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RAPID ASSESSMENT REPORT FOR SITE 2 BUILDING NS 53 ZONE H CNC CHARLESTON  
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9/1/1999  
TETRA TECH

**Rapid Assessment Report**  
for  
**Site 2, Building NS 53**

**Zone H**  
**Charleston Naval Complex**  
North Charleston, South Carolina



**Southern Division**  
**Naval Facilities Engineering Command**

**Contract Number N62467-94-D-0888**

**Contract Task Order 0068**

September 1999

**RAPID ASSESSMENT REPORT  
FOR  
SITE 2, BUILDING NS 53**

**ZONE H, CHARLESTON NAVAL COMPLEX  
NORTH CHARLESTON, SOUTH CAROLINA**

**COMPREHENSIVE LONG-TERM  
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT**

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

**Submitted by:  
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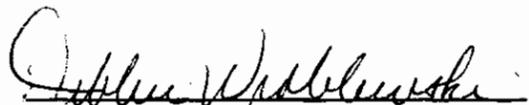
**SEPTEMBER 1999**

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## EXECUTIVE SUMMARY

Tetra Tech NUS, Inc. (TtNUS) has completed a Rapid Assessment (RA) for Site 2 which includes two underground storage tanks (USTs) which supplied fuel oil to Building NS 53 at Charleston Naval Complex (CNC) Zone H, in North Charleston, South Carolina. The RA was performed under the direction of the South Carolina Department of Health and Environmental Control's (SCDHEC's) Rapid Assessment Plan and approval letter dated November 4, 1998.

### **TtNUS performed the following actions during the RA:**

- Reviewed available Navy documents to identify potential sources and receptors for petroleum hydrocarbons in the vicinity, to evaluate public and private potable wells, to locate utilities line areas, to locate nearby surface water bodies, and to determine surface hydrology and drainage;
- Reviewed the previously prepared Underground Storage Tank Assessment Report for USTs NS53A and NS53B to determine boring locations and monitoring well placements;
- Conducted site survey to identify utilities and to construct a site plan;
- Performed direct push investigation, collected soil and groundwater samples for field screening of total petroleum hydrocarbons using an organic vapor analyzer;
- Collected groundwater samples from direct push borings for mobile lab screening analysis for benzene, toluene, ethyl benzene, total xylenes (BTEX), and diesel range organics;
- Installed four piezometer wells;
- Installed shallow permanent monitoring wells to approximately 12 feet below land surface (bls) and a vertical delineation well to approximately 27 feet bls;
- Collected groundwater samples from the permanent monitoring wells for laboratory analysis of analyzed for BTEX, methyl tert-butyl ether (MTBE), and naphthalene using U.S. Environmental Protection Agency (USEPA) Method 8260 and polynuclear aromatic hydrocarbons (PAHs) using USEPA Method 8270;
- Performed groundwater natural attenuation sampling;
- Collected soil samples for laboratory analysis of the for BTEX, and naphthalene using USEPA Method 8260, PAHs using USEPA Method 8270, total organic carbon (TOC) using USEPA Method 415.1, total recoverable petroleum hydrocarbon (TRPH) using USEPA Method 9071, and grain size analysis using sieve and hydrometer methods; and
- Surveyed monitoring well and piezometer top of casing elevations and collected depth to groundwater measurements to evaluate the groundwater flow direction.

### **Conclusion**

No Chemicals of Concern (CoCs) were detected in the onsite soils at concentrations that exceed the SCDHEC Risk Based Screening Levels (RBSLs) for clay-rich soils. And although all of the CoCs detected in the groundwater samples were below the RBSLs, during the December 19, 1998, and March 7, 1999, groundwater measurement events, petroleum free product was observed in some of the onsite monitoring wells.

The downgradient extent of hydrocarbon impact to groundwater has been delineated. Free product was present in piezometers CNC02-P03 (0.01 feet), CNC02-P04 (sheen), and monitoring well NBCH178-001 (sheen) in March 1999. The calculated concentration of benzene (0.31 mg/kg in groundwater in equilibrium with fuel oil) exceeds the construction worker RBSL (0.152 mg/L) and SSTL (0.282 mg/L) for benzene calculated in Section 3.5. The calculated concentration of naphthalene (23.35 mg/L in groundwater in equilibrium with fuel oil) exceeds the construction worker RBSL (1.63 mg/L) and SSTL (3.027 mg/L) for naphthalene calculated in Section 3.5. No concentrations of any compound of interest in the compliance well CNC02-M04 exceed their SSTLs. Compliance well concentrations are actual measured concentrations and were all non-detect.

### **Recommendation**

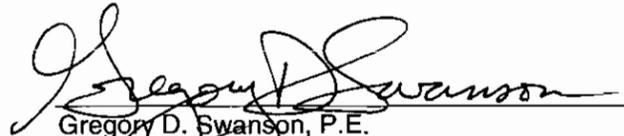
Since the dissolved hydrocarbon concentrations (benzene and naphthalene) at the source are above the SSTLs, corrective action is required according to SCDHEC guidelines. Free product should be removed from CNC02-P03, CNC02-P04, and NBCH178-001 and the chemical concentrations monitored until they fall below the SSTLs of 0.282 mg/L for benzene and 3.027 mg/L for naphthalene.

### CERTIFICATION PAGE

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



Approved By:



9/24/99

Gregory D. Swanson, P.E.  
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SCDHEC UST Site Rehabilitation Contractor Class I & II No. 24

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## 1.0 INTRODUCTION

Site 2 includes two underground storage tanks (USTs) which supplied fuel oil to Building NS 53 located at the Charleston Naval Complex (CNC), Zone H in North Charleston, South Carolina. This Rapid Assessment (RA) was performed by Tetra Tech NUS, Inc.'s (TtNUS's) Tallahassee, Florida, office, located at 1401 Oven Park Drive, Suite 102, Tallahassee, Florida 32308 (telephone number 850-385-9899) on behalf of the U.S. Navy Southern Division (SOUTHDIV) Naval Facilities Engineering Command (NAVFAC), 2155 Eagle Drive, North Charleston, South Carolina (telephone number 843-820-7307). Authorization to conduct the RA for the site was issued by NAVFAC under Contract Task Order (CTO) 0068. The RA was performed under the direction of the South Carolina Department of Health and Environmental Control's (SCDHEC's) Rapid Assessment Plan and approval letter dated November 4, 1998. TtNUS performed fieldwork necessary to complete the RA between December 18, 1998, and March 8, 1999.

### 1.1 SITE DESCRIPTION

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

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

Building NS 53 is a former barber shop and maintenance shop located on Bordelon Avenue at CNC. Two USTs were formerly located at the site. UST NS53A was a 3,000-gallon tank used to supply fuel oil to the building's boiler; UST NS53B was an 800-gallon tank used to supply fuel oil to the hot water heater. The USTs were located on the east side of the building between Building NS 53 and Sarsi Street. The USTs were removed between December 1996 and February 1997 [Supervisor of Ship Building, Conversion and

Repair, United States Navy, Portsmouth Virginia, Environmental Detachment Charleston (SPORTENDETCHASN), 1997).

The site lies within the Resource Conservation Recovery Act (RCRA) designated Solid Waste Management Unit (SWMU) 178. SWMU 178 was identified based on a polychlorinated biphenyl (PCB) transformer fire and leak in the fenced electrical area southeast of Building 53 and was proposed for a RCRA Facility Investigation (RFI) (SPORTENVDETCHASN, 1997). During the RA field investigation, the field crew identified the potential existence of between one and three USTs within the fenced electrical substation area (TTNUS, 1999).

## **1.2 SITE HISTORY**

In 1901, the U.S. Navy acquired 2,250 acres near Charleston to build a shipyard, and the first naval officer was assigned duty in early 1902. Subsequently, buildings and a dry dock were constructed in the Naval Yard. The dry dock was completed in 1909 along with several other brick buildings and the main power plant, which is still in operation today. The first ship was placed in dry dock and work began on fleet vessels in 1910. World War I brought about an expansion of the yards, facilities, land area, and work force. The yard built two gunboats, several submarine chasers, and tugs in addition to performing repairs and other services to the fleet. In 1933, building activity had increased principally in construction of several Coast Guard tugs, a Coast Guard cutter, and a Navy gunboat, creating the need for more facilities and a much larger work force. In 1943, civilian work force peaked with almost 26,000 employees divided among three daily shifts. In 1956, construction began on piers, barracks, and buildings for mine warfare ships and personnel. Later in the decade, the facility became a major home port for combatant ships and submarines of the U.S. Atlantic Fleet [Final RCRA Facility Investigation Report for Zone H, EnSafe/Allen & Hoshall (E/A&H), 1996].

In 1993, major cuts in defense spending, as a result in part to the end of the cold war, caused CNC to be added to the list of bases scheduled for closure under the Defense Base Realignment and Closure Act (BRAC). BRAC regulates the closure and transition of property back to the community (E/A&H, 1996). With the scheduled closure of the base, operations were scaled back and environmental cleanup proceeded to make the property available for redevelopment after closure.

Building NS 53 is a former barber shop and maintenance shop on the CNC. From 1935 until an unknown closure date the building was supplied oil fuel from two USTs designated UST NS53A and NS53B. The

USTs were located on the east side of the building immediately south of Building X33-A (SPORTENVDETHASN, 1997).

UST NS53A, a steel, 3,000-gallon fuel oil tank was installed in 1935 with the base of the tank approximately 9 feet below land surface (bls). The UST did not contain spill prevention equipment or overfill protection equipment. The distribution lines for UST NS53A were constructed of steel and copper and operated as suction lines as opposed to pressurized system. UST NS53B was an 800-gallon fuel oil tank also installed approximately 9 feet bls, without spill prevention equipment or overfill protection equipment. Distribution lines for the UST NS 53B were constructed of steel and operated as suction lines.

USTs NS53A and NS53B and their distribution lines were removed between December 2, 1996, and February 18, 1997. To complete the removal operation, the USTs was drained, cut open both ends, and cleaned with a steam cleaner. The UST was then cut up for recycling (SPORTENVDETHASN, 1997).

At the time of removal, UST NS 53A was described as moderately corroded and pitted and four 1/16-inch holes were identified on the west side of the tank. The UST contained residual fuel, rinse water and sludge, which was collected and recycled. Soil removed during the UST excavation was returned to the excavation (SPORTENVDETHASN, 1997).

At the time of removal, UST NS 53B was also described as moderately corroded and pitted; however, the tank was without visible holes. The UST did not contain product or sludge, but rinse water used in the tank was collected and recycled. Soil removed from the UST excavation was returned to the excavation and later transferred to CNC Building 1601 for remediation in Detachment Charleston's Bioremediation Facility (SPORTENVDETHASN, 1997).

In addition, during the excavation of UST NS53A, a set of 1 ½-inch steel supply and return lines were identified abandoned in the excavation and ½-inch copper lines were connected to supply fuel oil. UST NS53A was not connected to any piping. The supply lines may have been disconnected when Building NS 53 was converted from fuel oil to electric water heater (SPORTENVDETHASN, 1997).

The analytical results and the UST Assessment Report (SPORTENVDETHASN, 1997) are included as Appendix A.

### 1.3 RECEPTOR SURVEY RESULTS

A survey of the site vicinity was conducted by TtNUS personnel to identify potential receptors for petroleum hydrocarbon contamination. The site plan (Figure 2) depicts the public utilities located within 250 feet of the former UST location. Specific information concerning the depth of utilities bls is currently unavailable. However, according to facility personnel typically utility lines are located approximately 2 to 6 feet bls (SPORTENVDETHASN, 1999). The following utility receptors were located:

- **Water utility:** A water supply line originates at the northeast corner of Building NS-53 and travels north to connect to a supply line located along the south side of Hobson Avenue. The line lies cross gradient to the former UST locations. There are no water utility lines in a downgradient direction within 250 feet of the former UST location.
  
- **Sanitary sewer utility:** A sanitary sewer line originates at the northeast corner of Building NS 53 and travels northwest to connect to a supply line located along the north side of Hobson Avenue. A separate line originates at the southwest corner of Building NS 46 and travels northeast then northwest to connect to the line from Building NS-53. The nearest downgradient line is a portion of the utility line originating at the southwest corner of Building NS 46 and is located approximately 70 feet east of the UST area.
  
- **Natural gas utility:** A natural gas line extends along the entire southern edge of Hobson Avenue. The line is not believed to be connected to Building NS 53. The natural gas line is situated approximately 160 feet northeast of the former UST location in a cross gradient direction. There are no natural gas utility lines within 250 feet of the former UST location in a downgradient direction.
  
- **Storm sewer utility:** A storm sewer utility line originates on the southeast corner of Building NS 53 and travels north then west along the northern side of Building NS 53. The line originates near the former UST location in an up gradient direction. A separate storm sewer line is located on the northern edge of Kite Avenue in a cross gradient direction. There are no storm sewer utility lines within 250 feet of the former UST location in a downgradient direction.
  
- **Electrical utility:** The majority of the electrical utility lines in the site are overhead; however, one under ground electric line is located east of Building NS 53 lying in a southwest to northeast direction. The underground utility line is located immediately north of the former UST location in a cross gradient direction.

Shallow aquifer potable wells and irrigation wells were not identified within 1,000 feet of the site (E/A&H, 1996). Numerous monitoring wells are located within 1,000 feet of the site (E/A&H, 1996). Building basements are not present on CNC. The nearest surface water body to the site is Cooper River located approximately 500 feet from the site.

There are no city, county, or state zoning ordinances as the property (CNC) is currently owned by the federal government. Information concerning zoning ordinances can be obtained from the SOUTH DIV Remedial Project Manager located at 2155 Eagle Drive, North Charleston, South Carolina (telephone number 843-820-7307).

#### **1.4 REGIONAL GEOLOGY AND HYDROGEOLOGY**

CNC is located in Charleston County, South Carolina, in the Lower South Carolina Coastal Plain Physiographic Province on the Cooper River side of the Charleston Peninsula. The peninsula is formed by the confluence of the Cooper and Ashley Rivers. Topography in the area is typical of the South Carolina lower coastal plain and is characterized by having low-relief plains broken by the meandering streams and rivers, flowing toward the coast past occasional marine terrace escarpments (E/A&H, 1996).

The geology of the Charleston area is typical of the southern Atlantic Coastal Plain. Cretaceous-age and younger sediments thicken seaward and are underlain by older igneous and metamorphic basement rock. Surface exposures consist of recent or Pleistocene sands, silts, and clays of high organic content referred to as the Wando Formation (E/A&H, 1996). Underlying the Wando Formation, increasing with age, are the Oligocene-age Cooper Group and the Eocene-age Santee Limestone. The Cooper Group is comprised of the Parkers Ferry, Ashley, and Harleyville Formations. The formation of particular importance in the Cooper Group is the Ashley Formation, which was formerly referred to as the Cooper Marl in most regional geologic literature. In more recent geologic nomenclature, the name "Cooper" has been given to a group of formations which includes the Ashley Formation, a pale green to olive-brown, sandy phosphoric limestone or marl, which is locally muddy and/or sandy. The Ashley Formation in the Vicinity of Charleston is encountered at a depth of approximately 30 to 70 feet bls. The top of the Ashley Formation has been reported to be associated with an erosional basin, and the entire Cooper Unit, including the Ashley Formation, is indicated to be approximately 300 ft thick (E/A&H, 1996).

Groundwater occurs under water table or poorly confined conditions within the recent or Pleistocene deposits overlying the Ashley Formation of the Cooper Group. Transmissivity in the Pleistocene aquifer is generally less than 1,000 feet per 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 depths (E/A&H, 1996).

The Cooper Group is hydrogeologically significant mainly because of its low permeability. In most locales, its sandy, finely granular limestone produces little or no water, but instead acts as confining material causing artesian conditions in the underlying Santee Limestone. Yields from wells in the Santee Limestone are usually less than 300 gpm (E/A&H, 1996).

## 2.0 ASSESSMENT INFORMATION

### 2.1 SITE-SPECIFIC GEOLOGY AND HYDROGEOLOGY

#### 2.1.1 Site Geology

Eighteen direct push soil borings were advanced at Site 2 under the supervision of a TtNUS geologist between December 18, and December 21, 1998 (Figure 3). These borings ranged in depth from 2 to 12 feet bls and provided soil samples to characterize the subsurface lithology. On February 2 through February 4, 1999, four monitoring wells were installed on-site. Lithologic samples were collected and recorded during the drilling process to allow a vertical delineation of soils from land surface to a depth of 27 feet bls.

Based on lithologic descriptions from the above soil borings and monitoring wells, it appears that the subsurface soil consists of silty and clayey sands to a depth of approximately 4 to 5 feet bls, clay and sandy clay from 5 feet to approximately 10 feet bls, and sand and silty sand to the maximum exploration depth. A generalized view of the subsurface lithology is presented in Figures 4 and 5. Lithologic descriptions of the soil boring logs are presented in Appendix B.

#### 2.1.2 Site Hydrogeology

Four piezometers were installed at Site 2 as part of the RA investigation. The piezometers were installed to determine the groundwater flow direction in the field and assist in the placement of monitoring wells. The piezometers were located in former soil boring at locations paired as follows: piezometer CNC02-P01 and soil boring CNC07-B08; piezometer CNC02-P02 and soil boring CNC02-B10; piezometer CNC02-P03 and soil boring CNC07-B11; and piezometer CNC02-P04 and soil boring CNC02-B12.

Two of the piezometers were installed as temporary piezometers, which were removed after relative top-of-casing elevations were measured and groundwater measurements were recorded. Two piezometers, CNC02-P01 and CNC02-P02, were installed as permanent piezometers because overhead power lines limited drill rig access for the installation of monitoring wells. The piezometers will be used for continuing water level measurements and groundwater sampling.

Five monitoring wells, CNC02-M01 through CNC02-M05, were installed as part of this RA investigation. Two additional monitoring wells, NBCH178-001 and NBCH178-002, were previously installed during the

RFI. The monitoring wells and permanent piezometer locations are shown in Figure 3. Six of the monitoring wells, CNC02-M01 through CNC02-04, NBCH178-001, and NBCH178-002, were completed as shallow wells to an approximate depth of 12 feet bls. The monitoring wells were completed using 10 feet of PVC well screen that bracketed the water table. Monitoring well CNC02-M05 was completed as a Type III monitoring well with 6-inch diameter polyvinyl chloride (PVC) surface casing grouted to a depth of 20 feet bls. After the grout for the surface casing cured for 24 hours, the borehole was advanced to a depth of 26 feet and a 2-inch diameter PVC monitoring well was installed with a 5-foot, 0.01-inch machine slotted monitoring well screen. Well construction logs for the RA monitoring wells are presented in Appendix B.

In the site area, groundwater generally occurs under unconfined conditions at depths of 3 to 7 feet bls. Groundwater elevation measurements were recorded in various piezometers and monitoring wells on December 19, 1998; February 21, 1999; and March 7, 1999. During the December 19, 1998 and March 7, 1999, measurement events petroleum free product was observed in four and three of the measurement locations, respectively. The recorded water-level and free product data are presented in Table 1. Figure 6 presents the groundwater potentiometric surface during the March 7, 1999 field event. Based on the potentiometric map, it appears groundwater flow is toward the east-southeast toward Sarsi Street.

As part of the Final RFI Report for Zone H (E/A&H, 1996), a tidal influence investigation was conducted. The objective of the investigation was to provide long-term water level monitoring to determine the effects of the tidal fluctuation on wells and groundwater flow throughout Zone H. During the tidal study water levels were recorded in 19 wells throughout Zone H over a period of 4 days. Measurements were recorded every hour using data loggers. The 4-day period spanned nine high and nine low tide cycles.

Results of the tidal survey identified a maximum fluctuation in shallow monitoring wells of 1.12 feet with monitoring wells located closer to the tidal source being more influenced by tidal changes than wells on the peninsula. The heterogeneity of the aquifer material may limit or accentuate the tidal response in some wells. Tidal influence from Shipyard Creek appears to be greater than that of the Cooper River (possibly because of the quay wall along the Cooper River). The report concluded that the minimal fluctuations in the groundwater levels were not expected to play a significant role in directing contaminant transport in any direction other than that determined by the natural groundwater gradient (E/A&H, 1996).

## **2.2 ASSESSMENT RESULTS**

Eighteen soil borings were completed as part of the screening portion of the soil investigation at Site 2. Six soil borings were completed to collect soil samples for analysis at a fixed base laboratory to confirm the Chemicals of Concern (CoC). The soil borings for screening evaluation were completed using a Direct

Push Technology (DPT) rig; and samples were collected to evaluate subsurface soil vapors, soil contaminant concentration (via a mobile laboratory), and groundwater contaminant concentrations (via a mobile laboratory). The soil samples were collected from a maximum depth of 3 feet bls. The soil and groundwater samples collected for mobile laboratory screening were analyzed for benzene, toluene, ethyl benzene, total xylenes (BTEX), and diesel range organics.

Soil samples collected for fixed base laboratory analysis were analyzed for BTEX, and naphthalene using U.S. Environmental Protection Agency (USEPA) Method 8260, and polynuclear aromatic hydrocarbons (PAHs) using USEPA Method 8270. One sample was collected for total organic carbon (TOC) analysis using USEPA Method 415.1, total recoverable petroleum hydrocarbons (TRPH) using USEPA Method 9071, and grain-size analysis using sieve and hydrometer methods. The sample collection was conducted in accordance with the SCDHEC guidance document "Standard Limited Assessment" (June 1997). Lithologic logs for each soil boring are presented in Appendix B. The soil boring locations are shown on Figure 3 and the assessment results are presented in Section 2.4.1.

Groundwater samples for CoC evaluation were collected on March 8, 1999. Groundwater sampling was conducted using a peristaltic pump and low flow, quiescent techniques. The monitoring wells were sampled in accordance with the SCDHEC guidance document "South Carolina Risk-Based Corrective Action for Petroleum Releases" (January 1998). Each well was purged of three to six well volumes or until water quality parameters of pH, temperature, and conductivity stabilized. The field data sheets are included in Appendix C. A summary of the field parameter measurements is presented in Table 2. Groundwater samples were analyzed for BTEX, methyl tert-butyl ether (MTBE), and naphthalene using USEPA Method 8260 and PAHs using USEPA Method 8270. Three of the groundwater samples were also analyzed for the following natural attenuation parameters: dissolved oxygen, alkalinity, carbon dioxide, sulfide, ferrous iron, nitrite, manganese, nitrogen/nitrate, sulfate, and methane. The natural attenuation parameters are summarized in Table 3.

## **2.3 FIELD SCREENING ASSESSMENT**

### **2.3.1 Soil Vapor Assessment**

Eighteen soil borings were completed as part of the soil screening investigation. Organic vapor analyzer (OVA) headspace measurements were recorded at 1-foot intervals from the ground surface to the top of the water table. Eleven of the soil borings (CNC02-B06 through CNC02-B16) encountered the water

tables within 2 feet of land surface. The remaining soil borings encountered the water table at 3 feet bls. Table 4 summarizes the soil vapor screening results. Figure 3 presents the soil boring locations.

Soil vapor concentrations ranged from not detected to 20 parts per million (ppm). Detectable concentrations were reported in 8 of the 18 soil borings. However, only three of the soil borings (CNC02-B01, CNC02-B02, and CNC02-B15) were reported to contain soil vapor concentrations above 3 ppm.

The soil vapor assessment was used as a screening method to assist in identifying locations for collection of soil samples and groundwater monitoring wells. Soil sample and monitoring well locations were determined, in part, based on these data.

### **2.3.2 Soil Mobile Lab Results**

A single soil sample was collected from each of 18 soil borings (soil borings CNC02-B01 through CNC02-B18) and analyzed in a mobile laboratory for BTEX and diesel range organics using USEPA Method 8260. The soil samples were selected based on the soil vapor screening results with the additional criterion that the samples originate in the vadose zone above the water table. Table 5 presents a summary of the analytical data from the mobile laboratory.

As indicated in Table 5, with the exception of diesel range organics, none of the investigation analytes were detected at concentrations above instrument detection limits. Diesel range organics were detected in four of the subsurface soil samples at concentrations ranging from 105.99 to 24,261.98 parts per billion (ppb).

The mobile laboratory soil analysis was used as a screening method to assist in identifying locations for collection of soil samples for fixed base laboratory analysis and locations for groundwater monitoring wells. Soil sample and monitoring well locations were determined, in part, based on these data.

### **2.3.3 Groundwater Mobile Lab Results**

Fourteen groundwater-screening samples were collected and analyzed in a mobile laboratory for BTEX and diesel range organics using USEPA Method 8260. The groundwater screening samples were collected from piezometer CNC02-P01, monitoring well NBCH178-002, and soil borings CNC02-B04 and CNC02-B07 and CNC02-B09 through CNC02-B18. Groundwater samples were not collected from piezometers NCC02-P02, CNC02-P03, and CNC02-P04 and soil boring CNC02-B08 because of the observed presence of petroleum free product. Groundwater screening samples from soil borings were

typically collected across the water table at depths ranging from 3 to 8 feet bls. The sample locations are shown on Figure 3. Table 6 presents a summary of the analytical data from the mobile laboratory.

As indicated in Table 6, diesel range organics, detected in the groundwater samples from soil boring CNC02-B16 and piezometer CNC02-P01, was the only analyte detected at a concentration above instrument detection limits.

The mobile laboratory groundwater analysis was used as a screening method to assist in identifying locations for monitoring wells for the collection of groundwater samples for fixed base laboratory analysis.

## **2.4 CHEMICALS OF CONCERN IN SOIL AND GROUNDWATER**

### **2.4.1 Chemicals of Concern in Soil**

Six subsurface soil samples (plus one duplicate sample) were collected from the Site 2 area for determination of CoCs. The soil boring locations are shown on Figure 3. Table 7 summarizes the CoCs detected in the soil samples. The soil samples from soil borings CNC02-B01 and CNC02-B03 were the only samples that contained CoC analytes above instrument detection limits. Benzene (estimated 2.61  $\mu\text{g}/\text{kg}$ ) and toluene (estimated 1.26  $\mu\text{g}/\text{kg}$ ) were detected in the soil sample from soil boring CNC02-B03 and TRPH (271  $\text{mg}/\text{kg}$ ) was detected in the soil sample from CNC02-B03. None of the detected concentrations exceeded the SCDHEC Risk Based Screening Levels (RBSLs) for clay-rich soils. The RBSL for clay-rich soils was used based on a grain-size analysis completed on sample 02SLB0103 indicating a clayey sand matrix (Appendix D). Because of the limited detected concentrations of CoC in soils and the lack of concentrations exceeding RBSLs, an isoconcentration figure for soils was not completed.

### **2.4.2 Chemicals of Concern in Groundwater**

Table 8 presents the analytical results for CoCs detected in the groundwater samples. Groundwater analytical data sheets for the March 1999 field event are presented in Appendix C. MTBE detected in the groundwater sample from monitoring well NBCH178 002 (9.83  $\mu\text{g}/\text{L}$ ) was the only CoC detected in the groundwater samples. The detected concentration of MTBE did not exceed the SCDHEC RBSL of 40  $\mu\text{g}/\text{l}$ . The groundwater sample from the onsite deep monitoring well CNC02-M05 did not contain any CoCs above the method detection limits.

Because of the limited detected concentrations of CoCs in groundwater and the lack of concentrations exceeding RBSLs, an isoconcentration figure for groundwater has not been completed.

Although all of the CoCs detected in the groundwater samples were below the RBSLs during the December 19, 1998, and March 7, 1999, groundwater measurement events, petroleum free product was observed in monitoring wells NBCH178-001, CNC02-P03, and CNC02-P04; and CNC02-P02, CNC02-P03, CNC02-P04, and NBCH178-001. The free product data are presented in Table 1. Groundwater samples were not collected from wells containing petroleum free product.

## **2.5 ANALYTICAL DATA**

All analytical data from the February 1997 UST Closure Assessment are presented in Appendix A. Soil analytical data generated during this RA are summarized in Table 7. Groundwater analytical data generated during this RA are summarized in Table 8. The completed soil and groundwater analytical data for this RA are included in Appendix D.

## **2.6 AQUIFER CHARACTERISTICS AND EVALUATION**

Groundwater levels were measured on March 7, 1999. Water level contours plotted on Figure 6 indicate that the groundwater flows to the east-southeast, with a hydraulic gradient of ranging from 0.0162 to 0.0383 feet per foot between monitoring wells CNC02-M01 to CNC02-M03 and CNC02-P01 to CNC02-M04, respectively.

As part of the Final RFI Report for Zone H, rising and falling head slug tests were conducted on 19 shallow monitoring wells throughout Zone H to determine the hydraulic conductivity of the surficial aquifer (E/A&H, 1996). Slug tests were conducted by instantaneously removing (rising head) or adding (falling head) a volume (slug) of water from the well and measuring the recovering water level with a data logger. The data were then used to calculate the hydraulic conductivity for the rising head test and the hydraulic conductivity for the falling head test. The average hydraulic conductivity for each well was determined by calculating the geometric mean of the rising and falling head values. Because hydraulic conductivity data are lognormally distributed, the geometric mean was determined to be the most representative measure of central tendency.

The well construction details and boring logs for each well tested during the RCRA investigation were reviewed to determine which wells were most representative of the conditions present at Site 2. To make this determination the screened interval, lithology, and proximity to the site were evaluated. Based on this

evaluation, monitoring well NBCH178001 was selected as the most representative well. NBCH178001 is located immediately adjacent to Site 2 and is completed to a depth of approximately 12 feet with a 10-foot screened interval. The geometric mean of the rising and falling head conductivity for well NBCH178001 was 0.1531 feet per day.

Potential movement of groundwater at the site may be described in terms of transportation by natural flow system in the saturated zone, assuming groundwater flow follows Darcy's Law.

Darcy's Law may be expressed as:

$$V = \left( \frac{K}{n} \right) \times i$$

where:

- V = average velocity  
K = hydraulic conductivity = 0.1531 ft/day  
n = effective porosity = 0.47 (from sieve results of 38.3% sand & 38.5% clay and Figure C1 in SCDHEC, 1998)  
i = average hydraulic gradient = 0.00332 ft/ft

therefore:

$$V = \left( \frac{0.1531 \text{ ft/day}}{0.47} \right) \times 0.0332 \text{ ft/ft}$$

$$V = 0.1081 \text{ ft/day}$$

In summary, the seepage velocity of the surficial aquifer was calculated to be approximately 6.5 feet per year based on a hydraulic conductivity of 0.306 feet per day, a hydraulic gradient of 0.02725 feet per foot, and a porosity of 47% for sandy clay. Aquifer characterization graphs are provided in Appendix E.

## 2.7 FATE AND TRANSPORT MODEL DESCRIPTION

The Domenico model was the fate and transport model used to determine groundwater site-specific target levels (SSTLs) in the risk analysis. The Domenico dilution/attenuation model is presented in the SCDHEC guidance document, *South Carolina Risk-Based Corrective Action for Petroleum Releases* (SCDHEC 1998). This model is very conservative in that it assumes an infinite mass, areal source condition through which groundwater flows. The model incorporates biological decay effects through a first-order decay process; however, this mechanism was ignored because SCDHEC guidance specifies that the decay rate must be assumed to be zero if site-specific decay rates have not been determined.

The impacted groundwater source area was modeled as 50 ft (15.00 m) wide and 6.56 ft (2.0 m) deep; these values are conservative defaults suggested by the American Society for Testing Materials (ASTM) *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (ASTM 1997). The maximum source concentrations are assumed to exist throughout the source area, further compounding the conservatism of the estimate. Because of the existence of free product on-site, the maximum solubility in equilibrium with fuel oil, calculated using Raoult's Law, was used for the maximum constituent concentrations. Fuel oil constituents can vary greatly but were assumed for this investigation to be similar to kerosene, which is typically 44% naphthalene (Conoco, Inc. 1996. *CONCAWE Diesel Fuel/ Kerosene*).

Site-specific data were used for saturated hydraulic conductivity, hydraulic gradient, and fraction of organic carbon in soil (1.0795E-06 m/sec, 0.02725 ft/ft, and 0.00273 g-C/g-soil, respectively). The soil bulk density (1.5 g/cm<sup>3</sup>) and porosity (0.47 cm<sup>3</sup>/cm<sup>3</sup>) were determined using Figures C1 and C3 given in SCDHEC (1998), based on the sieve test results for sample 02SLB0105, 38.3% sand and 38.5% clay. The following estimates of dispersivity were used in the Domenico model as given in SCDHEC (1998):

Parameter	Estimate
Longitudinal Dispersivity, $\alpha_x$	$x/10$ , where $x$ = distance between the point of exposure and the source or compliance point
Transverse Dispersivity, $\alpha_y$	$\alpha_x/3$
Vertical Dispersivity, $\alpha_z$	$\alpha_x/20$

Table 9 summarizes fate and transport parameters used in modeling the SSTLs.

## 2.8 PREDICTED MIGRATION AND ATTENUATION OF CHEMICALS OF CONCERN

The most recent groundwater-gauging event shows that groundwater flow is primarily east-southeast, toward Sarsi Street. The current extent of impact is limited to wells CNC02-P03, CHC02-P04, and NBCH178-001, which all contained free product in the latest monitoring event. Concentrations of compounds of interest in all other monitoring wells have been non-detect, except for a concentration of 9.83 µg/l MTBE in NBCH178-002, which is less than the RBSL but greater than the detection limit.

The Domenico model was used to predict the distance at which the tip of the plume is attenuated to RBSLs in 10 and 20 years without using degradation due to biological decay. This was done by adjusting the time to 10 years ( $3.15 \times 10^8$  sec) and 20 years ( $6.31 \times 10^8$  sec) and solving for distance (x) by trial and error. The source was assumed to be free product, [i.e. the source concentration was assumed to be that of groundwater in equilibrium with fuel oil (see Section 2.6) for the entire 10- and 20-year periods. The distance was changed separately for benzene, toluene, and naphthalene until the required distance that is necessary for the concentration to attenuate to the groundwater ingestion RBSLs was determined. Only the calculated concentrations of benzene, toluene, and naphthalene at the source (in equilibrium with free product) were greater than their respective groundwater ingestion RBSLs; therefore, these were the only chemicals for which plume distances were calculated. The model estimates that after 10 years, the concentrations of benzene, toluene, and naphthalene will be 0.005 mg/L, 1.0 mg/L, and 0.010 mg/L (RBSLs) at distances of 83 feet, 40.75 feet, and 17.8 feet, respectively (Figure 7). Furthermore, after 20 years, the concentrations of benzene, toluene, and naphthalene are 0.005 mg/L, 1.0 mg/L, and 0.010 mg/L (RBSLs) at distances of 137 feet, 68.2 feet, and 35.2 feet, respectively (Figure 8). The Domenico 10-year and 20-year simulation spreadsheets are presented in Appendix F.

### **3.0 TIER 2 EVALUATION**

#### **3.1 COMPARISON OF ANALYTICAL RESULTS WITH RBSLs**

Soil samples were collected on January 20, 1999. The samples were analyzed for BTEX, PAHs, and TRPH. Benzene, toluene, naphthalene, and TRPH were found above detection limits; however, no analyte concentration exceeded its RBSL for clay-rich soil less than 5 feet above groundwater.

Groundwater sampling was conducted on March 9, 1999. Free product (fuel oil) was present in piezometers CNC02-P03 (0.01 feet), CNC02-P04 (sheen), and monitoring well NBCH178-001 (sheen) (Table 1). Free product was not detected in any of the remaining wells. The remaining wells were sampled and analyzed for BTEX, MTBE, and PAHs including naphthalene. MTBE was the only analyte detected in these wells with a concentration of 9.83 µg/L. This concentration is below the SCDHEC RBSL. A comparison of soil and groundwater concentrations to RBSLs is summarized in Tables 7 and 8, respectively.

For concentrations in the wells containing free product, the maximum solubility in equilibrium with fuel oil was calculated using Raoult's Law. Fuel oil constituents can vary greatly but were assumed for this investigation to be similar to kerosene, which is typically 44% naphthalene. Results of the Raoult's Law calculations are located in Appendix G. Calculated concentrations for benzene, toluene, and naphthalene (0.31 mg/L, 4.65 mg/L, and 23.35 mg/L, respectively) in equilibrium with free product exceeded their respective RBSLs (0.005 mg/L, 1.0 mg/L, and 0.010 mg/L).

#### **3.2 SITE CONCEPTUAL EXPOSURE MODEL**

This section focuses on the current and future land use issues concerning the site. The site is the former barber shop and maintenance shop. Figure 1 shows that the site is located in and surrounded by the CNC. The area surrounding CNC is "mature urban," having long been developed with commercial, industrial, and residential land use. Commercial areas are primarily west of CNC; industrial areas are primarily to the north of the base along Shipyard Creek. This facility is included in the BRAC activities; therefore, the future use of the facility is unknown.

Drinking water at the site and surrounding properties is provided by the city of Charleston water treatment plants. The CNC is located on the Cooper River with the site located approximately 500 feet south of the river. Another surface water body is Shipyard Creek located approximately 3,500 feet southwest of the

site. Potable wells and irrigation wells were not identified within 1,000 feet of the site (E/A&H 1996). Numerous monitoring wells are located within 1,000 feet of the site (E/A&H 1996). Building basements are not present on the CNC. Groundwater at the site flows to the east-southeast.

### **3.3 EXPOSURE PATHWAY ANALYSIS**

This section presents the receptor characterizations of the potentially exposed populations in the vicinity of the site and identifies the potentially complete exposure pathways for those receptors. SCDHEC requires that only those exposure pathways with COC concentrations exceeding Tier 1 RBSL concentrations are examined in a Tier 2 Risk-Based Corrective Action Report. Tables 10 and 11 present the exposure pathway assessments for current and future use scenarios, respectively.

#### **3.3.1 On-Site Commercial Worker**

An on-site commercial worker is defined as an employee who works in a commercial capacity at the site. Commercial use of the site in the future is likely; therefore, an on-site commercial worker was considered as a potential receptor. Incidental ingestion and dermal contact with impacted soil are expected to be negligible for commercial workers because they are located inside a building, the site is paved, and all soil concentrations of analytes were below RBSLs. Drinking water at this site is provided by the city; therefore, ingestion of groundwater is not a complete exposure pathway. The building foundation is assumed to be sufficient to prevent volatilization from both soil and groundwater into a commercial building, and there is no history of vapors in the commercial building. It is unlikely that any additional exposure pathways will exist for future on-site workers; therefore, no complete pathways exist for either current or future commercial workers.

#### **3.3.2 On-Site Visitor**

An on-site visitor is defined as any person other than a worker who might come on site. On-site visitors would have the same exposure pathways as commercial workers, but their exposure duration would be much shorter. This receptor does not have to be quantified because a potential on-site visitor's chemical intake would not drive risk or cleanup levels at the site.

#### **3.3.3 On-Site Construction Worker**

An on-site construction worker is defined as a laborer who would be involved in intrusive activities on or around the site, particularly in the area of subsurface utilities. On-site construction workers could be

exposed to constituents in soil by the following pathways: inhalation of volatiles from soil, dermal contact with soil, and incidental ingestion of soil. There is no soil impact above RBSLs at the site. On-site construction workers could be exposed to constituents in groundwater by the following pathways: inhalation of volatiles from groundwater, dermal contact with groundwater, and incidental ingestion of groundwater. Utilities lie downgradient of the impacted area, and this pathway was considered for groundwater exposure to a utility worker.

#### **3.3.4 On-Site Resident**

An on-site resident is defined as any person making his or her home at the site. This site is expected to remain a commercial/industrial facility; therefore, the on-site resident receptor was not considered further.

#### **3.3.5 Off-Site Resident**

An off-site resident is defined as any person making his or her home near the site. This receptor's location is either an actual current residence near the site or is a vacant lot or property on which a residence could be built. The site is located in an area that will likely remain commercial/industrial, therefore, this potential receptor was not considered further.

#### **3.3.6 Surface Water**

The Cooper River is located approximately 500 feet north of the site. Another surface water body, Shipyard Creek, is located approximately 3,500 feet southwest of the site. Because groundwater at the site flows to the east-southeast, neither surface water body is downgradient of the site. Therefore, this pathway was not considered further.

### **3.4 IDENTIFICATION OF DATA REQUIREMENTS**

No additional data are required to calculate SSTLs for the site.

### **3.5 SITE-SPECIFIC TARGET LEVELS**

Soil site-specific target levels (SSTLs) were not required because soil concentrations did not exceed RBSLs.

The only identified future potential receptor is the construction (utility) worker. Municipal water is supplied to the base, so shallow groundwater is not used for drinking water. Groundwater RBSLs for the construction worker were calculated for three pathways: dermal contact, incidental ingestion, and inhalation of volatiles. A target cancer risk of  $1 \times 10^{-6}$  and a target hazard quotient of 1 were used in the calculations. Standard defaults were used when available and applicable to a construction worker. When no standard parameters were available, conservative assumptions were used. Where possible, site-specific parameters were used for site conditions. For all pathways, the exposure frequency was assumed to be 90 days/year and the exposure duration was assumed to be 1 year. These assumptions were considered conservative based on the nature of utility work.

The dermal contact RBSLs were calculated using procedures *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance* (USEPA Peer Consultation Workshop Draft, 1998). Based on expected limited contact with groundwater, the event frequency was assumed to be 1 event/day and the event duration was assumed to be 1 hour/event. The skin surface area available for contact was 4500 cm<sup>2</sup>, based on one-fourth the skin surface area given in the risk assessment guidance document for a swimming adult.

The incidental ingestion RBSLs were calculated using the equation given in *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Interim Final)*, (USEPA 1989). An incidental ingestion rate of 0.01 L/day was assumed based on a fraction (12.5%) of the incidental ingestion rate for a wading adult (0.01 L/hr), considered for an 8-hour work day. The incidental ingestion rate for wading adults is given in *Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment* (USEPA Region 4 1995).

Utility lines in the area are typically 2 to 6 feet deep. The average depth to groundwater at the site is 5.04 feet bls. It was assumed that a construction worker might be exposed to chemicals volatilizing from standing groundwater. The inhalation RBSLs were calculated using Henry's Law:

$$RBSL_{\text{WATER}} = RBSL_{\text{AIR}}/H$$

Where H = Henry's Law constant [mg/L-air/mg/L-water]

The RBSL<sub>AIR</sub> for each chemical was calculated using the equation given in *ASTM Standard Guide for Risk-Based Corrective Action Applied to Petroleum Release Sites, Designation E 1739-95e1* (1997). SCDHEC values were used for Henry's Law constants.

The minimum RBSL for the three pathways was chosen as the RBSL for the construction worker.

The following table shows the calculated RBSLs for each pathway along with the selected (minimum) RBSL:

	<b>Dermal</b>	<b>Incidental Ingestion</b>	<b>Inhalation</b>	<b>Selected (Minimum)</b>	<b>Maximum Concentration*</b>
	<b>RBSL</b>	<b>RBSL</b>	<b>RBSL</b>	<b>RBSL</b>	
	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/l</b>
<b>Benzene</b>	0.85	68.52	0.152	0.152	<b>0.31</b>
<b>Toluene</b>	23.98	5677.78	5.376	5.376	4.64
<b>Ethylbenzene</b>	6.05	2838.89	14.499	6.05	0.104
<b>Xylenes</b>	102.33	56777.78	NA*	102.33	0.794
<b>Naphthalene</b>	1.63	1135.56	2.633	1.63	<b>23.35</b>

\* Calculated concentration of chemicals in groundwater in equilibrium with free product.

Bold and shaded cell indicates concentration exceeds the RBSL.

Appendix H provides the parameters and results of the RBSL calculations.

The Domenico model as described in Section 2.6 and fate and transport parameters provided in Table 9 were used to determine groundwater SSTLs for benzene and naphthalene. Benzene and naphthalene were the only two analytes with concentrations above RBSLs. Sample locations CNC02-P03, CNC02-P04, and NBCH178-001 contained free product, fuel oil, at the last monitoring event; therefore, the area surrounding these wells was used as the source for predicted migration. The distance from the source area to the sanitary sewer utility line, which is the nearest point of exposure, was estimated to be 70 feet. The minimum RBSLs calculated above for inhalation of volatiles, dermal contact, and incidental ingestion of groundwater were used as allowable point of exposure concentrations. Using the values of RBSLs (0.152 mg/L for benzene and 1.63 mg/L for naphthalene) at the point of exposure, the SSTLs at the source were calculated and compared with the calculated source concentrations in groundwater in equilibrium with free product. The SSTLs at the compliance well (CNC02-M04) were also calculated using the values of the RBSLs at the point of exposure. The distance from the compliance well to the point of exposure was estimated to be 13 feet (3.96 m).

Groundwater concentrations and calculated SSTLs were:

<b>Chemical of Concern</b>	<b>Source Area Concentration [mg/L]</b>	<b>Source SSTL [mg/L]</b>	<b>Compliance Point Concentration [mg/L]</b>	<b>Compliance Point SSTL [mg/L]</b>
Benzene	0.31	0.282	ND	0.152
Naphthalene	23.35	3.027	ND	1.63

Appendix F provides the Domenico model calculations generating SSTLs.

Free product should be removed; however, the presence of toluene, ethylbenzene, and xylenes at their solubility limit concentrations would be less than calculated RBSLs for utility worker exposure. Appendix H provides the calculations for constituent solubilities based on Raoult's Law.

### 3.6 RECOMMENDATIONS

The downgradient extent of hydrocarbon impact to groundwater has been delineated. Free product was present in piezometers CNC02-P03 (0.01 feet), CNC02-P04 (sheen), and monitoring well NBCH178-001 (sheen) in March 1999. The calculated concentration of benzene (0.31 mg/kg in groundwater in equilibrium with fuel oil) exceeds the construction worker RBSL (0.152 mg/L) and SSTL (0.282 mg/L) for benzene calculated in Section 3.5. The calculated concentration of naphthalene (23.35 mg/L in groundwater in equilibrium with fuel oil) exceeds the construction worker RBSL (1.63 mg/L) and SSTL (3.027 mg/L) for naphthalene calculated in Section 3.5. No concentrations of any compound of interest in the compliance well CNC02-M04 exceed their SSTLs. Compliance well concentrations are actual measured concentrations and were all non-detect.

Since the dissolved hydrocarbon concentrations (benzene and naphthalene) at the source are above the SSTLs, corrective action is required according to SCDHEC guidelines. Free product should be removed from CNC02-P03, CNC02-P04, and NBCH178-001 and the chemical concentrations monitored until they fall below the SSTLs of 0.282 mg/L for benzene and 3.027 mg/L for naphthalene.

## 4.0 REFERENCES

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TABLE 1

**GROUNDWATER ELEVATIONS  
SITE 2, BUILDING NS 53  
ZONE H, CHARLESTON NAVAL COMPLEX  
SOUTH CHARLESTON, SOUTH CAROLINA  
Page 1 of 2**

Monitoring Well No.	Total Depth of Well (ft)	Top of Casing Elevation (ft MSL / ft local elevation)	Date Measured	Depth to free product (BTOC)	Depth to Water (BTOC)	Groundwater Elevation (MSL)
CNC02-M01	12	9.77 / 9.77	12/19/98	NM	NM	NM
			2/21/99	NP	3.84	5.93
			3/7/99	NP	4.41	5.36
CNC02-M02	12	9.58 / 8.99	12/19/98	NM	NM	NM
			2/21/99	NP	4.63	4.95
			3/7/99	NP	5.00	4.58
CNC02-M03	12	8.96	12/19/98	NM	NM	NM
			2/21/99	NP	4.65	4.31
			3/7/99	MP	4.95	4.01
CNC02-M04	12	8.90 / 8.92	12/19/98	NM	NM	NM
			2/21/99	NP	4.20	4.70
			3/7/99	NP	4.55	4.35
CNC02-M05	27	9.62 / 9.00	12/19/98	NM	NM	NM
			2/21/99	NM	NM	NM
			3/7/99	NP	6.17	3.45
CNC02-P01	27	9.97 / 10.00	12/19/98	NP	4.89	5.08
			2/21/99	NM	NM	NM
			3/7/99	NP	4.29	5.68
CNC02-P02	12	9.55 / 9.59	12/19/99	4.42	4.49	5.06
			2/21/99	NM	NM	NM
			3/7/99	3.91	3.92	5.63
CNC02-P03	12	NS / 11.35	12/19/99	[1]	6.49	NA
			2/21/99	NM	NM	NM
			3/7/99	6.37	6.38	NA

**TABLE 1**  
**GROUNDWATER ELEVATIONS**  
**SITE 2, BUILDING NS 53**  
**ZONE H, CHARLESTON NAVAL COMPLEX**  
**SOUTH CHARLESTON, SOUTH CAROLINA**  
**Page 2 of 2**

Monitoring Well No.	Total Depth of Well (ft)	Top of Casing Elevation (ft MSL / ft local elevation)	Date Measured	Depth to free product (BTOC)	Depth to Water (BTOC)	Groundwater Elevation (MSL)
CNC02-P04	12	NS / 11.57	12/19/99	[1]	6.25	NA
			2/21/99	NM	NM	NM
			3/7/99	[1]	6.17	NA
NBCH178-001	27	12.23 / 12.20*	12/19/99	[1]	4.49	7.74
			2/21/99	NM	NM	NM
			3/7/99	[1]	7.08	5.15
NBCH178-002	12	9.16	2/21/99	NM	NM	NM
			2/21/99	NM	NM	NM
			3/7/99	NP	4.02	5.14

**Notes:**

MSL - Mean Sea Level

BTOC - Below Top of Casing

NS - Not surveyed

ft - feet

NM - Not measured

NA - Not applicable

[1] - Visible trace amounts; not measurable

NP - Not present

**TABLE 2****GROUNDWATER FIELD MEASUREMENTS  
SITE 2, BUILDING NS 53  
ZONE H, CHARLESTON NAVAL COMPLEX  
NORTH CHARLESTON, SOUTH CAROLINA**

Well I.D.	Date Sampled	Purge method	Volume (gallons)	Temp. (°C)	pH	Conductivity (µMHOS/cm)
CNC02-M01	3/8/99	PP	6.5	16.4	7.33	0.540
CNC02-M02	3/8/99	PP	4.0	18.5	7.19	2.77
CNC02-M03	3/8/99	PP	5.5	20.2	6.81	17.20
CNC02-M04	3/8/99	PP	6.5	17.8	6.98	3.36
CNC02-M05	3/8/99	PP	4.0	20.3	7.05	16.50
CNC02-P01	3/8/99	PP	5.0	16.5	6.75	1.82
NBCH178-002	3/8/99	PP	6.5	17.6	7.64	1.52

**Notes:**

°C) - Degrees Celcius

PP - Peristaltic pump, low flow technique

µMHOS/cm - micro HOS per centimeter

NTU - Nephelometric turbidity units

**TABLE 3**

**GROUNDWATER NATURAL ATTENUATION FIELD MEASUREMENTS  
SITE 2, BUILDING NS 53  
ZONE H, CHARLESTON NAVAL COMPLEX  
NORTH CHARLESTON, SOUTH CAROLINA**

Well I.D.	Date Sampled	Dissolved Oxygen (mg/L)	Akalinity (mg/L)	Carbon Dioxide (mg/L)	Sulfide (mg/L)	Ferrous Iron (mg/L)	Nitrite (mg/L)	Manganese (mg/L)	Nitrogen/ Nitrate (mg/L)*	Sulfate (mg/L)*	Methane (mg/L)*
CNC02-M02	3/8/99	3.65	250	76	0.01	0.02	0.029	0.1	0.150	145.0	12
CNC02-P01	3/8/99	0.00	500	NA	0.01	3.30	0.018	15.7	ND	386.0	850
NBCH178-002	3/8/99	2.91	220	52	0.01	0.20	0.013	0.0	0.015 J	86.4	190

**Notes:**

\* - Fixed base laboratory analysis

mg/L - milligrams per liter

**TABLE 4**

**SUMMARY OF OVA SOIL SCREENING RESULTS  
SITE 2, BUILDING NS 53  
ZONE H, CHARLESTON NAVAL COMPLEX  
NORTH CHARLESTON, SOUTH CAROLINA**

Sample Location	Sample Identification	Sample Depth (feet)	Total Organic Vapor Headspace Concentration (PPM)
CNC02-B01	02SSB0101	1	10
	02SSB0102	2	1
	02SSB0103	3	18
CNC02-B02	02SSB0201	1	9
	02SSB0202	2	15
	02SSB0203	3	20
CNC02-B03	02SSB0301	1	ND
	02SSB0302	2	ND
	02SSB0303	3	1
CNC02-B04	02SSB0401	1	ND
	02SSB0402	2	ND
	02SSB0403	3	ND
CNC02-B05	02SSB0501	1	ND
	02SSB0502	2	1
	02SSB0503	3	1
CNC02-B06	02SSB0601	1	ND
	02SSB0602	2	ND
CNC02-B07	02SSB0701	1	ND
	02SSB0702	2	ND
CNC02-B08	02SSB0801	1	ND
	02SSB0802	2	ND
CNC02-B09	02SSB0901	1	ND
	02SSB0902	2	1
CNC02-B10	02SSB1001	1	ND
	02SSB1002	2	ND
CNC02-B11	02SSB1101	1	ND
	02SSB1102	2	ND
CNC02-B12	02SSB1201	1	2
	02SSB1202	2	2
CNC02-B13	02SSB1301	1	ND
	02SSB1302	2	ND
CNC02-B14	02SSB1401	1	2
	02SSB1402	2	2
CNC02-B15	02SSB1501	1	5
	02SSB1502	2	3
CNC02-B16	02SSB1601	1	ND
	02SSB1602	2	ND
CNC02-B17	02SSB1701	1	ND
	02SSB1702	2	ND
	02SSB1703	3	ND
CNC02-B18	02SSB1801	1	ND
	02SSB1802	2	ND
	02SSB1803	3	ND

**Notes:**

OVA - organic vapor analyzer equipped with a flame ionization detector

PPM - parts per million

ND- not detected

**TABLE 5**

**SUMMARY OF MOBILE LABORATORY SCREENING RESULTS FOR SOIL  
SITE 2, BUILDING NS53  
ZONE H, CHARLESTON NAVAL COMPLEX  
NORTH CHARLESTON, SOUTH CAROLINA**

Sample Location	Sample Identification	Sample Depth (feet)	Mobile Laboratory Screening Data (PPB) <sup>(1)</sup>				
			Benzene	Toluene	Ethylbenzene	Total Xylenes	Diesel Range Organics
CNC02-B01	02SFB0103	3	<0.5	<0.5	<0.5	<1.0	24,261.98
CNC02-B02	02SFB0203	3	<0.5	<0.5	<0.5	<1.0	15,038.73
CNC02-B03	02SFB0303	3	<0.5	<0.5	<0.5	<1.0	2,788.91
CNC02-B04	02SFB0403	3	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B05	02SFB0503	3	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B06	02SFB0602	2	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B07	02SFB0702	2	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B08	02SFB0802	2	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B09	02SFB0902	2	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B10	02SFB1002	2	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B11	02SFB1102	2	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B12	02SFB1202	2	<0.5	<0.5	<0.5	<1.0	105.99
CNC02-B13	02SFB1302	2	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B14	02SFB1402	2	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B15	02SFB1501	1	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B16	02SFB1602	2	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B17	02SFB1703	3	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B18	02SFB1803	3	<0.5	<0.5	<0.5	<1.0	<100

**NOTES:**

<sup>(1)</sup> Laboratory screening data were analyzed using USEPA Method 8260. Compounds not detected are reported as less than the instrument detection limit.

PPB - parts per billion

**TABLE 6**

**SUMMARY OF MOBILE LABORATORY SCREENING RESULTS FOR GROUNDWATER  
SITE 2, BUILDING NS53  
ZONE H, CHARLESTON NAVAL COMPLEX  
NORTH CHARLESTON, SOUTH CAROLINA**

Sample Location	Sample Identification	Mobile Laboratory Screening Data (PPB) <sup>(1)</sup>				
		Benzene	Toluene	Ethylbenzene	Total Xylenes	Diesel Range Organics
CNC02-P01	02GFP0101	<0.5	<0.5	<0.5	<1.0	1,752.39
CNC02-P02	NS					
CNC02-P03	NS					
CNC02-P04	NS					
NBCH178-001	NS					
NBCH178-002	NBCH178-002	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B04	02GFB04	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B07	02GFB07	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B09	02GFB09	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B10	02GFB10	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B11	02GFB11	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B12	02GFB12	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B13	02GFB13	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B14	02GFB14	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B15	02GFB15	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B16	02GFB16	<0.5	<0.5	<0.5	<1.0	1.61
CNC02-B17	02GFB17	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B18	02GFB18	<0.5	<0.5	<0.5	<1.0	<100

**NOTES:**

<sup>(1)</sup>Laboratory screening data were analyzed using USEPA Method 8260. Compounds not detected are reported as less than the instrument detection limit.

PPB - parts per billion

NS - Free product present, no sample collected.

TABLE 7

SUMMARY OF FIXED-BASE LABORATORY ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN IN SOIL  
 SITE 2, BUILDING NS 53  
 ZONE H, CHARLESTON NAVAL COMPLEX  
 NORTH CHARLESTON, SOUTH CAROLINA

Soil Boring / Sample No.	Sample Date	Benzene	Ethyl-benzene	Naphthalene	Toluene	Xylenes (total)	Benzo(a) anthracene	Benzo(b) fluoranthene	Benzo(k) fluoranthene	Dibenzo(a,h) anthracene	Chrysene	TRPH (mg/kg)
RBSL <sup>(1)</sup>		5	364	52	478	11119	17687	7042	5593	21265	3146	
CNC02-B01/ 02SLB0103	20-Jan-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	271
CNC02-B03/ 02SLB0303	20-Jan-99	2.61 <sup>(J)</sup>	ND	ND	1.26 <sup>(J)</sup>	ND	ND	ND	ND	ND	ND	NA
CNC02-B04/ 02SLB0403	20-Jan-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
CNC02-B05/ 02SLB0503	20-Jan-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
CNC02-B08/ 07SLB0802	20-Jan-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
CNC07-B08/ 07SLB0802D <sup>(2)</sup>	20-Jan-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
CNC02-B10/ 02SLB1002	20-Jan-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
ZHTL0701 <sup>(3)</sup>	20-Jan-99	ND	ND	0.676	ND	ND	NA	NA	NA	ND	NA	NA
ZHRL00201 <sup>(4)</sup>	20-Jan-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA

All concentrations are in micrograms per kilograms (ug/kg) unless noted

NA - Compound not analyzed

ND - Compound not detected

\* Concentration in milligrams per kilograms

J - Estimated concentration

TRPH - total recoverable petroleum hydrocarbons

Sample 02SLB1902 was analyzed for total organic carbon and contained 2,730 milligrams/kilograms

<sup>(1)</sup> South Carolina Department of Health and Environmental Control Risk Based Screening Levels for clay-rich soils; depth to groundwater less than 5 feet

<sup>(2)</sup> duplicate sample

<sup>(3)</sup> trip blank sample

<sup>(4)</sup> equipment blank sample

TABLE 8

SUMMARY OF FIXED - BASE LABORATORY ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN IN GROUNDWATER  
 SITE 2, BUILDING NS53  
 ZONE H, CHARLESTON NAVAL COMPLEX  
 NORTH CHARLESTON, SOUTH CAROLINA

Monitoring Well/Sample No.	Sample Date	Benzene	Ethyl-benzene	Toluene	Xylenes (total)	Naphthalene	Benzo(a) anthracene	Benzo(b) fluoranthene	Benzo(k) fluoranthene	Chrysene	Dibenzo(a,h) anthracene	MTBE
RBSL <sup>(1)</sup>		5	700	1000	10000	10 <sup>(2)</sup>	10 <sup>(2)</sup>	10 <sup>(2)</sup>	10 <sup>(2)</sup>	10 <sup>(2)</sup>	10 <sup>(2)</sup>	40
CHC02-M01 / 02GLM0101	09-Mar-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHC02-M02 / 02GLM0201	09-Mar-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHC02-M03 / 02GLM0301	09-Mar-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHC02-M03 / 02GLM0301D	09-Mar-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHC02-M04 / 02GLM0401	09-Mar-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHC02-M05 / 02GLM0501	09-Mar-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHC02-P01 / 02GLP0101	09-Mar-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NBCH 178-002 / NBCH 178-002	09-Mar-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	9.83
ZHTL01501 <sup>(3)</sup>	09-Mar-99	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	ND
ZHRL00501 <sup>(4)</sup>	09-Mar-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

All concentrations are in ug/L. ND = Compound not detected. NA = Compound not analyzed.

<sup>(1)</sup> South Carolina Department of Health and Environmental Control Risk Based Screening Levels for clay-rich soils; depth to groundwater less than 5 feet.

<sup>(2)</sup> The Risk Based Screening Level for individual PAH CoC is 10 ug/l or 25 ug/l for total PAHs.

<sup>(3)</sup> trip blank sample.

<sup>(4)</sup> equipment blank sample.

**TABLE 9**

**FATE AND TRANSPORT INPUT PARAMETERS**

**ZONE H, CHARLESTON NAVAL COMPLEX  
NORTH CHARLESTON, SOUTH CAROLINA**

Parameter	Domenico Dilution/Attenuation Model <sup>(1)</sup>
Hydraulic Conductivity [m/sec]	1.0795E-06
Hydraulic Gradient	0.02725
Porosity	0.47
Estimated Plume Length [ft]	NA
Soil Bulk Density [kg/L]	1.5
Partition Coefficient [L/kg]	chemical specific <sup>(1)</sup>
Fractional Organic Carbon <sup>(a)</sup>	2.73E-03
First Order Decay Rate <sup>(a)</sup> [sec <sup>-1</sup> ]	0
Modeled Plume Length [ft]	NA
Modeled Plume Width [ft]	NA
Source Width <sup>(a)</sup> [m]	15
Source Thickness <sup>(a)</sup> [m]	2
Soluble Mass [kg]	Infinite <sup>(b)</sup>

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

(a) - Stated values are default values.

(b) - Assumption of the Domenico Model

**TABLE 10**

**EXPOSURE PATHWAY ASSESSMENT - CURRENT USE  
SITE 2, BUILDING NS 53  
ZONE H, CHARLESTON NAVAL COMPLEX  
NORTH CHARLESTON, SOUTH CAROLINA**

Media	Exposure Route	Pathway Selected for Evaluation? (Yes or No)	Exposure point or Reason for Non-Selection	Data Requirements (If pathway selected)
Air	Inhalation	No	No volatilization to enclosed space. No explosion hazard.	
	Explosion Hazard	No		
Groundwater	Ingestion	No	No water supply well downgradient.	
	Dermal contact	No		
	Inhalation	No	No basements	
Surface Water	Ingestion	No	No downgradient surface water	
	Dermal contact	No		
	Inhalation	No		
Surficial Soil	Ingestion	No	No surface soil with BTEX, MTBE, or PAHs above RBSLs	
	Dermal contact	No		
	Inhalation	No		
Subsurface Soil	Ingestion	No	No impacted subsurface soil	
	Dermal contact	No		
	Inhalation	No		

**TABLE 11**

**EXPOSURE PATHWAY ASSESSMENT - FUTURE USE  
SITE 2, BUILDING NS 53  
ZONE H, CHARLESTON NAVAL COMPLEX  
NORTH CHARLESTON, SOUTH CAROLINA**

Media	Exposure Route	Pathway Selected for Evaluation? (Yes or No)	Exposure point or Reason for Non-Selection	Data Requirements (If pathway selected)
Air	Inhalation	No	No volatilization to enclosed space. No explosion hazard.	
	Explosion Hazard	No		
Groundwater	Ingestion	Yes	Potential future utility worker may have dermal, inhalation, and incidental ingestion exposure	
	Dermal contact	Yes		
	Inhalation	Yes		
Surface Water	Ingestion	No	No downgradient surface water	
	Dermal contact	No		
	Inhalation	No		
Surficial Soil	Ingestion	No	No surface soil with BTEX, MTBE, or PAHs above RBSLs	
	Dermal contact	No		
	Inhalation	No		
Subsurface Soil	Ingestion	No	No impacted subsurface soil	
	Dermal contact	No		
	Inhalation	No		

TABLE 12

COMPARISON OF MAXIMUM CONCENTRATIONS TO RBSLs  
 SITE 2, BUILDING NS 53  
 ZONE H, CHARLESTON NAVAL COMPLEX  
 NORTH CHARLESTON, SOUTH CAROLINA

Chemical of Concern	Maximum Concentration (Soil) (mg/kg)	RBSLs (Soil) (mg/kg) <sup>(a)</sup>	Maximum Concentration (GW) (mg/L)	RBSLs (GW) (mg/L) <sup>(b)</sup>
Benzene	0.00261 J	0.005	<b>0.31</b>	0.152
Toluene	0.00126 J	0.478	4.64	5.376
Ethybenzene	ND	0.364	0.104	6.05
Xylenes	ND	11.119	0.794	102.33
Naphthalene	0.000676	0.052	<b>23.35</b>	1.630

(a) - From Risk-Based Corrective Action for Petroleum Releases, Table B4, Depth to GW - 0-5 ft, SCDHEC RBCA Guidelines, 1998.

(b) - Minimum RBSL calculated for Construction /Utility worker exposure to Groundwater, see Appendix H

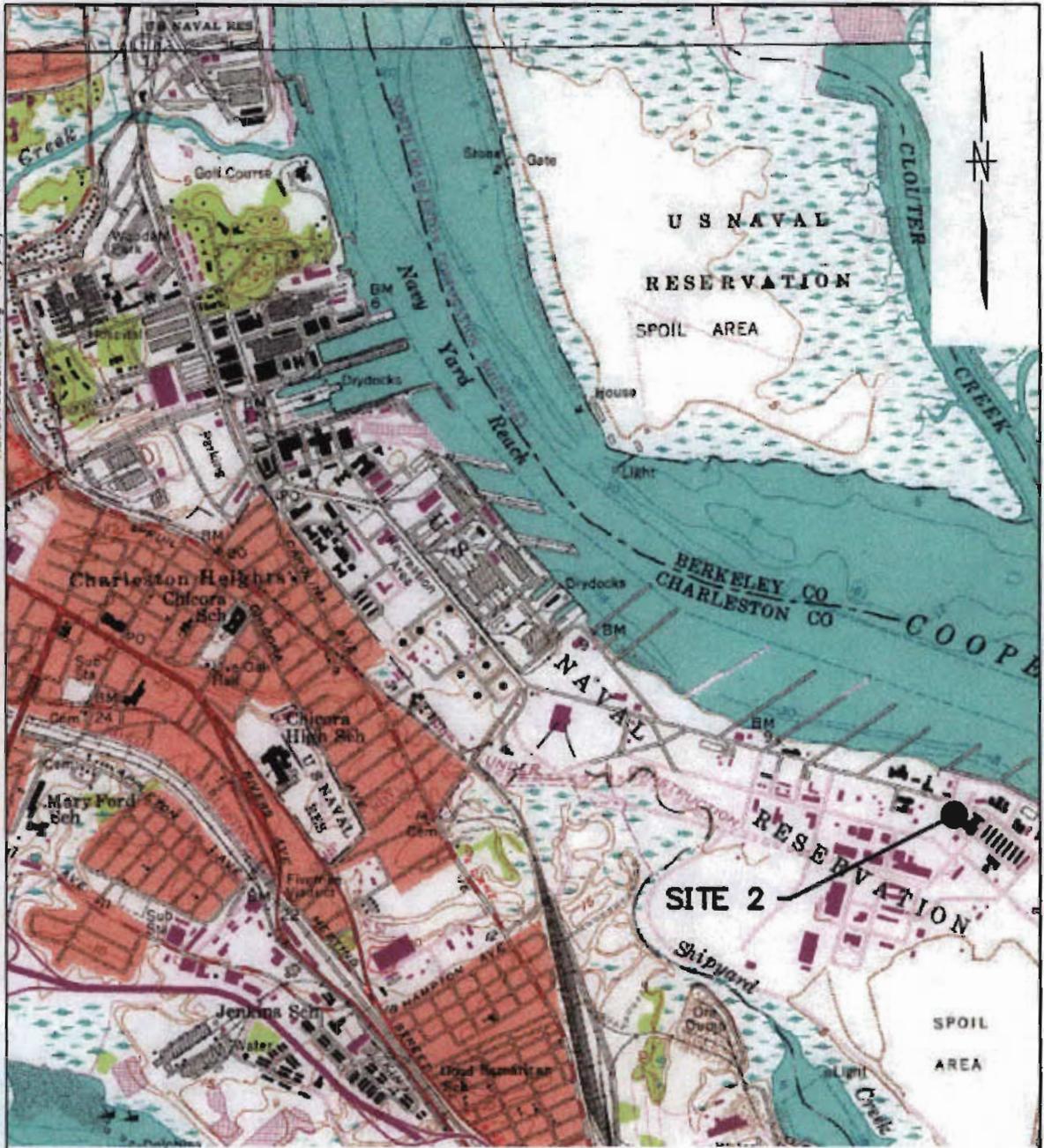
J = Estimated Concentration

GW - Groundwater

RBSLs - Risk Based Screening Levels

Shaded cell indicates the concentration exceeded the RBSL.

ACAD:7912CM130.dwg 07/08/99 MF



SOURCE: QUADRANGLE MAP SOUTH CAROLINA, REVISED 1979  
 QUADRANGLE MAP NORTH CHARLESTON REVISED, 1979

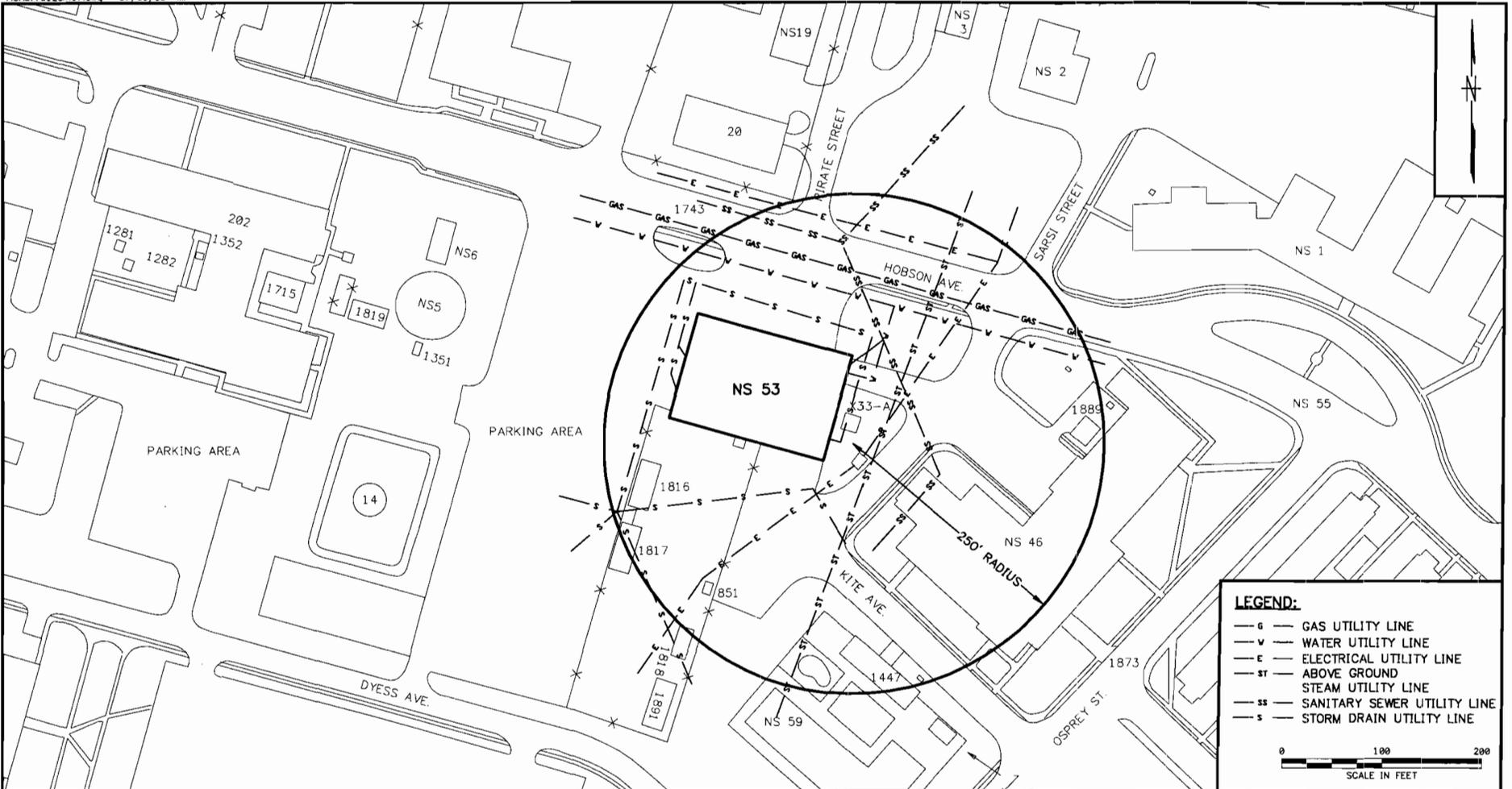


DRAWN BY	DATE
HJP	5/18/99
CHECKED BY	DATE
COST/SCHED-AREA	
SCALE	
AS NOTED	



**SITE LOCATION MAP**  
 SITE 2, BUILDING NS-53, ZONE H  
 CHARLESTON NAVAL COMPLEX  
 NORTH CHARLESTON, SC

CONTRACT NO.	
7912	
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO.	REV.
FIGURE 1	0



**LEGEND:**

- G — GAS UTILITY LINE
- V — WATER UTILITY LINE
- E — ELECTRICAL UTILITY LINE
- ST — ABOVE GROUND STEAM UTILITY LINE
- SS — SANITARY SEWER UTILITY LINE
- S — STORM DRAIN UTILITY LINE

0 100 200  
SCALE IN FEET

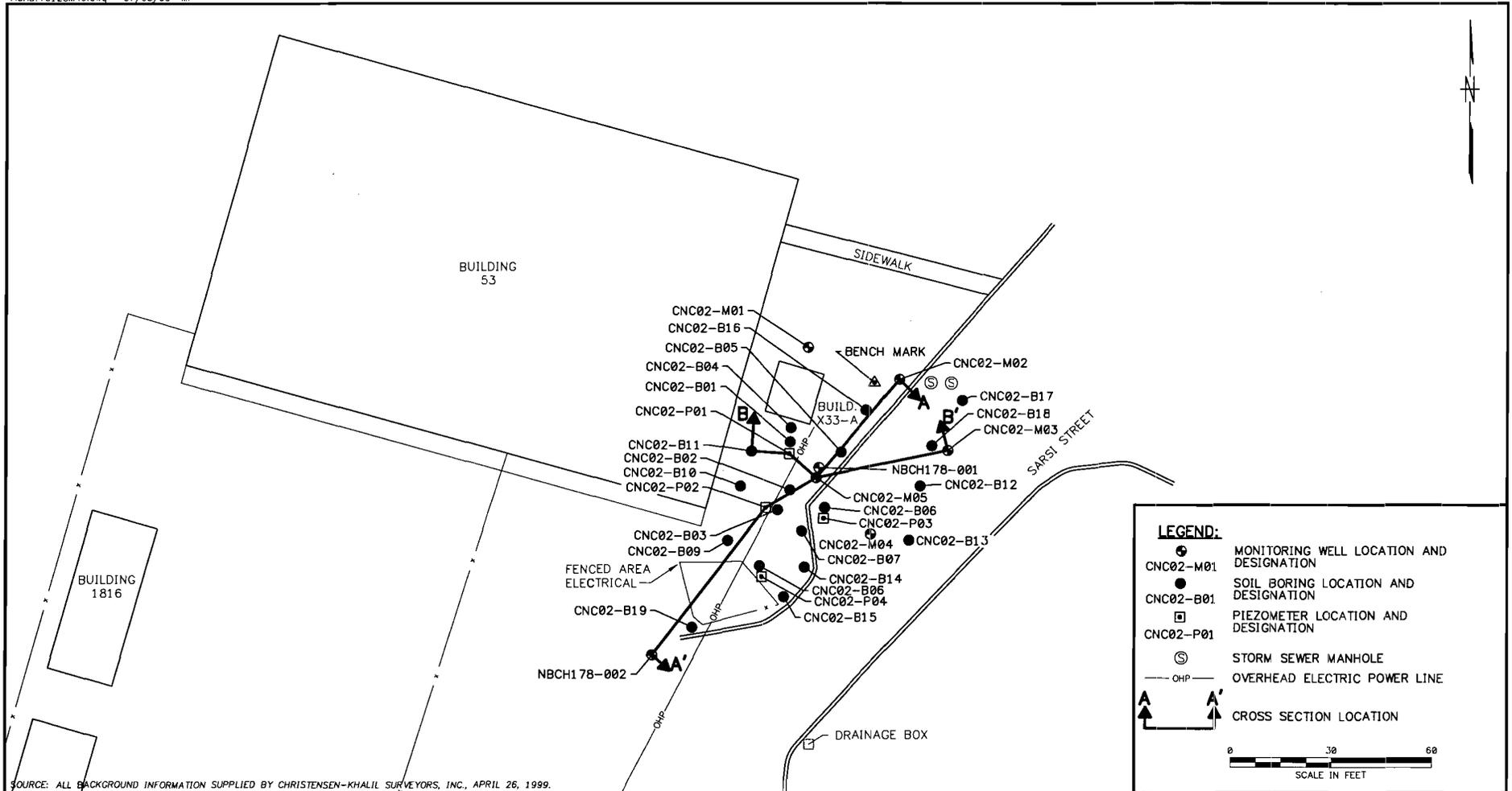
NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY: KW DATE: 5/24/99  
 CHECKED BY: DATE: \_\_\_\_\_  
 COST/SCHED-AREA: \_\_\_\_\_  
 SCALE: AS NOTED



**SITE VICINITY MAP**  
**SITE 2, BUILDING NS 53**  
**ZONE H, CHARLESTON NAVAL COMPLEX**  
**NORTH CHARLESTON, SOUTH CAROLINA**

CONTRACT NO. 7912	
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO. FIGURE 2	REV. 0



SOURCE: ALL BACKGROUND INFORMATION SUPPLIED BY CHRISTENSEN-KHALIL SURVEYORS, INC., APRIL 26, 1999.

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

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MF 7/8/99  
DATE

CHECKED BY  
DATE

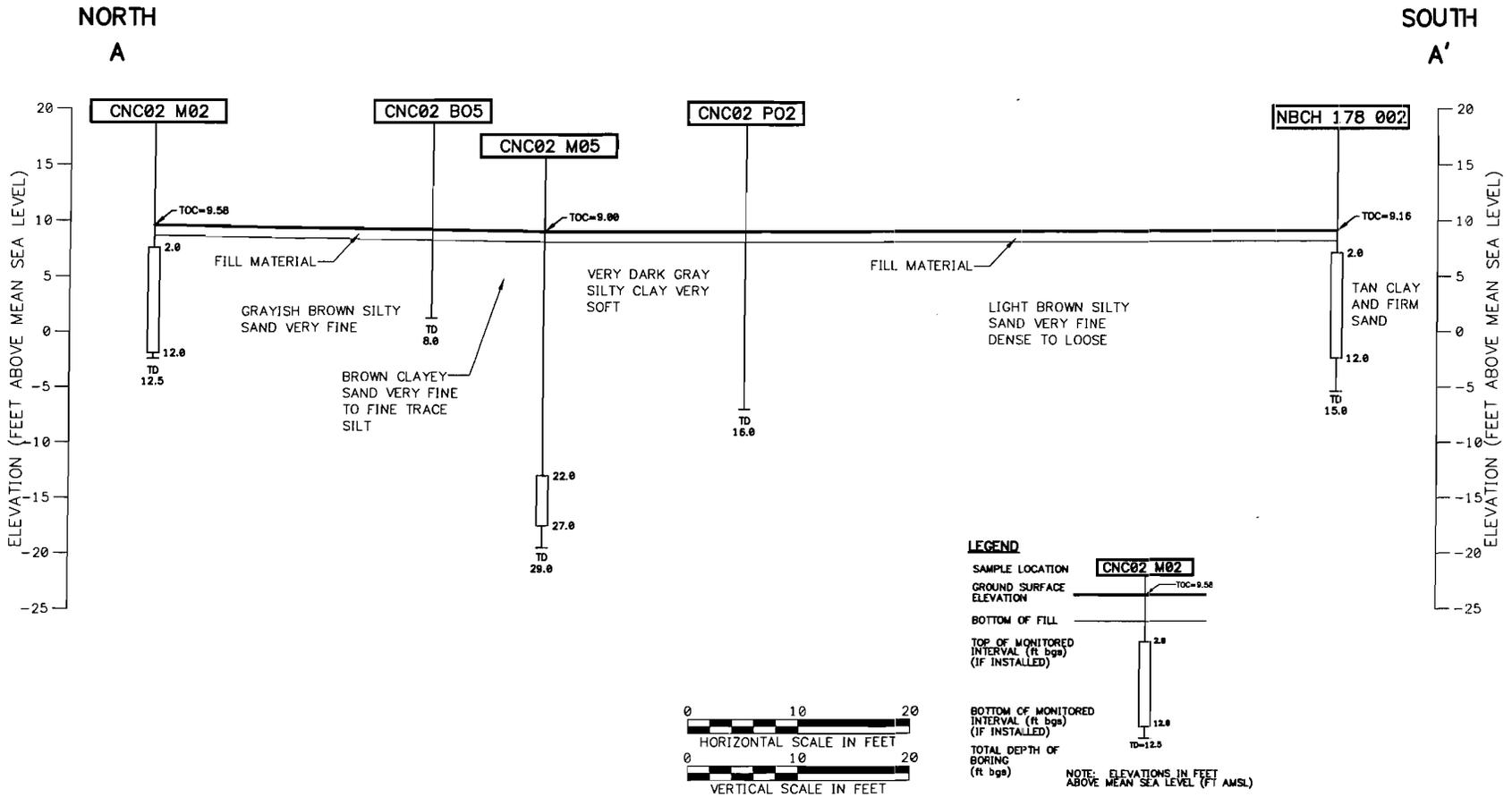
COST/SCHED-AREA

SCALE  
AS NOTED



**SITE AREA AND SAMPLING LOCATIONS**  
 SITE 2 BUILDING NS-53  
 CHARLESTON NAVAL COMPLEX  
 CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 7912	
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO. FIGURE 3	REV. 0



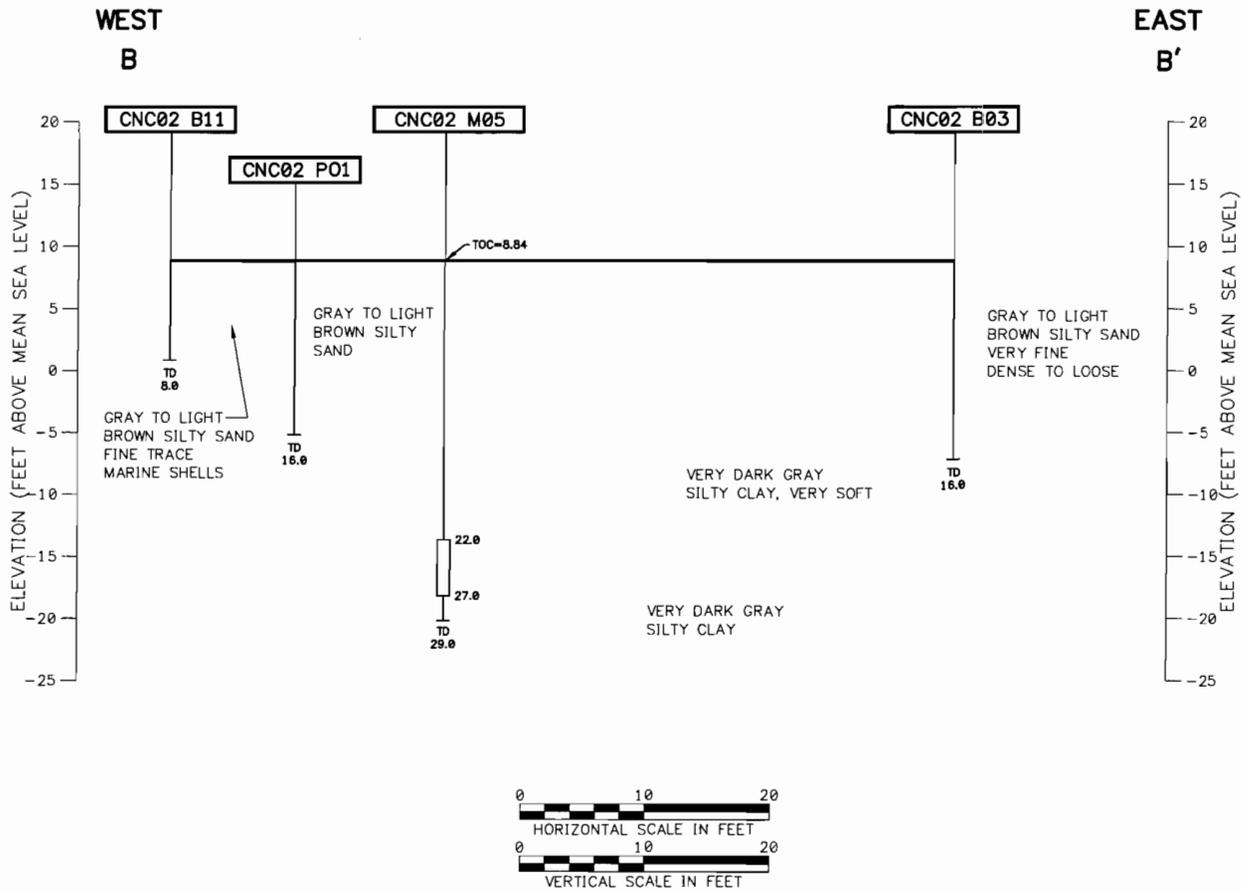
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DRAWN BY	DATE
MF	7/8/99
CHECKED BY	DATE
COST/SCHED-AREA	
SCALE	
AS NOTED	



GEOLOGIC CROSS SECTION  
 A-A'  
 SITE 2 BUILDING NS-53  
 ZONE H CHARLESTON NAVAL COMPLEX  
 NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO.	7912
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO.	REV.
FIGURE 4	0



**LEGEND**

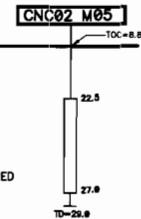
SAMPLE LOCATION  
GROUND SURFACE  
ELEVATION

TOP OF MONITORED  
INTERVAL (ft bgs)  
(IF INSTALLED)

BOTTOM OF MONITORED  
INTERVAL (ft bgs)  
(IF INSTALLED)

TOTAL DEPTH OF  
BORING  
(ft bgs)

NOTE: ELEVATIONS IN FEET  
ABOVE MEAN SEA LEVEL (FT AMSL)



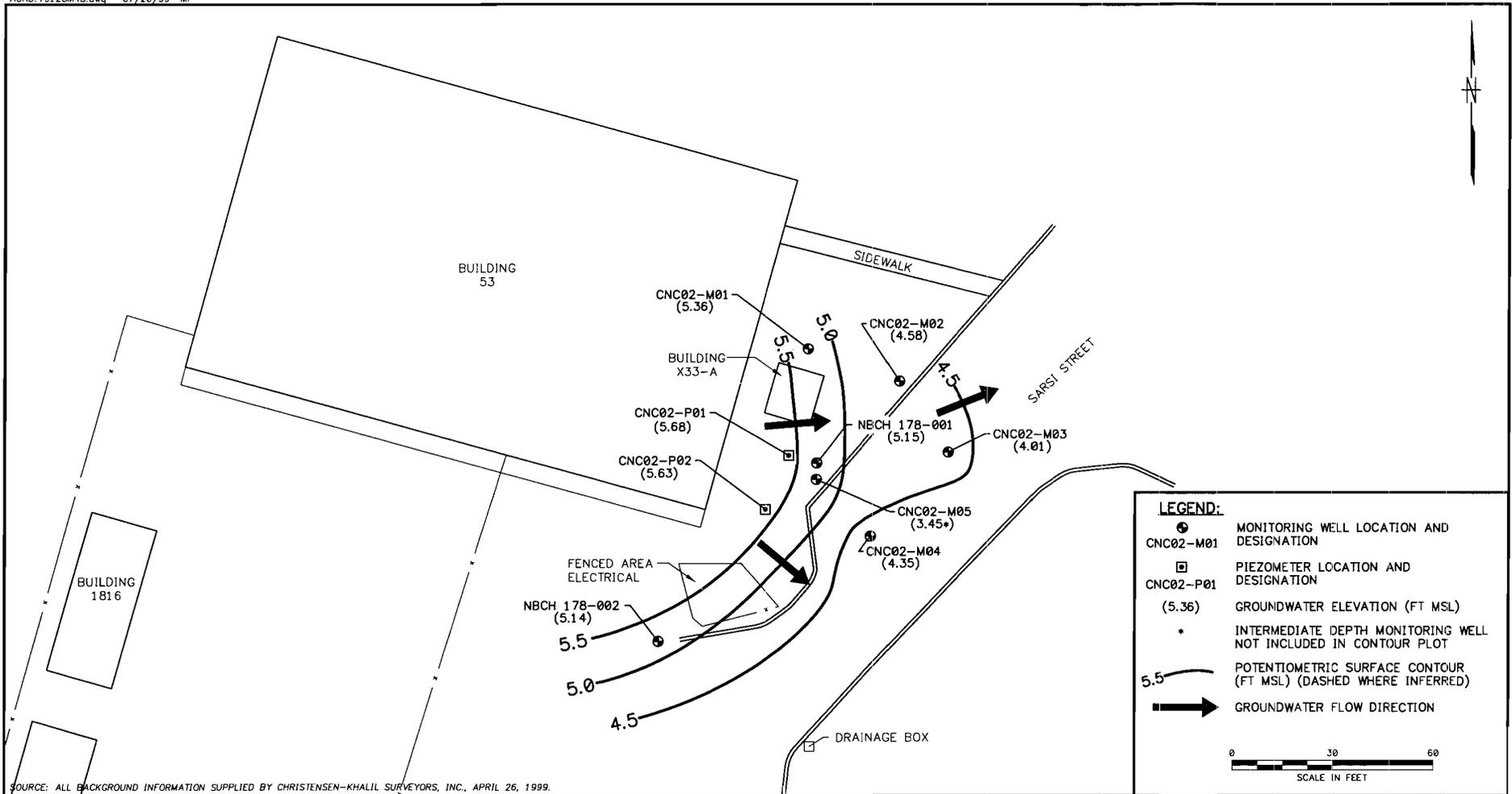
NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY	DATE
MF	7/8/99
CHECKED BY	DATE
COST/SCHED-AREA	
SCALE	
AS NOTED	



**GEOLOGIC CROSS SECTION**  
B-B'  
SITE 2 BUILDING NS-53  
ZONE H CHARLESTON NAVAL COMPLEX  
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 7912	
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO. FIGURE 5	REV. 0



SOURCE: ALL BACKGROUND INFORMATION SUPPLIED BY CHRISTENSEN-KHALIL SURVEYORS, INC., APRIL 26, 1999.

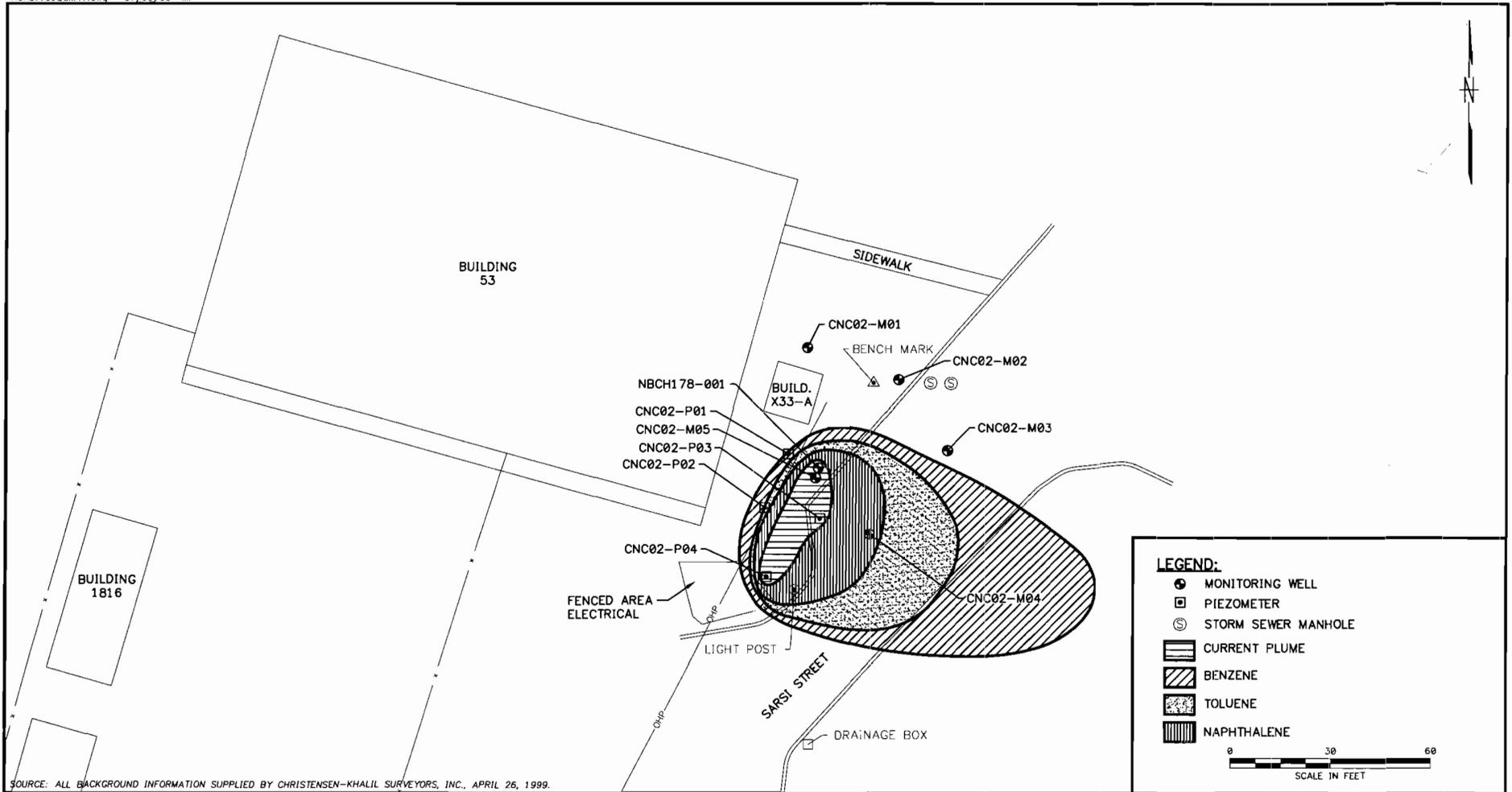
NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY	DATE
MF	7/8/99
CHECKED BY	DATE
COST/SCHED-AREA	
SCALE	
AS NOTED	



GROUNDWATER POTENTIOMETRIC MAP  
 MARCH 7, 1999  
 SITE 2 BUILDING NS-53  
 ZONE H, CHARLESTON NAVAL COMPLEX  
 NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 7912	
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO. FIGURE 6	REV. 0



SOURCE: ALL BACKGROUND INFORMATION SUPPLIED BY CHRISTENSEN-KHALIL SURVEYORS, INC., APRIL 26, 1999.

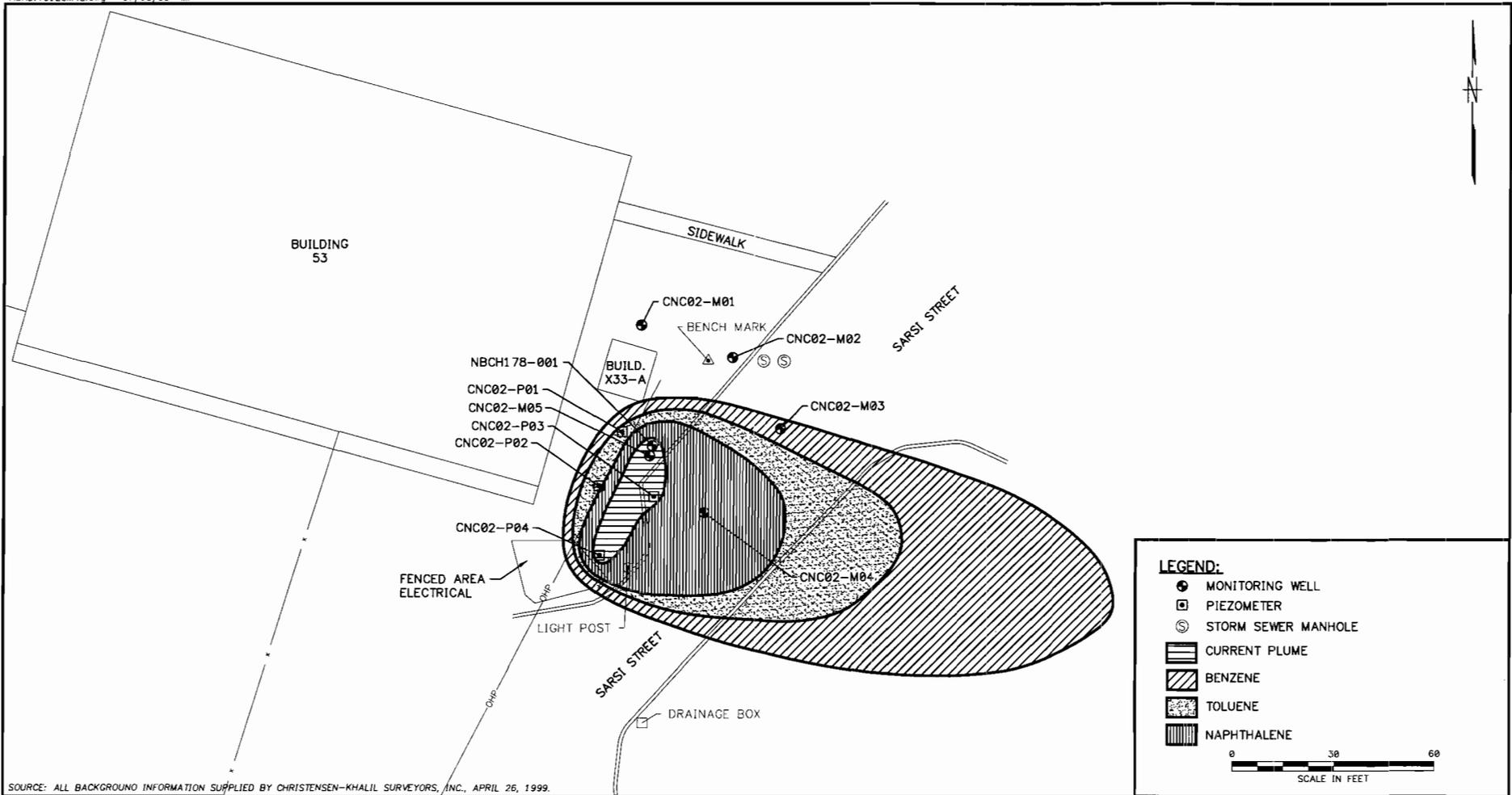
NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY MF DATE 7/14/99  
 CHECKED BY DATE  
 COST/SCHED-AREA  
 SCALE AS NOTED



PREDICTED 10 YEAR MIGRATION  
 SITE 2 BUILDING NS-53  
 CHARLESTON NAVAL COMPLEX  
 CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 7912	
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO. FIGURE 7	REV. 0



SOURCE: ALL BACKGROUND INFORMATION SUPPLIED BY CHRISTENSEN-KHALIL SURVEYORS, INC., APRIL 26, 1999.

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY	DATE
MF	7/14/99
CHECKED BY	DATE
COST/SCHED-AREA	
SCALE	
AS NOTED	



PREDICTED 20 YEAR MIGRATION  
 SITE 2 BUILDING NS-53  
 CHARLESTON NAVAL COMPLEX  
 CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 7912	
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO. FIGURE 8	REV. 0

**APPENDIX A**

**UNDERGROUND STORAGE TANK ASSESSMENT REPORT –  
USTs NS53A and NS53B**

South Carolina Department of Health and Environmental Control (S.C.D.H.E.C.)  
Underground Storage Tank (UST) Assessment Report

Date Received

State Use Only

Submit Completed Form to:  
UST Regulatory Section  
SCDHEC  
2600 Bull Street  
Columbia, South Carolina 29201  
Telephone (803) 734-5331

**I. OWNERSHIP OF UST(S)**

Agency/Owner: Southern Division, Naval Facilities Engineering Command, Caretaker Site Office

Mailing Address: P.O. Box 190010

City: N. Charleston

State: SC

Zip Code: 29419-9010

Area Code: 803 Telephone Number: 743-9985 Contact Person: LCDR Paul Rose

**II. SITE IDENTIFICATION AND LOCATION**

Site I.D. #: Unregulated

Facility Name: Charleston Naval Base Complex, Building NS 53

Street Address: Hobson Avenue

City: North Charleston, 29405-2413

County: Charleston

**III. CLOSURE INFORMATION**

Closure Started: 2 Dec 1996

Closure Completed: 18 Feb 1997

Number of USTs Closed: 2

N/A

SPORTENVDETCNASN

Consultant

UST Removal Contractor

**IV. CERTIFICATION (Read and Sign after completing entire submittal)**

I certify that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals responsible for obtaining this information, I believe that the submitted information is true, accurate and complete.

LCDR Paul Rose

Name (Type or Print)



Signature

**V. UST INFORMATION**

- A. Product.....
- B. Capacity.....
- C. Age.....
- D. Construction Material.....
- E. Month/Year of Last Use.....
- F. Depth (ft.) To Base of Tank.....
- G. Spill Prevention Equipment Y/N.....
- H. Overfill Prevention Equipment Y/N.....
- I. Method of Closure Removed/Filled.....
- J. Visible Corrosion or Pitting Y/N.....
- K. Visible Holes Y/N.....

NS53A	NS53B	Tank 3	Tank 4	Tank 5	Tank 6
Fuel oil	Fuel oil				
3,000 gal	800 gal				
1935	1935				
Steel	Steel				
Unk.	Unk.				
9'	9'				
N	N				
N	N				
R	R				
Y	Y				
Y	N				

**L. Method of disposal for any USTs removed from the ground (attach disposal manifests)**

USTs NS53A and NS53B were removed, drained, cut open at both ends, and cleaned with a steam cleaner. They were then cut up for recycling as scrap metal. (See Attachment III.)

**M. Method of disposal for any liquid petroleum, sludges, or waste waters removed from the USTs (attach disposal manifests)**

UST NS53A's residual fuel oil, rinse water, and sludge were recycled. UST NS 53B contained no product or sludge. It's rinse water was recycled.

**N. If any corrosion, pitting, or holes were observed, describe the location and extent for each UST**

UST NS53A was corroded and pitted. Four 1/16" holes were found on the west side of the tank during cutting and cleaning. See Site Map 4. UST NS53B was also corroded and pitted, but no holes were found.

## VI. PIPING INFORMATION

- A. Construction Material.....
- B. Distance from UST to Dispenser.....
- C. Number of Dispensers.....
- D. Type of System P/S.....
- E. Was Piping Removed from the Ground? Y/N....
- F. Visible Corrosion or Pitting Y/N.....
- G. Visible Holes Y/N.....
- H. Age.....

NS53A	NS53B	Tank 3	Tank 4	Tank 5
Steel & Cpr	Steel			
23' See note 1	25' See note 1			
1 See note 1	1 See note 1			
S	S			
Y	Y			
Y	Y			
N	N			
Unk.	Unk.			

Note 1: The tanks provided fuel oil to Building NS 53.

- I. If any corrosion, pitting, or holes were observed, describe the location and extent for each line.

Corrosion and pitting were present, but no holes were found.

## VII. BRIEF SITE DESCRIPTION AND HISTORY

NS 53 is a former barbershop/maintenance shop on the Charleston Naval Base. UST NS53A supplied fuel oil to the boiler; NS53B, the hot water heater. The tanks are in Solid Waste Management Unit (SWMU) 178 because of a Polychlorinated Biphenyls (PCB) transformer leak. Soil samples detected no PCBs.

UST NS53A had a set of 1 1/2" steel supply and return piping abandoned in the excavation and 1/2" copper tubing connected to the tank. UST NS53B and its associated piping was disconnected and abandoned at an unknown date, probably when the hot water heater was converted from oil to electric. UST NS53B was found empty. The lines from both tanks were most probably disconnected and abandoned when UST NS53B was taken out of service and UST NS53A was refit with copper tubing.

### VIII. SITE CONDITIONS

Yes No Unk

	Yes	No	Unk
<p>A. Were any petroleum-stained or contaminated soils found in the UST excavation, soil borings, trenches, or monitoring wells?</p> <p>If yes, indicate depth and location on the site map.</p>		X	
<p>B. Were any petroleum odors detected in the excavation, soil borings, trenches, or monitoring wells?</p> <p>If yes, indicate location on site map and describe the odor (strong, mild, etc.) [mild]</p>	X		
<p>C. Was water present in the UST excavation, soil borings, or trenches? If yes, how far below land surface (indicate location and depth)?</p> <p><u>UST excavation, 9' below GSL, 1" deep, insufficient for sampling</u></p>	X		
<p>D. Did contaminated soils remain stockpiled on site after closure? If yes, indicate the stockpile location on the site map.</p> <p>Name of DHEC representative authorizing soil removal:</p> <p>_____</p>			X*
<p>E. Was a petroleum sheen or free product detected on any excavation or boring waters?</p> <p>If yes, indicate location and thickness on the site map.</p>		X	

\* All soil from the excavation was returned to the tank pit.



## **X. SAMPLING METHODOLOGY**

**Provide a detailed description of the methods used to collect and store (preserve) the samples.**

After the removal of USTs NS53A and NS53B soil samples were taken. Sampling was performed in accordance with SC DHEC R.61-92 Part 280 and SC DHEC UST Assessment Guidelines.

Sample jars were prepared by the testing laboratory. The grab method was utilized to fill the sample containers leaving as little head space as possible and immediately capped. Soil samples were extracted at the tank ends. UST piping soil samples were taken under the piping at the mechanical connections.

The samples were marked, logged, and immediately placed in sample coolers packed with ice to maintain an approximate temperature of 4° C. Tools were thoroughly cleaned and decontaminated with organic-free soap and water after each sample.

The samples remained in the custody of SPORTENVDETHASN until they were transferred to General Engineering Laboratories for analysis as documented in the attached Chain-of-Custody Record.

## XI. RECEPTORS

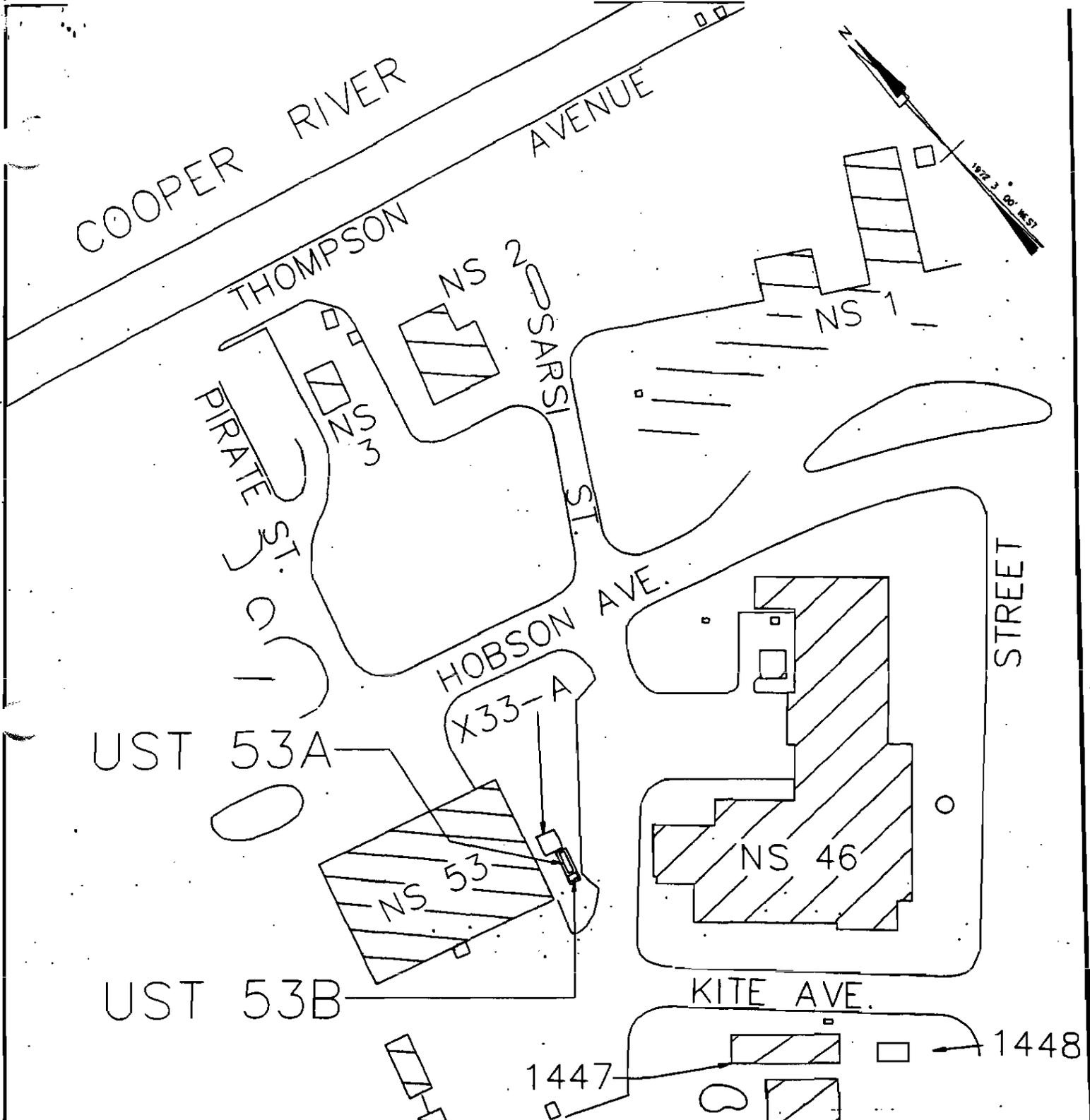
Yes    No

A.	<p>Are there any lakes, ponds, streams, or wetlands located within 1000 feet of the UST system?</p> <p style="text-align: center;">[Cooper R. 665']</p> <p>If yes, indicate type of receptor, distance, and direction on site map.</p>	X	
B.	<p>Are there any public, private, or irrigation water supply wells within 1000 feet of the UST system?</p> <p>If yes, indicate type of well, distance, and direction on site map.</p>		X
C.	<p>Are there any underground structures (e.g., basements) located within 100 feet of the UST system?</p> <p>If yes, indicate the type of structure, distance, and direction on site map.</p>		X
D.	<p>Are there any underground utilities (e.g., telephone, electricity, gas, water, sewer, storm drain) located within 100 feet of the UST system that could potentially come in contact with the contamination?</p> <p style="text-align: center;">[sewer, electric]</p> <p>If yes, indicate the type of utility, distance, and direction on the site map.</p>	X	
E.	<p>Has contaminated soil been identified at a depth of less than 3 feet below land surface in an area that is not capped by asphalt or concrete?</p> <p>If yes, indicate the area of contaminated soil on the site map.</p>		X

**SITE MAP**

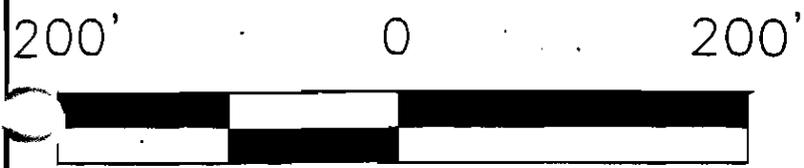
You must supply a scaled site map. It should include all buildings, road names, utilities, tank and pump island locations, sample locations, extent of excavation, and any other pertinent information.

Site Maps 1, 2, 3, and 4  
Photographs 1, 2, and 3



UST 53A

UST 53B

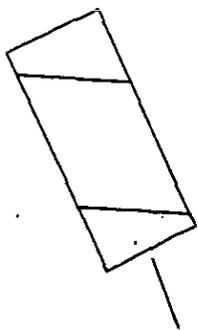
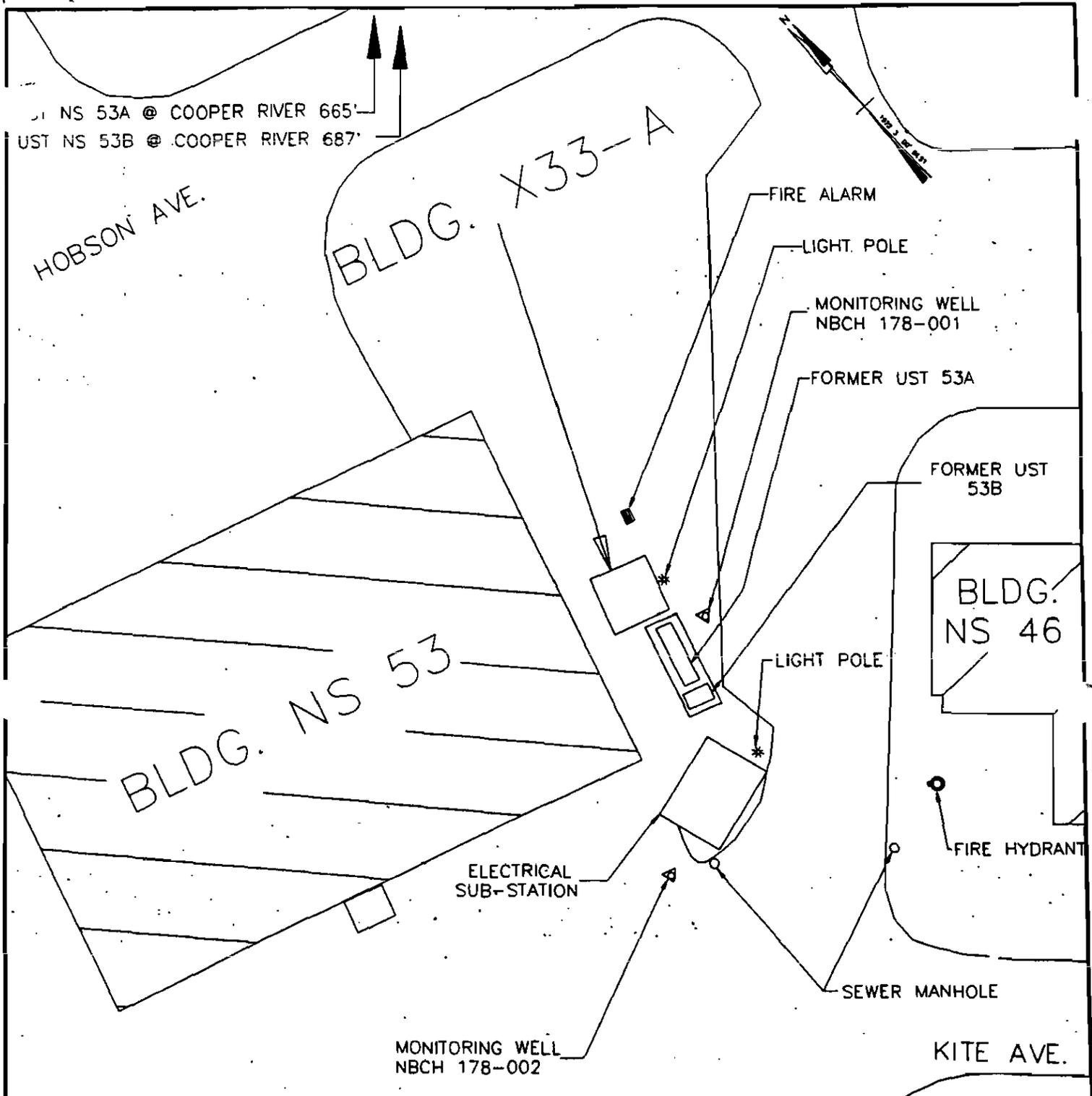


GRAPHIC SCALE

SPORTENVDETHASN  
 1899 North Hobson Ave.  
 North Charleston, SC 29405-2106  
 Ph. (803) 743-8777

Site Map 1  
 USTs 53A & 53B  
 Charleston Naval Base  
 Charleston, SC

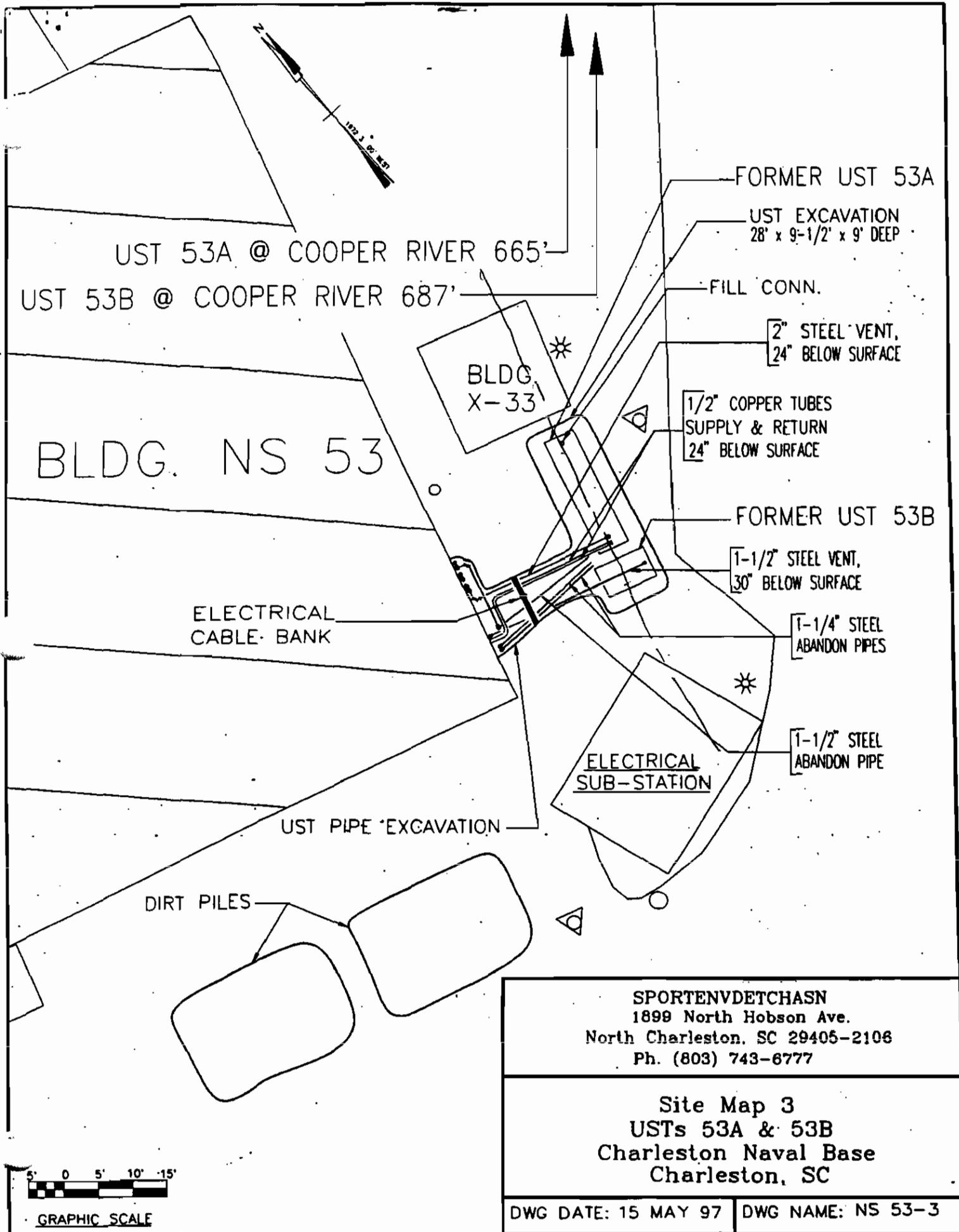
DWG DATE: 15 MAY 97 | DWG NAME: NS 53-1



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

Site Map 2  
 USTs 53A & 53B  
 Charleston Naval Base  
 Charleston, SC

DWG DATE: 15 MAY 97 | DWG NAME: NS 53-2



UST 53A @ COOPER RIVER 665'  
 UST 53B @ COOPER RIVER 687'

BLDG. NS 53

BLDG. X-33

FORMER UST 53A

UST EXCAVATION  
 28' x 9-1/2' x 9' DEEP

FILL CONN.

2" STEEL VENT,  
 24" BELOW SURFACE

1/2" COPPER TUBES  
 SUPPLY & RETURN  
 24" BELOW SURFACE

FORMER UST 53B

1-1/2" STEEL VENT,  
 30" BELOW SURFACE

1-1/4" STEEL  
 ABANDON PIPES

1-1/2" STEEL  
 ABANDON PIPE

ELECTRICAL  
 CABLE BANK

ELECTRICAL  
 SUB-STATION

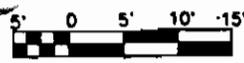
UST PIPE EXCAVATION

DIRT PILES

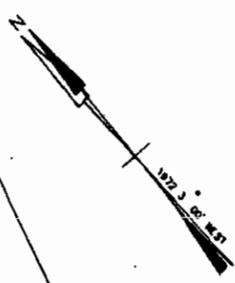
SPORTENVDETHASN  
 1899 North Hobson Ave.  
 North Charleston, SC 29405-2108  
 Ph. (803) 743-6777

Site Map 3  
 USTs 53A & 53B  
 Charleston Naval Base  
 Charleston, SC

DWG DATE: 15 MAY 97 | DWG NAME: NS 53-3



GRAPHIC SCALE



UST 53A @ COOPER RIVER 665'

UST 53B @ COOPER RIVER 687'

BLDG. NS 53

BLDG. X-33

FORMER UST 53A

FORMER UST 53B

S.S. SPORT 0261-1, MULTI-COLOR SAND & CLAY, LIGHT ODOR, OVA = 727 ppm

S.S. SPORT 0261-2, MULTI COLOR SAND & CLAY, LIGHT ODOR.

S.S. SPORT 0261-4, MULTI COLOR SAND & CLAY, LIGHT ODOR, OVA = 856.1 ppm

S.S. SPORT 0261-3, MULTI COLOR SAND & CLAY, LIGHT ODOR, OVA = 510 ppm

S.S. SPORT 0262-2, LIGHT BROWN & SANDY, NO ODOR, OVA = (0) ppm

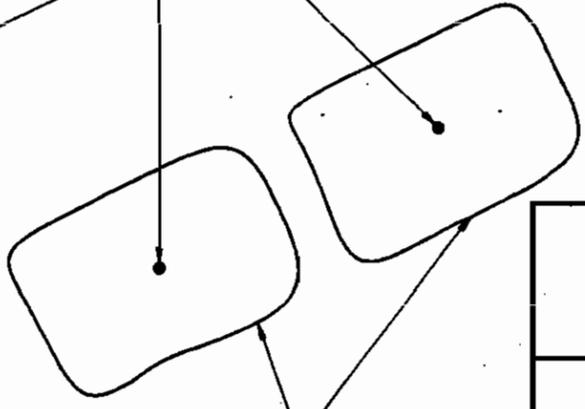
S.S. SPORT 0262-1, LIGHT BROWN & SANDY, NO ODOR, OVA = (0) ppm

S.S. SPORT 0262-3, MULTI COLOR SAND & CLAY, LIGHT ODOR, OVA = 3 ppm

S.S. SPORT 0261-5, DARK SAND & CLAY, LIGHT ODOR, OVA = (0) ppm

S.S. SPORT 0261-6, DARK SAND & CLAY, LIGHT ODOR, OVA = 31 ppm

ELECTRICAL SUB-STATION



DIRT PILES

(H) - HOLES FOUND, 1/16" - DIAMETER

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

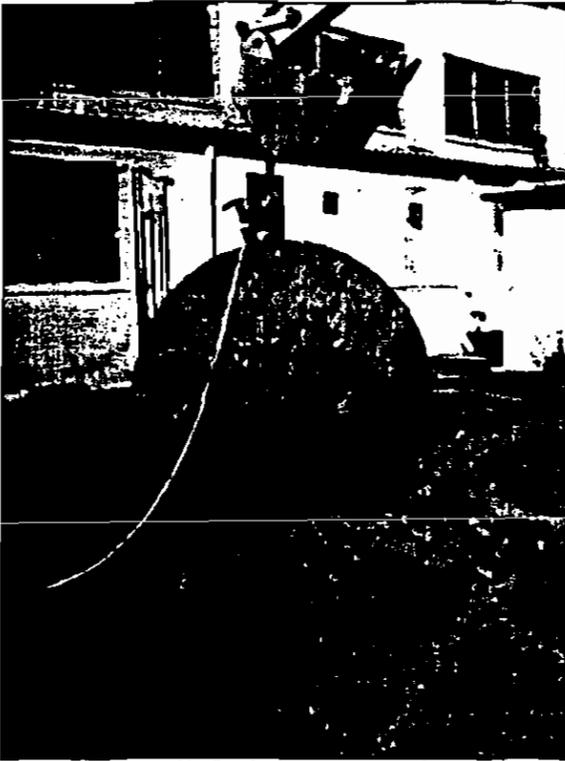
Site Map 4  
USTs 53A & 53B  
Charleston Naval Base  
Charleston, SC



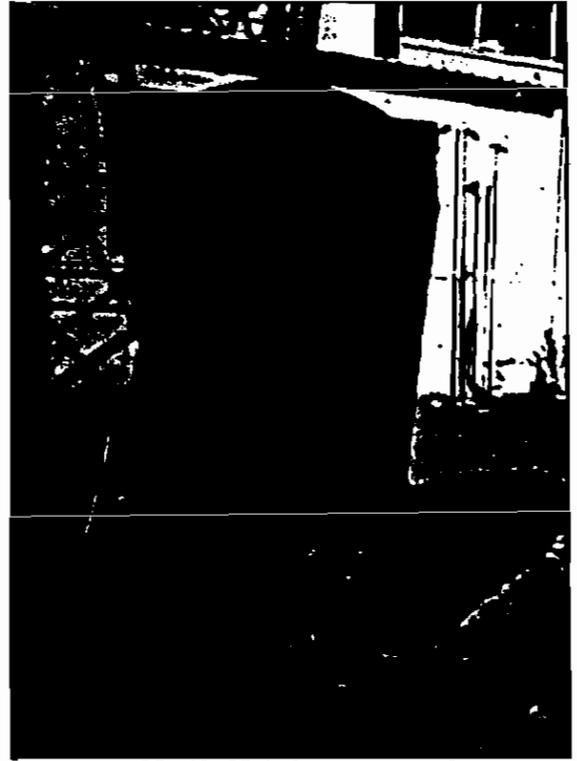
GRAPHIC SCALE

DWG DATE: 20 MAY 97 | DWG NAME: NS 53-4

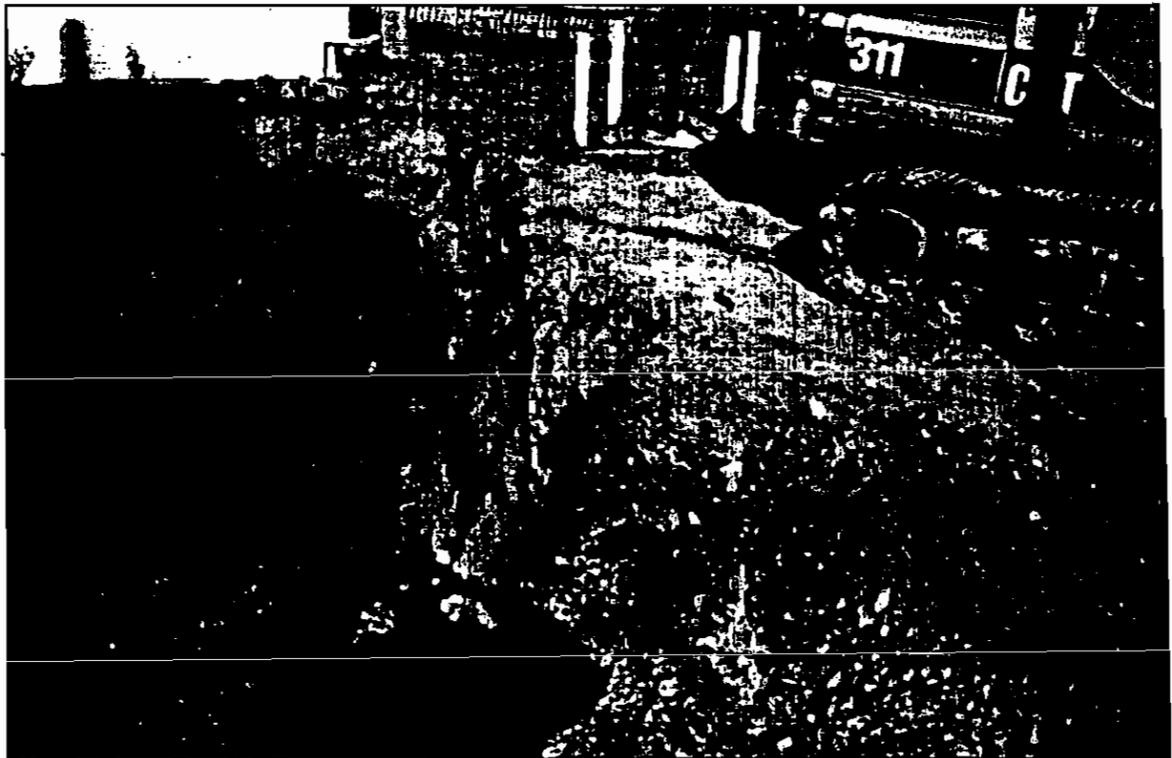
**USTs NS53A and NS53B**



**Photo 1: UST NS53A being removed from the excavation.**



**Photo 2: UST NS53B being removed from excavation.**



**Photo 3: Excavation for USTs NS53A and NS53B after removing the tanks.**

**Attachment II**

**ANALYTICAL RESULTS**

You must submit the laboratory report and chain-of-custody form for the samples. These samples must be analyzed by a South Carolina certified laboratory.

**Certified Analytical Results  
Chain-of-Custody**



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Laboratory Certifications

STATE	GEL	EPI
FL	EE7156/87294	EA7472/87431
NC	233	
SC	10120	10382
TN	02804	02934

Client: Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 16, 1996

Page 1 of 3

Sample ID : SPORT0261-1  
 Lab ID : 9612127-01  
 Matrix : Soil  
 Date Collected : 12/05/96  
 Date Received : 12/05/96  
 Priority : Routine  
 Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
<i>BTEX - 4 items</i>											
Benzene	U	0.00	10.0	20.0	ug/kg	10.	JGS2	12/10/96	2034	94778	1
Ethylbenzene	U	0.00	10.0	20.0	ug/kg	10.					
Toluene	U	0.00	10.0	20.0	ug/kg	10.					
Xylenes (TOTAL)	U	0.00	10.0	20.0	ug/kg	10.					
Naphthalene	U	0.00	10.0	20.0	ug/kg	10.					
<b>Extractable Organics</b>											
<i>Polynuclear Aromatic Hydrocarbons - 16 items</i>											
Acenaphthene	U	0.00	654	1310	ug/kg	4.0	BDG	12/10/96	0744	94576	2
Acenaphthylene	U	0.00	654	1310	ug/kg	4.0					
Anthracene	U	0.00	654	1310	ug/kg	4.0					
Benzo(a)anthracene	U	0.00	654	1310	ug/kg	4.0					
Benzo(a)pyrene	U	0.00	654	1310	ug/kg	4.0					
Benzo(b)fluoranthene	U	0.00	654	1310	ug/kg	4.0					
Benzo(ghi)perylene	U	0.00	654	1310	ug/kg	4.0					
Benzo(k)fluoranthene	U	0.00	654	1310	ug/kg	4.0					
Chrysene	U	0.00	654	1310	ug/kg	4.0					
Dibenzo(a,h)anthracene	U	0.00	654	1310	ug/kg	4.0					
Fluoranthene	U	0.00	654	1310	ug/kg	4.0					
Fluorene	U	0.00	654	1310	ug/kg	4.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	654	1310	ug/kg	4.0					
Naphthalene	U	0.00	654	1310	ug/kg	4.0					
Phenanthrene	J	746	654	1310	ug/kg	4.0					
Pyrene	U	0.00	654	1310	ug/kg	4.0					

The following prep procedures were performed:  
 GC/MS Base/Neutral Compounds

M5 12/06/96 1200 94576 3

PO Box 30712 - Charleston, SC 29417 - 2040 Savage Road - 29407



(803) 556-8171 • Fax (803) 766-1178

\*9612127-01\*

Printed on recycled paper.



# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	GEL	EPI
FL	837156/17294	217472/17431
NC	233	
SC	10120	10582
TN	02934	02934

**Client:** Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

**Contact:** Mr. Bill Hiers

**Project Description:** SUPSHIP-Portsmouth Detachment

cc: NFWC00196

Report Date: December 16, 1996

Page 2 of 3

Sample ID : SPORT0261-1

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
-----------	-----------	--------	----	----	-------	----	---------	------	------	-------	---

**Comments:**

A dilution was required for Volatile Organics due to a high concentration of hydrocarbons. A dilution was required for Extractable Organics due to matrix interference.

As a result, the detection limits are elevated.

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	96.2	(30.0 - 115.)
Nitrobenzene-d5	M610	49.7	(23.0 - 120.)
p-Terphenyl-d14	M610	108.	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	99.5	(59.7 - 159.)
Dibromofluoromethane	BTEX-8260	85.9	(74.0 - 128.)
Toluene-d8	BTEX-8260	92.2	(53.4 - 163.)
Bromofluorobenzene	NAP-8260	99.5	(59.7 - 159.)
Dibromofluoromethane	NAP-8260	85.9	(74.0 - 128.)
Toluene-d8	NAP-8260	92.2	(53.4 - 163.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 3550

**Notes:**

The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

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\*9612127-01\*





# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	GEL	EPI
FL	EST136/ST204	EST472/ST451
NC	233	
SC	18120	18562
TX	02934	02894

**Client:** Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

**Contact:** Mr. Bill Hiem

**Project Description:** SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 16, 1996

Page 3 of 3

Sample ID : SPORT0261-1

M = Method

Method-Description

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakemey at (803) 769-7386.

*Karen Blakemey*  
 \_\_\_\_\_  
 Reviewed By

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9612127-01





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Laboratory Certifications

STATE	GEL	EPI
FL	E87136/87294	E81472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Erv.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 16, 1996

Page 1 of 3

Sample ID : SPORT0261-2  
 Lab ID : 9612127-02  
 Matrix : Soil  
 Date Collected : 12/05/96  
 Date Received : 12/05/96  
 Priority : Routine  
 Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
<i>BTEX - 4 items</i>											
Benzene	U	0.00	10.0	20.0	ug/kg	10.	JGS2	12/10/96	2109	94778	1
Ethylbenzene	U	0.00	10.0	20.0	ug/kg	10.					
Toluene	U	0.00	10.0	20.0	ug/kg	10.					
Xylenes (TOTAL)	U	0.00	10.0	20.0	ug/kg	10.					
Naphthalene		72.7	10.0	20.0	ug/kg	10.					
<b>Extractable Organics</b>											
<i>Polynuclear Aromatic Hydrocarbons - 16 items</i>											
Acenaphthene	U	0.00	652	1300	ug/kg	4.0	BDG	12/10/96	0817	94576	2
Acenaphthylene	U	0.00	652	1300	ug/kg	4.0					
Anthracene	U	0.00	652	1300	ug/kg	4.0					
Benzo(a)anthracene	U	0.00	652	1300	ug/kg	4.0					
Benzo(a)pyrene	U	0.00	652	1300	ug/kg	4.0					
Benzo(b)fluoranthene	U	0.00	652	1300	ug/kg	4.0					
Benzo(ghi)perylene	U	0.00	652	1300	ug/kg	4.0					
Benzo(k)fluoranthene	U	0.00	652	1300	ug/kg	4.0					
Chrysene	U	0.00	652	1300	ug/kg	4.0					
Dibenz(a,h)anthracene	U	0.00	652	1300	ug/kg	4.0					
Fluoranthene	U	0.00	652	1300	ug/kg	4.0					
Fluorene	U	0.00	652	1300	ug/kg	4.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	652	1300	ug/kg	4.0					
Naphthalene	U	0.00	652	1300	ug/kg	4.0					
Phenanthrene	J	704	652	1300	ug/kg	4.0					
Pyrene	U	0.00	652	1300	ug/kg	4.0					

The following prep procedures were performed:  
 GC/MS Base/Neutral Compounds

MS 12/06/96 1200 94576 3

PO Box 30712 • Charleston, SC 29417 • 2040 Savage Road • 29407

(803) 556-8171 • Fax (803) 766-1178



\*9612127-02\*



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# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	GEL	EPI
FL	E8715687294	E8747287458
NC	239	
SC	10120	10582
TN	02934	02994

Client: Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 16, 1996

Page 2 of 3

Sample ID : SPORT0261-2

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
-----------	-----------	--------	----	----	-------	----	---------	------	------	-------	---

#### Comments:

A dilution was required for Volatile Organics due to a high concentration of hydrocarbons. A dilution was required for Extractable Organics due to matrix interference.

As a result, the detection limits are elevated.

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	89.5	(30.0 - 115.)
Nitrobenzene-d5	M610	0.00*	(23.0 - 120.)
p-Terphenyl-d14	M610	93.5	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	108.	(39.7 - 159.)
Dibromofluoromethane	BTEX-8260	90.6	(74.0 - 128.)
Toluene-d8	BTEX-8260	98.8	(53.4 - 163.)
Bromofluorobenzene	NAP-8260	108.	(39.7 - 159.)
Dibromofluoromethane	NAP-8260	90.6	(74.0 - 128.)
Toluene-d8	NAP-8260	98.8	(53.4 - 163.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 3550

#### Notes:

The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

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\*9612127-02\*





# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	OEL	EPI
FL	28715497204	28747277451
NC	233	
SC	10120	10582
TN	02934	02934

**Client:** Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

**Contact:** Mr. Bill Hiers

**Project Description:** SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 16, 1996

Page 3 of 3

Sample ID : SPORT0261-2

M = Method

Method-Description

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

*Karen Blakeney*  
 \_\_\_\_\_  
 Reviewed By

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9612127-02\*





# GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	237156/07294	EB7472/07451
NC	233	
SC	10120	10582
TX	02934	02934

**Client:** Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

**Contact:** Mr. Bill Hiers

**Project Description:** SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 17, 1996

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Sample ID : SPORT0261-3  
 Lab ID : 9612127-03  
 Matrix : Soil  
 Date Collected : 12/05/96  
 Date Received : 12/05/96  
 Priority : Routine  
 Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DP	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
<i>BTEX - 4 items</i>											
Benzene	U	0.00	10.0	20.0	ug/kg	10.	JGS2	12/13/96	1255	94778	1
Ethylbenzene	U	0.00	10.0	20.0	ug/kg	10.					
Toluene	U	0.00	10.0	20.0	ug/kg	10.					
Xylenes (TOTAL)	U	0.00	10.0	20.0	ug/kg	10.					
Naphthalene		23.9	10.0	20.0	ug/kg	10.					
<b>Extractable Organics</b>											
<i>Polynuclear Aromatic Hydrocarbons - 16 items</i>											
Acenaphthene	U	0.00	1660	3310	ug/kg	10.	WAM	12/13/96	1558	94796	2
Acenaphthylene	U	0.00	1660	3310	ug/kg	10.					
Anthracene	U	0.00	1660	3310	ug/kg	10.					
Benzo(a)anthracene	U	0.00	1660	3310	ug/kg	10.					
Benzo(a)pyrene	U	0.00	1660	3310	ug/kg	10.					
Benzo(b)fluoranthene	U	0.00	1660	3310	ug/kg	10.					
Benzo(ghi)perylene	U	0.00	1660	3310	ug/kg	10.					
Benzo(k)fluoranthene	U	0.00	1660	3310	ug/kg	10.					
Chrysene	U	0.00	1660	3310	ug/kg	10.					
Dibenz(a,h)anthracene	U	0.00	1660	3310	ug/kg	10.					
Fluoranthene	U	0.00	1660	3310	ug/kg	10.					
Fluorene	U	0.00	1660	3310	ug/kg	10.					
Indeno(1,2,3-c,d)pyrene	U	0.00	1660	3310	ug/kg	10.					
Naphthalene	U	0.00	1660	3310	ug/kg	10.					
Phenanthrene	U	0.00	1660	3310	ug/kg	10.					
Pyrene	U	0.00	1660	3310	ug/kg	10.					

The following prep procedures were performed:  
 GC/MS Base/Neutral Compounds

MS 12/12/96 1000 94796 3

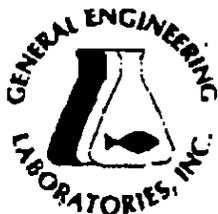
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9612127-03



# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	QEL	EPI
FL	E87136/87284	E87472/87481
NC	238	
SC	10120	10582
TN	02934	02994

**Client:** Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

**Contact:** Mr. Bill Hiers

**Project Description:** SUPSHIP-Portsmouth Detachment

CC: NPWC00196

Report Date: December 17, 1996

Page 2 of 3

Sample ID : SPORT0261-3

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
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**Comments:**

A dilution was required for Volatile Organics due to a high concentration of hydrocarbons. A dilution was required for Extractable Organics due to matrix interference.

As a result, the detection limits are elevated.

Surrogate Recovery	Test	Percent %	Acceptable Limits
2-Fluorobiphenyl	M610	0.00*	(30.0 - 115.)
Nitrobenzene-d5	M610	0.00*	(23.0 - 120.)
p-Terphenyl-d14	M610	0.00*	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	91.8	(59.7 - 159.)
Dibromofluoromethane	BTEX-8260	63.6*	(74.0 - 128.)
Toluene-d8	BTEX-8260	84.9	(53.4 - 163.)
Bromofluorobenzene	NAP-8260	91.8	(59.7 - 159.)
Dibromofluoromethane	NAP-8260	63.6*	(74.0 - 128.)
Toluene-d8	NAP-8260	84.9	(53.4 - 163.)

M = Method	Method-Description
M1	EPA 8260
M2	EPA 8270
M3	EPA 3550

**Notes:**

The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

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### Laboratory Certifications

STATE	QEL	HP1
FL	EF7136/87294	EF7472/87408
NC	233	
SC	10120	10812
TN	02834	02834

Client: Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 17, 1996

Page 3 of 3

Sample ID : SPORT0261-3

M = Method	Method-Description
------------	--------------------

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

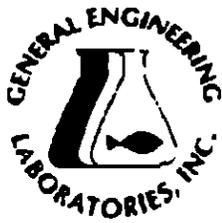
Karen Blakeney  
 Reviewed By

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# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	GEL	EPI
FL	EF7194/87294	EF7472/87294
NC	233	
SC	10120	10582
TN	02984	02994

Client: Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 16, 1996

Page 1 of 3

Sample ID : SPORT0261-4  
 Lab ID : 9612127-04  
 Matrix : Soil  
 Date Collected : 12/05/96  
 Date Received : 12/05/96  
 Priority : Routine  
 Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
<i>BTEX - 4 items</i>											
Benzene	U	0.00	10.0	20.0	ug/kg	10.	JGS2	12/10/96	2219	94778	1
Ethylbenzene	U	0.00	10.0	20.0	ug/kg	10.					
Toluene	U	0.00	10.0	20.0	ug/kg	10.					
Xylenes (TOTAL)	U	0.00	10.0	20.0	ug/kg	10.					
Naphthalene	U	7.70	10.0	20.0	ug/kg	10.					
<b>Extractable Organics</b>											
<i>Polynuclear Aromatic Hydrocarbons - 16 items</i>											
Acenaphthene	U	0.00	167	333	ug/kg	1.0	BDO	12/10/96	0956	94576	2
Acenaphthylene	U	0.00	167	333	ug/kg	1.0					
Anthracene	U	0.00	167	333	ug/kg	1.0					
Benzo(a)anthracene	U	0.00	167	333	ug/kg	1.0					
Benzo(a)pyrene	U	0.00	167	333	ug/kg	1.0					
Benzo(b)fluoranthene	U	0.00	167	333	ug/kg	1.0					
Benzo(ghi)perylene	U	0.00	167	333	ug/kg	1.0					
Benzo(k)fluoranthene	U	0.00	167	333	ug/kg	1.0					
Chrysene	U	0.00	167	333	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	0.00	167	333	ug/kg	1.0					
Fluoranthene	U	0.00	167	333	ug/kg	1.0					
Fluorene	U	0.00	167	333	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	167	333	ug/kg	1.0					
Naphthalene	U	0.00	167	333	ug/kg	1.0					
Phenanthrene	U	0.00	167	333	ug/kg	1.0					
Pyrene	U	0.00	167	333	ug/kg	1.0					

The following prep procedures were performed:  
 GC/MS Base/Neutral Compounds

MS 12/06/96 1200 94576 3

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# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	GEL	EPI
FL	E17156/7294	E17472/01451
NC	233	
SC	10120	10342
TN	02934	02304

Client: Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Eav.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 16, 1996

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Sample ID : SPORT0261-4

Parameter	Qualifier	Result	DL	RL Units	DF	Analyst	Date	Time	Batch	M
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**Comments:**

A dilution was required for Volatile Organics due to matrix interference.  
 As a result, the detection limits are elevated.

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	79.0	(30.0 - 115.)
Nitrobenzene-d5	M610	75.8	(23.0 - 120.)
p-Terphenyl-d14	M610	94.0	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	98.6	(59.7 - 159.)
Dibromofluoromethane	BTEX-8260	81.0	(74.0 - 128.)
Toluene-d8	BTEX-8260	90.0	(53.4 - 163.)
Bromofluorobenzene	NAP-8260	98.6	(59.7 - 159.)
Dibromofluoromethane	NAP-8260	81.0	(74.0 - 128.)
Toluene-d8	NAP-8260	90.0	(53.4 - 163.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 3550

**Notes:**

- The qualifiers in this report are defined as follows:
- ND indicates that the analyte was not detected at a concentration greater than the detection limit.
- J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
- U indicates that the analyte was not detected at a concentration greater than the detection limit.
- \* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

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# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	GEL	EPI
FL	8171.54/87284	817472/87459
NC	233	
SC	10130	10582
TN	02934	02934

**Client:** Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Eav.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

**Contact:** Mr. Bill Hiers  
**Project Description:** SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 16, 1996

Page 3 of 3

Sample ID : SPORT0261-4

M - Method	Method-Description
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This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakney at (803) 769-7386.

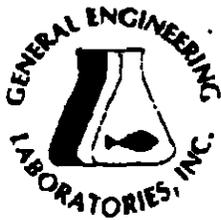
*Karen Blakney*  
 Reviewed By

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\*9612127-04\*





# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	DEL	EPI
FL	2775447294	27472/71431
NC	233	
SC	10120	10382
TX	02594	02934

**Client:** Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

**Contact:** Mr. Bill Hiers

**Project Description:** SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 17, 1996

Page 1 of 3

Sample ID : SPORT0261-5  
 Lab ID : 9612127-05  
 Matrix : Soil  
 Date Collected : 12/05/96  
 Date Received : 12/05/96  
 Priority : Routine  
 Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
<i>BTEX - 4 items</i>											
Benzene	U	0.00	1.00	2.00	ug/kg	1.0	JGS2	12/13/96	1738	94812	1
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.00	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					
<b>Extractable Organics</b>											
<i>Polynuclear Aromatic Hydrocarbons - 16 items</i>											
Acenaphthene	U	0.00	652	1300	ug/kg	4.0	BGG	12/10/96	1028	94576	2
Acenaphthylene	U	0.00	652	1300	ug/kg	4.0					
Anthracene	U	0.00	652	1300	ug/kg	4.0					
Benzo(a)anthracene	U	0.00	652	1300	ug/kg	4.0					
Benzo(a)pyrene	U	0.00	652	1300	ug/kg	4.0					
Benzo(b)fluoranthene	U	0.00	652	1300	ug/kg	4.0					
Benzo(ghi)perylene	U	0.00	652	1300	ug/kg	4.0					
Benzo(k)fluoranthene	U	0.00	652	1300	ug/kg	4.0					
Chrysene	U	0.00	652	1300	ug/kg	4.0					
Dibenzo(a,h)anthracene	U	0.00	652	1300	ug/kg	4.0					
Fluoranthene	U	0.00	652	1300	ug/kg	4.0					
Fluorene	U	0.00	652	1300	ug/kg	4.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	652	1300	ug/kg	4.0					
Naphthalene	U	0.00	652	1300	ug/kg	4.0					
Phenanthrene	U	0.00	652	1300	ug/kg	4.0					
Pyrene	U	0.00	652	1300	ug/kg	4.0					

The following prep procedures were performed:  
 GC/MS Base/Neutral Compounds

MS 12/06/96 1200 94576 3

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# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	GEL	EPI
FL	EF713647294	EF7472/87454
NC	233	
SC	10120	10382
TN	02934	02934

**Client:** Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

**Contact:** Mr. Bill Hies

**Project Description:** SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 17, 1996

Page 2 of 3

Sample ID : SPORT0261-5

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
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**Comments:**

A dilution was required for Extractable Organics due to matrix interference. As a result, the detection limits are elevated.

Surrogate Recovery	Test	Percent%	Acceptable Limits
Z-Fluorobiphenyl	M610	81.5	(50.0 - 115.)
Nitrobenzene-d5	M610	60.7	(23.0 - 120.)
p-Terphenyl-d14	M610	93.5	(37.5 - 128.)
Bromofluorobenzene	BTEX-8260	114.	(39.7 - 159.)
Dibromofluoromethane	BTEX-8260	76.2	(74.0 - 128.)
Toluene-d8	BTEX-8260	92.6	(53.4 - 163.)
Bromofluorobenzene	NAP-8260	114.	(39.7 - 159.)
Dibromofluoromethane	NAP-8260	76.2	(74.0 - 128.)
Toluene-d8	NAP-8260	92.6	(53.4 - 163.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 3550

**Notes:**

The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

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# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	GEL	EPI
FL	28715687294	ES 747287458
NC	239	
SC	10120	10582
TN	62834	02834

**Client:** Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

**Contact:** Mr. Bill Hiers

**Project Description:** SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 17, 1996

Page 3 of 3

Sample ID : SPORT0261-5

M = Method

Method-Description

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

*Karen Blakeney*  
 \_\_\_\_\_  
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# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	CEL	EPA
FL	EE7136/87294	EE7472/87
NC	233	
SC	10120	10582
TN	02294	02594

Client: Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 16, 1996

Page 1 of 3

Sample ID : SPORT0261-6  
 Lab ID : 9612127-06  
 Matrix : Soil  
 Date Collected : 12/05/96  
 Date Received : 12/05/96  
 Priority : Routine  
 Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
<i>BTEX - 4 items</i>											
Benzene	U	0.00	10.0	20.0	ug/kg	10.	JGS2	12/13/96	1813	94812	1
Ethylbenzene	U	0.00	10.0	20.0	ug/kg	10.					
Toluene	U	0.00	10.0	20.0	ug/kg	10.					
Xylenes (TOTAL)	U	0.00	10.0	20.0	ug/kg	10.					
Naphthalene	U	0.00	10.0	20.0	ug/kg	10.					
<b>Extractable Organics</b>											
<i>Polynuclear Aromatic Hydrocarbons - 16 items</i>											
Acenaphthene	U	0.00	1640	3270	ug/kg	10.	BDG	12/10/96	1101	94576	2
Acenaphthylene	U	0.00	1640	3270	ug/kg	10.					
Anthracene	U	0.00	1640	3270	ug/kg	10.					
Benzo(a)anthracene	U	0.00	1640	3270	ug/kg	10.					
Benzo(a)pyrene	U	0.00	1640	3270	ug/kg	10.					
Benzo(b)fluoranthene	U	0.00	1640	3270	ug/kg	10.					
Benzo(g,h)perylene	U	0.00	1640	3270	ug/kg	10.					
Benzo(k)fluoranthene	U	0.00	1640	3270	ug/kg	10.					
Chrysene	U	0.00	1640	3270	ug/kg	10.					
Dibenzo(a,h)anthracene	U	0.00	1640	3270	ug/kg	10.					
Fluoranthene	U	0.00	1640	3270	ug/kg	10.					
Fluorene	U	0.00	1640	3270	ug/kg	10.					
Indeno(1,2,3-c,d)pyrene	U	0.00	1640	3270	ug/kg	10.					
Naphthalene	U	0.00	1640	3270	ug/kg	10.					
Phenanthrene	U	0.00	1640	3270	ug/kg	10.					
Pyrene	U	0.00	1640	3270	ug/kg	10.					

The following prep procedures were performed:  
 GC/MS Base/Neutral Compounds

MS 12/06/96 1200 94576 3

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# GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	CEL	EPA
FL	88715687284	88747287488
NC	223	
SC	10120	10582
TN	82984	82984

Client: Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 16, 1996

Page 2 of 3

Sample ID : SPORT0261-6

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
-----------	-----------	--------	----	----	-------	----	---------	------	------	-------	---

**Comments:**

A dilution was required for Volatile Organics due to a high concentration of hydrocarbons. A dilution was required for Extractable Organics due to matrix interference.

As a result, the detection limits are elevated.

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	0.00*	(30.0 - 115.)
Nitrobenzene-d5	M610	0.00*	(23.0 - 120.)
p-Terphenyl-d14	M610	104.	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	109.	(39.7 - 159.)
Dibromofluoromethane	BTEX-8260	92.1	(74.0 - 128.)
Toluene-d8	BTEX-8260	92.0	(33.4 - 163.)
Bromofluorobenzene	NAP-8260	109.	(39.7 - 159.)
Dibromofluoromethane	NAP-8260	92.1	(74.0 - 128.)
Toluene-d8	NAP-8260	92.0	(33.4 - 163.)

**M - Method**

**Method-Description**

M1	EPA 8260
M2	EPA 8270
M3	EPA 3550

**Notes:**

The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

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# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	GEL	EPI
FL	887156/7204	227472/87451
NC	233	
SC	10120	10382
TN	02994	02834

**Client:** Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

**Contact:** Mr. Bill Hies

**Project Description:** SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 16, 1996

Page 3 of 3

Sample ID : SPORT0261-6

### M = Method

### Method-Description

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

*Karen Blakeney*  
 \_\_\_\_\_  
 Reviewed By

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# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	QEL	EM
FL	E37156/17204	E37472/17451
NC	E33	
SC	10120	10282
TN	02934	02934

**Client:** Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Erv.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

**Contact:** Mr. Bill Hiers

**Project Description:** SUPSHIP-Portsmouth Detachment

cc: NPWCD0196

Report Date: December 16, 1996

Page 2 of 2

Sample ID : SPORT0261-7

NI = Method	Method-Description
-------------	--------------------

**Notes:**

The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakemey at (803) 769-7386.

Karen Blakemey  
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9612127-07



# CHAIN OF CUSTODY RECORD

Page 1 of 1

9612127

KBB

Client Name/Facility Name			SAMPLE ANALYSIS REQUIRED (x) - use remarks area to specify specific components or methods														The F or P in the boxes to indicate whether sample was filtered and/or preserved					
SPORTENVDETCHASN			# OF CONTAINERS	pH, conductivity	TOC/DOC	TOX	Chloride, Fluoride, Sulfide	Nitrite/Nitrate	VOC - Specific Method required	METALS - specific	Pesticide	Herbicide	Total Phenol	Acid Extractables	B/N Extractables	PCB's	Cyanide	Coliform - specify type	BTEX PLUS	NAPTHALS	PAH	Remarks
SAMPLE ID	DATE	TIME																				
-01	SPORT 261-1	12/5/96	0913	X	X	2														X	X	UST NS-53A-1 Soil
-02	SPORT 261-2	12/5/96	0935	X	X	2														X	X	UST NS-53A-2 Soil
-03	SPORT 261-3	12/5/96	1059	X	X	2														X	X	UST NS-53B-1 Soil
-04	SPORT 261-4	12/5/96	1020	X	X	2														X	X	UST NS-53B-2 Soil
-05	SPORT 261-5	12/5/96	0840	X	X	2														X	X	UST NS-53A+B-3 Soil
-06	SPORT 261-6	12/5/96	0900	X	X	2														X	X	UST NS-53A+B-4 Soil
-07	SPORT 261-7	12/5/96	0830			3														X		UST NS-53A+B VOA TRIP BLANK

Relinquished by:	Date:	Time:	Received by:	Relinquished by:	Date:	Time:	Received by:
W. Z. ...	12/5/96	1125	W. R. Hiery, Jr.	W. R. Hiery, Jr.	12/5/96	1518	Crystal Henderson
Crystal Henderson	12-05-96	15:42	Chome ...	12/5/96	15:42	Temp 10°C	

White = sample collector    Yellow = file    Pink = with report



# GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	CEL	EPI
FL	287156/7294	287472/87438
NC	235	
SC	10020	10382
TN	02934	02984

**Client:** Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Bav.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

**Contact:** Mr. Bill Hiers

**Project Description:** SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 18, 1996

Page 1 of 3

Sample ID : SPORT0262-1  
 Lab ID : 9612156-01  
 Matrix : Soil  
 Date Collected : 12/06/96  
 Date Received : 12/06/96  
 Priority : Routine  
 Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
<i>BTEX - 4 items</i>											
Benzene	U	0.00	1.00	2.00	ug/kg	1.0	JGS2	12/13/96	1924	94812	1
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.00	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					
<b>Extractable Organics</b>											
<i>Polynuclear Aromatic Hydrocarbons - 16 items</i>											
Acenaphthene	U	0.00	660	1320	ug/kg	4.0	JCB	12/14/96	0030	94744	2
Acenaphthylene	U	0.00	660	1320	ug/kg	4.0					
Anthracene	U	0.00	660	1320	ug/kg	4.0					
Benzo(a)anthracene	U	0.00	660	1320	ug/kg	4.0					
Benzo(a)pyrene	U	0.00	660	1320	ug/kg	4.0					
Benzo(b)fluoranthene	U	0.00	660	1320	ug/kg	4.0					
Benzo(g,h)perylene	U	0.00	660	1320	ug/kg	4.0					
Benzo(k)fluoranthene	U	0.00	660	1320	ug/kg	4.0					
Chrysene	U	0.00	660	1320	ug/kg	4.0					
Dibenzo(a,h)anthracene	U	0.00	660	1320	ug/kg	4.0					
Fluoranthene	U	0.00	660	1320	ug/kg	4.0					
Fluorene	U	0.00	660	1320	ug/kg	4.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	660	1320	ug/kg	4.0					
Naphthalene	U	0.00	660	1320	ug/kg	4.0					
Phenanthrene	U	0.00	660	1320	ug/kg	4.0					
Pyrene	U	0.00	660	1320	ug/kg	4.0					

The following prep procedures were performed:  
 GC/MS Base/Neutral Compounds

MS 12/11/96 1300 94744 3

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### Laboratory Certification

STATE	DEL	EPI
PL	EN7156/7294	EN7172/7141
NC	233	
SC	10120	10582
TN	02934	02934

**Client:** Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

**Contact:** Mr. Bill Hiers

**Project Description:** SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 18, 1996

Page 2 of 3

Sample ID : SPORT0262-1

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
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**Comments:**

A dilution was required for Extractable Organics due to matrix interference. As a result, the detection limits are elevated.

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	96.1	(90.0 - 115.)
Nitrobenzene-d5	M610	63.3	(23.0 - 120.)
p-Terphenyl-d14	M610	102	(97.3 - 128.)
Bromofluorobenzene	BTEX-8260	128.	(99.7 - 159.)
Dibromofluoromethane	BTEX-8260	75.8	(74.0 - 128.)
Toluene-d8	BTEX-8260	97.4	(53.4 - 163.)
Bromofluorobenzene	NAP-8260	128.	(99.7 - 159.)
Dibromofluoromethane	NAP-8260	75.8	(74.0 - 128.)
Toluene-d8	NAP-8260	97.4	(53.4 - 163.)

M - Method	Method-Description
M1	EPA 8260
M2	EPA 8270
M3	EPA 3550

**Notes:**

The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

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# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	QEL	EPI
FL	EF7156/9728	187472/97451
NC	238	
SC	10120	10982
TN	02934	02934

Client: Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 18, 1996

Page 3 of 3

Sample ID : SPORT0262-1

### M = Method

### Method-Description

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakney at (803) 769-7386.

*Karen Blakney*  
 \_\_\_\_\_  
 Reviewed By

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9612156-01\*





# GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	BR7156/87294	BR7472/87438
NC	230	
SC	10120	10382
TN	02994	02994

**Client:** Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

**Contact:** Mr. Bill Hiers

**Project Description:** SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 18, 1996

Page 1 of 2

**Sample ID** : SPORT0262-2  
**Lab ID** : 9612156-02  
**Matrix** : Soil  
**Date Collected** : 12/06/96  
**Date Received** : 12/06/96  
**Priority** : Routine  
**Collector** : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
<i>BTEX - 4 items</i>											
Benzene	U	0.00	1.00	2.00	ug/kg	1.0	JGS2	12/13/96	1959	94812	1
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.00	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					
<b>Extractable Organics</b>											
<i>Polynuclear Aromatic Hydrocarbons - 16 items</i>											
Acenaphthene	U	0.00	163	330	ug/kg	1.0	JCB	12/14/96	0103	94744	2
Acenaphthylene	U	0.00	163	330	ug/kg	1.0					
Anthracene	U	0.00	163	330	ug/kg	1.0					
Benzo(a)anthracene	U	0.00	163	330	ug/kg	1.0					
Benzo(a)pyrene	U	0.00	163	330	ug/kg	1.0					
Benzo(b)fluoranthene	U	0.00	163	330	ug/kg	1.0					
Benzo(ghi)perylene	U	0.00	163	330	ug/kg	1.0					
Benzo(k)fluoranthene	U	0.00	163	330	ug/kg	1.0					
Chrysene	U	0.00	163	330	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	0.00	163	330	ug/kg	1.0					
Fluoranthene	U	0.00	163	330	ug/kg	1.0					
Fluorene	U	0.00	163	330	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	163	330	ug/kg	1.0					
Naphthalene	U	0.00	163	330	ug/kg	1.0					
Phenanthrene	U	0.00	163	330	ug/kg	1.0					
Pyrene	U	0.00	163	330	ug/kg	1.0					

The following prep procedures were performed:  
 GC/MS Basic/Neutral Compounds

MS 12/11/96 1300 94744 3

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# GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	E8715447234	287472/6161
NC	233	
SC	10130	10582
TN	0294	0294

**Client:** Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

**Contact:** Mr. Bill Hiers

**Project Description:** SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 18, 1996

Page 2 of 2

Sample ID : 8PORT0262-2

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	84.6	(30.0 - 115.)
Nitrobenzene-d5	M610	75.0	(23.0 - 120.)
p-Terphenyl-d14	M610	90.8	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	137.	(59.7 - 159.)
Dibromofluoromethane	BTEX-8260	81.3	(74.0 - 128.)
Toluene-d8	BTEX-8260	99.3	(53.4 - 163.)
Bromofluorobenzene	NAP-8260	137.	(59.7 - 159.)
Dibromofluoromethane	NAP-8260	81.3	(74.0 - 128.)
Toluene-d8	NAP-8260	99.3	(53.4 - 163.)

M = Method	Method-Description
M1	EPA 8260
M2	EPA 8270
M3	EPA 3550

**Notes:**

The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

*Karen Blakeney*  
 Reviewed By

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\*9612156-02\*





# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	QEL	EPI
FL	007136/87284	007472/87438
NC	232	
SC	10L30	10982
TN	02934	02934

Client: Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 18, 1996

Page 1 of 2

Sample ID : SPORT0262-3  
 Lab ID : 9612156-03  
 Matrix : Soil  
 Date Collected : 12/06/96  
 Date Received : 12/06/96  
 Priority : Routine  
 Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
<i>BTEX - 4 items</i>											
Benzene	U	0.00	1.00	2.00	ug/kg	1.0	JGS2	12/13/96	2034	94812	1
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.00	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					
<b>Extractable Organics</b>											
<i>Polynuclear Aromatic Hydrocarbons - 16 items</i>											
Acenaphthene	U	0.00	164	330	ug/kg	1.0	JCB	12/14/96	0136	94744	2
Acenaphthylene	U	0.00	164	330	ug/kg	1.0					
Anthracene	U	0.00	164	330	ug/kg	1.0					
Benzo(a)anthracene	U	0.00	164	330	ug/kg	1.0					
Benzo(a)pyrene	U	0.00	164	330	ug/kg	1.0					
Benzo(b)fluoranthene	U	0.00	164	330	ug/kg	1.0					
Benzo(ghi)perylene	U	0.00	164	330	ug/kg	1.0					
Benzo(k)fluoranthene	U	0.00	164	330	ug/kg	1.0					
Chrysene	U	0.00	164	330	ug/kg	1.0					
Dibenz(a,h)anthracene	U	0.00	164	330	ug/kg	1.0					
Fluoranthene	U	0.00	164	330	ug/kg	1.0					
Fluorene	U	0.00	164	330	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	164	330	ug/kg	1.0					
Naphthalene	U	0.00	164	330	ug/kg	1.0					
Phenanthrene	U	0.00	164	330	ug/kg	1.0					
Pyrene	U	0.00	164	330	ug/kg	1.0					

The following prep procedures were performed:  
 GC/MS Base/Neutral Compounds

MS 12/11/96 1300 94744 3

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# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	QEL	EPI
FL	EF7136/7294	EF7472/8743
NC	283	
SC	10120	10382
TN	02934	02934

**Client:** Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

**Contact:** Mr. Bill Hiers

**Project Description:** SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 18, 1996

Page 2 of 2

Sample ID : SPORT0262-3

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	84.6	(90.0 - 115.)
Nitrobenzene-d5	M610	70.1	(23.0 - 120.)
p-Terphenyl-d14	M610	80.2	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	116.	(59.7 - 159.)
Dibromofluoromethane	BTEX-8260	84.2	(74.0 - 128.)
Toluene-d8	BTEX-8260	93.5	(53.4 - 163.)
Bromofluorobenzene	NAP-8260	116.	(59.7 - 159.)
Dibromofluoromethane	NAP-8260	84.2	(74.0 - 128.)
Toluene-d8	NAP-8260	93.5	(53.4 - 163.)

M = Method	Method-Description
M1	EPA 8260
M2	EPA 8270
M3	EPA 3550

**Notes:**

The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeman at (803) 769-7386.

*Karen Blakeman*  
 Reviewed By

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9612156-03





# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certification

STATE	DEL	EPI
FL	EST13687294	2274728703
NC	233	
SC	10120	10582
TN	02934	02934

**Client:** Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

**Contact:** Mr. Bill Hies

**Project Description:** SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 16, 1996

Page 1 of 2

Sample ID : SPORT0262-4  
 Lab ID : 9612156-04  
 Matrix : GroundH2O  
 Date Collected : 12/06/96  
 Date Received : 12/06/96  
 Priority : Routine  
 Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
<i>BTEX - 4 ions</i>											
Benzene	U	0.00	1.00	2.00	ug/l	1.0	RMB	12/13/96	1058	94925	1
Ethylbenzene	U	0.00	1.00	2.00	ug/l	1.0					
Toluene	U	0.220	1.00	2.00	ug/l	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/l	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/l	1.0					

Surrogate Recovery	Test	Percent%	Acceptable Limits
Bromofluorobenzene	BTEX-8260	112.	(80.0 - 128.)
Dibromofluoromethane	BTEX-8260	115.	(67.7 - 135.)
Toluene-d8	BTEX-8260	106.	(76.8 - 122.)
Bromofluorobenzene	NAP-8260	112.	(80.0 - 128.)
Dibromofluoromethane	NAP-8260	115.	(67.7 - 135.)
Toluene-d8	NAP-8260	106.	(76.8 - 122.)

M = Method	Method-Description
M 1	EPA 8260

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9612156-04



# GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

### Laboratory Certifications

STATE	GEL	EPI
FL	EE7196/87294	EE7472/87451
NC	229	
SC	10120	10582
TN	02934	02934

**Client:** Supervisor of Ship Building & Conversion  
 SUPSHIP-Portsmouth Detachment-Env.  
 1899 North Hobson Ave.  
 North Charleston, South Carolina 29405-2106

**Contact:** Mr. Bill Hiers

**Project Description:** SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: December 16, 1996

Page 2 of 2

Sample ID : SPORT0262-4

M = Method

Method-Description

#### Notes:

The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakemey at: (803) 769-7386.

*Karen Blakemey*

Reviewed By

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9612156-04

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NI JC 00196

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 2040 Savage Road  
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 Charleston, South Carolina 29417  
 (803) 556-8171

CHAIN OF CUSTODY RECORD

9612156

K3B

Page 1 of 1

Client Name/Facility Name		SAMPLE ANALYSIS REQUIRED (S) - use remarks area to specify specific compounds or methods														The F or P in the boxes to indicate whether sample was filtered and/or preserved										
SPORTEN VDETCHASN																←										
Collected by/Company		# OF CONTAINERS	pH conductivity	TOC/DOC	TOX	Chloride, Fluoride, Sulfide	Nitrate/Nitrite	VOC - Specify Method required	METALS - specify	Pesticide	Herbicide	Total Phenol	Acid Extractables	BN Extractables	PCB's	Cyanide	Coliform - specify type	BTEX PLUS	NAPHTHALENE	PAH	Remarks					
SPORTEN VDETCHASN																						WELL	SOIL	COMF	GRAB	
SAMPLE ID	DATE	TIME	WELL	SOIL	COMF	GRAB	# OF CONTAINERS	pH conductivity	TOC/DOC	TOX	Chloride, Fluoride, Sulfide	Nitrate/Nitrite	VOC - Specify Method required	METALS - specify	Pesticide	Herbicide	Total Phenol	Acid Extractables	BN Extractables	PCB's	Cyanide	Coliform - specify type	BTEX PLUS	NAPHTHALENE	PAH	Remarks
D1 SPORT 262-1	12/6/96	0930 <sup>S</sup>	X				2																X	X		UST NS 53A-5 soil
-02 SPORT 262-2	12/6/96	0950	X				2																X	X		UST NS 53A-6 soil
-03 SPORT 262-3	12/6/96	0915	X				2																X	X		UST NS 53B-3 soil
-04 SPORT 262-4	12/6/96	0844				X	3																X			UST NS 53A/B VOA TRIP BLANK
Relinquished by:		Date:	Time:	Received by:		Date:	Time:	Received by:		Date:	Time:	Received by:														
2-2 [Signature]		12/6/96	1043	W.R. Hiers, Jr.		12/6/96	1430	W.R. Hiers, Jr.		12/6/96	1430	Crystal Henderson														
Relinquished by:		Date:	Time:	Received by lab by:		Date:	Time:	Remarks:																		
Crystal Henderson		12/6/96	14:55	Lionel Francis		14:55	12/6/96																			

White = sample collector    Yellow = file    Pink = with report

**Attachment III**

**Certificate of Disposal (tanks)**

# UST Certificate of Disposal

## CONTRACTOR

Supervisor of Shipbuilding, Conversion and Repair, USN  
Portsmouth, VA  
Environmental Detachment Charleston  
1899 North Hobson Avenue  
North Charleston 29405-2106

Telephone (803) 743-6482

## TANK ID & LOCATION

NS 53A; Building NS 53, Hobson Ave., Charleston Naval Base, N. Charleston, SC

## DISPOSAL LOCATION

Bldg. 1601 Tank Cleaning  
& Disposal Area  
Charleston Naval Complex

### TYPE OF TANK

### SIZE (GAL)

Fuel oil

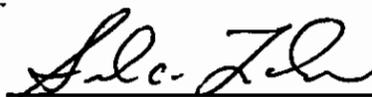
3,000 gal.

## CLEANING/DISPOSAL METHOD

The tank was cut open on both ends, cleaned with a steam cleaner, cut into sections, and disposed of as recyclable scrap metal.

## DISPOSAL CERTIFICATION

I certify that the above tank has been properly cleaned and disposed of as recyclable scrap metal.



Sidney C. Ladson

1 6/4/97

(Date)

# UST Certificate of Disposal

## CONTRACTOR

Supervisor of Shipbuilding, Conversion and Repair, USN  
Portsmouth, VA  
Environmental Detachment Charleston  
1899 North Hobson Avenue  
North Charleston 29405-2106

Telephone (803) 743-6482

## TANK ID & LOCATION

NS 53B; Building NS 53, Hobson Ave., Charleston Naval Base, N. Charleston, SC

## DISPOSAL LOCATION

Bldg. 1601 Tank Cleaning  
& Disposal Area  
Charleston Naval Complex

### TYPE OF TANK

Fuel oil

### SIZE (GAL)

800 gal.

## CLEANING/DISPOSAL METHOD

The tank was cut open on both ends, cleaned with a steam cleaner, cut into sections, and disposed of as recyclable scrap metal.

## DISPOSAL CERTIFICATION

I certify that the above tank has been properly cleaned and disposed of as recyclable scrap metal.

  
\_\_\_\_\_  
Sidney C. Ladson

6/4/97  
\_\_\_\_\_  
(Date)

**APPENDIX B**  
**GEOLOGIC BORING LOGS**

# EnSafe/Allen & Hoshall

# Monitoring Well NBCH178002

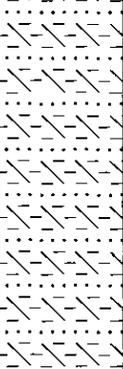
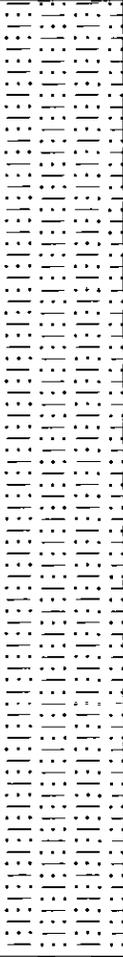
Project: Zone H-Naval Base Charleston	Coordinates: 2325426.05 E, 370821.77 N
Location: Charleston, SC	Surface Elevation: 8.4 feet <i>msl</i>
Started at 0830 on 9-14-04	TOC Elevation: 8.0 feet <i>msl</i>
Completed at 0945 on 9-14-04	Depth to Groundwater: 3.2 feet TOC Measured 2-9-04
Drilling Method: 4.25" ID (7.5" OD) HSA with split spoon	Groundwater Elevation: 6.04 feet <i>msl</i>
Drilling Company: Alliance Environmental	Total Well Depth: 2 feet bgs
Geologist: S. Weatherford	Well Screen: 2 to 2.5 feet bgs

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PI (grain)	EMPIRIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft- <i>msl</i> )	WELL DIAGRAM
0								Surface conditions: Cement, soil, fill and rock.	8.4	<p>2" ID Sch. 40 PVC, 0.01 slot screen end cap 10-20 sand bentonite seal</p>
6			1	100	7	SM	Sand: brown to tan, fine to medium, with fill material, strong petroleum odor.	8.4		
10			2	100	0	CL	Clay: tan, with fine sand, damp.	8.4		
15			3	100	0	PE	Clay: olive-green, medium plasticity, with shell fragments, fizzes with HCl, damp to brittle, dry, olive-green clay with shell fragments — Cooper Marl.	8.0		
20									6.04	

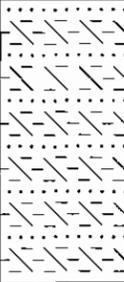
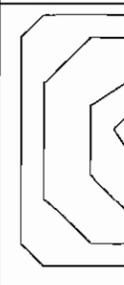
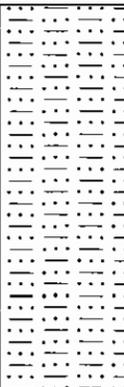
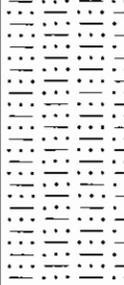
BASE: Charleston Naval Complex, Zone H	SITE ID: CNC02	PROJECT NO.: N7912
BORING ID: CNC02-B01	WELL ID: N/A	PIEZOMETER ID: N/A
CONTRACTOR: Catlin	COMPLETION DATE: 12-18-98	LOGGED BY: Pam Jackson
METHOD: Power Probe DPT	BORING DIAMETER (in): 3	TOTAL DEPTH (ft bls): 14
TOC ELEVATION (ft msl): N/A	SCREEN INTERVAL (ft bls): N/A	DEPTH TO GW (ft bls): 4

DEPTH (FT)	SAMPLE ID	HEADSPACE (PPM)	LITHOLOGIC DESCRIPTION	LITHOLOGIC SYMBOLS	USCS	BLOW COUNTS	WELL CONSTRUCTION
0	02SFB0103	10	<p>CLAYEY SAND: ~20% silt, 5-20% clay, increasing w/ depth, very fine to fine-grained, plastic, dry to wet, grayish brown to dark gray.</p> <p>SILTY SAND: ~20 to 40% silt, some clay, very fine top fine-grained, wet, soft to stiff, cohesive, light brown to dark gray, strong petroleum odor.</p>		SC		
1		18					
-5					SM		
-10							
-15							

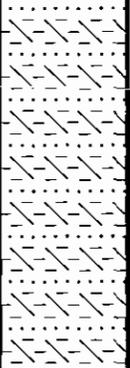
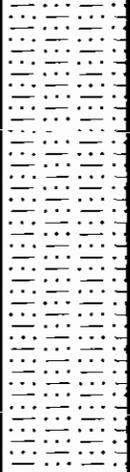
BASE: Charleston Naval Complex, Zone H	SITE ID: CNC02	PROJECT NO.: N7912
BORING ID: CNC02-B02	WELL ID: N/A	PIEZOMETER ID: N/A
CONTRACTOR: Catlin	COMPLETION DATE: 12-18-98	LOGGED BY: Pam Jackson
METHOD: Power Probe DPT	BORING DIAMETER (In): 3-inch	TOTAL DEPTH (ft bls): 14-feet
TOC ELEVATION (ft msl): N/A	SCREEN INTERVAL (ft bls): N/A	DEPTH TO GW (ft bls): 4-feet

DEPTH (FT)	SAMPLE ID	HEADSPACE (PPM)	LITHOLOGIC DESCRIPTION	LITHOLOGIC SYMBOLS	USCS	BLOW COUNTS	WELL CONSTRUCTION
0							
9			CLAYEY SAND: ~15% silt, ~20-30% clay, very fine to fine-grained, trace pebbles, loose, slightly cohesive, dry to wet, grayish brown.		SC		
15							
20	02SFB0203						
5			SILTY SAND: ~30 to 40% silt, some clay, very fine-grained, very soft, saturated, light brown.		SM		
10							
15							

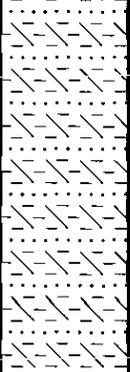
BASE: Charleston Naval Complex, Zone H	SITE ID: CNC02	PROJECT NO.: N7912
BORING ID: CNC02-B03	WELL ID: N/A	PIEZOMETER ID: N/A
CONTRACTOR: Catlin	COMPLETION DATE: 12-18-98	LOGGED BY: Pam Jackson
METHOD: Power Probe DPT	BORING DIAMETER (in): 3-inch	TOTAL DEPTH (ft bls): 16-feet
TOC ELEVATION (ft msl): N/A	SCREEN INTERVAL (ft bls): N/A	DEPTH TO GW (ft bls): 3.5-feet

DEPTH (FT)	SAMPLE ID	HEADSPACE (PPM)	LITHOLOGIC DESCRIPTION	LITHOLOGIC SYMBOLS	USCS	BLOW COUNTS	WELL CONSTRUCTION
0	02SFB0303	0	CLAYEY SAND: ~15%-20% clay, some silt, fine-grained, loose, non-cohesive, dry to damp, light brown.		SC		
0							
1		SAND: some clay & silt, fine-grained, poorly sorted, wet, petroleum odor, medium gray.		SW			
-5		WOOD: a solid 2-foot chunk of wood, strong petroleum odor.					
-10		SILTY SAND: very fine to fine-grained, ~20-30% silt, some clay, fragments of wood, saturated, very soft, gray to light brown.		SM			
-15	SILTY SAND: ~40% silt, very fine, dense to loose, cohesive, organic sulfurous odor, light brown.						

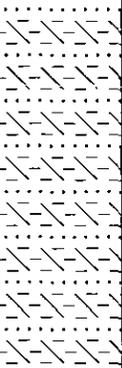
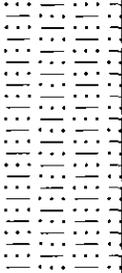
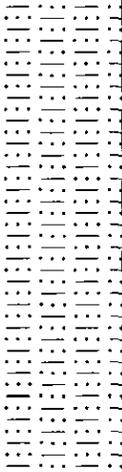
BASE: Charleston Naval Complex, Zone H	SITE ID: CNC02	PROJECT NO.: N7912
BORING ID: CNC02-B04	WELL ID: N/A	PIEZOMETER ID: N/A
CONTRACTOR: Catlin	COMPLETION DATE: 12/19/98	LOGGED BY: Pam Jackson
METHOD: Power Probe DPT	BORING DIAMETER (in): 3	TOTAL DEPTH (ft bls): 12
TOC ELEVATION (ft msl): N/A	SCREEN INTERVAL (ft bls): N/A	DEPTH TO GW (ft bls): 4

DEPTH (FT)	SAMPLE ID	HEADSPACE (PPM)	LITHOLOGIC DESCRIPTION	LITHOLOGIC SYMBOLS	USCS	BLOW COUNTS	WELL CONSTRUCTION
0	02SFB0403	0	CLAYEY SAND: ~20-25% clay, silt, very fine to fine-grained, cohesive, soft, dry to wet, brown.		SC		
0		0					
0		0					
-5			SAND: clayey, silty, very fine to medium-grained, very soft, medium gray, saturated.		SC		
-10			SILTY SAND: ~30% silt, very fine to fine-grained, soft, wet, light brown.		SM		
-15							

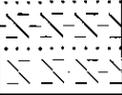
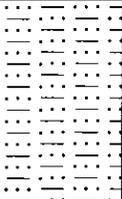
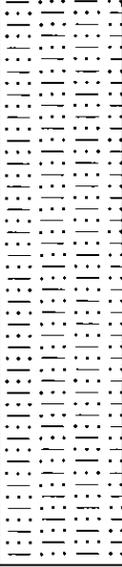
BASE: Charleston Naval Complex, Zone H	SITE ID: CNC02	PROJECT NO.: N7912
BORING ID: CNC02-B05	WELL ID: N/A	PIEZOMETER ID: N/A
CONTRACTOR: Catlin	COMPLETION DATE: 12/19/98	LOGGED BY: Pam Jackson
METHOD: Power Probe DPT	BORING DIAMETER (In): 3	TOTAL DEPTH (ft bls): 4
TOC ELEVATION (ft msl): N/A	SCREEN INTERVAL (ft bls): N/A	DEPTH TO GW (ft bls): 4

DEPTH (FT)	SAMPLE ID	HEADSPACE (PPM)	LITHOLOGIC DESCRIPTION	LITHOLOGIC SYMBOLS	USCS	BLOW COUNTS	WELL CONSTRUCTION
0			CLAYEY SAND: ~20% clay, very fine to fine-grained, trace silt, loose, brown, dry.		SC		
1	02SFB0503	1					
4			End of boring. Met refusal.				
-5							
-10							
-15							

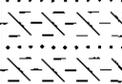
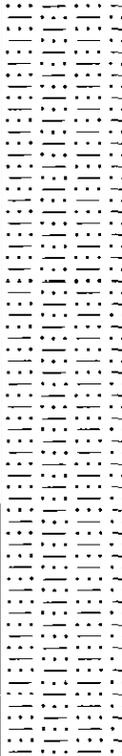
BASE: Charleston Naval Complex, Zone H	SITE ID: CNC02	PROJECT NO.: N7912
BORING ID: CNC02-B06	WELL ID: N/A	PIEZOMETER ID: N/A
CONTRACTOR: Catlin	COMPLETION DATE: 12/19/98	LOGGED BY: Pam Jackson
METHOD: Power Probe DPT	BORING DIAMETER (in): 3	TOTAL DEPTH (ft bls): 12
TOC ELEVATION (ft msl): N/A	SCREEN INTERVAL (ft bls): N/A	DEPTH TO GW (ft bls): 3

DEPTH (FT)	SAMPLE ID	HEADSPACE (PPM)	LITHOLOGIC DESCRIPTION	LITHOLOGIC SYMBOLS	USCS	BLOW COUNTS	WELL CONSTRUCTION
0	02SFB0602	0	SANDY CLAY: ~30-40% very fine to fine-grained sand, some silt, soft, dry to wet, brown to gray		CL		
0							
-5			SILTY SAND: ~20% silt, some clay, , very fine to fine-grained, saturated, very soft, gray.				
-10			SILTY SAND: ~40% silt, very fine-grained, wet, soft, light brown.		SM		
-15			End of boring.				

BASE: Charleston Naval Complex, Zone H	SITE ID: CNC02	PROJECT NO.: N7912
BORING ID: CNC02-B07	WELL ID: N/A	PIEZOMETER ID: N/A
CONTRACTOR: Catlin	COMPLETION DATE: 12/19/98	LOGGED BY: Pam Jackson
METHOD: Power Probe DPT	BORING DIAMETER (in): 3	TOTAL DEPTH (ft bls): 12
TOC ELEVATION (ft msl): N/A	SCREEN INTERVAL (ft bls): N/A	DEPTH TO GW (ft bls): 3

DEPTH (FT)	SAMPLE ID	HEADSPACE (PPM)	LITHOLOGIC DESCRIPTION	LITHOLOGIC SYMBOLS	USCS	BLOW COUNTS	WELL CONSTRUCTION
0	02SFB0702	0	SAND: very fine-grained, loose, dry, grayish orange.		SP		
0		CLAYEY SAND: ~30% clay, silt, very fine to fine-grained, soft, wet, gray.		SC			
-5		SILTY SAND: ~20% silt, some shell, very fine to fine-grained, trace medium-grained, very soft, wet, grayish brown.		SM			
-5		SILTY SAND: as above, increasing silt content (~40%), very fine-grained, soft, wet, light brown.					
-10			End of boring.				
-15							

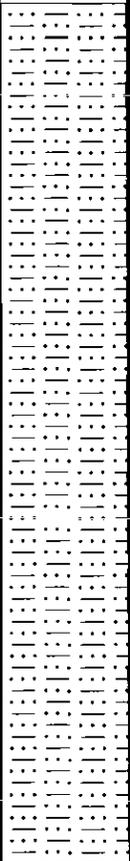
BASE: Charleston Naval Complex, Zone H	SITE ID: CNC02	PROJECT NO.: N7912
BORING ID: CNC02-B08	WELL ID: N/A	PIEZOMETER ID: N/A
CONTRACTOR: Catlin	COMPLETION DATE: 12/19/98	LOGGED BY: Pam Jackson
METHOD: Power Probe DPT	BORING DIAMETER (in): 3	TOTAL DEPTH (ft bls): 12
TOC ELEVATION (ft msl): N/A	SCREEN INTERVAL (ft bls): N/A	DEPTH TO GW (ft bls): 3

DEPTH (FT)	SAMPLE ID	HEADSPACE (PPM)	LITHOLOGIC DESCRIPTION	LITHOLOGIC SYMBOLS	USCS	BLOW COUNTS	WELL CONSTRUCTION
0	02SFB0802	0	SAND: very fine-grained, loose, dry, grayish orange.		SP		
0		0	CLAYEY SAND: ~15% clay, silt, very fine to fine-grained, cohesive, soft, wet, greenish gray, free product.		SC		
-5			SILTY SAND: ~40% silt, very fine-grained, soft, wet, light grayish brown.		SM		
-15			End of boring.				

BASE: Charleston Naval Complex, Zone H	SITE ID: CNC02	PROJECT NO.: N7912
BORING ID: CNC02-B09	WELL ID: N/A	PIEZOMETER ID: N/A
CONTRACTOR: Catlin	COMPLETION DATE: 12/19/98	LOGGED BY: Pam Jackson
METHOD: Power Probe DPT	BORING DIAMETER (in): 3	TOTAL DEPTH (ft bls): 12
TOC ELEVATION (ft msl): N/A	SCREEN INTERVAL (ft bls): N/A	DEPTH TO GW (ft bls): 3

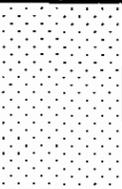
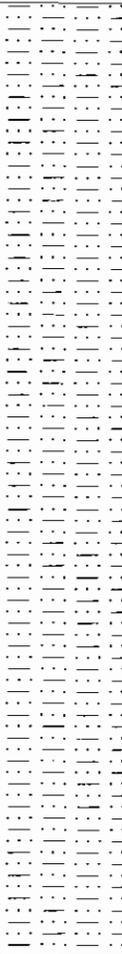
DEPTH (FT)	SAMPLE ID	HEADSPACE (PPM)	LITHOLOGIC DESCRIPTION	LITHOLOGIC SYMBOLS	USCS	BLOW COUNTS	WELL CONSTRUCTION
0	02SFB0902	0	SILTY SAND: ~20% silt (decreasing w/ depth), fine-grained, loose, dry to wet, grayish orange.		SM		
1		1	CLAYEY SAND: ~30-40% clay, silt, fine-grained, loose, cohesive, saturated, gray.		SC		
5			SAND: fine-grained, loose, well sorted, gray.		SP		
10			SILTY SAND: ~30-40% silt, very fine-grained, shells, soft, light grayish brown.		SM		
			End of boring.				
-15							

BASE: Charleston Naval Complex, Zone H	SITE ID: CNC02	PROJECT NO.: N7912
BORING ID: CNC02-B10	WELL ID: N/A	PIEZOMETER ID: N/A
CONTRACTOR: Catlin	COMPLETION DATE: 12/19/98	LOGGED BY: Pam Jackson
METHOD: Power Probe DPT	BORING DIAMETER (in): 3	TOTAL DEPTH (ft bls): 12
TOC ELEVATION (ft msl): N/A	SCREEN INTERVAL (ft bls): N/A	DEPTH TO GW (ft bls): 3

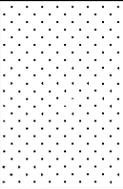
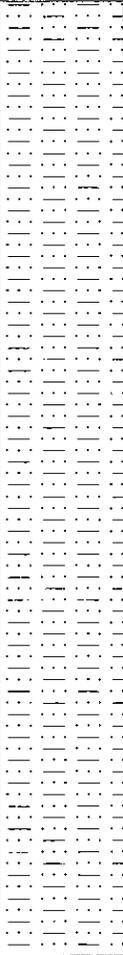
DEPTH (FT)	SAMPLE ID	HEADSPACE (PPM)	LITHOLOGIC DESCRIPTION	LITHOLOGIC SYMBOLS	USCS	BLOW COUNTS	WELL CONSTRUCTION
0			SAND: very fine-grained, loose, dry to wet, grayish orange.		SP		
0	02SFB1002	0					
5			SILTY SAND: ~30-40% silt, some clay, very fine-grained very soft, saturated, medium gray.		SM		
-10			End of boring.				
-15							



BASE: Charleston Naval Complex, Zone H	SITE ID: CNC02	PROJECT NO.: N7912
BORING ID: CNC02-B12	WELL ID: N/A	PIEZOMETER ID: N/A
CONTRACTOR: Catlin	COMPLETION DATE: 12/19/98	LOGGED BY: Pam Jackson
METHOD: Power Probe DPT	BORING DIAMETER (in): 3	TOTAL DEPTH (ft bls): 12
TOC ELEVATION (ft msl): N/A	SCREEN INTERVAL (ft bls): N/A	DEPTH TO GW (ft bls): 3

DEPTH (FT)	SAMPLE ID	HEADSPACE (PPM)	LITHOLOGIC DESCRIPTION	LITHOLOGIC SYMBOLS	USCS	BLOW COUNTS	WELL CONSTRUCTION
0							
		2	SAND: very fine to medium-grained, trace coarse-grained, loose, dry, pale grayish brown.		SW		
	02SFB1202	2	SILTY SAND: ~30-40% silt, some clay, fine-grained, soft wet, gray, becoming light brown w/ depth.		SM		
			End of boring.				
-10							
-15							

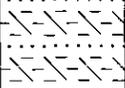
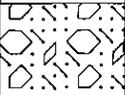
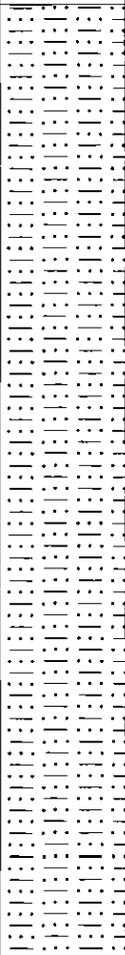
BASE: Charleston Naval Complex, Zone H	SITE ID: CNC02	PROJECT NO.: N7912
BORING ID: CNC02-B13	WELL ID: N/A	PIEZOMETER ID: N/A
CONTRACTOR: Catlin	COMPLETION DATE: 12/19/98	LOGGED BY: Pam Jackson
METHOD: Power Probe DPT	BORING DIAMETER (in): 3	TOTAL DEPTH (ft bls): 12
TOC ELEVATION (ft msl): N/A	SCREEN INTERVAL (ft bls): N/A	DEPTH TO GW (ft bls): 3

DEPTH (FT)	SAMPLE ID	HEADSPACE (PPM)	LITHOLOGIC DESCRIPTION	LITHOLOGIC SYMBOLS	USCS	BLOW COUNTS	WELL CONSTRUCTION
0		0	SAND: very fine-grained, trace silt increasing to ~15% w/ depth, loose, dry, pale grayish brown to brown.		SP		
0	02SFB1302	0	SILTY SAND: ~40% silt, trace phosphate pebbles, very fine-grained, soft, wet, gray, becoming light brown w/ depth.		SM		
-5							
-10							
-15			End of boring.				

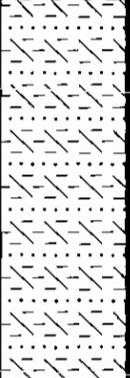
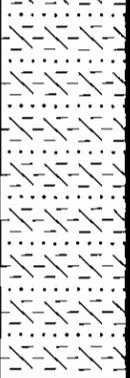
BASE: Charleston Naval Complex, Zone H	SITE ID: CNC02	PROJECT NO.: N7912
BORING ID: CNC02-B14	WELL ID: N/A	PIEZOMETER ID: N/A
CONTRACTOR: Catlin	COMPLETION DATE: 12/19/98	LOGGED BY: Pam Jackson
METHOD: Power Probe DPT	BORING DIAMETER (in): 3	TOTAL DEPTH (ft bls): 12
TOC ELEVATION (ft msl): N/A	SCREEN INTERVAL (ft bls): N/A	DEPTH TO GW (ft bls): 3

DEPTH (FT)	SAMPLE ID	HEADSPACE (PPM)	LITHOLOGIC DESCRIPTION	LITHOLOGIC SYMBOLS	USCS	BLOW COUNTS	WELL CONSTRUCTION
0			SILTY SAND: ~10% silt, very fine-grained, some shell, loose, dry, organic, very dark gray.				
2	02SFB1402	2	SILTY SAND: ~40% silt, very fine-grained, soft, cohesive, damp to wet, light brown.		SM		
-5							
-10							
-15			End of boring.				

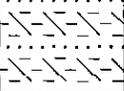
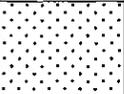
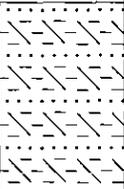
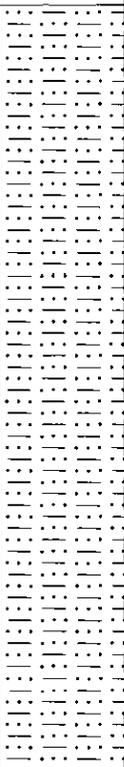
BASE: Charleston Naval Complex, Zone H	SITE ID: CNC02	PROJECT NO.: N7912
BORING ID: CNC02-B15	WELL ID: N/A	PIEZOMETER ID: N/A
CONTRACTOR: Catlin	COMPLETION DATE: 12/19/98	LOGGED BY: Pam Jackson
METHOD: Power Probe DPT	BORING DIAMETER (in): 3	TOTAL DEPTH (ft bls): 12
TOC ELEVATION (ft msl): N/A	SCREEN INTERVAL (ft bls): N/A	DEPTH TO GW (ft bls): 3

DEPTH (FT)	SAMPLE ID	HEADSPACE (PPM)	LITHOLOGIC DESCRIPTION	LITHOLOGIC SYMBOLS	USCS	BLOW COUNTS	WELL CONSTRUCTION
0	02SFB1502	5	CLAYEY SAND: ~30-35% clay, very fine to fine-grained, trace medium to coarse-grained, loose, dry, cohesive, reddish brown.		SC		
		3	SAND-GRAVEL-CLAY: ~20% clay, very fine to coarse-grained sand, fine to medium grained gravel, loose, dry, reddish brown.		CG		
				SILTY SAND: ~30-40% silt, some clay, very fine-grained soft, cohesive, wet, brown, becoming grayish brown w/ depth.		SM	
			End of boring.				

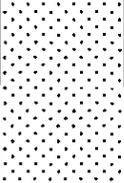
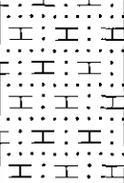
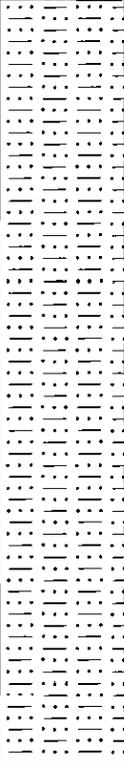
BASE: Charleston Naval Complex, Zone H	SITE ID: CNC02	PROJECT NO.: N7912
BORING ID: CNC02-B16	WELL ID: N/A	PIEZOMETER ID: N/A
CONTRACTOR: Catlin	COMPLETION DATE: 12/21/98	LOGGED BY: Pam Jackson
METHOD: Power Probe DPT	BORING DIAMETER (in): 3	TOTAL DEPTH (ft bls): 12
TOC ELEVATION (ft msl): N/A	SCREEN INTERVAL (ft bls): N/A	DEPTH TO GW (ft bls): 3

DEPTH (FT)	SAMPLE ID	HEADSPACE (PPM)	LITHOLOGIC DESCRIPTION	LITHOLOGIC SYMBOLS	USCS	BLOW COUNTS	WELL CONSTRUCTION
0		0	CLAYEY SAND: ~20-35% clay, fine-grained, trace shells, soft, cohesive, dry to wet, brown to very dark gray.				
	02SFB1602	0			SC		
-5			CLAYEY SAND: ~20% clay, fine-grained, loose, saturated, petroleum odor, gray.				
-10			SILTY SAND: ~40% silt, very fine-grained, soft, wet, petroleum odor, light brown.		SM		
-15			End of boring.				

BASE: Charleston Naval Complex, Zone H	SITE ID: CNC02	PROJECT NO.: N7912
BORING ID: CNC02-B17	WELL ID: N/A	PIEZOMETER ID: N/A
CONTRACTOR: Catlin	COMPLETION DATE: 12/21/98	LOGGED BY: Pam Jackson
METHOD: Power Probe DPT	BORING DIAMETER (in): 3	TOTAL DEPTH (ft bls): 12
TOC ELEVATION (ft msl): N/A	SCREEN INTERVAL (ft bls): N/A	DEPTH TO GW (ft bls): 4

DEPTH (FT)	SAMPLE ID	HEADSPACE (PPM)	LITHOLOGIC DESCRIPTION	LITHOLOGIC SYMBOLS	USCS	BLOW COUNTS	WELL CONSTRUCTION
0	02SFB1703	0	CLAYEY SAND: ~25% clay, very fine to coarse-grained, trace pebbles, some shell, soft, dry, brown.		SC		
		0	SAND: fine-grained, well sorted, loose, dry, very pale yellowish gray.		SP		
		0	SANDY CLAY: ~30% silt, ~10% fine sand, soft, cohesive, damp, brown.		CL		
		0	SILTY SAND: ~30% silt, very fine-grained, trace phosphate pebbles, soft to medium dense, wet, light brown.		SM		
			End of boring.				

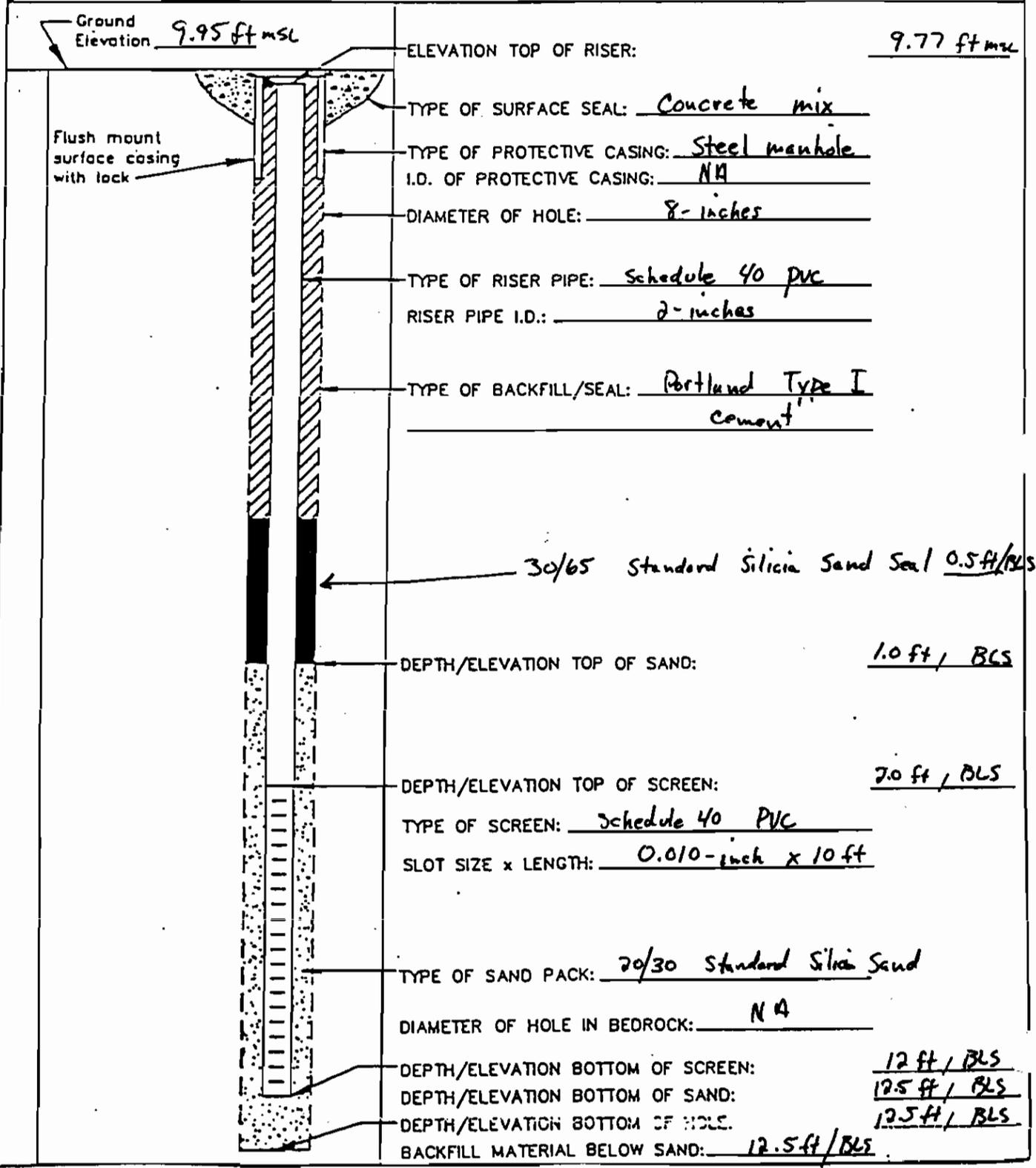
BASE: Charleston Naval Complex, Zone H	SITE ID: CNC02	PROJECT NO.: N7912
BORING ID: CNC02-B18	WELL ID: N/A	PIEZOMETER ID: N/A
CONTRACTOR: Catlin	COMPLETION DATE: 12/21/98	LOGGED BY: Pam Jackson
METHOD: Power Probe DPT	BORING DIAMETER (in): 3	TOTAL DEPTH (ft bls): 12
TOC ELEVATION (ft msl): N/A	SCREEN INTERVAL (ft bls): N/A	DEPTH TO GW (ft bls): 4

DEPTH (FT)	SAMPLE ID	HEADSPACE (PPM)	LITHOLOGIC DESCRIPTION	LITHOLOGIC SYMBOLS	USCS	BLOW COUNTS	WELL CONSTRUCTION
0			SAND: fine-grained, well sorted, loose, dry, very pale yellowish gray.		SP		
0			SILTY CLAY: ~40% silt, trace very fine-grained sand, non-plastic, stiff, damp to wet, gray.		CL		
0	02SFB1803		SILTY SAND: ~40% silt, very fine-grained sand, stiff, wet, light brown.		SM		
			End of boring.				

# MONITORING WELL SHEET

PROJECT CNC Zone H LOCATION Site 2 Building NS-53  
 PROJECT NO. CTO 0068/7912 BORING CNC 02-m01  
 ELEVATION TOC = DATE 12/1/98  
 FIELD GEOLOGIST. Pam Jackson

DRILLER Custom Drilling  
 DRILLING METHOD Hollow stem auger  
 DEVELOPMENT METHOD over pumping



Ground Elevation 9.95 ft msl ELEVATION TOP OF RISER: 9.77 ft msl

TYPE OF SURFACE SEAL: Concrete mix

TYPE OF PROTECTIVE CASING: Steel manhole  
 I.D. OF PROTECTIVE CASING: NA

DIAMETER OF HOLE: 8-inches

TYPE OF RISER PIPE: Schedule 40 pvc  
 RISER PIPE I.D.: 2-inches

TYPE OF BACKFILL/SEAL: Portland Type I cement

30/65 standard silica sand seal 0.5 ft/BLS

DEPTH/ELEVATION TOP OF SAND: 1.0 ft / BLS

DEPTH/ELEVATION TOP OF SCREEN: 7.0 ft / BLS

TYPE OF SCREEN: Schedule 40 PVC  
 SLOT SIZE x LENGTH: 0.010-inch x 10 ft

TYPE OF SAND PACK: 20/30 standard silica sand  
 DIAMETER OF HOLE IN BEDROCK: NA

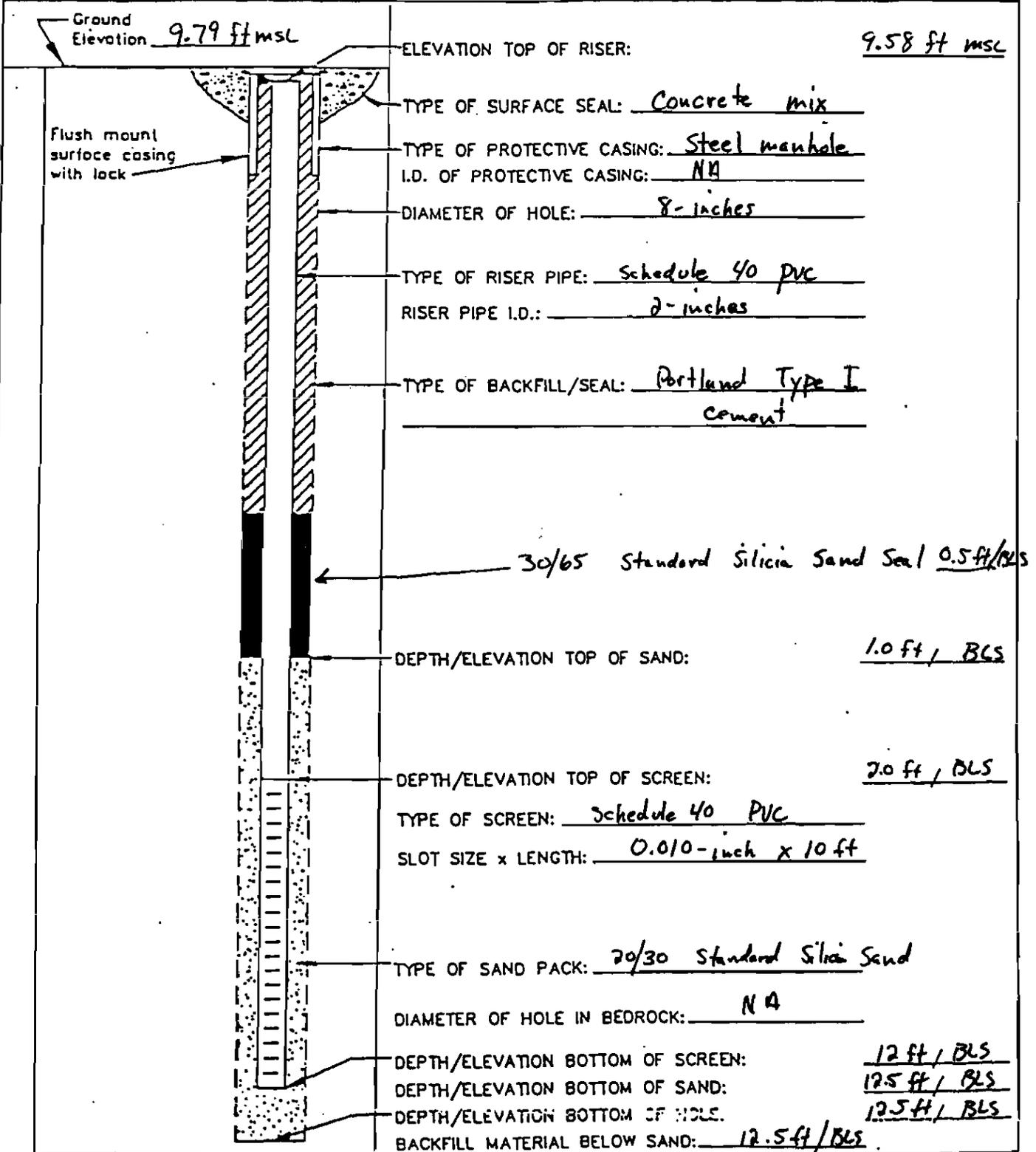
DEPTH/ELEVATION BOTTOM OF SCREEN: 12 ft / BLS  
 DEPTH/ELEVATION BOTTOM OF SAND: 12.5 ft / BLS  
 DEPTH/ELEVATION BOTTOM OF HOLE: 12.5 ft / BLS  
 BACKFILL MATERIAL BELOW SAND: 12.5 ft / BLS

# MONITORING WELL SHEET

PROJECT CNC Zone H  
 PROJECT NO. CTO 0068/7912  
 ELEVATION TOC =  
 FIELD GEOLOGIST Pam Jackson

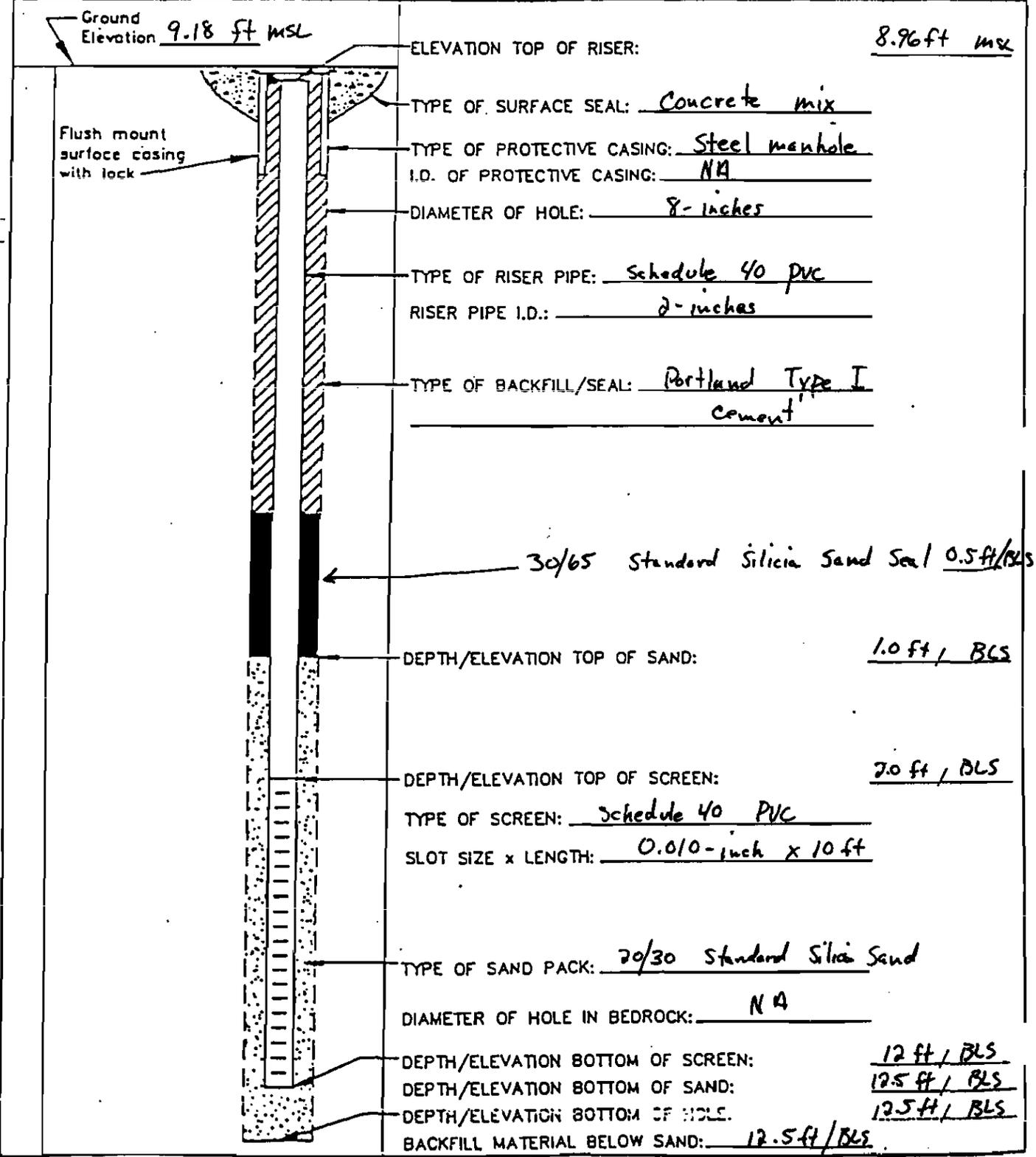
LOCATION Site 2 Building NS-83  
 BORING CNC 02-m02  
 DATE 12/198

DRILLER Custom Drilling  
 DRILLING METHOD Hollow Stem auger  
 DEVELOPMENT METHOD over pumping



# MONITORING WELL SHEET

PROJECT <u>CNC Zone H</u>	LOCATION <u>Site 2 Building NS-S3</u>	DRILLER <u>Custom Drilling</u>
PROJECT NO. <u>CTO 0068/7912</u>	BORING <u>CNC 02-M03</u>	DRILLING METHOD <u>Hollow Stem Auger</u>
ELEVATION <u>TOC =</u>	DATE <u>12/1/98</u>	DEVELOPMENT METHOD <u>over pumping</u>
FIELD GEOLOGIST <u>Pam Jackson</u>		



Ground Elevation 9.18 ft MSL

ELEVATION TOP OF RISER: 8.96 ft MSL

TYPE OF SURFACE SEAL: Concrete mix

TYPE OF PROTECTIVE CASING: Steel manhole

I.D. OF PROTECTIVE CASING: NA

DIAMETER OF HOLE: 8-inches

TYPE OF RISER PIPE: Schedule 40 PVC

RISER PIPE I.D.: 2-inches

TYPE OF BACKFILL/SEAL: Portland Type I cement

30/65 Standard Silica Sand Seal 0.5ft/BLS

DEPTH/ELEVATION TOP OF SAND: 1.0 ft / BLS

DEPTH/ELEVATION TOP OF SCREEN: 7.0 ft / BLS

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010-inch x 10 ft

TYPE OF SAND PACK: 20/30 Standard Silica Sand

DIAMETER OF HOLE IN BEDROCK: NA

DEPTH/ELEVATION BOTTOM OF SCREEN: 12 ft / BLS

DEPTH/ELEVATION BOTTOM OF SAND: 12.5 ft / BLS

DEPTH/ELEVATION BOTTOM OF HOLE: 12.5 ft / BLS

BACKFILL MATERIAL BELOW SAND: 12.5 ft / BLS

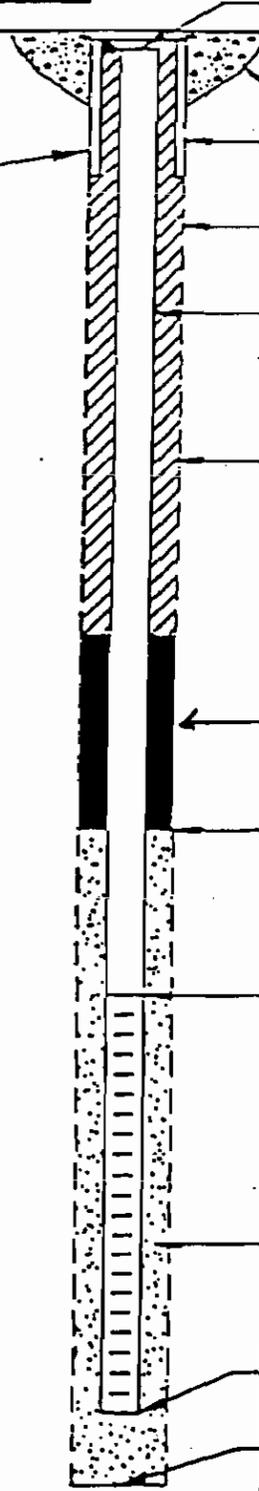
# MONITORING WELL SHEET

PROJECT CNC Zone H LOCATION Site 2 Building MS-53  
 PROJECT NO. CTO 0068/7912 BORING CNC 02-M04  
 ELEVATION TOC = DATE 12/198  
 FIELD GEOLOGIST Pam Jackson

DRILLER Custom Drilling  
 DRILLING METHOD Hollow Stem auger  
 DEVELOPMENT METHOD over pumping

Ground Elevation 9.14 ft msl

Flush mount surface casing with lock



ELEVATION TOP OF RISER:

8.90 ft msl

TYPE OF SURFACE SEAL: Concrete mix

TYPE OF PROTECTIVE CASING: Steel manhole

I.D. OF PROTECTIVE CASING: NA

DIAMETER OF HOLE: 8-inches

TYPE OF RISER PIPE: Schedule 40 PVC

RISER PIPE I.D.: 2-inches

TYPE OF BACKFILL/SEAL: Portland Type I cement

30/65 standard silica sand seal 0.5 ft/BLS

DEPTH/ELEVATION TOP OF SAND:

1.0 ft / BLS

DEPTH/ELEVATION TOP OF SCREEN:

7.0 ft / BLS

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010-inch x 10 ft

TYPE OF SAND PACK: 20/30 standard silica sand

DIAMETER OF HOLE IN BEDROCK: NA

DEPTH/ELEVATION BOTTOM OF SCREEN:

12 ft / BLS

DEPTH/ELEVATION BOTTOM OF SAND:

12.5 ft / BLS

DEPTH/ELEVATION BOTTOM OF HOLE:

12.5 ft / BLS

BACKFILL MATERIAL BELOW SAND: 12.5 ft / BLS

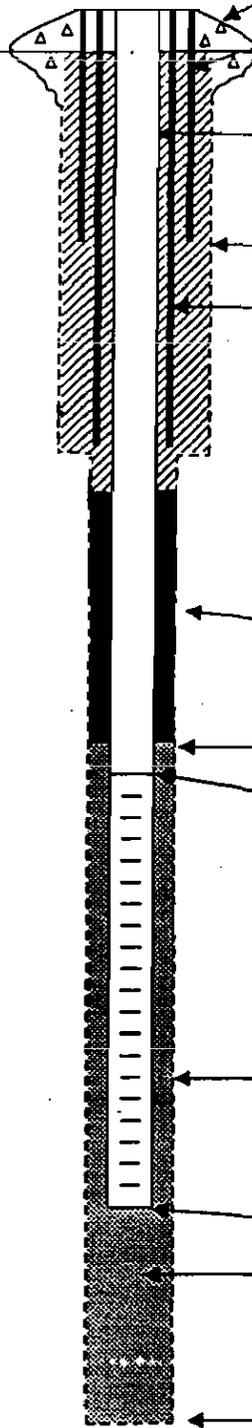
# MONITORING WELL SHEET

PROJECT CNC Zone H LOCATION Site 2 Building NS 53  
 PROJECT NO. CTO 0068/7912 BORING CNC 02-m05  
 ELEVATION TOC = 9.62 ft msl DATE 12/198  
 FIELD GEOLOGIST Pam Jackson

DRILLER Custom Drilling  
 DRILLING METHOD Hollow Stem Auger  
 DEVELOPMENT METHOD over pumping

GROUND ELEVATION

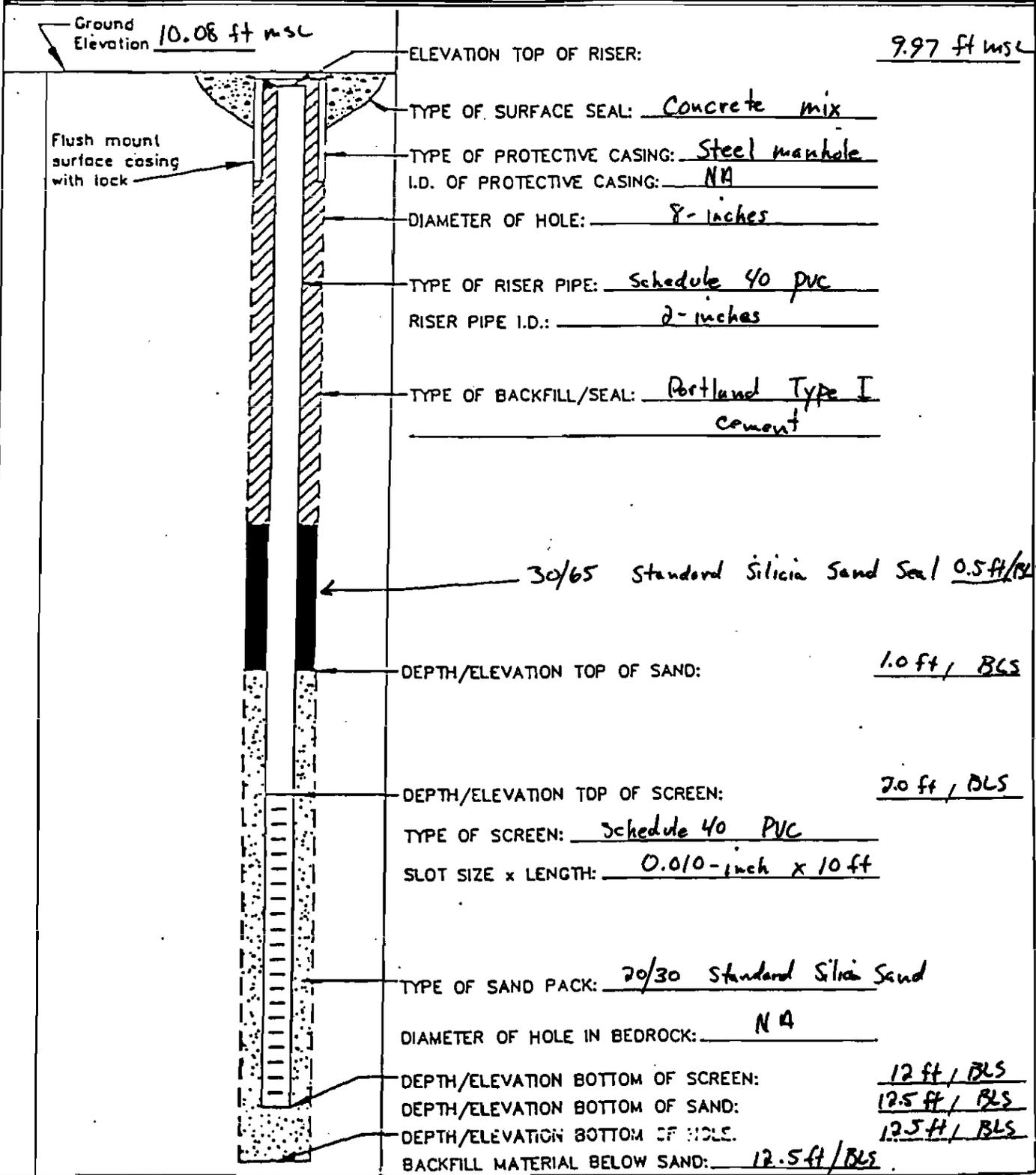
9.95 ft msl



TYPE OF SURFACE SEAL: Concrete mix  
 I.D. OF SURFACE CASING: 8-inch well  
 TYPE OF SURFACE CASING: u-girt with Steel manhole cover  
 RISER PIPE I.D.: 2-inch  
 TYPE OF RISER PIPE: Schedule 40 PVC  
 BOREHOLE DIAMETER: 10-inches  
 PERM. CASING I.D.: Schedule 40 PVC  
 TYPE OF CASING & BACKFILL: Portland Type I Cement  
 ELEVATION / DEPTH BOTTOM OF CASING: 20 ft / BLS  
 ELEVATION / DEPTH TOP OF SEAL: 19 ft / BLS  
 TYPE OF SEAL: 1-foot Bentonite Pellets 19 to 20' BLS  
 DEPTH TOP OF SAND PACK: 20 ft / BLS  
 ELEVATION/DEPTH TOP OF SCREEN: 27 ft / BLS  
 TYPE OF SCREEN: Schedule 40 PVC 0.010 slot  
 TYPE OF SAND PACK: 20/30 Standard silica Sand  
 BOREHOLE DIA. BELOW CASING: 6 inches  
 ELEVATION / DEPTH BOTTOM OF SCREEN: 27 ft / BLS  
 ELEVATION / DEPTH BOTTOM OF SAND PACK: 27.5 ft / BLS  
 TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 Standard Silica Sand  
 ELEVATION / DEPTH OF HOLE: 27.5 ft / BLS

# MONITORING WELL SHEET

PROJECT <u>CNC Zone H</u>	LOCATION <u>Site 2 Building NS-53</u>	DRILLER <u>Custom Drilling</u>
PROJECT NO. <u>CTO 0068/7912</u>	BORING <u>CNC02-P01</u>	DRILLING METHOD <u>Hollow Stem auger</u>
ELEVATION <u>TOC = 9.97 ft msl</u>	DATE <u>12/1/98</u>	DEVELOPMENT METHOD <u>over pumping</u>
FIELD GEOLOGIST <u>Pam Jackson</u>		



Ground Elevation 10.08 ft msl

ELEVATION TOP OF RISER: 9.97 ft msl

TYPE OF SURFACE SEAL: Concrete mix

TYPE OF PROTECTIVE CASING: Steel manhole

I.D. OF PROTECTIVE CASING: NA

DIAMETER OF HOLE: 8-inches

TYPE OF RISER PIPE: Schedule 40 PVC

RISER PIPE I.D.: 2-inches

TYPE OF BACKFILL/SEAL: Portland Type I cement

30/65 standard Silica Sand Seal 0.5 ft/BLS

DEPTH/ELEVATION TOP OF SAND: 1.0 ft / BLS

DEPTH/ELEVATION TOP OF SCREEN: 2.0 ft / BLS

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010-inch x 10 ft

TYPE OF SAND PACK: 20/30 standard Silica Sand

DIAMETER OF HOLE IN BEDROCK: NA

DEPTH/ELEVATION BOTTOM OF SCREEN: 12 ft / BLS

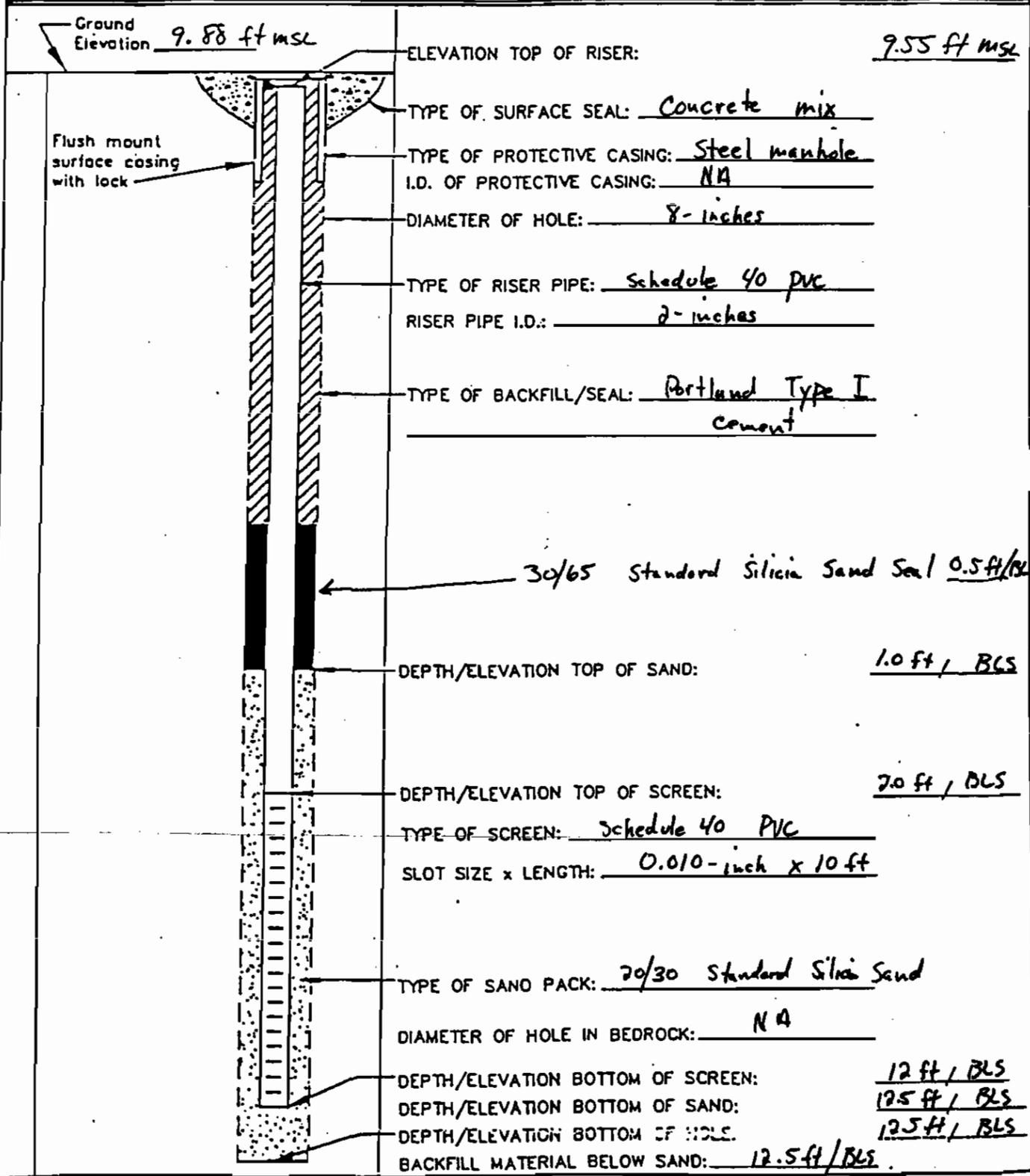
DEPTH/ELEVATION BOTTOM OF SAND: 12.5 ft / BLS

DEPTH/ELEVATION BOTTOM OF HOLE: 12.5 ft / BLS

BACKFILL MATERIAL BELOW SAND: 12.5 ft / BLS

# MONITORING WELL SHEET

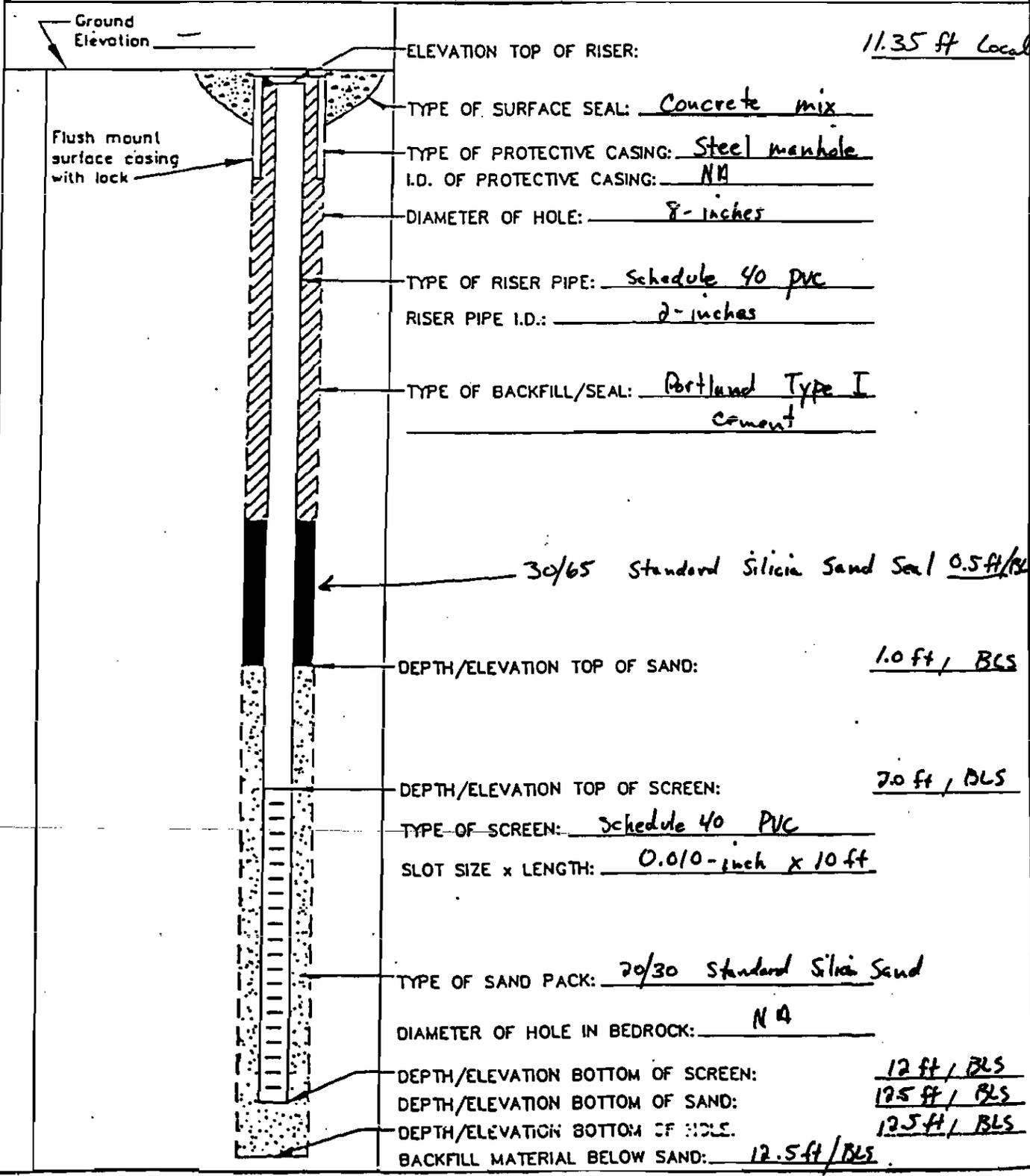
PROJECT <u>CNC zone H</u>	LOCATION <u>Site 2 Building NS-53</u>	DRILLER <u>Custom Drilling</u>
PROJECT NO. <u>CTO 0068/7912</u>	BORING <u>CNC02-P02</u>	DRILLING METHOD <u>Hollow Stem Auger</u>
ELEVATION <u>TOC = 7.55 ft msl</u>	DATE <u>12/198</u>	DEVELOPMENT METHOD <u>over pumping</u>
FIELD GEOLOGIST <u>Pam Jackson</u>		



# MONITORING WELL SHEET

CNC 02-P03

PROJECT <u>CNC Zone H</u>	LOCATION <u>CNC Site 2</u>	DRILLER <u>Custom Drilling</u>
PROJECT NO. <u>CTO 0068/7912</u>	BORING <u>CNC02-P03</u>	DRILLING METHOD <u>Hollow Stem Auger</u>
ELEVATION <u>TOC = 11.35' Local</u>	DATE <u>12/1/98</u>	DEVELOPMENT METHOD <u>over pumping</u>
FIELD GEOLOGIST <u>Pam Jackson</u>		



ELEVATION TOP OF RISER: 11.35 ft Local

TYPE OF SURFACE SEAL: Concrete mix

TYPE OF PROTECTIVE CASING: Steel manhole

I.D. OF PROTECTIVE CASING: NA

DIAMETER OF HOLE: 8-inches

TYPE OF RISER PIPE: Schedule 40 PVC

RISER PIPE I.D.: 2-inches

TYPE OF BACKFILL/SEAL: Portland Type I cement

30/65 standard silica sand seal 0.5 ft/BLS

DEPTH/ELEVATION TOP OF SAND: 1.0 ft / BLS

DEPTH/ELEVATION TOP OF SCREEN: 7.0 ft / BLS

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010-inch x 10 ft

TYPE OF SAND PACK: 20/30 standard silica sand

DIAMETER OF HOLE IN BEDROCK: NA

DEPTH/ELEVATION BOTTOM OF SCREEN: 12 ft / BLS

DEPTH/ELEVATION BOTTOM OF SAND: 12.5 ft / BLS

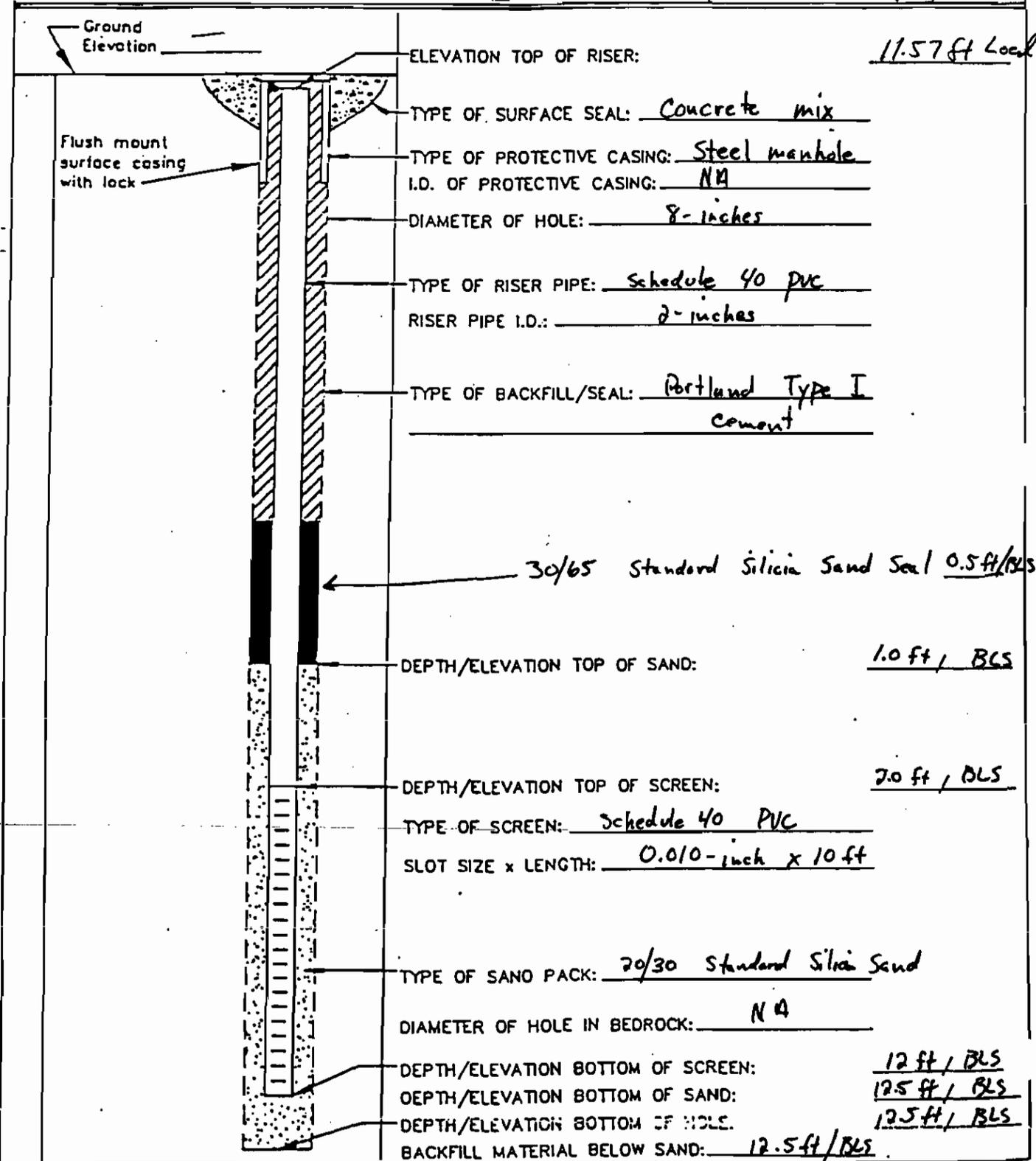
DEPTH/ELEVATION BOTTOM OF HOLE: 12.5 ft / BLS

BACKFILL MATERIAL BELOW SAND: 12.5 ft / BLS

# MONITORING WELL SHEET

CNC02- P04

PROJECT <u>CNC Zone H</u>	LOCATION <u>Site 2 Building NS-353</u>	DRILLER <u>Custom Drilling</u>
PROJECT NO. <u>CTO 0068/7912</u>	BORING <u>CNC 02- P04</u>	DRILLING METHOD <u>Hollow Stem Auger</u>
ELEVATION <u>TOC = 11.57' Local</u>	DATE <u>12/ /98</u>	DEVELOPMENT METHOD <u>over pumping</u>
FIELD GEOLOGIST <u>Pam Jackson</u>		



ELEVATION TOP OF RISER: 11.57 ft Local

TYPE OF SURFACE SEAL: Concrete mix

TYPE OF PROTECTIVE CASING: Steel manhole

I.D. OF PROTECTIVE CASING: NA

DIAMETER OF HOLE: 8-inches

TYPE OF RISER PIPE: Schedule 40 PVC

RISER PIPE I.D.: 2-inches

TYPE OF BACKFILL/SEAL: Portland Type I cement

30/65 standard silica sand seal 0.5 ft/BLS

DEPTH/ELEVATION TOP OF SAND: 1.0 ft / BLS

DEPTH/ELEVATION TOP OF SCREEN: 7.0 ft / BLS

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010-inch x 10 ft

TYPE OF SAND PACK: 20/30 standard silica sand

DIAMETER OF HOLE IN BEDROCK: NA

DEPTH/ELEVATION BOTTOM OF SCREEN: 12 ft / BLS

DEPTH/ELEVATION BOTTOM OF SAND: 12.5 ft / BLS

DEPTH/ELEVATION BOTTOM OF HOLE: 12.5 ft / BLS

BACKFILL MATERIAL BELOW SAND: 12.5 ft / BLS

**APPENDIX C**

**FIELD SAMPLING DATA SHEETS**



# SAMPLE LOG SHEET

## NATURAL ATTENUATION PARAMETERS

Tetra Tech NUS, Inc.

Page 1 of 2

Project Site Name: Zone H, Site 2  
 Project No.: 7912  
 Sampled By: P. Jackson

Sample ID No.: 02GSM0201  
 Sample Location: CNC02-M02  
 Duplicate:

**SAMPLING DATA:**

Date: <u>3-8-99</u>	Color (Visual)	pH (SU)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (Meter, mg/l)	Sal. (%)
Time:							
Method: <u>Peristaltic pump</u>							

**SAMPLE COLLECTION/ANALYSIS INFORMATION:**

**Dissolved Oxygen:**

Equipment: HACH Digital Titrator OX-DT

Analysis Time: 1305

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
<input checked="" type="checkbox"/>	1-5 mg/L	200 ml	0.200 N	0.01
<input type="checkbox"/>	2-10 mg/L	100 ml	0.200 N	0.02

Titration Count	Multiplier	Concentration
<u>365</u>	x 0.01	= <u>3.65</u>
	x 0.02	=

Notes:

**Alkalinity:**

Equipment: HACH Digital Titrator AL-DT

Analysis Time: 1335

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration
<input type="checkbox"/>	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	=
<input type="checkbox"/>	40-160 mg/L	25 ml	0.1600 N	0.4	&	x 0.4	=
<input type="checkbox"/>	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	=
<input type="checkbox"/>	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=
<input type="checkbox"/>	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0	=
<input checked="" type="checkbox"/>	1000-4000 mg/L	10 ml	1.600 N	10.0	<u>0</u> & <u>25</u>	x 10.0	= <u>250</u>

Relationship	Hydroxide	Carbonate	Bicarbonate
Concentration	<u>0</u> mg/L	<u>0</u> mg/L	<u>250</u> mg/L

Notes:

Standard Additions:  Titrant Molarity: \_\_\_\_\_ Digits Required: 1st.: \_\_\_\_\_ 2nd.: \_\_\_\_\_ 3rd.: \_\_\_\_\_

**Carbon Dioxide:**

Equipment: HACH Digital Titrator CA-DT

Analysis Time: 1350

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
<input type="checkbox"/>	10-50 mg/L	200 ml	0.3636 N	0.1
<input type="checkbox"/>	20-100 mg/L	100 ml	0.3636 N	0.2
<input type="checkbox"/>	100-400 mg/L	200 ml	3.636 N	1.0
<input checked="" type="checkbox"/>	200-1000 mg/L	100 ml	3.636 N	2.0

Titration Count	Multiplier	Concentration
	x 0.1	=
	x 0.2	=
	x 1.0	=
<u>38</u>	x 2.0	= <u>76</u>

Notes:

Standard Additions:  Titrant Molarity: \_\_\_\_\_ Digits Required: 0.1ml: \_\_\_\_\_ 0.2ml: \_\_\_\_\_ 0.3ml: \_\_\_\_\_



GROUNDWATER SAMPLE LOG SHEET  
NATURAL ATTENUATION PARAMETERS

Tetra Tech NUS, Inc.

Page 2 of 2

Project Site Name: <u>CWC Zone H</u>	Sample ID No.: <u>02GESM0201</u>
Project No.: <u>7912</u>	Sample Location: <u>CWC02-002</u>
Sampled By: <u>P. JACKSON</u>	Duplicate: <input type="checkbox"/>

SAMPLE COLLECTION/ANALYSIS INFORMATION:

**Sulfide:**

Equipment:  HACH DR-890 Colorimeter      HS-C Color Chart      Analysis Time: 1415

Program No.: \_\_\_\_\_

Concentration: 0.01 mg/L      Filtered:

Notes: \_\_\_\_\_

**Ferrous Iron:**

Equipment:  HACH DR-890 Colorimeter      IR-18C Color Wheel      Analysis Time: 1450  
1550 P5

Program No.: \_\_\_\_\_

Concentration: 0.02 mg/L      Filtered:

Notes: \_\_\_\_\_

**Nitrite:**

Equipment:  HACH DR-890 Colorimeter      Analysis Time: 1435

Program No.: \_\_\_\_\_

Concentration: 0.029 mg/L      Filtered:   
Reagent Blank Correction:

Standard Solution:       Results: \_\_\_\_\_

Notes: \_\_\_\_\_

**Nitrate:**

Equipment:  HACH DR-890 Colorimeter      Analysis Time: \_\_\_\_\_

Program No.: \_\_\_\_\_

Concentration: \_\_\_\_\_ mg/L

Standard Solution:       Results: \_\_\_\_\_

Standard Additions:       Digits Required: 0.1ml: \_\_\_\_\_ 0.2ml: \_\_\_\_\_ 0.3ml: \_\_\_\_\_

Nitrite Interference Treatment:

Reagent Blank Correction:

Notes: \_\_\_\_\_

1500 Manganese 157<sup>P5</sup> mg/L  
0.1



**SAMPLE LOG SHEET**  
**NATURAL ATTENUATION PARAMETERS**

Tetra Tech NUS, Inc.

Page 1 of 2

Project Site Name: Zone H, Site 2 Sample ID No.: 02GSP0101  
 Project No.: 7912 Sample Location: CNC02-110  
 Sampled By: P. JACKSON Duplicate:  PO1

**SAMPLING DATA:**

Date: <u>3-8-99</u>	Color	pH	S.C.	Temp.	Turbidity	DO	Sal.
Time:	(Visual)	(SU)	(mS/cm)	(°C)	(NTU)	(Meter, mg/l)	(%)
Method: <u>Peristaltic pump</u>							

**SAMPLE COLLECTION/ANALYSIS INFORMATION:**

**Dissolved Oxygen:**  
 Equipment: HACH Digital Titrator OX-DT Analysis Time: 1320

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration
<input checked="" type="checkbox"/>	1-5 mg/L	200 ml	0.200 N	0.01	<u>0</u>	x 0.01	= <u>0</u>
<input type="checkbox"/>	2-10 mg/L	100 ml	0.200 N	0.02		x 0.02	=

Notes: Initial reagents indicated no O<sub>2</sub>

**Alkalinity:**  
 Equipment: HACH Digital Titrator AL-DT Analysis Time: 1340

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration
<input type="checkbox"/>	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	=
<input type="checkbox"/>	40-160 mg/L	25 ml	0.1600 N	0.4	&	x 0.4	=
<input type="checkbox"/>	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	=
<input type="checkbox"/>	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=
<input type="checkbox"/>	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0	=
<input checked="" type="checkbox"/>	1000-4000 mg/L	10 ml	1.600 N	10.0	<u>0</u> & <u>50</u>	x 10.0	= <u>500</u>

Relationship	Hydroxide	Carbonate	Bicarbonate
Concentration	<u>0</u> mg/L	<u>0</u> mg/L	<u>500</u> mg/L

Notes: Sodium Hydroxide turned sample dark yellow & as

Standard Additions:  Titrant Molarity: \_\_\_\_\_ Digits Required: 1st.: \_\_\_\_\_ 2nd.: \_\_\_\_\_ 3rd.: \_\_\_\_\_

**Carbon Dioxide:**  
 Equipment: HACH Digital Titrator CA-DT Analysis Time: 1355

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration
<input type="checkbox"/>	10-50 mg/L	200 ml	0.3636 N	0.1		x 0.1	=
<input type="checkbox"/>	20-100 mg/L	100 ml	0.3636 N	0.2		x 0.2	=
<input type="checkbox"/>	100-400 mg/L	200 ml	3.636 N	1.0		x 1.0	=
<input checked="" type="checkbox"/>	200-1000 mg/L	100 ml	3.636 N	2.0	<u>?</u>	x 2.0	= <u>?</u>

Notes: Sodium Hydroxide turned sample dark yellow - did not turn pink.

Standard Additions:  Titrant Molarity: \_\_\_\_\_ Digits Required: 0.1ml: \_\_\_\_\_ 0.2ml: \_\_\_\_\_ 0.3ml: \_\_\_\_\_



GROUNDWATER SAMPLE LOG SHEET  
NATURAL ATTENUATION PARAMETERS

Tetra Tech NUS, Inc.

Page 2 of 2

Project Site Name: <u>CNC Zone H</u>	Sample ID No.: <u>02GSP0101</u>
Project No.: <u>7912</u>	Sample Location: <u>CNC02-P01</u>
Sampled By: <u>P. JACKSON</u>	Duplicate: <input type="checkbox"/>

**SAMPLE COLLECTION/ANALYSIS INFORMATION:**

**Sulfide:**

Equipment: HACH DR-890 Colorimeter      HS-C Color Chart      Analysis Time: 1416

Program No.: \_\_\_\_\_

Concentration: 0.01 mg/L      Filtered:

Notes: \_\_\_\_\_

**Ferrous Iron:**

Equipment: HACH DR-890 Colorimeter      IR-18C Color Wheel      Analysis Time: 1451  
~~155105~~

Program No.: \_\_\_\_\_

Concentration: 3.30\* mg/L      Filtered:

Notes: \*Detection limit. May be higher value

**Nitrite:**

Equipment: HACH DR-890 Colorimeter      Analysis Time: 1436

Program No.: \_\_\_\_\_

Concentration: 0.018 mg/L      Filtered:   
Reagent Blank Correction:

Standard Solution:       Results: \_\_\_\_\_

Notes: \_\_\_\_\_

**Nitrate:**

Equipment: HACH DR-890 Colorimeter      Analysis Time: \_\_\_\_\_

Program No.: \_\_\_\_\_

Concentration: \_\_\_\_\_ mg/L

Standard Solution:       Results: \_\_\_\_\_      Nitrite Interference Treatment:

Standard Additions:       Reagent Blank Correction:

Digits Required: 0.1ml: \_\_\_\_\_ 0.2ml: \_\_\_\_\_ 0.3ml: \_\_\_\_\_

Notes: \_\_\_\_\_

1500 Manganese 15.7 mg/L



# SAMPLE LOG SHEET

## NATURAL ATTENUATION PARAMETERS

Tetra Tech NUS, Inc.

Page 1 of 2

Project Site Name: <u>Zone H, Site 2</u>	Sample ID No.: <u>NBCH 178-002</u>
Project No.: <u>7912</u>	Sample Location: <u>NBCH 178-002</u>
Sampled By: <u>P. Jackson</u>	Duplicate: <input type="checkbox"/>

**SAMPLING DATA:**

Date: <u>3-8-99</u>	Color (Visual)	pH (SU)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (Meter, mg/l)	Sal. (%)
Time:							
Method: <u>Peristaltic pump</u>							

**SAMPLE COLLECTION/ANALYSIS INFORMATION:**

**Dissolved Oxygen:**

Equipment: HACH Digital Titrator OX-DT      Analysis Time: 1330

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration
<input checked="" type="checkbox"/>	1-5 mg/L	200 ml	0.200 N	0.01	<u>291</u>	x 0.01	= <u>2.91</u>
<input checked="" type="checkbox"/>	2-10 mg/L	100 ml	0.200 N	0.02		x 0.02	=

Notes:

**Alkalinity:**

Equipment: HACH Digital Titrator AL-DT      Analysis Time: 1345

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration
<input type="checkbox"/>	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	=
<input type="checkbox"/>	40-160 mg/L	25 ml	0.1600 N	0.4	&	x 0.4	=
<input type="checkbox"/>	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	=
<input type="checkbox"/>	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=
<input type="checkbox"/>	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0	=
<input checked="" type="checkbox"/>	1000-4000 mg/L	10 ml	1.600 N	10.0	<u>0</u> & <u>22</u>	x 10.0	= <u>220</u>

Relationship	Hydroxide	Carbonate	Bicarbonate
Concentration	<u>0</u> mg/L	<u>0</u> mg/L	<u>220</u> mg/L

Notes:

Standard Additions:     Titrant Molarity: \_\_\_\_\_    Digits Required: 1st.: \_\_\_\_\_ 2nd.: \_\_\_\_\_ 3rd.: \_\_\_\_\_

**Carbon Dioxide:**

Equipment: HACH Digital Titrator CA-DT      Analysis Time: 1400

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration
<input type="checkbox"/>	10-50 mg/L	200 ml	0.3636 N	0.1		x 0.1	=
<input type="checkbox"/>	20-100 mg/L	100 ml	0.3636 N	0.2		x 0.2	=
<input type="checkbox"/>	100-400 mg/L	200 ml	3.636 N	1.0		x 1.0	=
<input checked="" type="checkbox"/>	200-1000 mg/L	100 ml	3.636 N	2.0	<u>26</u>	x 2.0	= <u>52</u>

Notes:

Standard Additions:     Titrant Molarity: \_\_\_\_\_    Digits Required: 0.1ml: \_\_\_\_\_ 0.2ml: \_\_\_\_\_ 0.3ml: \_\_\_\_\_



**GROUNDWATER SAMPLE LOG SHEET  
NATURAL ATTENUATION PARAMETERS**

Tetra Tech NUS, Inc.

Page 2 of 2

Project Site Name: <u>CNC Zone H</u>	Sample ID No.: <u>NBCH178-002</u>
Project No.: <u>7912</u>	Sample Location: <u>NBCH178-002</u>
Sampled By: <u>P. Jackson</u>	Duplicate: <input type="checkbox"/>

**SAMPLE COLLECTION/ANALYSIS INFORMATION:**

**Sulfide:**

Equipment: HACH DR-890 Colorimeter	HS-C Color Chart	Analysis Time: <u>1417</u>
Program No.:		
Concentration: <u>0.01</u> mg/L		Filtered: <input checked="" type="checkbox"/>
Notes:		

**Ferrous Iron:**

Equipment: HACH DR-890 Colorimeter	IR-18C Color Wheel	Analysis Time: <u>1452</u>
Program No.:		
Concentration: <u>0.20</u> mg/L		Filtered: <input type="checkbox"/>
Notes:		

**Nitrite:**

Equipment: HACH DR-890 Colorimeter	Analysis Time: <u>1437</u>
Program No.:	
Concentration: <u>0.013</u> mg/L	Filtered: <input checked="" type="checkbox"/>
	Reagent Blank Correction: <input checked="" type="checkbox"/>
	Standard Solution: <input type="checkbox"/> Results: _____
Notes:	

**Nitrate:**

Equipment: HACH DR-890 Colorimeter	Analysis Time: _____
Program No.:	
Concentration: _____ mg/L	
Standard Solution: <input type="checkbox"/>	Results: _____
Standard Additions: <input type="checkbox"/>	Digits Required: 0.1ml: _____ 0.2ml: _____ 0.3ml: _____
	Nitrite Interference Treatment: <input type="checkbox"/>
	Reagent Blank Correction: <input type="checkbox"/>
Notes:	

1500 Manganese 0 mg/L

**APPENDIX D**

**SOIL AND GROUNDWATER LABORATORY ANALYTICAL DATA**



# GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

Page 1 of 3

Sample ID : 02SLB0103  
Lab ID : 9901644-04  
Matrix : Soil  
Date Collected : 01/20/99  
Date Received : 01/20/99  
Priority : Routine  
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
<i>BTEX/NAP/MTBE - 6 items</i>											
BENZENE	U	ND	0.495	5.00	ug/kg	1.0	SLG	01/22/99	1820	140472	1
ETHYLBENZENE	U	ND	0.297	5.00	ug/kg	1.0					
TERT-BUTYL METHYL ETHER		ND	0.176	5.50	ug/kg	1.0					
NAPHTHALENE	U	ND	0.671	5.00	ug/kg	1.0					
TOLUENE	U	ND	1.03	5.00	ug/kg	1.0					
XYLENES, TOTAL	U	ND	0.275	5.00	ug/kg	1.0					
<b>Organic Prep</b>											
EVAPORATIVE LOSS @ 105 C		15.0	1.00	1.00	wt%	1.0	GJ	01/22/99	1540	140397	2
<b>Extractable Organics</b>											
<i>Polyaromatic Hydrocarbon Compounds - 15 items</i>											
ACENAPHTHENE	U	ND	188	392	ug/kg	1.0	JPA	01/25/99	1409	140432	3
ACENAPHTHYLENE	U	ND	173	392	ug/kg	1.0					
ANTHRACENE	U	ND	103	392	ug/kg	1.0					
BENZO(A)ANTHRACENE	U	ND	80.4	392	ug/kg	1.0					
BENZO(A)PYRENE	U	ND	84.3	392	ug/kg	1.0					
BENZO(B)FLUORANTHENE	U	ND	167	392	ug/kg	1.0					
BENZO(G,H,I)PERYLENE	U	ND	95.6	392	ug/kg	1.0					
BENZO(K)FLUORANTHENE	U	ND	155	392	ug/kg	1.0					
CHRYSENE	U	ND	64.3	392	ug/kg	1.0					
DIBENZ(A,H)ANTHRACENE	U	ND	97.6	392	ug/kg	1.0					
FLUORANTHENE	U	ND	76.8	392	ug/kg	1.0					
FLUORENE	U	ND	134	392	ug/kg	1.0					
INDENO(1,2,3-CD)PYRENE	U	ND	94.5	392	ug/kg	1.0					
PHENANTHRENE	U	ND	70.6	392	ug/kg	1.0					
PYRENE	U	ND	84.7	392	ug/kg	1.0					
<b>General Chemistry</b>											
Total Rec. Petro. Hydrocarbons		271	59.0	118	mg/kg	1.0	AAT	02/04/99	1500	141509	4



# GENERAL ENGINEERING LABORATORIES

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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442  
Contact: Mr. Arnold Lamb  
Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

Page 2 of 3

Sample ID : 02SLB0103

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
-----------	-----------	--------	----	----	-------	----	---------	------	------	-------	---

### The following prep procedures were performed:

Volatiles 8260 High Level  
GC/MS Base/Neutral Compounds

SLG 01/27/99 1505 140472 5  
CPU 01/22/99 2215 140432 2

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610-TETR	60.7	(44.7 - 110.)
Nitrobenzene-d5	M610-TETR	56.7	(42.4 - 107.)
p-Terphenyl-d14	M610-TETR	81.4	(45.5 - 104.)
Bromofluorobenzene	BTEX/NAP/MTBE-8260B	112.	(53.5 - 154.)
Dibromofluoromethane	BTEX/NAP/MTBE-8260B	108.	(63.4 - 136.)
Toluene-d8	BTEX/NAP/MTBE-8260B	115.	(72.1 - 137.)

M = Method	Method-Description
M 1	SW846 8260B
M 2	EPA 3550
M 3	EPA 8270C
M 4	SW846 9071A
M 5	EPA 5035

### Notes:

The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.



# GENERAL ENGINEERING LABORATORIES

*Meeting today's needs with a vision for tomorrow.*

## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442  
Contact: Mr. Arnold Lamb  
Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

Page 3 of 3

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Sample ID : 02SLB0103

---

### M = Method

### Method-Description

---

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Valerie Davis at (843) 769-7391.

Reviewed By

**GEOTECHNICAL SPREADSHEET**

Project Number: tet00498  
 Sample Number: 9901644-11  
 Boring Number: NA  
 Location: NA

Depth: UNKNOWN  
 Tested By: M. Yates  
 Date: 2/17/99

Site  
2

**GRAIN-SIZE ANALYSIS**

**HYGROSCOPIC MOISTURE CONTENT DETERMINATION**

weight of total air dried sample= 116.19  
 weight of container + air-dried soil= 33.72  
 weight of container + oven-dried soil= 32.75  
 weight of container= 7.05  
  
 weight of water= 0.97  
 weight of oven-dried soil= 25.7  
 weight of air-dried soil= 26.67  
 hygroscopic moisture correction factor= 0.96  
 weight of oven-dried sample for hydro. anal.= 111.54

**SIEVE ANALYSIS**

weight of oven-dried sample= 111.54

Sieve #	Weight Ret.	Weight Passed	% Passing
4	7.52	104.02	93.3
10	0	104.02	93.3
20	2.6	101.42	90.9
40	2.16	99.26	89.0
60	3.9	95.36	85.5
100	16.55	78.51	70.7
200	17.48	61.33	55.0
230	2.21	59.12	53.0
pan	0.46	58.66	52.6

**HYDROMETER ANALYSIS**

weight 111.54  
 SG 2.45

TIME	ACTUAL READING	TEMP.	COMPOSITE CORRECTION	R	LENGTH	K	DIAMETER	P
2	1.037	22	0.00325	1.03375	6.5	0.01421	.02560	51.1
5	1.034	22	0.00325	1.03075	7.3	0.01421	.01716	46.6
15	1.032	22	0.00325	1.02875	7.8	0.01421	.01026	43.6
30	1.031	22	0.00325	1.02775	8.1	0.01421	.00738	42.0
60	1.029	22	0.00325	1.02575	8.6	0.01421	.00538	39.0
250	1.027	21	0.00350	1.02350	9.1	0.01438	.00275	35.6
1440	1.023	21	0.00350	1.01950	10.2	0.01438	.00121	29.5





# GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442  
Contact: Mr. Arnold Lamb  
Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

Page 1 of 3

Sample ID : 02SLB1002  
Lab ID : 9901644-05  
Matrix : Soil  
Date Collected : 01/20/99  
Date Received : 01/20/99  
Priority : Routine  
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
<i>BTEX/NAP/MTBE - 6 items</i>											
BENZENE	U	ND	0.441	5.00	ug/kg	1.0	SLG	01/22/99	1848	140472	1
ETHYLBENZENE	U	ND	0.265	5.00	ug/kg	1.0					
TERT-BUTYL METHYL ETHER		ND	0.157	5.00	ug/kg	1.0					
NAPHTHALENE	U	ND	0.598	5.00	ug/kg	1.0					
TOLUENE	U	ND	0.922	5.00	ug/kg	1.0					
XYLENES, TOTAL	U	ND	0.245	5.00	ug/kg	1.0					
<b>Organic Prep</b>											
EVAPORATIVE LOSS @ 105 C		16.0	1.00	1.00	wt%	1.0	GJ	01/22/99	1540	140397	2
<b>Extractable Organics</b>											
<i>Polyaromatic Hydrocarbon Compounds - 15 items</i>											
ACENAPHTHENE	U	ND	191	397	ug/kg	1.0	JPA	01/25/99	1441	140432	3
ACENAPHTHYLENE	U	ND	175	397	ug/kg	1.0					
ANTHRACENE	U	ND	104	397	ug/kg	1.0					
BENZO(A)ANTHRACENE	U	ND	81.4	397	ug/kg	1.0					
BENZO(A)PYRENE	U	ND	85.4	397	ug/kg	1.0					
BENZO(B)FLUORANTHENE	U	ND	169	397	ug/kg	1.0					
BENZO(G,H,I)PERYLENE	U	ND	96.9	397	ug/kg	1.0					
BENZO(K)FLUORANTHENE	U	ND	157	397	ug/kg	1.0					
CHRYSENE	U	ND	65.1	397	ug/kg	1.0					
DIBENZ(A,H)ANTHRACENE	U	ND	98.9	397	ug/kg	1.0					
FLUORANTHENE	U	ND	77.8	397	ug/kg	1.0					
FLUORENE	U	ND	136	397	ug/kg	1.0					
INDENO(1,2,3-CD)PYRENE	U	ND	95.7	397	ug/kg	1.0					
PHENANTHRENE	U	ND	71.5	397	ug/kg	1.0					
PYRENE	U	ND	85.8	397	ug/kg	1.0					





# GENERAL ENGINEERING LABORATORIES

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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
 794 South Military Trail  
 Deerfield Beach, Florida 33442  
 Contact: Mr. Arnold Lamb  
 Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

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Sample ID : 02SLB1002

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
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**The following prep procedures were performed:**

Volatiles 8260 High Level  
 GC/MS Base/Neutral Compounds

SLG 01/27/99 1505 140472 4  
 CPU 01/22/99 2215 140432 2

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610-TETR	49.4	(30.0 - 115.)
Nitrobenzene-d5	M610-TETR	45.9	(23.0 - 120.)
p-Terphenyl-d14	M610-TETR	76.8	(37.3 - 128.)
Bromofluorobenzene	BTEX/NAP/MTBE-8260B	113.	(53.5 - 154.)
Dibromofluoromethane	BTEX/NAP/MTBE-8260B	108.	(63.4 - 136.)
Toluene-d8	BTEX/NAP/MTBE-8260B	115.	(72.1 - 137.)

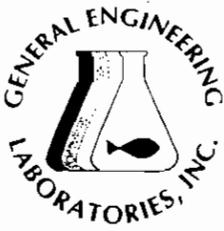
M = Method	Method-Description
M 1	SW846 8260B
M 2	EPA 3550
M 3	EPA 8270C
M 4	EPA 5035

**Notes:**

The qualifiers in this report are defined as follows:

- ND indicates that the analyte was not detected at a concentration greater than the detection limit.
- J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
- U indicates that the analyte was not detected at a concentration greater than the detection limit.
- \* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.



# GENERAL ENGINEERING LABORATORIES

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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442  
Contact: Mr. Arnold Lamb  
Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

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Sample ID : 02SLB1002

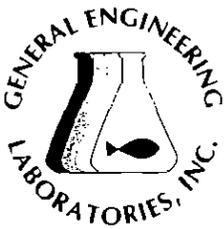
### M = Method

### Method-Description

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# GENERAL ENGINEERING LABORATORIES

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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
 794 South Military Trail  
 Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

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Sample ID : 02SLB0403  
 Lab ID : 9901644-06  
 Matrix : Soil  
 Date Collected : 01/20/99  
 Date Received : 01/20/99  
 Priority : Routine  
 Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
<i>BTEX/NAP/MTBE - 6 items</i>											
BENZENE	U	ND	0.509	5.00	ug/kg	1.0	SLG	01/22/99	1917	140472	1
ETHYLBENZENE	U	ND	0.305	5.00	ug/kg	1.0					
TERT-BUTYL METHYL ETHER		ND	0.181	5.65	ug/kg	1.0					
NAPHTHALENE	U	ND	0.689	5.00	ug/kg	1.0					
TOLUENE	U	ND	1.06	5.00	ug/kg	1.0					
XYLENES, TOTAL	U	ND	0.283	5.00	ug/kg	1.0					
<b>Organic Prep</b>											
EVAPORATIVE LOSS @ 105 C		15.0	1.00	1.00	wt%	1.0	GJ	01/22/99	1540	140397	2
<b>Extractable Organics</b>											
<i>Polyaromatic Hydrocarbon Compounds - 15 items</i>											
ACENAPHTHENE	U	ND	188	392	ug/kg	1.0	JPA	01/25/99	1514	140432	3
ACENAPHTHYLENE	U	ND	173	392	ug/kg	1.0					
ANTHRACENE	U	ND	103	392	ug/kg	1.0					
BENZO(A)ANTHRACENE	U	ND	80.4	392	ug/kg	1.0					
BENZO(A)PYRENE	U	ND	84.3	392	ug/kg	1.0					
BENZO(B)FLUORANTHENE	U	ND	167	392	ug/kg	1.0					
BENZO(G,H,I)PERYLENE	U	ND	95.6	392	ug/kg	1.0					
BENZO(K)FLUORANTHENE	U	ND	155	392	ug/kg	1.0					
CHRYSENE	U	ND	64.3	392	ug/kg	1.0					
DIBENZ(A,H)ANTHRACENE	U	ND	97.6	392	ug/kg	1.0					
FLUORANTHENE	U	ND	76.8	392	ug/kg	1.0					
FLUORENE	U	ND	134	392	ug/kg	1.0					
INDENO(1,2,3-CD)PYRENE	U	ND	94.5	392	ug/kg	1.0					
PHENANTHRENE	U	ND	70.6	392	ug/kg	1.0					
PYRENE	U	ND	84.7	392	ug/kg	1.0					





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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

Page 2 of 3

Sample ID : 02SLB0403

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
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**The following prep procedures were performed:**

Volatiles 8260 High Level  
GC/MS Base/Neutral Compounds

SLG 01/27/99 1505 140472 4  
CPU 01/22/99 2215 140432 2

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610-TETR	54.9	(30.0 - 115.)
Nitrobenzene-d5	M610-TETR	52.2	(23.0 - 120.)
p-Terphenyl-d14	M610-TETR	78.3	(37.3 - 128.)
Bromofluorobenzene	BTEX/NAP/MTBE-8260B	119.	(53.5 - 154.)
Dibromofluoromethane	BTEX/NAP/MTBE-8260B	110.	(63.4 - 136.)
Toluene-d8	BTEX/NAP/MTBE-8260B	119.	(72.1 - 137.)

M = Method	Method-Description
M 1	SW846 8260B
M 2	EPA 3550
M 3	EPA 8270C
M 4	EPA 5035

**Notes:**

The qualifiers in this report are defined as follows:

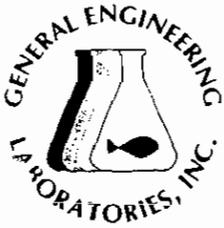
ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.



# GENERAL ENGINEERING LABORATORIES

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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

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Sample ID : 02SLB0403

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**M = Method**

**Method-Description**

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This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Valerie Davis at (843) 769-7391.

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# GENERAL ENGINEERING LABORATORIES

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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442  
Contact: Mr. Arnold Lamb  
Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

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Sample ID : 02SLB0503  
Lab ID : 9901644-07  
Matrix : Soil  
Date Collected : 01/20/99  
Date Received : 01/20/99  
Priority : Routine  
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
<i>BTEX/NAP/MTBE - 6 items</i>											
BENZENE	U	ND	0.509	5.00	ug/kg	1.0	SLG	01/26/99	1547	140472	1
ETHYLBENZENE	U	ND	0.305	5.00	ug/kg	1.0					
TERT-BUTYL METHYL ETHER		ND	0.181	5.65	ug/kg	1.0					
NAPHTHALENE	U	ND	0.689	5.00	ug/kg	1.0					
TOLUENE	U	ND	1.06	5.00	ug/kg	1.0					
XYLENES, TOTAL	U	ND	0.283	5.00	ug/kg	1.0					
<b>Organic Prep</b>											
EVAPORATIVE LOSS @ 105 C		16.0	1.00	1.00	wt%	1.0	GJ	01/22/99	1540	140397	2
<b>Extractable Organics</b>											
<i>Polyaromatic Hydrocarbon Compounds - 15 items</i>											
ACENAPHTHENE	U	ND	191	397	ug/kg	1.0	JPA	01/25/99	1546	140432	3
ACENAPHTHYLENE	U	ND	175	397	ug/kg	1.0					
ANTHRACENE	U	ND	104	397	ug/kg	1.0					
BENZO(A)ANTHRACENE	U	ND	81.4	397	ug/kg	1.0					
BENZO(A)PYRENE	U	ND	85.4	397	ug/kg	1.0					
BENZO(B)FLUORANTHENE	U	ND	169	397	ug/kg	1.0					
BENZO(G,H,I)PERYLENE	U	ND	96.9	397	ug/kg	1.0					
BENZO(K)FLUORANTHENE	U	ND	157	397	ug/kg	1.0					
CHRYSENE	U	ND	65.1	397	ug/kg	1.0					
DIBENZ(A,H)ANTHRACENE	U	ND	98.9	397	ug/kg	1.0					
FLUORANTHENE	U	ND	77.8	397	ug/kg	1.0					
FLUORENE	U	ND	136	397	ug/kg	1.0					
INDENO(1,2,3-CD)PYRENE	U	ND	95.7	397	ug/kg	1.0					
PHENANTHRENE	U	ND	71.5	397	ug/kg	1.0					
PYRENE	U	ND	85.8	397	ug/kg	1.0					





# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
 794 South Military Trail  
 Deerfield Beach, Florida 33442  
 Contact: Mr. Arnold Lamb  
 Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

Page 2 of 3

Sample ID : 02SLB0503

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
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**The following prep procedures were performed:**

Volatiles 8260 High Level  
 GC/MS Base/Neutral Compounds

SLG 01/27/99 1505 140472 4  
 CPU 01/22/99 2215 140432 2

Surrogate Recovery	Test	Percent %	Acceptable Limits
1-Fluorobiphenyl	M610-TETR	59.5	(30.0 - 115.)
Nitrobenzene-d5	M610-TETR	55.5	(23.0 - 120.)
p-Terphenyl-d14	M610-TETR	84.2	(37.3 - 128.)
Bromofluorobenzene	BTEX/NAP/MTBE-8260B	114.	(53.5 - 154.)
Dibromofluoromethane	BTEX/NAP/MTBE-8260B	116.	(63.4 - 136.)
Toluene-d8	BTEX/NAP/MTBE-8260B	112.	(72.1 - 137.)

M = Method	Method-Description
M 1	SW846 8260B
M 2	EPA 3550
M 3	EPA 8270C
M 4	EPA 5035

**Notes:**

The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.



# GENERAL ENGINEERING LABORATORIES

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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458 ✓
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442  
Contact: Mr. Arnold Lamb  
Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

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Sample ID : 02SLB0503

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**M = Method**

**Method-Description**

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# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
 794 South Military Trail  
 Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

Page 1 of 3

Sample ID : 02SLB0802  
 Lab ID : 9901644-08  
 Matrix : Soil  
 Date Collected : 01/20/99  
 Date Received : 01/20/99  
 Priority : Routine  
 Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
<i>BTEX/NAP/MTBE - 6 items</i>											
BENZENE	U	ND	0.504	5.00	ug/kg	1.0	SLG	01/22/99	2015	140472	1
ETHYLBENZENE	U	ND	0.302	5.00	ug/kg	1.0					
TERT-BUTYL METHYL ETHER		ND	0.179	5.60	ug/kg	1.0					
NAPHTHALENE	U	ND	0.683	5.00	ug/kg	1.0					
TOLUENE	U	ND	1.05	5.00	ug/kg	1.0					
XYLENES, TOTAL	U	ND	0.280	5.00	ug/kg	1.0					
<b>Organic Prep</b>											
EVAPORATIVE LOSS @ 105 C		11.0	1.00	1.00	wt%	1.0	GJ	01/22/99	1540	140397	2
<b>Extractable Organics</b>											
<i>Polyaromatic Hydrocarbon Compounds - 15 items</i>											
ACENAPHTHENE	U	ND	180	375	ug/kg	1.0	JPA	01/25/99	1618	140432	3
ACENAPHTHYLENE	U	ND	165	375	ug/kg	1.0					
ANTHRACENE	U	ND	98.6	375	ug/kg	1.0					
BENZO(A)ANTHRACENE	U	ND	76.9	375	ug/kg	1.0					
BENZO(A)PYRENE	U	ND	80.6	375	ug/kg	1.0					
BENZO(B)FLUORANTHENE	U	ND	160	375	ug/kg	1.0					
BENZO(G,H,I)PERYLENE	U	ND	91.5	375	ug/kg	1.0					
BENZO(K)FLUORANTHENE	U	ND	149	375	ug/kg	1.0					
CHRYSENE	U	ND	61.5	375	ug/kg	1.0					
DIBENZ(A,H)ANTHRACENE	U	ND	93.4	375	ug/kg	1.0					
FLUORANTHENE	U	ND	73.5	375	ug/kg	1.0					
FLUORENE	U	ND	129	375	ug/kg	1.0					
INDENO(1,2,3-CD)PYRENE	U	ND	90.4	375	ug/kg	1.0					
PHENANTHRENE	U	ND	67.5	375	ug/kg	1.0					
PYRENE	U	ND	81.0	375	ug/kg	1.0					





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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
 794 South Military Trail  
 Deerfield Beach, Florida 33442  
 Contact: Mr. Arnold Lamb  
 Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

Page 2 of 3

Sample ID : 02SLB0802

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
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**The following prep procedures were performed:**

Volatiles 8260 High Level	SLG	01/27/99	1505	140472	4
GC/MS Base/Neutral Compounds	CPU	01/22/99	2215	140432	2

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610-TETR	50.5	(30.0 - 115.)
Nitrobenzene-d5	M610-TETR	48.4	(23.0 - 120.)
p-Terphenyl-d14	M610-TETR	71.4	(37.3 - 128.)
Bromofluorobenzene	BTEX/NAP/MTBE-8260B	124.	(53.5 - 154.)
Dibromofluoromethane	BTEX/NAP/MTBE-8260B	107.	(63.4 - 136.)
Toluene-d8	BTEX/NAP/MTBE-8260B	119.	(72.1 - 137.)

M = Method	Method-Description
M 1	SW846 8260B
M 2	EPA 3550
M 3	EPA 8270C
M 4	EPA 5035

**Notes:**

The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.



# GENERAL ENGINEERING LABORATORIES

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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442  
Contact: Mr. Arnold Lamb  
Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

Page 3 of 3

Sample ID : 02SLB0802

### M = Method

### Method-Description

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*Valerie Davis*

Reviewed By



# GENERAL ENGINEERING LABORATORIES

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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442  
Contact: Mr. Arnold Lamb  
Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

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Sample ID : 02SLB0802D  
Lab ID : 9901644-10  
Matrix : Soil  
Date Collected : 01/20/99  
Date Received : 01/20/99  
Priority : Routine  
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
<i>BTEX/NAP/MTBE - 6 items</i>											
BENZENE	U	ND	0.504	5.00	ug/kg	1.0	SLG	01/22/99	2046	140472	1
ETHYLBENZENE	U	ND	0.302	5.00	ug/kg	1.0					
TERT-BUTYL METHYL ETHER		ND	0.179	5.60	ug/kg	1.0					
NAPHTHALENE	U	ND	0.683	5.00	ug/kg	1.0					
TOLUENE	U	ND	1.05	5.00	ug/kg	1.0					
XYLENES, TOTAL	U	ND	0.280	5.00	ug/kg	1.0					
<b>Organic Prep</b>											
EVAPORATIVE LOSS @ 105 C		14.0	1.00	1.00	wt%	1.0	GJ	01/22/99	1540	140397	2
<b>Extractable Organics</b>											
<i>Polyaromatic Hydrocarbon Compounds - 15 items</i>											
ACENAPHTHENE	U	ND	186	388	ug/kg	1.0	JPA	01/25/99	1649	140432	3
ACENAPHTHYLENE	U	ND	171	388	ug/kg	1.0					
ANTHRACENE	U	ND	102	388	ug/kg	1.0					
BENZO(A)ANTHRACENE	U	ND	79.5	388	ug/kg	1.0					
BENZO(A)PYRENE	U	ND	83.4	388	ug/kg	1.0					
BENZO(B)FLUORANTHENE	U	ND	165	388	ug/kg	1.0					
BENZO(G,H,I)PERYLENE	U	ND	94.7	388	ug/kg	1.0					
BENZO(K)FLUORANTHENE	U	ND	154	388	ug/kg	1.0					
CHRYSENE	U	ND	63.6	388	ug/kg	1.0					
DIBENZ(A,H)ANTHRACENE	U	ND	96.6	388	ug/kg	1.0					
FLUORANTHENE	U	ND	76.0	388	ug/kg	1.0					
FLUORENE	U	ND	133	388	ug/kg	1.0					
INDENO(1,2,3-CD)PYRENE	U	ND	93.5	388	ug/kg	1.0					
PHENANTHRENE	U	ND	69.8	388	ug/kg	1.0					
PYRENE	U	ND	83.8	388	ug/kg	1.0					





# GENERAL ENGINEERING LABORATORIES

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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

- Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

Page 2 of 3

Sample ID : 02SLB0802D

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
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**The following prep procedures were performed:**

Volatiles 8260 High Level  
GC/MS Base/Neutral Compounds

SLG 01/27/99 1505 140472 4  
CPU 01/22/99 2215 140432 2

Surrogate Recovery	Test	Percent%	Acceptable Limits
?-Fluorobiphenyl	M610-TETR	58.4	(30.0 - 115.)
Nitrobenzene-d5	M610-TETR	58.1	(23.0 - 120.)
p-Terphenyl-d14	M610-TETR	81.8	(37.3 - 128.)
Bromofluorobenzene	BTEX/NAP/MTBE-8260B	114.	(53.5 - 154.)
Dibromofluoromethane	BTEX/NAP/MTBE-8260B	113.	(63.4 - 136.)
Toluene-d8	BTEX/NAP/MTBE-8260B	115.	(72.1 - 137.)

M = Method	Method-Description
M 1	SW846 8260B
M 2	EPA 3550
M 3	EPA 8270C
M 4	EPA 5035

**Notes:**

The qualifiers in this report are defined as follows:

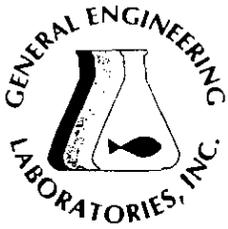
ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.



# GENERAL ENGINEERING LABORATORIES

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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442  
Contact: Mr. Arnold Lamb  
Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

Page 3 of 3

Sample ID : 02SLB0802D

### M = Method

### Method-Description

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### Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442  
Contact: Mr. Arnold Lamb  
Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

Page 1 of 3

Sample ID : 02SLB0303  
Lab ID : 9901644-17  
Matrix : Soil  
Date Collected : 01/20/99  
Date Received : 01/20/99  
Priority : Routine  
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
<i>BTEX/NAP/MTBE - 6 items</i>											
BENZENE	J	2.61	0.549	5.00	ug/kg	1.0	SLG	01/26/99	1843	140472	1
ETHYLBENZENE	U	ND	0.329	5.00	ug/kg	1.0					
TERT-BUTYL METHYL ETHER		ND	0.195	6.10	ug/kg	1.0					
NAPHTHALENE	U	ND	0.744	5.00	ug/kg	1.0					
TOLUENE	J	1.26	1.15	5.00	ug/kg	1.0					
XYLENES, TOTAL	U	ND	0.305	5.00	ug/kg	1.0					
<b>Organic Prep</b>											
EVAPORATIVE LOSS @ 105 C		18.0	1.00	1.00	wt%	1.0	GJ	01/22/99	1545	140519	2
<b>Extractable Organics</b>											
<i>Polyaromatic Hydrocarbon Compounds - 15 items</i>											
ACENAPHTHENE	U	ND	195	407	ug/kg	1.0	JPA	01/25/99	2001	140432	3
ACENAPHTHYLENE	U	ND	179	407	ug/kg	1.0					
ANTHRACENE	U	ND	107	407	ug/kg	1.0					
BENZO(A)ANTHRACENE	U	ND	83.4	407	ug/kg	1.0					
BENZO(A)PYRENE	U	ND	87.5	407	ug/kg	1.0					
BENZO(B)FLUORANTHENE	U	ND	173	407	ug/kg	1.0					
BENZO(G,H,I)PERYLENE	U	ND	99.3	407	ug/kg	1.0					
BENZO(K)FLUORANTHENE	U	ND	161	407	ug/kg	1.0					
CHRYSENE	U	ND	66.7	407	ug/kg	1.0					
DIBENZ(A,H)ANTHRACENE	U	ND	101	407	ug/kg	1.0					
FLUORANTHENE	U	ND	79.8	407	ug/kg	1.0					
FLUORENE	U	ND	140	407	ug/kg	1.0					
INDENO(1,2,3-CD)PYRENE	U	ND	98.1	407	ug/kg	1.0					
PHENANTHRENE	U	ND	73.3	407	ug/kg	1.0					
PYRENE	U	ND	87.9	407	ug/kg	1.0					





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STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
 794 South Military Trail  
 Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

Page 2 of 3

Sample ID : 02SLB0303

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
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**The following prep procedures were performed:**

Volatiles 8260 High Level  
 GC/MS Base/Neutral Compounds

SLG 01/27/99 1505 140472 4  
 CPU 01/22/99 2215 140432 2

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610-TETR	52.8	(30.0 - 115.)
Nitrobenzene-d5	M610-TETR	50.6	(23.0 - 120.)
p-Terphenyl-d14	M610-TETR	81.6	(37.3 - 128.)
Bromofluorobenzene	BTEX/NAP/MTBE-8260B	113.	(53.5 - 154.)
Dibromofluoromethane	BTEX/NAP/MTBE-8260B	113.	(63.4 - 136.)
Toluene-d8	BTEX/NAP/MTBE-8260B	114.	(72.1 - 137.)

M = Method	Method-Description
M 1	SW846 8260B
M 2	EPA 3550
M 3	EPA 8270C
M 4	EPA 5035

**Notes:**

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

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.



# GENERAL ENGINEERING LABORATORIES

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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442  
Contact: Mr. Arnold Lamb  
Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

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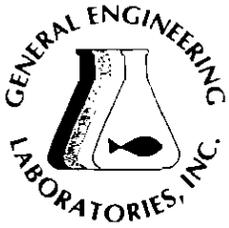
Sample ID : 02SLB0303

### M = Method

### Method-Description

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### Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
 794 South Military Trail  
 Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

Page 1 of 2

Sample ID : 02SLB1902  
 Lab ID : 9901644-09  
 Matrix : Soil  
 Date Collected : 01/20/99  
 Date Received : 01/20/99  
 Priority : Routine  
 Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Organic Prep</b>											
EVAPORATIVE LOSS @ 105 C		14.0	1.00	1.00	wt%	1.0	GJ	01/22/99	1540	140397	1
<b>General Chemistry</b>											
Total Organic Carbon		2730	43.1	100	mg/kg	1.0	LS	02/02/99	1355	141188	2

M = Method	Method-Description
M 1	EPA 3550
M 2	EPA 415.1 Modified

### Notes:

The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

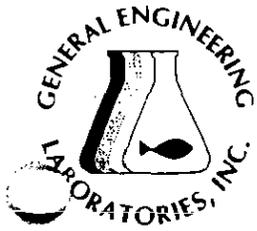
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.





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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442  
Contact: Mr. Arnold Lamb  
Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

Page 2 of 2

Sample ID : 02SLB1902

**M = Method**

**Method-Description**

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*Valerie Davis*

Reviewed By

# CHAIN OF CUSTODY RECORD

Page 1 of 2

99016447

Client Name/Facility Name			Collected by/Company			# OF CONTAINERS	SAMPLE ANALYSIS REQUIRED (x) - use remarks area to specify specific compounds or methods													Remarks				
Tetra Tech NUS/CNK			James R. Hill / TTNUS				pH, conductivity	TOC/DOC	TOX	Chloride, Fluoride, Sulfide	Nitrite/Nitrate	VOC - Specify Method required	METALS - specify	Pesticide	Herbicide	Total Phenol	Acid Extractables	B/N Extractables	PCB's		Cyanide	Coliforms - specify type	Grain Size	
SAMPLE ID	DATE	TIME	WELL	SOIL	COMP	GRAB																		
01 ZHTL4444	1-30-99	730					2				2													Trip Blank.
02 ZHRL4444	"	1130					8	1			3	2	2											Equip. Blank.
03 BSHIDW41	"	0822					5				3	1	1											
04 42SLB4143	"	915					8				3	1	1								3			
05 42SLB4143M	"	0915					5				3	1	1											
06 42SLB4143S	"	0915					5				3	1	1											
07 42SLB1442	"	0940					4				3	1												
08 42SLB4443	"	1008					4				3	1												
09 42SLB4443	"	1027					4				3	1												
10 42SLB4442	"	1040					4				3	1												
11 42SLB1442	"	1050					1	1																
12 42SLB1842D	"	1305					4				3	1												
13 42SLB1243	"	1400					8				3	1	1								3			
Relinquished by:			Date:	Time:	Received by:			Relinquished by:			Date:	Time:	Received by:											
Relinquished by:			Date:	Time:	Received by lab by:			Date:	Time:	Remarks:														

White = sample collector    Yellow = file    Pink = with report

37824  
1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12

VOC = BTEX, MTBE    Standard Turnaround





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STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb  
Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

Page 1 of 2

Sample ID : ZHTL00601  
Lab ID : 9901644-01  
Matrix : Water  
Date Collected : 01/20/99  
Date Received : 01/20/99  
Priority : Routine  
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
<i>BTEX/NAP/MTBE - 6 items</i>											
BENZENE	U	ND	0.300	5.00	ug/l	1.0	MAP	01/30/99	1459	141130	1
ETHYLBENZENE	U	ND	0.300	5.00	ug/l	1.0					
TERT-BUTYL METHYL ETHER		ND	3.60	5.00	ug/l	1.0					
NAPHTHALENE	J	0.676	0.600	5.00	ug/l	1.0					
TOLUENE	U	ND	0.500	5.00	ug/l	1.0					
XYLENES, TOTAL	U	ND	1.10	5.00	ug/l	1.0					

Surrogate Recovery	Test	Percent%	Acceptable Limits
Bromofluorobenzene	BTEX/NAP/MTBE-8260B	124.	(60.2 - 139.)
Dibromofluoromethane	BTEX/NAP/MTBE-8260B	109.	(70.6 - 152.)
Toluene-d8	BTEX/NAP/MTBE-8260B	124.	(68.4 - 135.)

M = Method	Method-Description
M 1	SW846 8260B

**Notes:**

The qualifiers in this report are defined as follows:

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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442  
Contact: Mr. Arnold Lamb  
Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

Page 2 of 2

Sample ID : ZHTL00601

### M = Method

### Method-Description

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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10382
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442  
Contact: Mr. Arnold Lamb  
Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

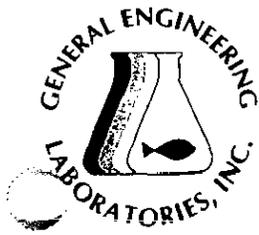
Report Date: February 08, 1999

Page 1 of 2

Sample ID : ZHRL00201  
Lab ID : 9901644-02  
Matrix : Water  
Date Collected : 01/20/99  
Date Received : 01/20/99  
Priority : Routine  
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
<i>BTEX/NAP/MTBE - 6 items</i>											
BENZENE	U	ND	0.300	5.00	ug/l	1.0	MAP	01/30/99	1534	141130	1
ETHYLBENZENE	U	ND	0.300	5.00	ug/l	1.0					
TERT-BUTYL METHYL ETHER		ND	3.60	5.00	ug/l	1.0					
NAPHTHALENE	U	ND	0.600	5.00	ug/l	1.0					
TOLUENE	U	ND	0.500	5.00	ug/l	1.0					
XYLENES, TOTAL	U	ND	1.10	5.00	ug/l	1.0					
<b>Extractable Organics</b>											
<i>Polyaromatic Hydrocarbon Compounds - 15 items</i>											
ACENAPHTHENE	U	ND	2.27	10.3	ug/l	1.0	TSD	01/23/99	0058	140430	2
ACENAPHTHYLENE	U	ND	1.34	10.3	ug/l	1.0					
ANTHRACENE	U	ND	2.37	10.3	ug/l	1.0					
BENZO(A)ANTHRACENE	U	ND	2.88	10.3	ug/l	1.0					
BENZO(A)PYRENE	U	ND	2.06	10.3	ug/l	1.0					
BENZO(B)FLUORANTHENE	U	ND	4.84	10.3	ug/l	1.0					
BENZO(G,H,I)PERYLENE	U	ND	2.58	10.3	ug/l	1.0					
BENZO(K)FLUORANTHENE	U	ND	2.68	10.3	ug/l	1.0					
CHRYSENE	U	ND	2.27	10.3	ug/l	1.0					
DIBENZ(A,H)ANTHRACENE	U	ND	2.27	10.3	ug/l	1.0					
FLUORANTHENE	U	ND	3.19	10.3	ug/l	1.0					
FLUORENE	U	ND	2.16	10.3	ug/l	1.0					
INDENO(1,2,3-CD)PYRENE	U	ND	3.50	10.3	ug/l	1.0					
PHENANTHRENE	U	ND	1.85	10.3	ug/l	1.0					
PYRENE	U	ND	2.58	10.3	ug/l	1.0					
<b>General Chemistry</b>											
Total Rec. Petro. Hydrocarbons	U	ND	1.22	2.00	mg/l	1.0	AAT	02/01/99	1000	141158	3





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STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
 794 South Military Trail  
 Deerfield Beach, Florida 33442  
 Contact: Mr. Arnold Lamb  
 Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: February 08, 1999

Page 2 of 2

Sample ID : ZHRL00201

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
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The following prep procedures were performed:

GC/MS Base/Neutral Compounds

ES 01/22/99 1300 140430 4

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610-TETR	66.0	(43.0 - 108.)
Nitrobenzene-d5	M610-TETR	58.6	(35.0 - 111.)
-Terphenyl-d14	M610-TETR	78.1	(33.0 - 125.)
Bromofluorobenzene	BTEX/NAP/MTBE-8260B	126.	(60.2 - 139.)
Dibromofluoromethane	BTEX/NAP/MTBE-8260B	107.	(70.6 - 152.)
Toluene-d8	BTEX/NAP/MTBE-8260B	126.	(68.4 - 135.)

M = Method	Method-Description
M 1	SW846 8260B
M 2	SW846 8270C
M 3	SW-846 9070
M 4	EPA 3510

**Notes:**

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Reviewed By

P O Box 30712 • Charleston, SC 29417 • 2040 Savage Road • 29407

(843) 556-8171 • Fax (843) 766-1178

\*9901644-02\*



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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
 794 South Military Trail  
 Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

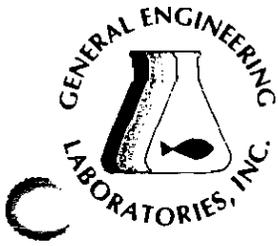
Report Date: March 26, 1999

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Sample ID : ZHTLO1501  
 Lab ID : 9903340-01  
 Matrix : Water  
 Date Collected : 03/09/99  
 Date Received : 03/09/99  
 Priority : Routine  
 Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
TERT-BUTYL METHYL ETHER		ND	3.60	5.00	ug/l	1.0	MAP	03/17/99	1445	144624	1
NAPHTHALENE	U	ND	0.600	5.00	ug/l	1.0	MAP	03/17/99	1445	144624	2
<i>Priority Pollutant Volatiles - 32 items</i>											
1,1,1-TRICHLOROETHANE	U	ND	0.200	1.00	ug/l	1.0	MAP	03/17/99	1445	144624	1
1,1,2,2-TETRACHLOROETHANE		ND	0.500	1.00	ug/l	1.0					
1,1,2-TRICHLOROETHANE	U	ND	0.400	1.00	ug/l	1.0					
1,1-DICHLOROETHANE	U	ND	0.400	1.00	ug/l	1.0					
1,1-DICHLOROETHENE	U	ND	0.700	1.00	ug/l	1.0					
1,2-DICHLOROBENZENE	U	ND	0.400	1.00	ug/l	1.0					
1,2-DICHLOROETHANE	U	ND	0.200	1.00	ug/l	1.0					
1,2-DICHLOROPROPANE	U	ND	0.200	1.00	ug/l	1.0					
TRANS-1,2-DICHLOROETHENE		ND	0.700	1.00	ug/l	1.0					
1,3-DICHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
1,4-DICHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
BENZENE	U	ND	0.300	5.00	ug/l	1.0					
BROMOFORM	U	ND	0.400	1.00	ug/l	1.0					
CARBON TETRACHLORIDE	U	ND	0.200	1.00	ug/l	1.0					
CHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
CHLORODIBROMOMETHANE		ND	0.300	1.00	ug/l	1.0					
CHLOROETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROFORM	U	ND	0.700	1.00	ug/l	1.0					
BROMODICHLOROMETHANE		ND	0.400	1.00	ug/l	1.0					
DICHLORODIFLUOROMETHANE		ND	1.20	5.00	ug/l	1.0					
ETHYLBENZENE	U	ND	0.300	5.00	ug/l	1.0					
BROMOMETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROMETHANE	U	ND	0.200	1.00	ug/l	1.0					
METHYLENE CHLORIDE	U	ND	1.20	5.00	ug/l	1.0					
TETRACHLOROETHYLENE	U	ND	0.700	1.00	ug/l	1.0					





# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
 794 South Military Trail  
 Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

Page 2 of 3

Sample ID : ZHTLO1501

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
TOLUENE	U	ND	0.500	5.00	ug/l	1.0					
TRICHLOROETHYLENE (TCB)		ND	0.600	1.00	ug/l	1.0	MAP	03/17/99	1445	144624	1
TRICHLOROFUOROMETHANE		ND	1.70	5.00	ug/l	1.0					
VINYL CHLORIDE	U	ND	0.400	1.00	ug/l	1.0					
XYLENES, TOTAL	U	ND	1.10	5.00	ug/l	1.0					
CIS-1,3-DICHLOROPROPENE	U	ND	0.300	1.00	ug/l	1.0					
TRANS-1,3-DICHLOROPROPENE		ND	0.300	1.00	ug/l	1.0					

Surrogate Recovery	Test	Percent %	Acceptable Limits
Bromofluorobenzene	MTBE-8260B	73.3	(73.0 - 129.)
Dibromofluoromethane	MTBE-8260B	77.1	(66.0 - 117.)
Toluene-d8	MTBE-8260B	80.1	(73.0 - 122.)
Bromofluorobenzene	NAP-8260B	73.3	(73.0 - 129.)
Dibromofluoromethane	NAP-8260B	77.1	(66.0 - 117.)
Toluene-d8	NAP-8260B	80.1	(73.0 - 122.)
Bromofluorobenzene	PP VOA-TETR	73.3	(73.0 - 129.)
Dibromofluoromethane	PP VOA-TETR	77.1	(66.0 - 117.)
Toluene-d8	PP VOA-TETR	80.1	(73.0 - 122.)

M = Method	Method-Description
M 1	EPA 8260B
M 2	EPA 8260

**Notes:**

The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.



# GENERAL ENGINEERING LABORATORIES

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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442  
Contact: Mr. Arnold Lamb  
Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

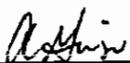
Page 3 of 3

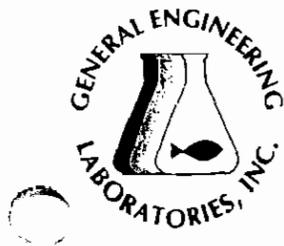
Sample ID : ZHTLO1501

### M = Method

### Method-Description

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Valerie Davis at (843) 769-7391.

  
Reviewed By



# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10382
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
 794 South Military Trail  
 Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

Page 1 of 4

Sample ID : ZHRL00501  
 Lab ID : 9903340-02  
 Matrix : Water  
 Date Collected : 03/08/99  
 Date Received : 03/09/99  
 Priority : Routine  
 Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatle Organics</b>											
Ethylene Dibromide	U	ND	1.00	1.00	ug/l	1.0	MAP	03/17/99	1516	144624	1
TERT-BUTYL METHYL ETHER		ND	3.60	5.00	ug/l	1.0					
NAPHTHALENE	U	ND	0.600	5.00	ug/l	1.0	MAP	03/17/99	1516	144624	2
<i>Priority Pollutant Volatiles - 32 items</i>											
1,1,1-TRICHLOROETHANE	U	ND	0.200	1.00	ug/l	1.0	MAP	03/17/99	1516	144624	1
1,1,2,2-TETRACHLOROETHANE		ND	0.500	1.00	ug/l	1.0					
1,1,2-TRICHLOROETHANE	U	ND	0.400	1.00	ug/l	1.0					
1,1-DICHLOROETHANE	U	ND	0.400	1.00	ug/l	1.0					
1,1-DICHLOROETHENE	U	ND	0.700	1.00	ug/l	1.0					
1,2-DICHLOROBENZENE	U	ND	0.400	1.00	ug/l	1.0					
1,2-DICHLOROETHANE	U	ND	0.200	1.00	ug/l	1.0					
1,2-DICHLOROPROPANE	U	ND	0.200	1.00	ug/l	1.0					
TRANS-1,2-DICHLOROETHENE		ND	0.700	1.00	ug/l	1.0					
1,3-DICHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
1,4-DICHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
BENZENE	U	ND	0.300	5.00	ug/l	1.0					
BROMOFORM	U	ND	0.400	1.00	ug/l	1.0					
CARBON TETRACHLORIDE	U	ND	0.200	1.00	ug/l	1.0					
CHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
CHLORODIBROMOMETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROFORM	U	ND	0.700	1.00	ug/l	1.0					
BROMODICHLOROMETHANE	U	ND	0.400	1.00	ug/l	1.0					
DICHLORODIFLUOROMETHANE	U	ND	1.20	5.00	ug/l	1.0					
ETHYLBENZENE	U	ND	0.300	5.00	ug/l	1.0					
BROMOMETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROMETHANE	U	ND	0.200	1.00	ug/l	1.0					
METHYLENE CHLORIDE	U	ND	1.20	5.00	ug/l	1.0					





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### Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

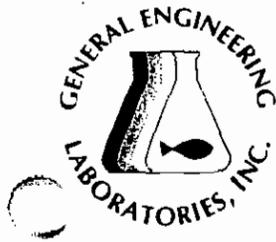
Page 2 of 4

Sample ID : ZHRL00501

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
TETRACHLOROETHYLENE	U	ND	0.700	1.00	ug/l	1.0					
TOLUENE	U	ND	0.500	5.00	ug/l	1.0	MAP	03/17/99	1516	144624	1
TRICHLOROETHYLENE (TCE)		ND	0.600	1.00	ug/l	1.0					
TRICHLOROFLUOROMETHANE		ND	1.70	5.00	ug/l	1.0					
VINYL CHLORIDE	U	ND	0.400	1.00	ug/l	1.0					
XYLENES, TOTAL	U	ND	1.10	5.00	ug/l	1.0					
CIS-1,3-DICHLOROPROPENE	U	ND	0.300	1.00	ug/l	1.0					
TRANS-1,3-DICHLOROPROPENE		ND	0.300	1.00	ug/l	1.0					
<b>Extractable Organics</b>											
<i>Polyaromatic Hydrocarbon Compounds - 15 items</i>											
ACENAPHTHENE	U	ND	2.75	12.5	ug/l	1.0	MKP	03/17/99	0251	144250	3
ACENAPHTHYLENE	U	ND	1.63	12.5	ug/l	1.0					
ANTHRACENE	U	ND	2.88	12.5	ug/l	1.0					
BENZO(A)ANTHRACENE	U	ND	3.50	12.5	ug/l	1.0					
BENZO(A)PYRENE	U	ND	2.50	12.5	ug/l	1.0					
BENZO(B)FLUORANTHENE	U	ND	5.88	12.5	ug/l	1.0					
BENZO(G,H,I)PERYLENE	U	ND	3.13	12.5	ug/l	1.0					
BENZO(K)FLUORANTHENE	U	ND	3.25	12.5	ug/l	1.0					
CHRYSENE	U	ND	2.75	12.5	ug/l	1.0					
DIBENZ(A,H)ANTHRACENE	U	ND	2.75	12.5	ug/l	1.0					
FLUORANTHENE	U	ND	3.88	12.5	ug/l	1.0					
FLUORENE	U	ND	2.63	12.5	ug/l	1.0					
INDENO(1,2,3-CD)PYRENE	U	ND	4.25	12.5	ug/l	1.0					
PHENANTHRENE	U	ND	2.25	12.5	ug/l	1.0					
PYRENE	U	ND	3.13	12.5	ug/l	1.0					
<b>General Chemistry</b>											
Total Rec. Petro. Hydrocarbons	J	1.26	1.22	5.00	mg/l	1.0	AAT	03/25/99	0900	145262	4

The following prep procedures were performed:  
GC/MS Base/Neutral Compounds

ES 03/10/99 1430 144250 5



# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
 794 South Military Trail  
 Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

Page 3 of 4

Sample ID : ZHRL00501

Surrogate Recovery	Test	Percent %	Acceptable Limits
2-Fluorobiphenyl	M610-TETR	55.1	(41.2 - 107.)
Nitrobenzene-d5	M610-TETR	48.6	(35.3 - 108.)
p-Terphenyl-d14	M610-TETR	82.9	(36.6 - 110.)
Bromofluorobenzene	EDB-8260B	73.4	(73.0 - 129.)
Dibromofluoromethane	EDB-8260B	77.6	(66.0 - 117.)
Toluene-d8	EDB-8260B	80.9	(73.0 - 122.)
Bromofluorobenzene	MTBE-8260B	73.4	(73.0 - 129.)
Dibromofluoromethane	MTBE-8260B	77.6	(66.0 - 117.)
Toluene-d8	MTBE-8260B	80.9	(73.0 - 122.)
Bromofluorobenzene	NAP-8260B	73.4	(73.0 - 129.)
Dibromofluoromethane	NAP-8260B	77.6	(66.0 - 117.)
Toluene-d8	NAP-8260B	80.9	(73.0 - 122.)
Bromofluorobenzene	PP VOA-TETR	73.4	(73.0 - 129.)
Dibromofluoromethane	PP VOA-TETR	77.6	(66.0 - 117.)
Toluene-d8	PP VOA-TETR	80.9	(73.0 - 122.)

M = Method	Method-Description
M 1	EPA 8260B
M 2	EPA 8260
M 3	SW846 8270C
M 4	SW-846 9070
M 5	EPA 3510

**Notes:**

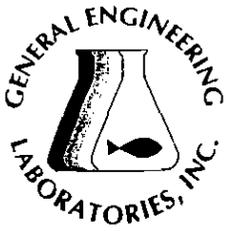
The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.



# GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442  
Contact: Mr. Arnold Lamb  
Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

Page 4 of 4

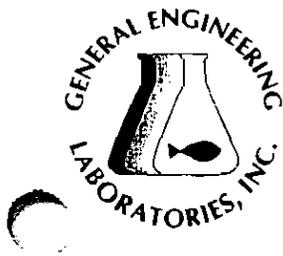
Sample ID : ZHRL00501

**M = Method**

**Method-Description**

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Valerie Davis at (843) 769-7391.

Reviewed By



# GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

### Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
 794 South Military Trail  
 Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

Page 1 of 4

Sample ID : 02GLM0101  
 Lab ID : 9903340-03  
 Matrix : Water  
 Date Collected : 03/08/99  
 Date Received : 03/09/99  
 Priority : Routine  
 Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
Ethylene Dibromide	U	ND	1.00	1.00	ug/l	1.0	MAP	03/17/99	1547	144624	1
TERT-BUTYL METHYL ETHER		ND	3.60	5.00	ug/l	1.0					
NAPHTHALENE	U	ND	0.600	5.00	ug/l	1.0	MAP	03/17/99	1547	144624	2
<i>Priority Pollutant Volatiles - 32 items</i>											
1,1,1-TRICHLOROETHANE	U	ND	0.200	1.00	ug/l	1.0	MAP	03/17/99	1547	144624	1
1,1,2,2-TETRACHLOROETHANE		ND	0.500	1.00	ug/l	1.0					
1,1,2-TRICHLOROETHANE	U	ND	0.400	1.00	ug/l	1.0					
1,1-DICHLOROETHANE	U	ND	0.400	1.00	ug/l	1.0					
1,1-DICHLOROETHENE	U	ND	0.700	1.00	ug/l	1.0					
1,2-DICHLOROBENZENE	U	ND	0.400	1.00	ug/l	1.0					
1,2-DICHLOROETHANE	U	ND	0.200	1.00	ug/l	1.0					
1,2-DICHLOROPROPANE	U	ND	0.200	1.00	ug/l	1.0					
TRANS-1,2-DICHLOROETHENE		ND	0.700	1.00	ug/l	1.0					
1,3-DICHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
1,4-DICHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
BENZENE	U	ND	0.300	5.00	ug/l	1.0					
BROMOFORM	U	ND	0.400	1.00	ug/l	1.0					
CARBON TETRACHLORIDE	U	ND	0.200	1.00	ug/l	1.0					
CHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
CHLORODIBROMOMETHANE		ND	0.300	1.00	ug/l	1.0					
CHLOROETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROFORM	U	ND	0.700	1.00	ug/l	1.0					
BROMODICHLOROMETHANE		ND	0.400	1.00	ug/l	1.0					
DICHLORODIFLUOROMETHANE		ND	1.20	5.00	ug/l	1.0					
ETHYLBENZENE	U	ND	0.300	5.00	ug/l	1.0					
BROMOMETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROMETHANE	U	ND	0.200	1.00	ug/l	1.0					
METHYLENE CHLORIDE	U	ND	1.20	5.00	ug/l	1.0					





# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

Page 2 of 4

Sample ID : 02GLM0101

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
TETRACHLOROETHYLENE	U	ND	0.700	1.00	ug/l	1.0					
TOLUENE	U	ND	0.500	5.00	ug/l	1.0	MAP	03/17/99	1547	144624	1
TRICHLOROETHYLENE (TCE)		ND	0.600	1.00	ug/l	1.0					
TRICHLOROFUOROMETHANE		ND	1.70	5.00	ug/l	1.0					
VINYL CHLORIDE	U	ND	0.400	1.00	ug/l	1.0					
XYLENES, TOTAL	U	ND	1.10	5.00	ug/l	1.0					
CIS-1,3-DICHLOROPROPENE	U	ND	0.300	1.00	ug/l	1.0					
TRANS-1,3-DICHLOROPROPENE		ND	0.300	1.00	ug/l	1.0					

### Extractable Organics

#### Polyaromatic Hydrocarbon Compounds - 15 items

ACENAPHTHENE	U	ND	2.24	10.2	ug/l	1.0	MKP	03/17/99	0321	144250	3
ACENAPHTHYLENE	U	ND	1.33	10.2	ug/l	1.0					
ANTHRACENE	U	ND	2.35	10.2	ug/l	1.0					
BENZO(A)ANTHRACENE	U	ND	2.86	10.2	ug/l	1.0					
BENZO(A)PYRENE	U	ND	2.04	10.2	ug/l	1.0					
BENZO(B)FLUORANTHENE	U	ND	4.79	10.2	ug/l	1.0					
BENZO(G,H,I)PERYLENE	U	ND	2.55	10.2	ug/l	1.0					
BENZO(K)FLUORANTHENE	U	ND	2.65	10.2	ug/l	1.0					
CHRYSENE	U	ND	2.24	10.2	ug/l	1.0					
DIBENZ(A,H)ANTHRACENE	U	ND	2.24	10.2	ug/l	1.0					
FLUORANTHENE	U	ND	3.16	10.2	ug/l	1.0					
FLUORENE	U	ND	2.14	10.2	ug/l	1.0					
INDENO(1,2,3-CD)PYRENE	U	ND	3.47	10.2	ug/l	1.0					
PHENANTHRENE	U	ND	1.84	10.2	ug/l	1.0					
PYRENE	U	ND	2.55	10.2	ug/l	1.0					

The following prep procedures were performed:

GC/MS Base/Neutral Compounds

ES 03/10/99 1430 144250 4

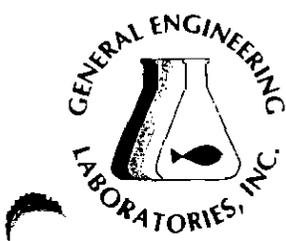
Surrogate Recovery	Test	Percent %	Acceptable Limits
2-Fluorobiphenyl	M610-TETR	60.3	(41.2 - 107.)
Nitrobenzene-d5	M610-TETR	53.6	(35.3 - 108.)

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\*9903340-03\*



# GENERAL ENGINEERING LABORATORIES

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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
 794 South Military Trail  
 Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

Page 3 of 4

Sample ID : 02GLM0101

Surrogate Recovery	Test	Percent %	Acceptable Limits
p-Terphenyl-d14	M610-TETR	74.8	(36.6 - 110.)
Bromofluorobenzene	EDB-8260B	74.6	(73.0 - 129.)
Dibromofluoromethane	EDB-8260B	77.8	(66.0 - 117.)
Toluene-d8	EDB-8260B	82.7	(73.0 - 122.)
Bromofluorobenzene	MTBE-8260B	74.6	(73.0 - 129.)
Dibromofluoromethane	MTBE-8260B	77.8	(66.0 - 117.)
Toluene-d8	MTBE-8260B	82.7	(73.0 - 122.)
Bromofluorobenzene	NAP-8260B	74.6	(73.0 - 129.)
Dibromofluoromethane	NAP-8260B	77.8	(66.0 - 117.)
Toluene-d8	NAP-8260B	82.7	(73.0 - 122.)
Bromofluorobenzene	PP VOA-TETR	74.6	(73.0 - 129.)
Dibromofluoromethane	PP VOA-TETR	77.8	(66.0 - 117.)
Toluene-d8	PP VOA-TETR	82.7	(73.0 - 122.)

M = Method	Method-Description
M 1	EPA 8260B
M 2	EPA 8260
M 3	SW846 8270C
M 4	EPA 3510

**Notes:**

The qualifiers in this report are defined as follows:

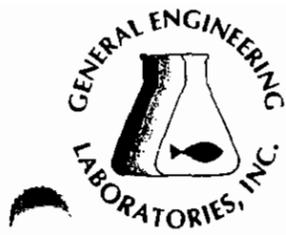
ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.





# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

Page 1 of 4

Sample ID : 02GLM0201  
Lab ID : 9903340-04  
Matrix : Water  
Date Collected : 03/08/99  
Date Received : 03/09/99  
Priority : Routine  
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
Ethylene Dibromide	U	ND	1.00	1.00	ug/l	1.0	MAP	03/17/99	1618	144624	1
TERT-BUTYL METHYL ETHER		ND	3.60	5.00	ug/l	1.0					
NAPHTHALENE	U	ND	0.600	5.00	ug/l	1.0	MAP	03/17/99	1618	144624	2
<i>Priority Pollutant Volatiles - 32 items</i>											
1,1,1-TRICHLOROETHANE	U	ND	0.200	1.00	ug/l	1.0	MAP	03/17/99	1618	144624	1
1,1,2,2-TETRACHLOROETHANE		ND	0.500	1.00	ug/l	1.0					
1,1,2-TRICHLOROETHANE	U	ND	0.400	1.00	ug/l	1.0					
1,1-DICHLOROETHANE	U	ND	0.400	1.00	ug/l	1.0					
1,1-DICHLOROETHENE	U	ND	0.700	1.00	ug/l	1.0					
1,2-DICHLOROBENZENE	U	ND	0.400	1.00	ug/l	1.0					
1,2-DICHLOROETHANE	U	ND	0.200	1.00	ug/l	1.0					
1,2-DICHLOROPROPANE	U	ND	0.200	1.00	ug/l	1.0					
TRANS-1,2-DICHLOROETHENE		ND	0.700	1.00	ug/l	1.0					
1,3-DICHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
1,4-DICHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
BENZENE	U	ND	0.300	5.00	ug/l	1.0					
BROMOFORM	U	ND	0.400	1.00	ug/l	1.0					
CARBON TETRACHLORIDE	U	ND	0.200	1.00	ug/l	1.0					
CHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
CHLORODIBROMOMETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROFORM	U	ND	0.700	1.00	ug/l	1.0					
BROMODICHLOROMETHANE	U	ND	0.400	1.00	ug/l	1.0					
DICHLORODIFLUOROMETHANE	U	ND	1.20	5.00	ug/l	1.0					
ETHYLBENZENE	U	ND	0.300	5.00	ug/l	1.0					
BROMOMETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROMETHANE	U	ND	0.200	1.00	ug/l	1.0					
METHYLENE CHLORIDE	U	ND	1.20	5.00	ug/l	1.0					

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\*9903340-04\*



# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

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FL	E87156/87294	E87472/87458
NC	233	
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TN	02934	02934

Client: Tetra Tech NUS, Inc.  
 794 South Military Trail  
 Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

Page 2 of 4

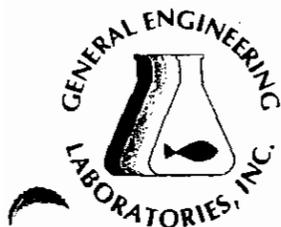
Sample ID : 02GLM0201

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
TETRACHLOROETHYLENE	U	ND	0.700	1.00	ug/l	1.0					
TOLUENE	U	ND	0.500	5.00	ug/l	1.0	MAP	03/17/99	1618	144624	1
TRICHLOROETHYLENE (TCE)		ND	0.600	1.00	ug/l	1.0					
TRICHLOROFLUOROMETHANE		ND	1.70	5.00	ug/l	1.0					
VINYL CHLORIDE	U	ND	0.400	1.00	ug/l	1.0					
XYLENES, TOTAL	U	ND	1.10	5.00	ug/l	1.0					
CIS-1,3-DICHLOROPROPENE	U	ND	0.300	1.00	ug/l	1.0					
TRANS-1,3-DICHLOROPROPENE		ND	0.300	1.00	ug/l	1.0					
<b>Extractable Organics</b>											
<i>Polyaromatic Hydrocarbon Compounds - 15 items</i>											
ACENAPHTHENE	U	ND	2.20	10.0	ug/l	1.0	MKP	03/17/99	0351	144250	3
ACENAPHTHYLENE	U	ND	1.30	10.0	ug/l	1.0					
ANTHRACENE	U	ND	2.30	10.0	ug/l	1.0					
BENZO(A)ANTHRACENE	U	ND	2.80	10.0	ug/l	1.0					
BENZO(A)PYRENE	U	ND	2.00	10.0	ug/l	1.0					
BENZO(B)FLUORANTHENE	U	ND	4.70	10.0	ug/l	1.0					
BENZO(G,H,I)PERYLENE	U	ND	2.50	10.0	ug/l	1.0					
BENZO(K)FLUORANTHENE	U	ND	2.60	10.0	ug/l	1.0					
CHRYSENE	U	ND	2.20	10.0	ug/l	1.0					
DIBENZ(A,H)ANTHRACENE	U	ND	2.20	10.0	ug/l	1.0					
FLUORANTHENE	U	ND	3.10	10.0	ug/l	1.0					
FLUORENE	U	ND	2.10	10.0	ug/l	1.0					
INDENO(1,2,3-CD)PYRENE	U	ND	3.40	10.0	ug/l	1.0					
PHENANTHRENE	U	ND	1.80	10.0	ug/l	1.0					
PYRENE	U	ND	2.50	10.0	ug/l	1.0					
<b>General Chemistry</b>											
NITROGEN, NITRATE		0.150	0.0127	0.0500	mg/l	1.0	RWS	03/09/99	1856	144226	4
SULFATE (AS SO4)		145	0.190	1.00	mg/l	5.0	RWS	03/09/99	2204	144226	4

The following prep procedures were performed:

GC/MS Base/Neutral Compounds

ES 03/10/99 1430 144250 5



# GENERAL ENGINEERING LABORATORIES

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cc: TETR00498

Report Date: March 26, 1999

Page 3 of 4

Sample ID : 02GLM0201

Surrogate Recovery	Test	Percent %	Acceptable Limits
2-Fluorobiphenyl	M610-TETR	58.8	(41.2 - 107.)
Nitrobenzene-d5	M610-TETR	51.7	(35.3 - 108.)
p-Terphenyl-d14	M610-TETR	73.9	(36.6 - 110.)
Bromofluorobenzene	EDB-8260B	73.0	(73.0 - 129.)
Dibromofluoromethane	EDB-8260B	77.7	(66.0 - 117.)
Toluene-d8	EDB-8260B	82.2	(73.0 - 122.)
Bromofluorobenzene	MTBE-8260B	73.0	(73.0 - 129.)
Dibromofluoromethane	MTBE-8260B	77.7	(66.0 - 117.)
Toluene-d8	MTBE-8260B	82.2	(73.0 - 122.)
Bromofluorobenzene	NAP-8260B	73.0	(73.0 - 129.)
Dibromofluoromethane	NAP-8260B	77.7	(66.0 - 117.)
Toluene-d8	NAP-8260B	82.2	(73.0 - 122.)
Bromofluorobenzene	PP VOA-TETR	73.0	(73.0 - 129.)
Dibromofluoromethane	PP VOA-TETR	77.7	(66.0 - 117.)
Toluene-d8	PP VOA-TETR	82.2	(73.0 - 122.)

M = Method	Method-Description
M 1	EPA 8260B
M 2	EPA 8260
M 3	SW846 8270C
M 4	EPA 300.0
M 5	EPA 3510

**Notes:**

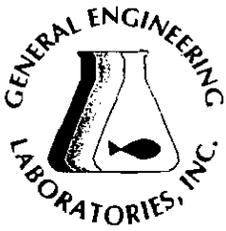
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ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.



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Contact: Mr. Arnold Lamb  
Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

Page 4 of 4

Sample ID : 02GLM0201

**M = Method** **Method-Description**

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Valerie Davis at (843) 769-7391.

Reviewed By

GENERAL ENGINEER LABORATORY

Lab Name:QUANTERRA

SDG Number: GEL003

Matrix: (soil/water) WATER

Lab Sample ID:I9C100197 001

Method: RSK SOP-175

Dissolved Gasses in Water

Sample WT/Vol: 43 / mL

Date Received: 03/10/99

Work Order: CRGR3101

Date Extracted:03/19/99

Dilution factor: 1

Date Analyzed: 03/19/99

Moisture %:NA

QC Batch: 9082177

Client Sample Id: 02GLMO201

CAS NO.	COMPOUND	CONCENTRATION UNITS:	
		(ug/L or ug/kg)	ug/L
74-82-8	Methane	12	B



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 794 South Military Trail  
 Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

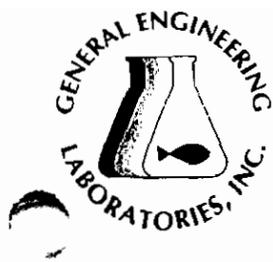
Report Date: March 26, 1999

Page 1 of 4

Sample ID : 02GLM0301  
 Lab ID : 9903340-05  
 Matrix : Water  
 Date Collected : 03/08/99  
 Date Received : 03/09/99  
 Priority : Routine  
 Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
Ethylene Dibromide	U	ND	1.00	1.00	ug/l	1.0	MAP	03/17/99	1649	144624	1
TERT-BUTYL METHYL ETHER		ND	3.60	5.00	ug/l	1.0					
NAPHTHALENE	U	ND	0.600	5.00	ug/l	1.0	MAP	03/17/99	1649	144624	2
<i>Priority Pollutants Volatiles - 32 items</i>											
1,1,1-TRICHLOROETHANE	U	ND	0.200	1.00	ug/l	1.0	MAP	03/17/99	1649	144624	1
1,1,2,2-TETRACHLOROETHANE		ND	0.500	1.00	ug/l	1.0					
1,1,2-TRICHLOROETHANE	U	ND	0.400	1.00	ug/l	1.0					
1,1-DICHLOROETHANE	U	ND	0.400	1.00	ug/l	1.0					
1,1-DICHLOROETHENE	U	ND	0.700	1.00	ug/l	1.0					
1,2-DICHLOROBENZENE	U	ND	0.400	1.00	ug/l	1.0					
1,2-DICHLOROETHANE	U	ND	0.200	1.00	ug/l	1.0					
1,2-DICHLOROPROPANE	U	ND	0.200	1.00	ug/l	1.0					
TRANS-1,2-DICHLOROETHENE		ND	0.700	1.00	ug/l	1.0					
1,3-DICHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
1,4-DICHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
BENZENE	U	ND	0.300	5.00	ug/l	1.0					
BROMOFORM	U	ND	0.400	1.00	ug/l	1.0					
CARBON TETRACHLORIDE	U	ND	0.200	1.00	ug/l	1.0					
CHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
CHLORODIBROMOMETHANE		ND	0.300	1.00	ug/l	1.0					
CHLOROETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROFORM	U	ND	0.700	1.00	ug/l	1.0					
BROMODICHLOROMETHANE		ND	0.400	1.00	ug/l	1.0					
DICHLORODIFLUOROMETHANE		ND	1.20	5.00	ug/l	1.0					
ETHYLBENZENE	U	ND	0.300	5.00	ug/l	1.0					
BROMOMETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROMETHANE	U	ND	0.200	1.00	ug/l	1.0					
METHYLENE CHLORIDE	U	ND	1.20	5.00	ug/l	1.0					





# GENERAL ENGINEERING LABORATORIES

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Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

Page 2 of 4

Sample ID : 02GLM0301

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
TETRACHLOROETHYLENE	U	ND	0.700	1.00	ug/l	1.0					
TOLUENE	U	ND	0.500	5.00	ug/l	1.0	MAP	03/17/99	1649	144624	1
TRICHLOROETHYLENE (TCB)		ND	0.600	1.00	ug/l	1.0					
TRICHLOROFLUOROMETHANE		ND	1.70	5.00	ug/l	1.0					
VINYL CHLORIDE	U	ND	0.400	1.00	ug/l	1.0					
XYLENES, TOTAL	U	ND	1.10	5.00	ug/l	1.0					
CIS-1,3-DICHLOROPROPENE	U	ND	0.300	1.00	ug/l	1.0					
TRANS-1,3-DICHLOROPROPENE		ND	0.300	1.00	ug/l	1.0					

### Extractable Organics

#### Polyaromatic Hydrocarbon Compounds - 15 items

ACENAPHTHENE	U	ND	2.27	10.3	ug/l	1.0	MKP	03/17/99	0422	144250	3
ACENAPHTHYLENE	U	ND	1.34	10.3	ug/l	1.0					
ANTHRACENE	U	ND	2.37	10.3	ug/l	1.0					
BENZO(A)ANTHRACENE	U	ND	2.88	10.3	ug/l	1.0					
BENZO(A)PYRENE	U	ND	2.06	10.3	ug/l	1.0					
BENZO(B)FLUORANTHENE	U	ND	4.84	10.3	ug/l	1.0					
BENZO(G,H,I)PERYLENE	U	ND	2.58	10.3	ug/l	1.0					
BENZO(K)FLUORANTHENE	U	ND	2.68	10.3	ug/l	1.0					
CHRYSENE	U	ND	2.27	10.3	ug/l	1.0					
DIBENZ(A,H)ANTHRACENE	U	ND	2.27	10.3	ug/l	1.0					
FLUORANTHENE	U	ND	3.19	10.3	ug/l	1.0					
FLUORENE	U	ND	2.16	10.3	ug/l	1.0					
INDENO(1,2,3-CD)PYRENE	U	ND	3.50	10.3	ug/l	1.0					
PHENANTHRENE	U	ND	1.85	10.3	ug/l	1.0					
PYRENE	U	ND	2.58	10.3	ug/l	1.0					

The following prep procedures were performed:

GC/MS Base/Neutral Compounds

ES 03/10/99 1430 144250 4

Surrogate Recovery	Test	Percent %	Acceptable Limits
2-Fluorobiphenyl	M610-TETR	67.0	(41.2 - 107.)
Nitrobenzene-d5	M610-TETR	59.1	(35.3 - 108.)

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cc: TETR00498

Report Date: March 26, 1999

Page 3 of 4

Sample ID : 02GLM0301

Surrogate Recovery	Test	Percent %	Acceptable Limits
p-Terphenyl-d14	M610-TETR	74.8	(36.6 - 110.)
Bromofluorobenzene	EDB-8260B	72.7*	(73.0 - 129.)
Dibromofluoromethane	EDB-8260B	79.0	(66.0 - 117.)
Toluene-d8	EDB-8260B	81.1	(73.0 - 122.)
Bromofluorobenzene	MTBE-8260B	72.7*	(73.0 - 129.)
Dibromofluoromethane	MTBE-8260B	79.0	(66.0 - 117.)
Toluene-d8	MTBE-8260B	81.1	(73.0 - 122.)
Bromofluorobenzene	NAP-8260B	72.7*	(73.0 - 129.)
Dibromofluoromethane	NAP-8260B	79.0	(66.0 - 117.)
Toluene-d8	NAP-8260B	81.1	(73.0 - 122.)
Bromofluorobenzene	PP VOA-TETR	72.7*	(73.0 - 129.)
Dibromofluoromethane	PP VOA-TETR	79.0	(66.0 - 117.)
Toluene-d8	PP VOA-TETR	81.1	(73.0 - 122.)

M = Method	Method-Description
M 1	EPA 8260B
M 2	EPA 8260
M 3	SW846 8270C
M 4	EPA 3510

### Notes:

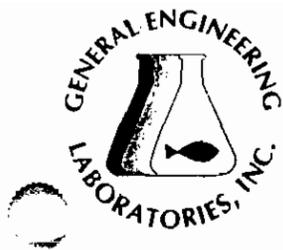
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J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).

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\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.



# GENERAL ENGINEERING LABORATORIES

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Report Date: March 26, 1999

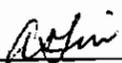
Page 4 of 4

Sample ID : 02GLM0301

**M = Method**

**Method-Description**

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Valerie Davis at (843) 769-7391.

Reviewed By 





# GENERAL ENGINEERING LABORATORIES

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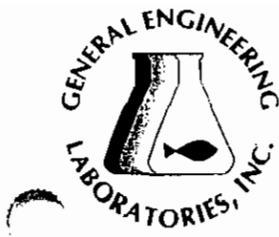
Report Date: March 26, 1999

Page 1 of 4

Sample ID : 02GLM0401  
 Lab ID : 9903340-06  
 Matrix : Water  
 Date Collected : 03/08/99  
 Date Received : 03/09/99  
 Priority : Routine  
 Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
Ethylene Dibromide	U	ND	1.00	1.00	ug/l	1.0	MAP	03/18/99	0039	144624	1
TERT-BUTYL METHYL ETHER		ND	3.60	5.00	ug/l	1.0					
NAPHTHALENE	U	ND	0.600	5.00	ug/l	1.0	MAP	03/18/99	0039	144624	2
<i>Priority Pollutant Volatiles - 32 items</i>											
1,1,1-TRICHLOROETHANE	U	ND	0.200	1.00	ug/l	1.0	MAP	03/18/99	0039	144624	1
1,1,2,2-TETRACHLOROETHANE		ND	0.500	1.00	ug/l	1.0					
1,1,2-TRICHLOROETHANE	U	ND	0.400	1.00	ug/l	1.0					
1,1-DICHLOROETHANE	U	ND	0.400	1.00	ug/l	1.0					
1,1-DICHLOROETHENE	U	ND	0.700	1.00	ug/l	1.0					
1,2-DICHLOROBENZENE	U	ND	0.400	1.00	ug/l	1.0					
1,2-DICHLOROETHANE	U	ND	0.200	1.00	ug/l	1.0					
1,2-DICHLOROPROPANE	U	ND	0.200	1.00	ug/l	1.0					
TRANS-1,2-DICHLOROETHENE		ND	0.700	1.00	ug/l	1.0					
1,3-DICHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
1,4-DICHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
BENZENE	U	ND	0.300	5.00	ug/l	1.0					
BROMOFORM	U	ND	0.400	1.00	ug/l	1.0					
CARBON TETRACHLORIDE	U	ND	0.200	1.00	ug/l	1.0					
CHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
CHLORODIBROMOMETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROFORM	U	ND	0.700	1.00	ug/l	1.0					
BROMODICHLOROMETHANE	U	ND	0.400	1.00	ug/l	1.0					
DICHLORODIFLUOROMETHANE		ND	1.20	5.00	ug/l	1.0					
ETHYLBENZENE	U	ND	0.300	5.00	ug/l	1.0					
BROMOMETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROMETHANE	U	ND	0.200	1.00	ug/l	1.0					
METHYLENE CHLORIDE	U	ND	1.20	5.00	ug/l	1.0					





# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

Page 2 of 4

Sample ID : 02GLM0401

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
TETRACHLOROETHYLENE	U	ND	0.700	1.00	ug/l	1.0					
TOLUENE	U	ND	0.500	5.00	ug/l	1.0	MAP	03/18/99	0039	144624	1
TRICHLOROETHYLENE (TCE)	U	ND	0.600	1.00	ug/l	1.0					
TRICHLOROFLUOROMETHANE	U	ND	1.70	5.00	ug/l	1.0					
VINYL CHLORIDE	U	ND	0.400	1.00	ug/l	1.0					
XYLENES, TOTAL	U	ND	1.10	5.00	ug/l	1.0					
CIS-1,3-DICHLOROPROPENE	U	ND	0.300	1.00	ug/l	1.0					
TRANS-1,3-DICHLOROPROPENE	U	ND	0.300	1.00	ug/l	1.0					

### Extractable Organics

#### Polyaromatic Hydrocarbon Compounds - 15 items

ACENAPHTHENE	U	ND	2.29	10.4	ug/l	1.0	MKP	03/17/99	0452	144250	3
ACENAPHTHYLENE	U	ND	1.35	10.4	ug/l	1.0					
ANTHRACENE	U	ND	2.39	10.4	ug/l	1.0					
BENZO(A)ANTHRACENE	U	ND	2.91	10.4	ug/l	1.0					
BENZO(A)PYRENE	U	ND	2.08	10.4	ug/l	1.0					
BENZO(B)FLUORANTHENE	U	ND	4.89	10.4	ug/l	1.0					
BENZO(G,H,I)PERYLENE	U	ND	2.60	10.4	ug/l	1.0					
BENZO(K)FLUORANTHENE	U	ND	2.70	10.4	ug/l	1.0					
CHRYSENE	U	ND	2.29	10.4	ug/l	1.0					
DIBENZ(A,H)ANTHRACENE	U	ND	2.29	10.4	ug/l	1.0					
FLUORANTHENE	U	ND	3.22	10.4	ug/l	1.0					
FLUORENE	U	ND	2.18	10.4	ug/l	1.0					
INDENO(1,2,3-CD)PYRENE	U	ND	3.54	10.4	ug/l	1.0					
PHENANTHRENE	U	ND	1.87	10.4	ug/l	1.0					
PYRENE	U	ND	2.60	10.4	ug/l	1.0					

The following prep procedures were performed:

GC/MS Base/Neutral Compounds

ES 03/10/99 1430 144250 4

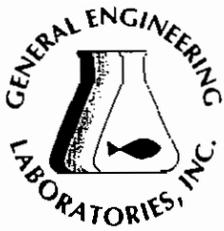
Surrogate Recovery	Test	Percent %	Acceptable Limits
2-Fluorobiphenyl	M610-TETR	63.0	(41.2 - 107.)
Nitrobenzene-d5	M610-TETR	56.4	(35.3 - 108.)

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Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

Page 3 of 4

Sample ID : 02GLM0401

Surrogate Recovery	Test	Percent %	Acceptable Limits
p-Terphenyl-d14	M610-TETR	69.7	(36.6 - 110.)
Bromofluorobenzene	EDB-8260B	71.1*	(73.0 - 129.)
Dibromofluoromethane	EDB-8260B	77.5	(66.0 - 117.)
Toluene-d8	EDB-8260B	82.0	(73.0 - 122.)
Bromofluorobenzene	MTBE-8260B	71.1*	(73.0 - 129.)
Dibromofluoromethane	MTBE-8260B	77.5	(66.0 - 117.)
Toluene-d8	MTBE-8260B	82.0	(73.0 - 122.)
Bromofluorobenzene	NAP-8260B	71.1*	(73.0 - 129.)
Dibromofluoromethane	NAP-8260B	77.5	(66.0 - 117.)
Toluene-d8	NAP-8260B	82.0	(73.0 - 122.)
Bromofluorobenzene	PP VOA-TETR	71.1*	(73.0 - 129.)
Dibromofluoromethane	PP VOA-TETR	77.5	(66.0 - 117.)
Toluene-d8	PP VOA-TETR	82.0	(73.0 - 122.)

M = Method	Method-Description
M 1	EPA 8260B
M 2	EPA 8260
M 3	SW846 8270C
M 4	EPA 3510

### Notes:

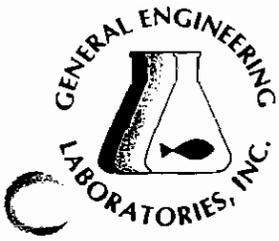
The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.



# GENERAL ENGINEERING LABORATORIES

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## Laboratory Certifications

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FL	E87156/87294	E87472/87458
NC	233	
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Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

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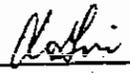
Sample ID : 02GLM0401

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**M = Method** **Method-Description**

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This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Valerie Davis at (843) 769-7391.

  
\_\_\_\_\_  
Reviewed By



# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

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FL	E87156/87294	E87472/87458
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SC	10120	10582
TN	02934	02934

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 Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

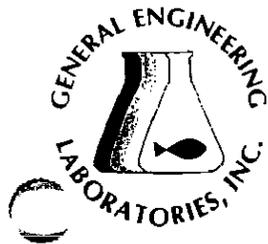
Report Date: March 26, 1999

Page 1 of 4

Sample ID : 02GLM0501  
 Lab ID : 9903340-07  
 Matrix : Water  
 Date Collected : 03/08/99  
 Date Received : 03/09/99  
 Priority : Routine  
 Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
Ethylene Dibromide	U	ND	1.00	1.00	ug/l	1.0	MAP	03/18/99	0110	144624	1
TERT-BUTYL METHYL ETHER		ND	3.60	5.00	ug/l	1.0					
NAPHTHALENE	U	ND	0.600	5.00	ug/l	1.0	MAP	03/18/99	0110	144624	2
<i>Priority Pollutant Volatiles - 32 items</i>											
1,1,1-TRICHLOROETHANE	U	ND	0.200	1.00	ug/l	1.0	MAP	03/18/99	0110	144624	1
1,1,2,2-TETRACHLOROETHANE		ND	0.500	1.00	ug/l	1.0					
1,1,2-TRICHLOROETHANE	U	ND	0.400	1.00	ug/l	1.0					
1,1-DICHLOROETHANE	U	ND	0.400	1.00	ug/l	1.0					
1,1-DICHLOROETHENE	U	ND	0.700	1.00	ug/l	1.0					
1,2-DICHLOROBENZENE	U	ND	0.400	1.00	ug/l	1.0					
1,2-DICHLOROETHANE	U	ND	0.200	1.00	ug/l	1.0					
1,2-DICHLOROPROPANE	U	ND	0.200	1.00	ug/l	1.0					
TRANS-1,2-DICHLOROETHENE		ND	0.700	1.00	ug/l	1.0					
1,3-DICHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
1,4-DICHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
BENZENE	U	ND	0.300	5.00	ug/l	1.0					
BROMOFORM	U	ND	0.400	1.00	ug/l	1.0					
CARBON TETRACHLORIDE	U	ND	0.200	1.00	ug/l	1.0					
CHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
CHLORODIBROMOMETHANE		ND	0.300	1.00	ug/l	1.0					
CHLOROETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROFORM		1.63	0.700	1.00	ug/l	1.0					
BROMODICHLOROMETHANE		ND	0.400	1.00	ug/l	1.0					
DICHLORODIFLUOROMETHANE		ND	1.20	5.00	ug/l	1.0					
ETHYLBENZENE	U	ND	0.300	5.00	ug/l	1.0					
BROMOMETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROMETHANE	U	ND	0.200	1.00	ug/l	1.0					
METHYLENE CHLORIDE	U	ND	1.20	5.00	ug/l	1.0					





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FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

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Sample ID : 02GLM0501

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
TETRACHLOROETHYLENE	U	ND	0.700	1.00	ug/l	1.0					
TOLUENE	U	ND	0.500	5.00	ug/l	1.0	MAP	03/18/99	0110	144624	1
TRICHLOROETHYLENE (TCB)		ND	0.600	1.00	ug/l	1.0					
TRICHLOROFLUOROMETHANE		ND	1.70	5.00	ug/l	1.0					
VINYL CHLORIDE	U	ND	0.400	1.00	ug/l	1.0					
XYLENES, TOTAL	U	ND	1.10	5.00	ug/l	1.0					
CIS-1,3-DICHLOROPROPENE	U	ND	0.300	1.00	ug/l	1.0					
TRANS-1,3-DICHLOROPROPENE		ND	0.300	1.00	ug/l	1.0					
<b>Extractable Organics</b>											
<i>Polyaromatic Hydrocarbon Compounds - 15 Items</i>											
ACENAPHTHENE	U	ND	2.27	10.3	ug/l	1.0	MKP	03/17/99	0522	144250	3
ACENAPHTHYLENE	U	ND	1.34	10.3	ug/l	1.0					
ANTHRACENE	U	ND	2.37	10.3	ug/l	1.0					
BENZO(A)ANTHRACENE	U	ND	2.88	10.3	ug/l	1.0					
BENZO(A)PYRENE	U	ND	2.06	10.3	ug/l	1.0					
BENZO(B)FLUORANTHENE	U	ND	4.84	10.3	ug/l	1.0					
BENZO(G,H,I)PERYLENE	U	ND	2.58	10.3	ug/l	1.0					
BENZO(K)FLUORANTHENE	U	ND	2.68	10.3	ug/l	1.0					
CHRYSENE	U	ND	2.27	10.3	ug/l	1.0					
DIBENZ(A,H)ANTHRACENE	U	ND	2.27	10.3	ug/l	1.0					
FLUORANTHENE	U	ND	3.19	10.3	ug/l	1.0					
FLUORENE	U	ND	2.16	10.3	ug/l	1.0					
INDENO(1,2,3-CD)PYRENE	U	ND	3.50	10.3	ug/l	1.0					
PHENANTHRENE	U	ND	1.85	10.3	ug/l	1.0					
PYRENE	U	ND	2.58	10.3	ug/l	1.0					

The following prep procedures were performed:

GC/MS Base/Neutral Compounds

ES 03/10/99 1430 144250 4

Surrogate Recovery	Test	Percent %	Acceptable Limits
2-Fluorobiphenyl	M610-TETR	42.3	(41.2 - 107.)
Nitrobenzene-d5	M610-TETR	42.7	(35.3 - 108.)

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STATE	GEL	EPI
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Client: Tetra Tech NUS, Inc.  
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 Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

Page 3 of 4

Sample ID : 02GLM0501

Surrogate Recovery	Test	Percent %	Acceptable Limits
p-Terphenyl-d14	M610-TETR	48.8	(36.6 - 110.)
Bromofluorobenzene	EDB-8260B	72.5*	(73.0 - 129.)
Dibromofluoromethane	EDB-8260B	77.7	(66.0 - 117.)
Toluene-d8	EDB-8260B	82.8	(73.0 - 122.)
Bromofluorobenzene	MTBE-8260B	72.5*	(73.0 - 129.)
Dibromofluoromethane	MTBE-8260B	77.7	(66.0 - 117.)
Toluene-d8	MTBE-8260B	82.8	(73.0 - 122.)
Bromofluorobenzene	NAP-8260B	72.5*	(73.0 - 129.)
Dibromofluoromethane	NAP-8260B	77.7	(66.0 - 117.)
Toluene-d8	NAP-8260B	82.8	(73.0 - 122.)
Bromofluorobenzene	PP VOA-TETR	72.5*	(73.0 - 129.)
Dibromofluoromethane	PP VOA-TETR	77.7	(66.0 - 117.)
Toluene-d8	PP VOA-TETR	82.8	(73.0 - 122.)

M = Method	Method-Description
M 1	EPA 8260B
M 2	EPA 8260
M 3	SW846 8270C
M 4	EPA 3510

**Notes:**

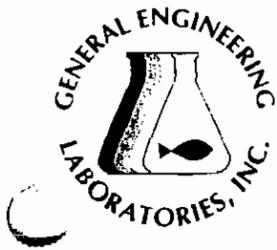
The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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

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\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.



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Page 4 of 4

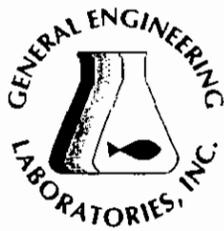
Sample ID : 02GLM0501

### M = Method

### Method-Description

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Valerie Davis at (843) 769-7391.

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# GENERAL ENGINEERING LABORATORIES

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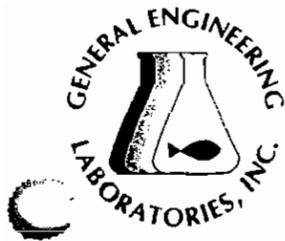
Report Date: March 26, 1999

Page 1 of 4

Sample ID : 02GLM0301D  
 Lab ID : 9903340-08  
 Matrix : Water  
 Date Collected : 03/08/99  
 Date Received : 03/09/99  
 Priority : Routine  
 Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
Ethylene Dibromide	U	ND	1.00	1.00	ug/l	1.0	MAP	03/18/99	0141	144624	1
TERT-BUTYL METHYL ETHER		ND	3.60	5.00	ug/l	1.0					
NAPHTHALENE	U	ND	0.600	5.00	ug/l	1.0	MAP	03/18/99	0141	144624	2
<i>Priority Pollutant Volatiles - 32 items</i>											
1,1,1-TRICHLOROETHANE	U	ND	0.200	1.00	ug/l	1.0	MAP	03/18/99	0141	144624	1
1,1,2,2-TETRACHLOROETHANE		ND	0.500	1.00	ug/l	1.0					
1,1,2-TRICHLOROETHANE	U	ND	0.400	1.00	ug/l	1.0					
1,1-DICHLOROETHANE	U	ND	0.400	1.00	ug/l	1.0					
1,1-DICHLOROETHENE	U	ND	0.700	1.00	ug/l	1.0					
1,2-DICHLOROETHANE	U	ND	0.400	1.00	ug/l	1.0					
1,2-DICHLOROETHANE	U	ND	0.200	1.00	ug/l	1.0					
1,2-DICHLOROPROPANE	U	ND	0.200	1.00	ug/l	1.0					
TRANS-1,2-DICHLOROETHENE		ND	0.700	1.00	ug/l	1.0					
1,3-DICHLOROETHANE	U	ND	0.300	1.00	ug/l	1.0					
1,4-DICHLOROETHANE	U	ND	0.300	1.00	ug/l	1.0					
BENZENE	U	ND	0.300	5.00	ug/l	1.0					
BROMOFORM	U	ND	0.400	1.00	ug/l	1.0					
CARBON TETRACHLORIDE	U	ND	0.200	1.00	ug/l	1.0					
CHLOROETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLORODIBROMOMETHANE		ND	0.300	1.00	ug/l	1.0					
CHLOROETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROFORM	U	ND	0.700	1.00	ug/l	1.0					
BROMODICHLOROMETHANE		ND	0.400	1.00	ug/l	1.0					
DICHLORODIFLUOROMETHANE		ND	1.20	5.00	ug/l	1.0					
ETHYLBENZENE	U	ND	0.300	5.00	ug/l	1.0					
BROMOMETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROMETHANE	U	ND	0.200	1.00	ug/l	1.0					
METHYLENE CHLORIDE	U	ND	1.20	5.00	ug/l	1.0					





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NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
 794 South Military Trail  
 Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

Page 2 of 4

Sample ID : 02GLM0301D

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
TETRACHLOROETHYLENE	U	ND	0.700	1.00	ug/l	1.0					
TOLUENE	U	ND	0.500	5.00	ug/l	1.0	MAP	03/18/99	0141	144624	1
TRICHLOROETHYLENE (TCE)		ND	0.600	1.00	ug/l	1.0					
TRICHLOROFUOROMETHANE		ND	1.70	5.00	ug/l	1.0					
VINYL CHLORIDE	U	ND	0.400	1.00	ug/l	1.0					
XYLENES, TOTAL	U	ND	1.10	5.00	ug/l	1.0					
CIS-1,3-DICHLOROPROPENE	U	ND	0.300	1.00	ug/l	1.0					
TRANS-1,3-DICHLOROPROPENE		ND	0.300	1.00	ug/l	1.0					

### Extractable Organics

#### Polyaromatic Hydrocarbon Compounds - 15 items

ACENAPHTHENE	U	ND	2.24	10.2	ug/l	1.0	MKP	03/17/99	0553	144250	3
ACENAPHTHYLENE	U	ND	1.33	10.2	ug/l	1.0					
ANTHRACENE	U	ND	2.35	10.2	ug/l	1.0					
BENZO(A)ANTHRACENE	U	ND	2.86	10.2	ug/l	1.0					
BENZO(A)PYRENE	U	ND	2.04	10.2	ug/l	1.0					
BENZO(B)FLUORANTHENE	U	ND	4.79	10.2	ug/l	1.0					
BENZO(G,H,I)PERYLENE	U	ND	2.55	10.2	ug/l	1.0					
BENZO(K)FLUORANTHENE	U	ND	2.65	10.2	ug/l	1.0					
CHRYSENE	U	ND	2.24	10.2	ug/l	1.0					
DIBENZ(A,H)ANTHRACENE	U	ND	2.24	10.2	ug/l	1.0					
FLUORANTHENE	U	ND	3.16	10.2	ug/l	1.0					
FLUORENE	U	ND	2.14	10.2	ug/l	1.0					
INDENO(1,2,3-CD)PYRENE	U	ND	3.47	10.2	ug/l	1.0					
PHENANTHRENE	U	ND	1.84	10.2	ug/l	1.0					
PYRENE	U	ND	2.55	10.2	ug/l	1.0					

The following prep procedures were performed:

GC/MS Base/Neutral Compounds

ES 03/10/99 1430 144250 4

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610-TETR	71.2	(41.2 - 107.)
Nitrobenzene-d5	M610-TETR	63.0	(35.3 - 108.)

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# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
 794 South Military Trail  
 Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC - Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

Page 3 of 4

Sample ID : 02GLM0301D

Surrogate Recovery	Test	Percent %	Acceptable Limits
p-Terphenyl-d14	M610-TETR	72.7	(36.6 - 110.)
Bromofluorobenzene	EDB-8260B	71.4*	(73.0 - 129.)
Dibromofluoromethane	EDB-8260B	78.3	(66.0 - 117.)
Toluene-d8	EDB-8260B	82.7	(73.0 - 122.)
Bromofluorobenzene	MTBE-8260B	71.4*	(73.0 - 129.)
Dibromofluoromethane	MTBE-8260B	78.3	(66.0 - 117.)
Toluene-d8	MTBE-8260B	82.7	(73.0 - 122.)
Bromofluorobenzene	NAP-8260B	71.4*	(73.0 - 129.)
Dibromofluoromethane	NAP-8260B	78.3	(66.0 - 117.)
Toluene-d8	NAP-8260B	82.7	(73.0 - 122.)
Bromofluorobenzene	PP VOA-TETR	71.4*	(73.0 - 129.)
Dibromofluoromethane	PP VOA-TETR	78.3	(66.0 - 117.)
Toluene-d8	PP VOA-TETR	82.7	(73.0 - 122.)

M = Method	Method-Description
M 1	EPA 8260B
M 2	EPA 8260
M 3	SW846 8270C
M 4	EPA 3510

**Notes:**

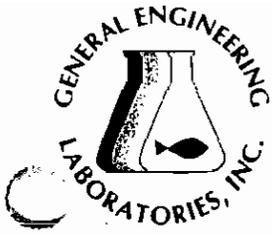
The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.



# GENERAL ENGINEERING LABORATORIES

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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442  
Contact: Mr. Arnold Lamb  
Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

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Sample ID : 02GLM0301D

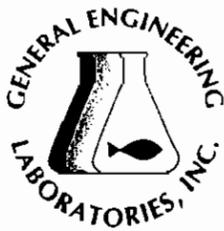
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M = Method	Method-Description
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This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Valerie Davis at (843) 769-7391.

Reviewed By



# GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
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Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

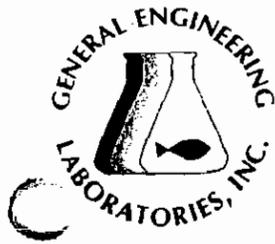
Report Date: March 26, 1999

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Sample ID : 02GLP0101  
Lab ID : 9903340-09  
Matrix : Water  
Date Collected : 03/08/99  
Date Received : 03/09/99  
Priority : Routine  
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
Ethylene Dibromide	U	ND	1.00	1.00	ug/l	1.0	MAP	03/18/99	0211	144624	1
TERT-BUTYL METHYL ETHER		ND	3.60	5.00	ug/l	1.0					
NAPHTHALENE	U	ND	0.600	5.00	ug/l	1.0	MAP	03/18/99	0211	144624	2
<b>Priority Pollutants Volatiles - 32 items</b>											
1,1,1-TRICHLOROETHANE	U	ND	0.200	1.00	ug/l	1.0	MAP	03/18/99	0211	144624	1
1,1,2,2-TETRACHLOROETHANE		ND	0.500	1.00	ug/l	1.0					
1,1,2-TRICHLOROETHANE	U	ND	0.400	1.00	ug/l	1.0					
1,1-DICHLOROETHANE	U	ND	0.400	1.00	ug/l	1.0					
1,1-DICHLOROETHENE	U	ND	0.700	1.00	ug/l	1.0					
1,2-DICHLOROETHANE	U	ND	0.400	1.00	ug/l	1.0					
1,2-DICHLOROETHANE	U	ND	0.200	1.00	ug/l	1.0					
1,2-DICHLOROPROPANE	U	ND	0.200	1.00	ug/l	1.0					
TRANS-1,2-DICHLOROETHENE		ND	0.700	1.00	ug/l	1.0					
1,3-DICHLOROETHANE	U	ND	0.300	1.00	ug/l	1.0					
1,4-DICHLOROETHANE	U	ND	0.300	1.00	ug/l	1.0					
BENZENE	U	ND	0.300	5.00	ug/l	1.0					
BROMOFORM	U	ND	0.400	1.00	ug/l	1.0					
CARBON TETRACHLORIDE	U	ND	0.200	1.00	ug/l	1.0					
CHLOROETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLORODIBROMOMETHANE		ND	0.300	1.00	ug/l	1.0					
CHLOROETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROFORM	U	ND	0.700	1.00	ug/l	1.0					
BROMODICHLOROMETHANE		ND	0.400	1.00	ug/l	1.0					
DICHLORODIFLUOROMETHANE		ND	1.20	5.00	ug/l	1.0					
ETHYLBENZENE	U	ND	0.300	5.00	ug/l	1.0					
BROMOMETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROMETHANE	U	ND	0.200	1.00	ug/l	1.0					
METHYLENE CHLORIDE	U	ND	1.20	5.00	ug/l	1.0					





# GENERAL ENGINEERING LABORATORIES

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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

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Sample ID : 02GLP0101

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
TETRACHLOROETHYLENE	U	ND	0.700	1.00	ug/l	1.0					
TOLUENE	U	ND	0.500	5.00	ug/l	1.0	MAP	03/18/99	0211	144624	1
TRICHLOROETHYLENE (TCB)		ND	0.600	1.00	ug/l	1.0					
TRICHLOROFUOROMETHANE		ND	1.70	5.00	ug/l	1.0					
VINYL CHLORIDE	U	ND	0.400	1.00	ug/l	1.0					
XYLENES, TOTAL	U	ND	1.10	5.00	ug/l	1.0					
CIS-1,3-DICHLOROPROPENE	U	ND	0.300	1.00	ug/l	1.0					
TRANS-1,3-DICHLOROPROPENE		ND	0.300	1.00	ug/l	1.0					
<b>Extractable Organics</b>											
<i>Polyaromatic Hydrocarbon Compounds - 15 items</i>											
ACENAPHTHENE	U	ND	2.27	10.3	ug/l	1.0	MKP	03/17/99	0624	144250	3
ACENAPHTHYLENE	U	ND	1.34	10.3	ug/l	1.0					
ANTHRACENE	U	ND	2.37	10.3	ug/l	1.0					
BENZO(A)ANTHRACENE	U	ND	2.88	10.3	ug/l	1.0					
BENZO(A)PYRENE	U	ND	2.06	10.3	ug/l	1.0					
BENZO(B)FLUORANTHENE	U	ND	4.84	10.3	ug/l	1.0					
BENZO(G,H,I)PERYLENE	U	ND	2.58	10.3	ug/l	1.0					
BENZO(K)FLUORANTHENE	U	ND	2.68	10.3	ug/l	1.0					
CHRYSENE	U	ND	2.27	10.3	ug/l	1.0					
DIBENZ(A,H)ANTHRACENE	U	ND	2.27	10.3	ug/l	1.0					
FLUORANTHENE	U	ND	3.19	10.3	ug/l	1.0					
FLUORENE	U	ND	2.16	10.3	ug/l	1.0					
INDENO(1,2,3-CD)PYRENE	U	ND	3.50	10.3	ug/l	1.0					
PHENANTHRENE	U	ND	1.85	10.3	ug/l	1.0					
PYRENE	U	ND	2.58	10.3	ug/l	1.0					
<b>General Chemistry</b>											
NITROGEN, NITRATE	U	ND	0.0127	0.0500	mg/l	1.0	RWS	03/09/99	1937	144226	4
SULFATE (AS SO4)		386	0.380	2.00	mg/l	10.	RWS	03/09/99	2244	144226	4

The following prep procedures were performed:  
GC/MS Base/Neutral Compounds

ES 03/10/99 1430 144250 5



# GENERAL ENGINEERING LABORATORIES

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### Laboratory Certifications

STATE	GEL	EPI
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Client: Tetra Tech NUS, Inc.  
 794 South Military Trail  
 Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

Page 3 of 4

Sample ID : 02GLP0101

Surrogate Recovery	Test	Percent %	Acceptable Limits
2-Fluorobiphenyl	M610-TETR	62.0	(41.2 - 107.)
Nitrobenzene-d5	M610-TETR	57.5	(35.3 - 108.)
p-Terphenyl-d14	M610-TETR	62.7	(36.6 - 110.)
Bromofluorobenzene	EDB-8260B	71.4*	(73.0 - 129.)
Dibromofluoromethane	EDB-8260B	78.1	(66.0 - 117.)
Toluene-d8	EDB-8260B	82.0	(73.0 - 122.)
Bromofluorobenzene	MTBE-8260B	71.4*	(73.0 - 129.)
Dibromofluoromethane	MTBE-8260B	78.1	(66.0 - 117.)
Toluene-d8	MTBE-8260B	82.0	(73.0 - 122.)
Bromofluorobenzene	NAP-8260B	71.4*	(73.0 - 129.)
Dibromofluoromethane	NAP-8260B	78.1	(66.0 - 117.)
Toluene-d8	NAP-8260B	82.0	(73.0 - 122.)
Bromofluorobenzene	PP VOA-TETR	71.4*	(73.0 - 129.)
Dibromofluoromethane	PP VOA-TETR	78.1	(66.0 - 117.)
Toluene-d8	PP VOA-TETR	82.0	(73.0 - 122.)

M = Method	Method-Description
M 1	EPA 8260B
M 2	EPA 8260
M 3	SW846 8270C
M 4	EPA 300.0
M 5	EPA 3510

#### Notes:

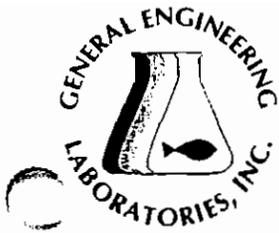
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\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.



# GENERAL ENGINEERING LABORATORIES

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## Laboratory Certifications

STATE	GEL	EPI
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NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442  
Contact: Mr. Arnold Lamb  
Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

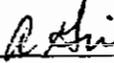
Page 4 of 4

Sample ID : 02GLP0101

### M = Method

### Method-Description

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Valerie Davis at (843) 769-7391.

Reviewed By 



GENERAL ENGINEER LABORATORY

Lab Name:QUANTERRA

SDG Number: GEL003

Matrix: (soil/water) WATER

Lab Sample ID:I9C100197 002

Method: RSK SOP-175

Dissolved Gasses in Water

Sample WT/Vol: 43 / mL

Date Received: 03/10/99

Work Order: CRGR4101

Date Extracted:03/19/99

Dilution factor: 1

Date Analyzed: 03/19/99

Moisture %:NA

QC Batch: 9082177

Client Sample Id: 02GLP0101

CAS NO.	COMPOUND	CONCENTRATION UNITS:	
		(ug/L or ug/kg)	ug/L
74-82-8	Methane	320	BE

GENERAL ENGINEER LABORATORY

Lab Name:QUANTERRA

SDG Number: GEL003

Matrix: (soil/water) WATER

Lab Sample ID:I9C100197 002

Method: RSK SOP-175

Dissolved Gasses in Water

Sample WT/Vol: 43 / mL

Date Received: 03/10/99

Work Order: CRGR4201

Date Extracted:03/19/99

Dilution factor: 20

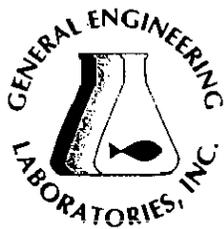
Date Analyzed: 03/19/99

Moisture %:NA

QC Batch: 9082177

Client Sample Id: 02GLP0101 -RE 1

CAS NO.	COMPOUND	CONCENTRATION UNITS:		Q
		(ug/L or ug/kg)	ug/L	
74-84-0	Ethane	10		U
74-85-1	Ethene	10		U
74-82-8	Methane	850		B D



# GENERAL ENGINEERING LABORATORIES

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SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
 794 South Military Trail  
 Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

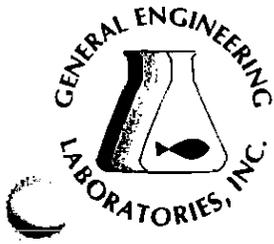
Report Date: March 26, 1999

Page 1 of 4

Sample ID : NBCH178-002  
 Lab ID : 9903340-10  
 Matrix : Water  
 Date Collected : 03/08/99  
 Date Received : 03/09/99  
 Priority : Routine  
 Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
<b>Volatile Organics</b>											
Ethylene Dibromide	U	ND	1.00	1.00	ug/l	1.0	MAP	03/18/99	0242	144624	1
TERT-BUTYL METHYL ETHER		9.83	3.60	5.00	ug/l	1.0					
NAPHTHALENE	U	ND	0.600	5.00	ug/l	1.0	MAP	03/18/99	0242	144624	2
<i>Priority Pollutants Volatiles - 32 items</i>											
1,1,1-TRICHLOROETHANE	U	ND	0.200	1.00	ug/l	1.0	MAP	03/18/99	0242	144624	1
1,1,2,2-TETRACHLOROETHANE		ND	0.500	1.00	ug/l	1.0					
1,1,2-TRICHLOROETHANE	U	ND	0.400	1.00	ug/l	1.0					
1,1-DICHLOROETHANE	U	ND	0.400	1.00	ug/l	1.0					
1,1-DICHLOROETHENE	U	ND	0.700	1.00	ug/l	1.0					
1,2-DICHLOROBENZENE	U	ND	0.400	1.00	ug/l	1.0					
1,2-DICHLOROETHANE	U	ND	0.200	1.00	ug/l	1.0					
1,2-DICHLOROPROPANE	U	ND	0.200	1.00	ug/l	1.0					
TRANS-1,2-DICHLOROETHENE		ND	0.700	1.00	ug/l	1.0					
1,3-DICHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
1,4-DICHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
BENZENE	U	ND	0.300	5.00	ug/l	1.0					
BROMOFORM	U	ND	0.400	1.00	ug/l	1.0					
CARBON TETRACHLORIDE	U	ND	0.200	1.00	ug/l	1.0					
CHLOROBENZENE	U	ND	0.300	1.00	ug/l	1.0					
CHLORODIBROMOMETHANE		ND	0.300	1.00	ug/l	1.0					
CHLOROETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROFORM	U	ND	0.700	1.00	ug/l	1.0					
BROMODICHLOROMETHANE		ND	0.400	1.00	ug/l	1.0					
DICHLORODIFLUOROMETHANE		ND	1.20	5.00	ug/l	1.0					
ETHYLBENZENE	U	ND	0.300	5.00	ug/l	1.0					
BROMOMETHANE	U	ND	0.300	1.00	ug/l	1.0					
CHLOROMETHANE	U	ND	0.200	1.00	ug/l	1.0					
METHYLENE CHLORIDE	U	ND	1.20	5.00	ug/l	1.0					





# GENERAL ENGINEERING LABORATORIES

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## Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
 794 South Military Trail  
 Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

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Sample ID : NBCH178-002

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
TETRACHLOROETHYLENE	U	ND	0.700	1.00	ug/l	1.0					
TOLUENE	U	ND	0.500	5.00	ug/l	1.0	MAP	03/18/99	0242	144624	1
TRICHLOROETHYLENE (TCE)	U	ND	0.600	1.00	ug/l	1.0					
TRICHLOROFUOROMETHANE	U	ND	1.70	5.00	ug/l	1.0					
VINYL CHLORIDE	U	ND	0.400	1.00	ug/l	1.0					
XYLENES, TOTAL	U	ND	1.10	5.00	ug/l	1.0					
CIS-1,3-DICHLOROPROPENE	U	ND	0.300	1.00	ug/l	1.0					
TRANS-1,3-DICHLOROPROPENE	U	ND	0.300	1.00	ug/l	1.0					
<b>Extractable Organics</b>											
<i>Polyaromatic Hydrocarbon Compounds - 15 items</i>											
ACENAPHTHENE	U	ND	2.24	10.2	ug/l	1.0	MKP	03/17/99	0655	144250	3
ACENAPHTHYLENE	U	ND	1.33	10.2	ug/l	1.0					
ANTHRACENE	U	ND	2.35	10.2	ug/l	1.0					
BENZO(A)ANTHRACENE	U	ND	2.86	10.2	ug/l	1.0					
BENZO(A)PYRENE	U	ND	2.04	10.2	ug/l	1.0					
BENZO(B)FLUORANTHENE	U	ND	4.79	10.2	ug/l	1.0					
BENZO(G,H,I)PERYLENE	U	ND	2.55	10.2	ug/l	1.0					
BENZO(K)FLUORANTHENE	U	ND	2.65	10.2	ug/l	1.0					
CHRYSENE	U	ND	2.24	10.2	ug/l	1.0					
DIBENZ(A,H)ANTHRACENE	U	ND	2.24	10.2	ug/l	1.0					
FLUORANTHENE	U	ND	3.16	10.2	ug/l	1.0					
FLUORENE	U	ND	2.14	10.2	ug/l	1.0					
INDENO(1,2,3-CD)PYRENE	U	ND	3.47	10.2	ug/l	1.0					
PHENANTHRENE	U	ND	1.84	10.2	ug/l	1.0					
PYRENE	U	ND	2.55	10.2	ug/l	1.0					
<b>General Chemistry</b>											
NITROGEN, NITRATE	J	0.0150	0.0127	0.0500	mg/l	1.0	RWS	03/09/99	1950	144226	4
SULFATE (AS SO4)	-	86.4	0.0760	0.400	mg/l	2.0	RWS	03/09/99	2257	144226	4

The following prep procedures were performed:  
 GC/MS Base/Neutral Compounds

ES 03/10/99 1430 144250 5



# GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

### Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Tetra Tech NUS, Inc.  
794 South Military Trail  
Deerfield Beach, Florida 33442

Contact: Mr. Arnold Lamb

Project Description: CNC- Zone H UST (CTO68)

cc: TETR00498

Report Date: March 26, 1999

Page 3 of 4

Sample ID : NBCH178-002

Surrogate Recovery	Test	Percent %	Acceptable Limits
2-Fluorobiphenyl	M610-TETR	52.3	(41.2 - 107.)
Nitrobenzene-d5	M610-TETR	44.1	(35.3 - 108.)
p-Terphenyl-d14	M610-TETR	66.3	(36.6 - 110.)
Bromofluorobenzene	EDB-8260B	71.8*	(73.0 - 129.)
Dibromofluoromethane	EDB-8260B	77.2	(66.0 - 117.)
Toluene-d8	EDB-8260B	82.7	(73.0 - 122.)
Bromofluorobenzene	MTBE-8260B	71.8*	(73.0 - 129.)
Dibromofluoromethane	MTBE-8260B	77.2	(66.0 - 117.)
Toluene-d8	MTBE-8260B	82.7	(73.0 - 122.)
Bromofluorobenzene	NAP-8260B	71.8*	(73.0 - 129.)
Dibromofluoromethane	NAP-8260B	77.2	(66.0 - 117.)
Toluene-d8	NAP-8260B	82.7	(73.0 - 122.)
Bromofluorobenzene	PP VOA-TETR	71.8*	(73.0 - 129.)
Dibromofluoromethane	PP VOA-TETR	77.2	(66.0 - 117.)
Toluene-d8	PP VOA-TETR	82.7	(73.0 - 122.)

M = Method	Method-Description
M 1	EPA 8260B
M 2	EPA 8260
M 3	SW846 8270C
M 4	EPA 300.0
M 5	EPA 3510

**Notes:**

The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

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

U indicates that the analyte was not detected at a concentration greater than the detection limit.

\* indicates that a quality control analyte recovery is outside of specified acceptance criteria.



GENERAL ENGINEER LABORATORY

Lab Name:QUANTERRA

SDG Number: GEL003

Matrix: (soil/water) WATER

Lab Sample ID:I9C100197 003

Method: RSK SOP-175

Dissolved Gasses in Water

Sample WT/Vol: 43 / mL

Date Received: 03/10/99

Work Order: CRGR5101

Date Extracted:03/19/99

Dilution factor: 1

Date Analyzed: 03/19/99

Moisture %:NA

QC Batch: 9082177

Client Sample Id: NBCH178-002

CAS NO.	COMPOUND	CONCENTRATION UNITS:	
		(ug/L or ug/kg)	ug/L
74-82-8	Methane	220	Q B E

GENERAL ENGINEER LABORATORY

Lab Name:QUANTERRA

SDG Number: GEL003

Matrix: (soil/water) WATER

Lab Sample ID:I9C100197 003

Method: RSK SOP-175

Dissolved Gasses in Water

Sample WT/Vol: 43 / mL

Date Received: 03/10/99

Work Order: CRGR5201

Date Extracted:03/19/99

Dilution factor: 5

Date Analyzed: 03/19/99

Moisture %:NA

QC Batch: 9082177

Client Sample Id: NBCH178-002 -RE 1

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/kg)	ug/L	Q
74-82-8	Methane		190	B D

# CHAIN OF CUSTODY RECORD

9903340%

Client Name/Facility Name		SAMPLE ANALYSIS REQUIRED (x) - use remarks area to specify specific compounds or methods															Remarks				
Zone H, Charleston Naval Complex		# OF CONTAINERS	pH, conductivity	TOC/DOC	TOX- PAH	Chloride, Fluoride, Sulfide	Nitrite/Nitrate	VOC - Specify Method required	METALS - specify	Pesticide	Herbicide	Total Phenol	Acid Extractables	B/N Extractables	PCB/TPH	Cyanide		California - specify type	ANIONS	Methane	
Collected by/Company	Complex																				
SAMPLE ID	DATE	TIME	WELL	SOIL	COMP	GRAB															
01 ZHT101501	—	—						3												trip blank	
<del>ZH150</del>																					
02 ZHRL00501	3-8	1700	✓			6		2	3						1					RIP SATE + EDB	
03 0ZGLM0101		1500	✓			5		2	3												
04 0ZGLM0201		1510	✓			9		2	3									1	3		
05 0ZGLM0301		1520	✓			5		2	3												
06 0ZGLM0401		1530	✓			5		2	3												
07 0ZGLM0501		1540	✓			5		2	3												
08 0ZGLM0301D		1520	✓			5		2	3												
09 0ZGLP0101		1550	✓			9		2	3									1	3	+ EDB PS	
10 NBCH178-002	3-9	1600	✓			9		2	3									1	3	+ EDB PS	
<del>encl</del>																					
11 0ZGLM0701	3-9	0820	✓			6		2	3						1					+ EDB	

Relinquished by:	Date: 3-9-99	Time: 1230	Received by:	Relinquished by:	Date:	Time:	Received by:
Relinquished by:	Date:	Time:	Received by lab by:	Date: 3/9/99	Time: 1230	Remarks: VOC = 8260 w/ MTBE & NAPHTH (see remarks 5) PAH = 8270 TPH = 71 ANIONS = NITRATE & SULFATE	

White = sample collector    Yellow = file    Pink = with report

35720  
2  
2  
3  
4  
3  
4  
2

# CHAIN OF CUSTODY RECORD

Page 2 of 2

Client Name/Facility Name <i>CNC Zone H</i>				SAMPLE ANALYSIS REQUIRED (x) - use remarks area to specify specific compounds or methods														Use F or P in the boxes to indicate whether sample was filtered and/or preserved					
Collected by/Company <i>TANUS/MS/W</i>																							
SAMPLE ID	DATE	TIME	WELL	SOIL	COMP	GRAB	# OF CONTAINERS	pH conductivity	TOC/DOC	TOX PAH	Chloride, Fluoride, Sulfide	Nitrate/Nitrate	VOC - Specify Method Required	METALS - specify	Festicide	Herbicide	Total Phenol	Acid Extractables	B/N Extractables	PCBs TPH	Cyanide	Coliform - specify type	Remarks
<i>12</i> 11GLM0101	<i>3-9</i>	<i>0840</i>	<i>-</i>				<i>6</i>			<i>2</i>			<i>3</i>							<i>1</i>			<i>+ EDB</i>
<i>13</i> 11GLM0101D		<i>0840</i>	<i>-</i>				<i>6</i>			<i>2</i>			<i>3</i>							<i>1</i>			<i>+ EDB</i>
<i>14</i> 11GLM0601		<i>1010</i>	<i>✓</i>				<i>6</i>			<i>2</i>			<i>3</i>							<i>1</i>			<i>+ EDB</i>
<i>15</i> NBCH663-002	<i>↓</i>	<i>1000</i>	<i>✓</i>				<i>6</i>			<i>2</i>			<i>3</i>							<i>1</i>			<i>+ EDB</i>

Relinquished by: <i>TK/MS</i>	Date: <i>3-9-99</i>	Time: <i>1230</i>	Received by:	Relinquished by:	Date:	Time:	Received by:
Relinquished by: <i>[Signature]</i>	Date:	Time:	Received by lab by: <i>Sharon Chandler</i>	Date: <i>3/9/99</i>	Time: <i>1230</i>	Remarks: <i>VOC = 8260 W / MTBE &amp; NAPHTH (See 12MA)</i> <i>PAH = 8270 TPH = <del>8270</del> 9071</i> <i>ANIONS = NITRATE &amp; SULFATE</i>	

White = sample collector    Yellow = file    Pink = with report

**APPENDIX E**

**AQUIFER CHARACTERIZATION GRAPHS**

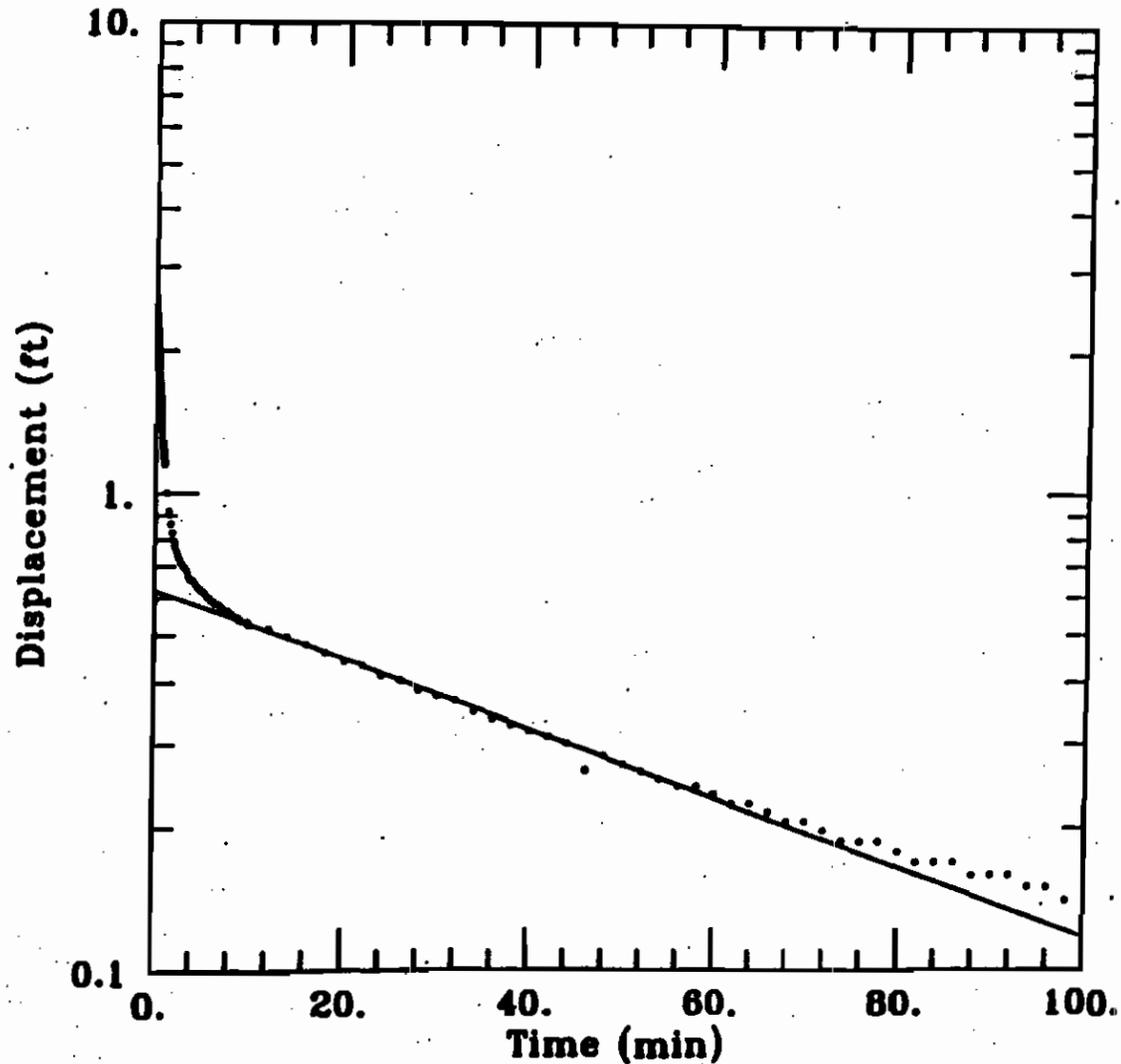
Client: CLEAN

Company: E/A&H

Location: NAS CHARLESTON

Project: 2908-08450

# NBCH178001 Rising Head Slug Test



DATA SET:  
17801RIS.AQT  
01/16/95

AQUIFER MODEL:  
Unconfined  
SOLUTION METHOD:  
Bouwer-Rice

TEST DATA:  
H0 = 0.5886 ft  
rc = 0.08333 ft  
rw = 0.3333 ft  
L = 8. ft  
b = 12. ft  
H = 8. ft

PARAMETER ESTIMATES:  
K = 7.17E-05 ft/min  
y0 = 0.6229 ft

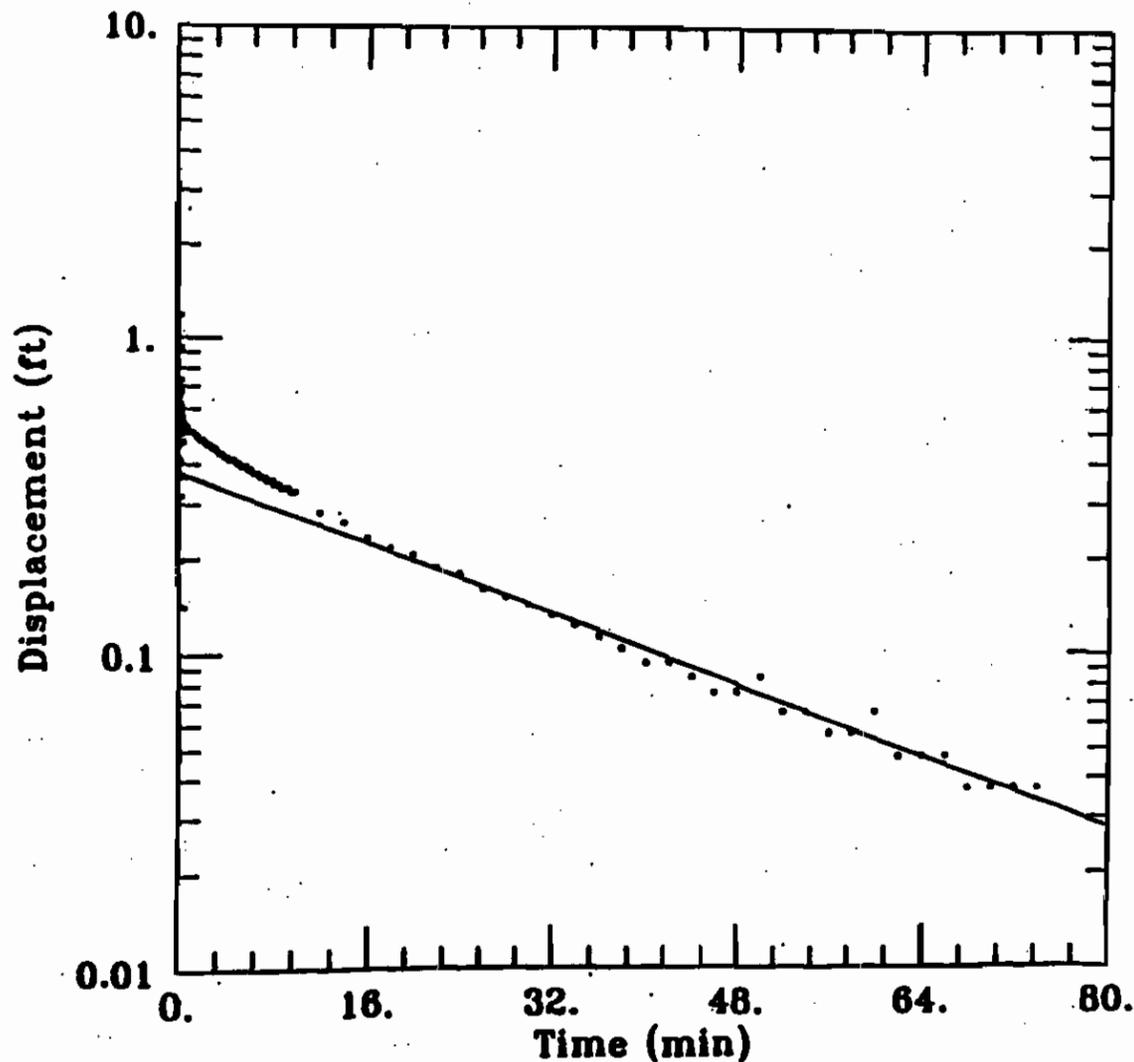
Client: CLEAN

Company: E/A&H

Location: NAS CHARLESTON

Project: 2908-08450

## NBCH178001 Falling Head Slug Test



DATA SET:  
17801FAL.AQT  
01/16/95

AQUIFER MODEL:

Unconfined

SOLUTION METHOD:

Bower-Rice

TEST DATA:

$H_0 = 0.5886$  ft

$r_c = 0.08333$  ft

$r_w = 0.3333$  ft

$L = 8$  ft

$b = 12$  ft

$H = 8$  ft

PARAMETER ESTIMATES:

$K = 0.0001409$  ft/min

$y_0 = 0.378$  ft

**APPENDIX F**

**PREDECTED 10-YEAR AND 20-YEAR MIGRATION**

**SITE 2, BUILDING NS 53  
ZONE H, CHARLESTON NAVAL COMPLEX  
NORTH CHARLESTON, SOUTH CAROLINA**

**DOMENICO'S DILUTION/ATTENUATION EQUATION FOR GROUNDWATER TRANSPORT**

**Predicted 10-year Migration of Constituents in Groundwater**

Parameter Descriptions:	Units
POE = Point of Exposure	
SSTL = Site-Specific Target Level	mg/L
SSTL <sub>source</sub> = Hydrocarbon Concentration in Plume Source Area protective of RBSLs at POE	mg/L
SSTL <sub>comp</sub> = Hydrocarbon Concentration at Compliance Point protective of RBSLs at POE	mg/L
X <sub>POE</sub> = x = Distance from Plume Source to POE (along Centerline)	m
X <sub>comp</sub> = x = Distance from POE to Compliance Point (along Centerline)	m
Y = Source Width (Perpendicular to Flow Direction)	m
Z = Source Depth (Perpendicular to Flow Direction in Vertical Plane)	m
K <sub>s</sub> = Saturated Hydraulic Conductivity	m/sec
I = Groundwater Gradient	cm/cm
θ = Porosity in Saturated Zone	cm <sup>3</sup> /cm <sup>3</sup>

Parameter Descriptions:	Units
ρ <sub>s</sub> = Soil Bulk Density	g/cm <sup>3</sup>
f <sub>oc</sub> = Fraction Organic Carbon in Soil	g-C/g-soil
α <sub>x</sub> = Longitudinal Dispersivity = x/10	m
α <sub>y</sub> = Transverse Dispersivity = α <sub>x</sub> /3	m
α <sub>z</sub> = Vertical Dispersivity = α <sub>x</sub> /20	m
k <sub>oc</sub> = Organic Carbon Partition Coefficient	cm <sup>3</sup> -H <sub>2</sub> O/g-C
k <sub>d</sub> = Soil-Water Sorption Coefficient	cm <sup>3</sup> -H <sub>2</sub> O/g-soil
V = Pore Water Velocity	m/sec
R <sub>c</sub> = Constituent Retardation Factor	
V/R <sub>c</sub> = Maximum Transport Rate of Dissolved Constituent = (K <sub>s</sub> )(I)(θR <sub>c</sub> )	m/sec
RBSL = Risk-Based Screening Level in Water Provided by SCDHEC (1998)	mg/L

**Dilution & Attenuation without Biological Decay**

Constituent	X <sub>POE</sub> ft	X <sub>POE</sub> m	Y m	Z m	t sec	K <sub>s</sub> m/sec	I m/m	θ cm <sup>3</sup> /cm <sup>3</sup>	ρ <sub>s</sub> g/cm <sup>3</sup>	α <sub>x</sub> m	α <sub>y</sub> m	α <sub>z</sub> m	f <sub>oc</sub> g-C/g-soil	k <sub>oc</sub> cm <sup>3</sup> -H <sub>2</sub> O/g-C	k <sub>d</sub> cm <sup>3</sup> -H <sub>2</sub> O/g-soil	V m/sec	R <sub>c</sub>	C <sub>POE</sub> /C <sub>SOURCE</sub>
Benzene	83	25.2987	15	2	3.15E+08	1.08E-06	0.0273	0.47	1.5	2.53	0.84	0.13	2.73E-03	81	0.22113	6.26E-06	1.706	1.557E-02
Toluene	40.75	12.4208	15	2	3.15E+08	1.08E-06	0.0273	0.47	1.5	1.24	0.41	0.06	2.73E-03	133	0.36309	6.26E-06	2.199	2.152E-01
Naphthalene	17.8	5.42551	15	2	3.15E+08	1.08E-06	0.0273	0.47	1.5	0.54	0.18	0.03	2.73E-03	1543	4.21239	6.26E-06	14.444	4.290E-04

Source: South Carolina Department of Health and Environmental Control (SCDHEC) 1998. Risk-Based Corrective Action for Petroleum Releases, Bureau of Underground Storage Tank Management.

**DOMENICO DILUTION/ATTENUATION MODEL WITHOUT BIOLOGICAL DECAY**

Constituent	C <sub>source</sub> mg/L	C <sub>x</sub> mg/L
Benzene	0.313	0.005
Toluene	4.648	1.000
Naphthalene	23.348	0.010

$$\frac{C_x}{C_{SOURCE}} = \frac{1}{2} \operatorname{erfc} \left[ \frac{\left( x - \frac{vt}{R_c} \right)}{2 \sqrt{\alpha_x \frac{vt}{R_c}}} \right] \times \operatorname{erf} \left[ \frac{Y}{4 \sqrt{\alpha_y x}} \right] \times \operatorname{erf} \left[ \frac{Z}{2 \sqrt{\alpha_z x}} \right]$$

Prepared By: Penelope

Reviewed By: Barbara Sparks

**SITE 2, BUILDING NS 53  
ZONE H, CHARLESTON NAVAL COMPLEX  
NORTH CHARLESTON, SOUTH CAROLINA**

Predicted Migration 20

**DOMENICO'S DILUTION/ATTENUATION EQUATION FOR GROUNDWATER TRANSPORT**

**Predicted 20-year Migration of Constituents in Groundwater**

Parameter Descriptions:	Units	Parameter Descriptions:	Units
POE = Point of Exposure		$\rho_s$ = Soil Bulk Density	g/cm <sup>3</sup>
SSTL = Site-Specific Target Level	mg/L	$f_{oc}$ = Fraction Organic Carbon in Soil	g-C/g-soil
SSTL <sub>SOURCE</sub> = Hydrocarbon Concentration in Plume Source Area protective of RBSLs at POE	mg/L	$\alpha_x$ = Longitudinal Dispersivity = $x/10$	m
SSTL <sub>COMP</sub> = Hydrocarbon Concentration at Compliance Point protective of RBSLs at POE	mg/L	$\alpha_y$ = Transverse Dispersivity = $\alpha_x/3$	m
$X_{POE} = x$ = Distance from Plume Source to POE (along Centerline)	m	$\alpha_z$ = Vertical Dispersivity = $\alpha_x/20$	m
$X_{COMP} = x$ = Distance from POE to Compliance Point (along Centerline)	m	$k_{oc}$ = Organic Carbon Partition Coefficient	cm <sup>3</sup> -H <sub>2</sub> O/g-C
Y = Source Width (Perpendicular to Flow Direction)	m	$k_0$ = Soil-Water Sorption Coefficient	cm <sup>3</sup> -H <sub>2</sub> O/g-soil
Z = Source Depth (Perpendicular to Flow Direction in Vertical Plane)	m	V = Pore Water Velocity	m/sec
$K_s$ = Saturated Hydraulic Conductivity	m/sec	$R_c$ = Constituent Retardation Factor	
I = Groundwater Gradient	cm/cm	$V/R_c$ = Maximum Transport Rate of Dissolved Constituent = $(K_s I)/R_c$	m/sec
$\theta$ = Porosity in Saturated Zone	cm <sup>3</sup> /cm <sup>3</sup>	RBSL = Risk-Based Screening Level in Water Provided by SCDHEC (1998)	mg/L

**Dilution & Attenuation without Biological Decay**

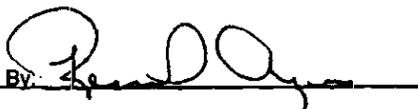
Constituent	$X_{POE}$ ft	$X_{POE}$ m	Y m	Z m	t sec	$K_s$ m/sec	I m/m	$\theta$ m <sup>3</sup> /cm <sup>3</sup>	$\rho_s$ g/cm <sup>3</sup>	$\alpha_x$ m	$\alpha_y$ m	$\alpha_z$ m	$f_{oc}$ g-C/g-soil	$k_{oc}$ cm <sup>3</sup> -H <sub>2</sub> O/g-C	$k_0$ cm <sup>3</sup> -H <sub>2</sub> O/g-soil	V m/sec	$R_c$	$C_{POE}/C_{SOURCE}$
Benzene	137	41.7581	15	2	6.31E+08	1.08E-06	0.0273	0.47	1.5	4.18	1.39	0.21	2.73E-03	81	0.22113	6.26E-08	1.706	1.706E-02
Toluene	68.2	20.7876	15	2	6.31E+08	1.08E-06	0.0273	0.47	1.5	2.08	0.69	0.10	2.73E-03	133	0.36309	6.26E-08	2.159	2.153E-01
Naphthalene	35.2	10.7291	15	2	6.31E+08	1.08E-06	0.0273	0.47	1.5	1.07	0.36	0.05	2.73E-03	1543	4.21239	6.26E-08	14.444	4.473E-04

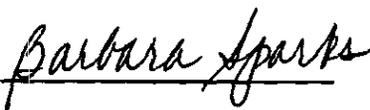
Source: South Carolina Department of Health and Environmental Control (SCDHEC) 1998. Risk-Based Corrective Action for Petroleum Releases, Bureau of Underground Storage Tank Management.

**DOMENICO DILUTION/ATTENUATION MODEL WITHOUT BIOLOGICAL DECAY**

$$\frac{C_x}{C_{SOURCE}} = \frac{1}{2} \operatorname{erfc} \left[ \frac{\left( x - \frac{vt}{R_c} \right)}{2 \sqrt{\alpha_x \frac{vt}{R_c}}} \right] \times \operatorname{erf} \left[ \frac{Y}{4 \sqrt{\alpha_y x}} \right] \times \operatorname{erf} \left[ \frac{Z}{2 \sqrt{\alpha_z x}} \right]$$

Constituent	$C_{SOURCE}$ mg/L	$C_x$ mg/L
Benzene	0.313	0.005
Toluene	4.846	1.000
Naphthalene	23.346	0.010

Prepared By: 

Reviewed By: 

**APPENDIX G**

**RBSL CALCULATIONS FOR UTILITY WORKER EXPOSURE TO GROUNDWATER**

**Construction Worker Dermal RBSLs**

	Kow	MW	Kp	B	t <sub>event</sub>	c	b	t*	t <sub>event</sub>	DA <sub>event</sub>
			cm/hr	unitless	hr/event			hr	hr/event	
<b>Benzene</b>	199.5262315	78.1	0.11551543	0.392637855	2.87E-01	6.32E-01	6.03E-01	6.90E-01	1	eq 3.3
<b>Toluene</b>	537.0317964	92.1	0.259561335	0.958068292	3.44E-01	1.13E+00	1.31E+00	1.33E+00	1	eq 3.2
<b>Ethylbenzene</b>	1412.537545	106.2	0.589219802	2.256154884	4.13E-01	2.36E+00	4.39E+00	1.70E+00	1	eq 3.2
<b>Xylene*</b>	1584.893192	106.2	0.638675123	2.531447415	4.13E-01	2.63E+00	5.31E+00	1.72E+00	1	eq 3.2
<b>Naphthalene</b>	1995.262315	128.2	0.605452393	2.636638957	5.48E-01	2.73E+00	5.69E+00	2.29E+00	1	eq 3.2

	BW	AT	EV	ED	EF	SA	CSF derm	Rfd derm	Target	RBSL	RBSL
	kg	day	events/day	yrs	days/yr	cm <sup>2</sup>	(mg/kg-day) <sup>-1</sup>	mg/kg-day	Risk or HQ	mg/L	mg/L
<b>Benzene</b>	70	25550	1	1	90	4500	2.99E-02	NA	1.00E-06		8.52E-01
<b>Toluene</b>	70	365	1	1	90	4500	NA	1.60E-01	1.0	2.40E+01	
<b>Ethylbenzene</b>	70	365	1	1	90	4500	NA	9.70E-02	1.0	6.05E+00	
<b>Xylene*</b>	70	365	1	1	90	4500	NA	1.84E+00	1.0	1.02E+02	
<b>Naphthalene</b>	70	365	1	1	90	4500	NA	3.20E-02	1.0	1.63E+00	

\* Kow and MW values for xylene, m-

Prepared By: *R. Da...*

Reviewed By: *Barbara Sparks*

**Construction Worker Incidental Ingestion RBSLs**

	BW	AT	IR	ED	EF	Target	CSF oral	Rfd oral	RBSL
	kg	day	L/day	yrs	days/yr	Risk or HQ			mg/L
<b>Benzene</b>	70	25550	0.01	1	90	1.00E-06	2.90E-02		6.85E+01
<b>Toluene</b>	70	365	0.01	1	90	1.0	NA	2.00E-01	5677.778
<b>Ethylbenzene</b>	70	365	0.01	1	90	1.0	NA	1.00E-01	2838.889
<b>Xylene</b>	70	365	0.01	1	90	1.0	NA	2.00E+00	56777.78
<b>Naphthalene</b>	70	365	0.01	1	90	1.0	NA	4.00E-02	1135.556

Prepared By:

*P. De...*

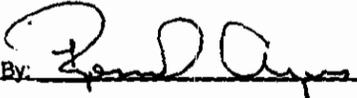
Reviewed By:

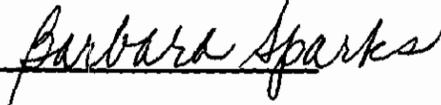
*Barbara Sparks*

Construction Worker Inhalation RBSLs

Chemical	TR (carc)	HI (nonc)	BWadult	AT	Sfi (carc)	RfD (nonc)	IR air	EF	ED	RBSLair	H	RBSLwater
			kg	yr	[mg/kg-day] <sup>-1</sup>	[mg/kg-day]	m <sup>3</sup> /day	day/yr	yr	mg/m <sup>3</sup>	cm <sup>3</sup> /cm <sup>3</sup>	mg/L
Benzene	1.00E-06	NA	70	70	2.90E-02	NA	20	90	1	3.43E-02	2.26E-01	0.152
Toluene	NA	1	70	1	NA	1.14E-01	20	90	1	1.62E+00	3.01E-01	5.376
Ethylbenzene	NA	1	70	1	NA	2.86E-01	20	90	1	4.06E+00	2.80E-01	14.499
Xylenes	NA	1	70	1	NA	NA*	20	90	1	NA*	2.78E-01	NA*
Naphthalene	NA	1	70	1	NA	3.71E-04	20	90	1	5.27E-03	2.00E-03	2.633

\*No inhalation reference dose is available for xylenes; therefore, no RBSL can be calculated for xylene.

Prepared By: 

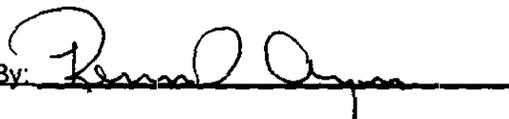
Reviewed By: 

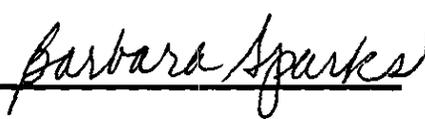
**Minimum Construction Worker RBSLs**

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	<b>Dermal</b>	<b>Incidental Ingestion</b>	<b>Inhalation</b>	<b>Minimum</b>
	<b>RBSL</b>	<b>RBSL</b>	<b>RBSL</b>	<b>RBSL</b>
	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>
<b>Benzene</b>	0.85	68.52	0.15	0.15
<b>Toluene</b>	23.98	5677.78	5.38	5.38
<b>Ethylbenzene</b>	6.05	2838.89	14.50	6.05
<b>Xylene</b>	102.33	56777.78	NA*	102.33
<b>Naphthalene</b>	1.63	1135.56	2.63	1.63

\*No inhalation reference dose is available for xylenes; therefore, no inhalation RBSL can be calculated.

Prepared By: 

Reviewed By: 

**APPENDIX H**

**SSTL CALCULATION: DOMENICO MODEL**

SITE 2, BUILDING NS 53  
 ZONE H, CHARLESTON NAVAL COMPLEX  
 NORTH CHARLESTON, SOUTH CAROLINA

**HYDROCARBON CONSTITUENT CONCENTRATIONS IN WATER BASED ON RAOULT'S LAW**

Parameter Descriptions:	Units
$C_W$ = Aqueous Solubility of Organic Constituents Dissolved from Product	mg/L
$C_F$ = Concentration of the Constituent in the Fuel Oil	mg/L
$K_{FW}$ = Fuel/Water Partition Coefficient	
$P_F$ = Density of Fuel Oil	g/mL
$MW_F$ = Molecular Weight of Fuel Oil	g/mol
$C_{SAT}$ = Aqueous Solubility of the Pure Phase Constituent	mol/L
$MW_C$ = Molecular Weight of the Constituent	g/mol
$K_{FW} = (10^3(\text{mL/L}) P_F) / (MW_F * C_{SAT} / (1000 * MW_C))$	
$C_W = C_F / K_{FW}$	mg/L

Source: "Solubility, Sorption, and Transport of Hydrophobic Organic Chemicals in Complex Mixtures," EPA Environmental Research Brief, EPA/600/M-91/009, Robert S. Kerr Environmental Research Laboratory, ADA, Oklahoma.

Source: "CONCAWE 1996 Diesel Fuel/Kerosene" Conoco, Inc., Houston Texas

**Key Assumptions:**

$MW_F$  : Molecular Weight of Kerosene, Source: "CONCAWE 1996 Diesel Fuel/Kerosene" Conoco Inc., Houston Texas. 170 g/mol

$P_F$  : Density of the Product, Source: Conoco Material Safety Date Sheet for Diesel fuel/ Kerosene 0.88 g/mL

**Concentration of Chemical Constituents in Water Based on Molar Solubility**

Constituent	$MW_F$ g/mol	$C_{SAT}$ mg/L	$MW_C$ g/mol	$P_F$ g/mL	$K_{FW}$	$C_F$ mg/L	$C_W$ mg/L
Benzene	170.00	1,750	78	0.88	230.72	72.16	0.31
Toluene	170.00	535	92	0.88	890.16	4,136.00	4.65
Ethylbenzene	170.00	152	106	0.88	3609.91	378.40	0.10
Xylene	170.00	198	106	0.88	2771.24	2,200.00	0.79
Napthalene	170.00	40	128.16	0.88	16585.41	387,200.00	23.35

Prepared By:     *Randall*    

Reviewed By:     *Barbara Sparks*

SITE 2, BUILDING NS 53  
 ZONE H, CHARLESTON NAVAL COMPLEX  
 NORTH CHARLESTON, SOUTH CAROLINA

DOMENICO'S DILUTION/ATTENUATION EQUATION FOR GROUNDWATER TRANSPORT

Site-Specific Target Level Calculations for Groundwater: Potential Future Off-Site Exposure

Parameter Descriptions:	Units	Parameter Descriptions:	Units
POE = Point of Exposure		$\rho_s$ = Soil Bulk Density	g/cm <sup>3</sup>
SSTL = Site-Specific Target Level	mg/L	$f_{oc}$ = Fraction Organic Carbon in Soil	g-C/g-soil
SSTL <sub>SOURCE</sub> = Hydrocarbon Concentration in Plume Source Area protective of RBSLs at POE	mg/L	$\alpha_x$ = Longitudinal Dispersivity = 0.2x	m
SSTL <sub>COMP</sub> = Hydrocarbon Concentration at Compliance Point protective of RBSLs at POE	mg/L	$\alpha_y$ = Transverse Dispersivity = $\alpha_x/300$	m
X <sub>POE</sub> = x = Distance from Plume Source to POE (along Centerline)	m	$\alpha_z$ = Vertical Dispersivity = $1 \times 10^{00}$	m
X <sub>COMP</sub> = x = Distance from POE to Compliance Point (along Centerline)	m	$k_{oc}$ = Organic Carbon Partition Coefficient	cm <sup>3</sup> -H <sub>2</sub> O/g-C
Y = Source Width (Perpendicular to Flow Direction)	m	$k_D$ = Soil-Water Sorption Coefficient	cm <sup>3</sup> -H <sub>2</sub> O/g-soil
Z = Source Depth (Perpendicular to Flow Direction in Vertical Plane)	m	V = Pore Water Velocity	m/sec
K <sub>s</sub> = Saturated Hydraulic Conductivity	m/sec	R <sub>c</sub> = Constituent Retardation Factor	
I = Groundwater Gradient	cm/cm	V/R <sub>c</sub> = Maximum Transport Rate of Dissolved Constituent = (K <sub>s</sub> I)/R <sub>c</sub>	m/sec
$\theta$ = Porosity in Saturated Zone	cm <sup>3</sup> /cm <sup>3</sup>	RBSL = Risk-Based Screening Level in Water Provided by SCDHEC (1998)	mg/L

Dilution & Attenuation without Biological Decay

Constituent	X <sub>POE</sub>	X <sub>POE</sub>	Y	Z	t	K <sub>s</sub>	I	$\theta$	$\rho_s$	$\alpha_x$	$\alpha_y$	$\alpha_z$	f <sub>oc</sub>	k <sub>oc</sub>	k <sub>D</sub>	V	R <sub>c</sub>	C <sub>POE</sub> /C <sub>SOURCE</sub>
	ft	m	m	m	sec	m/sec	m/m	cm <sup>3</sup> /cm <sup>3</sup>	g/cm <sup>3</sup>	m	m	m	g-C/g-soil	cm <sup>3</sup> -H <sub>2</sub> O/g-C	cm <sup>3</sup> -H <sub>2</sub> O/g-soil	m/sec		
Benzene	70	21.3363	15	2	1.00E+14	1.08E-06	0.0273	0.47	1.5	2.13	0.71	0.11	2.73E-03	81	0.22113	6.26E-08	1.706	5.385E-01
Naphthalene	70	21.3363	15	2	1.00E+14	1.08E-06	0.0273	0.47	1.5	2.13	0.71	0.11	2.73E-03	1543	4.21239	6.26E-08	14.444	5.385E-01

Constituent	X <sub>COMP</sub>	X <sub>COMP</sub>	Y	Z	t	K <sub>s</sub>	I	$\theta$	$\rho_s$	$\alpha_x$	$\alpha_y$	$\alpha_z$	f <sub>oc</sub>	k <sub>oc</sub>	k <sub>D</sub>	V	R <sub>c</sub>	C <sub>POE</sub> /C <sub>COMP</sub>
	ft	m	m	m	sec	m/sec	m/m	cm <sup>3</sup> /cm <sup>3</sup>	g/cm <sup>3</sup>	m	m	m	g-C/g-soil	cm <sup>3</sup> -H <sub>2</sub> O/g-C	cm <sup>3</sup> -H <sub>2</sub> O/g-soil	m/sec		
Benzene	13	3.96245	15	2	1.00E+14	1.08E-06	0.02725	0.47	1.5	0.40	0.13	0.02	2.73E-03	81	0.22113	6.26E-08	1.706	1.000E+00
Naphthalene	13	3.96245	15	2	1.00E+14	1.08E-06	0.02725	0.47	1.5	0.40	0.13	0.02	2.73E-03	1543	4.21239	6.26E-08	14.444	1.000E+00

Source: South Carolina Department of Health and Environmental Control (SCDHEC) 1998. Risk-Based Corrective Action for Petroleum Releases, Bureau of Underground Storage Tank Management.

DOMEN

$$\frac{C_x}{C_{SOURCE}} = \frac{1}{2} \operatorname{erfc} \left[ \frac{\left( x - \frac{vt}{R_c} \right)}{2\sqrt{\alpha_x \frac{vt}{R_c}}} \right] \times \operatorname{erf} \left[ \frac{Y}{4\sqrt{\alpha_y x}} \right] \times \operatorname{erf} \left[ \frac{Z}{2\sqrt{\alpha_z x}} \right]$$

Constituent	POE RBSL mg/L	SSTL <sub>SOURCE</sub> mg/L	SSTL <sub>COMP</sub> mg/L
Benzene	0.152	0.282	0.152
Naphthalene	1.630	3.027	1.630

Prepared By: *Rene D. Ayers*

Reviewed By: *Barbara Sparks*

SSTLs

SITE 2, BUILDING NS 53  
 ZONE H, CHARLESTON NAVAL COMPLEX  
 NORTH CHARLESTON, SOUTH CAROLINA

Groundwater and Soil SSTLs

Constituent	POE RBSLs mg/L	Theoretical Aqueous Solubility of Organic Constituent in Product mg/L	SSTL <sub>SOURCE</sub> mg/L	SSTL <sub>COMP</sub> mg/L
Benzene	0.152	0.313	0.282	0.152
Naphthalene	1.63	23.346	3.027	1.630

SSTL<sub>SOURCE</sub> - Groundwater SSTLs in the source area protective of RBSLs at the POE.

SSTL<sub>COMP</sub> - Groundwater SSTLs at the compliance well that are protective of RBSLs at the POE.