AUTOIGNITION: 495°F 257°C

FLAMMABILITY CLASS: II

LOWER EXPLOSIVE LIMIT (%): 0.6

UPPER EXPLOSIVE LIMIT (%): 7.5

**FIRE AND EXPLOSION HAZARDS**

OSHA and NFPA Class II COMBUSTIBLE LIQUID (see Section 14 for transportation classification). When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

**EXTINGUISHING MEDIA**

**SMALL FIRES:** Any extinguisher suitable for Class B fires - dry chemical, CO<sub>2</sub>, water spray, fire fighting foam, or Halon.

**LARGE FIRES:** Water spray, fog or fire fighting foam. Water may not achieve extinguishment, but may be used to disperse vapors, control the magnitude of the fire, and/or to cool fire-exposed containers.

**FIRE FIGHTING INSTRUCTIONS**

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Fire fighting activities that may result in potential exposure to high heat, smoke or toxic byproducts of combustion should require positive pressure-demand NIOSH/MSHA-approved self-contained breathing apparatus (SCBA) with full-facepiece and full protective firefighting clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water.

For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for NFPA 704 Hazard Rating.



Material Safety Data Sheet

#2 FUEL OIL

6. ACCIDENTAL RELEASE MEASURES (Rev. 09/94)

ACTIVATE YOUR FACILITY'S SPILL CONTINGENCY PLAN (e.g. SPCC, RCRA, OPA, or EMERGENCY plan), if available.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless the system is designed and permitted to handle such materials. The use of fire fighting foam may be useful in certain situations to reduce vapors.

**SMALL SPILLS:** Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal. Cleanup crews must be properly trained and must utilize proper protective equipment.

**LARGE SPILLS:** Dike far ahead of the spill. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection as well as protect personnel attempting to stop leak. Consideration should be given to environmental clean-up and waste material generation when determining if the use of large volumes of water is appropriate for non-fire emergency situations. Cleanup crews must be properly trained and must utilize proper protective equipment.

7. HANDLING AND STORAGE (Rev. 09/94)

**HANDLING PRECAUTIONS**

Handle as a combustible liquid. Keep away from heat, sparks, and open flame! No smoking or open flame in storage, use or handling areas. Keep containers closed and clearly labeled. Ground all drums and transfer vessels when handling. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition. Use only with adequate ventilation. Avoid breathing vapors. Do not use as a cleaning agent. Wash thoroughly after handling.

**STORAGE PRECAUTIONS**

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Store in a well-ventilated area. This storage area should comply with NFPA 30 ("Flammable and Combustible Liquid Code"). Avoid storage near incompatible materials.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when this material is loaded into tanks previously containing low flash point products (such as gasoline) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents". The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

**WORK/HYGIENIC PRACTICES**

Emergency eye wash capability should be available in the vicinity of any potential exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective.

Promptly remove contaminated clothing and laundry before reuse. Use care when laundering to prevent the formation of flammable vapors which could



**Material Safety Data Sheet**

**#2 FUEL OIL**

**7. HANDLING AND STORAGE - Continued**

**WORK/HYGIENIC PRACTICES - Continued**

ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

**8. EXPOSURE CONTROLS/PERSONAL PROTECTION (Rev. 09/94)**

**ENGINEERING CONTROLS**

Use adequate ventilation to keep vapor and mist concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Use explosion-proof equipment and lighting in classified/controlled areas.

**EYE/FACE PROTECTION**

Safety glasses and faceshield or chemical splash goggles are recommended where there is a possibility of splashing or spraying.

**SKIN PROTECTION**

Avoid repeated or prolonged skin contact. Gloves constructed of nitrile, neoprene, or PVC are recommended. Chemical protective clothing such as of Saranex(R) or equivalent recommended based on degree of exposure.

(R) - Saranex is a registered trademark of E.I. DuPont.

Note: The resistance of specific materials may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

**RESPIRATORY PROTECTION**

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, and NIOSH Respirator Decision Logic for additional guidance on respiratory protection.

**9. PHYSICAL AND CHEMICAL PROPERTIES (Rev. 09/94)**

**APPEARANCE**

Red or reddish/orange colored (dyed) liquid.

**ODOR**

A mild, petroleum distillate odor.

**BASIC PHYSICAL PROPERTIES**

**BOILING RANGE:** 340-700°F

**VAPOR PRESSURE:** 0.009 psia @ 70°F

**VAPOR DENSITY (AIR=1):** >1.0

**SPECIFIC GRAVITY:** 0.86 @ 60°F

**SOLUBILITY (H<sub>2</sub>O):** negligible in water

**PERCENT VOLATILES:** 100%

**EVAPORATION RATE:** slow; AP 7% in 24 hrs @76°F; will vary with conditions

**VISCOSITY:** 32.6 - 37.9 SUS @ 100°F

**HESS****Material Safety Data Sheet**

#2 FUEL OIL

**10. STABILITY AND REACTIVITY**

STABILITY: Stable

**CONDITIONS TO AVOID (STABILITY)**

Material is stable under normal conditions. Avoid high temperatures, open flames, welding, smoking and ignitions sources.

**INCOMPATIBLE MATERIALS**

Keep away from strong oxidizers, ignition sources and heat; Viton(R); Flourel(R).

**HAZARDOUS DECOMPOSITION PRODUCTS**

Carbon monoxide, carbon dioxide and reactive hydrocarbons (smoke).

HAZARDOUS POLYMERIZATION: Will Not Occur

**11. TOXICOLOGICAL INFORMATION (Rev. 09/94)****SKIN EFFECTS**

Practically non-toxic. Rabbit Dermal LD50 = 5 ml/kg; 500 mg/24 hours

**ACUTE ORAL EFFECTS**

Oral-rat LD50: 14 ml/kg

**CHRONIC EFFECTS/CARCINOGENICITY**

Carcinogenicity - NTP: No IARC: No OSHA: No ACGIH: No

Studies by API and others have shown that similar products produce skin cancer or skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation. Potential risks to humans can be minimized by observing good work practices and personal hygiene procedures.

**MUTAGENICITY (GENETIC EFFECTS)**

Products of similar composition have been positive in mutagenicity tests.

**MISCELLANEOUS TOXICOLOGICAL INFORMATION**

The naphthalene constituent of this product in its pure form has been demonstrated to cause flushing, headache, ocular effects, neurological effects, gastrointestinal effects, rare hepatocellular injury, blood effects, erythema, dermatitis, injury to offspring with prenatal exposure, and laryngeal and intestinal carcinoma in test animals. There is no data that this product as a whole will exhibit the health effect characteristics of naphthalene.

**12. ECOLOGICAL INFORMATION**

Keep out of sewage, drainage and waterways. Report spills and releases, as applicable, under Federal and State regulations.

**13. DISPOSAL CONSIDERATIONS (Rev. 09/94)**

Maximize product recovery for reuse or recycling. Contaminated materials may be classified as RCRA Hazardous Waste due to the low flash point. Also consult state regulations. Waste may be incinerated, with approval of EPA, at approved disposal site.



**Material Safety Data Sheet**

**#2 FUEL OIL**

**14. TRANSPORT INFORMATION (Rev. 02/94)**

PROPER SHIPPING NAME: Fuel Oil, No. 2

HAZARD CLASS: 3  
 DOT IDENTIFICATION NUMBER: NA1993  
 DOT SHIPPING LABEL: Flammable Liquid

May be reclassified for transportation as a COMBUSTIBLE LIQUID under conditions of DOT 49 CFR 173.120(b)(2).

**15. REGULATORY INFORMATION (Rev. 09/94)**

**U.S. FEDERAL REGULATORY INFORMATION**  
 Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal reporting requirements. Consult those regulations applicable to your facility/operation.

**CLEAN WATER ACT (OIL SPILLS):**  
 Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) or, if not practical, the U.S. Coast Guard with follow-up to the National Response Center, as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

This product and its constituents listed herein are on the EPA TSCA Inventory.

**SARA TITLE III NOTIFICATIONS AND INFORMATION**

SARA TITLE III - HAZARD CLASSES: Acute Health Hazard  
 Chronic Health Hazard  
 Fire Hazard

**SARA TITLE III - SECTION 313 SUPPLIER NOTIFICATION**

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

CAS NUMBER	INGREDIENT NAME	PERCENT BY WEIGHT
91-20-3	Naphthalene	< 0.1 to 2.0

This information must be included on all MSDSs that are copied and distributed for this material.

**U.S. STATE REGULATORY INFORMATION**

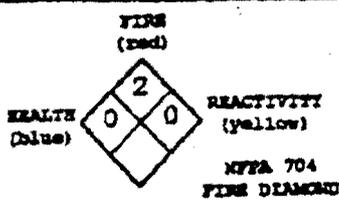
Any spill or uncontrolled release of this product may be subject to state and/or local reporting requirements. This product and/or its constituents may also be subject to other regulations at the state and/or local level. Consult those regulations applicable to your facility/operation.

**CANADIAN REGULATORY INFORMATION**

WHMIS: Class B, Division 2 (Flammable Liquid)  
 Class D, Division 2, Subdivision B (Toxic by other means)

**16. OTHER INFORMATION (Rev. 09/94)**

NFPA HAZARD RATING - HEALTH: 0 Negligible  
 - FIRE: 2 Moderate  
 - REACTIVITY: 0 Negligible



**HESS****Material Safety Data Sheet**

#2 FUEL OIL

**16. OTHER INFORMATION - Continued**

HMIS HAZARD RATING - HEALTH: 2 Moderate  
 - FIRE: 2 Moderate  
 - REACTIVITY: 1 Slight

MSDS IDENTIFICATION CODE/NUMBER: 0088

SUPERCEDES MSDS DATED: 09/07/93

**Glossary:**

AP = Approximately                    < = Less than                    > = Greater than  
 N/A = Not Applicable                N/E = Not Established            N/D = Not Determined  
 ppm = parts per million

**Acronyms:**

ACGIH = American Conference of Governmental Industrial Hygienists  
 AIHA = American Industrial Hygiene Association  
 ANSI = American National Standards Institute (212)642-4900  
 API = American Petroleum Institute (202)682-8000  
 CERCLA = Comprehensive Emergency Response, Compensation, and Liability Act  
 DOT = U.S. Department of Transportation  
 EPA = U.S. Environmental Protection Agency  
 HMIS = Hazardous Materials Information System  
 IARC = International Agency For Research On Cancer  
 MSHA = Mine Safety and Health Administration  
 NFPA = National Fire Protection Association (617)770-3000  
 NOIC = Notice of Intended Change (proposed change to ACGIH TLV)  
 NIOSH = National Institute of Occupational Safety and Health  
 NTP = National Toxicology Program  
 OPA = Oil Pollution Act of 1990  
 OSHA = U.S. Occupational Safety & Health Administration  
 PEL = Permissible Exposure Limit (OSHA)  
 RCRA = Resource Conservation and Recovery Act  
 REL = Recommended Exposure Limit (NIOSH)  
 SARA = Superfund Amendments and Reauthorization Act of 1986 Title III  
 SCBA = Self-Contained Breathing Apparatus  
 SPCC = Spill Prevention, Control, and Countermeasures  
 STEL = Short-Term Exposure Limit (generally 15 minutes)  
 TLV = Threshold Limit Value (ACGIH)  
 TSCA = Toxic Substances Control Act  
 TWA = Time Weighted Average (8 hr.)  
 WEEL = Workplace Environmental Exposure Level (AIHA)  
 WHMIS = Canadian Workplace Hazardous Materials Information System

**DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES**

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgement.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.