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RAPID ASSESSMENT REPORT FOR SITE 31 BUILDING 760 ZONE C CNC CHARLESTON SC

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TETRA TECH

Rev.1
12/08/99

Rapid Assessment Report
For
Site 31, Building 760

Zone C
Charleston Naval Complex
North Charleston, South Carolina

Southern Division
Naval Facilities Engineering Command
Contract Number N62467-94-D-0888
Contract Task Order 0093

December 1999

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RAPID ASSESSMENT REPORT

FOR

SITE 31, BUILDING 760
ZONE C, 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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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.

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EXECUTIVE SUMMARY

Tetra Tech NUS, Inc. (TtNUS) has completed a Rapid Assessment (RA) for Site 31 (Building 760) a closed underground storage tank (UST) system. The UST system supplied heating oil to Building 760 which served as family housing for Naval families at Charleston Naval Complex (CNC) Zone C, in North Charleston, South Carolina. The RA was performed under the direction of the South Carolina Department of Health and Environmental Control.

TtNUS performed the following actions during the RA:

- Reviewed available Navy documents to identify potential sources and receptors for petroleum hydrocarbons in the vicinity, evaluate public and private potable wells, locate utilities, locate nearby surface water bodies, and to determine surface hydrology and drainage;
- Reviewed the previously prepared Storage Tank Assessment Report for UST 760 to determine soil boring locations and monitoring well placements;
- Conducted a site survey to identify utilities and to construct a site plan;
- Performed a direct push investigation to collect soil samples for field screening using an organic vapor analyzer and collect soil and groundwater samples for mobile lab screening analysis for benzene, toluene, ethyl benzene, total xylenes (BTEX), and diesel range organics;
- Installed three piezometers to approximately 12 feet below land surface (bls), five shallow permanent monitoring wells to approximately 13 feet bls, and one vertical delineation monitoring well to approximately 25 feet bls;
- Collected groundwater samples from the permanent monitoring wells for laboratory analysis 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 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 top of casing elevations and collected depth to groundwater measurements to evaluate the groundwater flow direction.

Conclusion

Benzene and naphthalene were the only Chemicals of Concern (CoC) detected in the onsite soils at concentrations that exceed the SCDHEC Risk Based Screening Levels (RBSLs) for sandy-rich soils. The benzene and naphthalene concentrations were identified in soil sample 31SLB031112 (boring CNC31-B03) collected from 11 to 12 feet bls at the north end of the former tank field. Benzene was detected at 10 micrograms per kilogram (ug/kg) and naphthalene was detected at 13,400 ug/kg, which exceeds the RBSLs of 5 ug/kg and 210 ug/kg established for benzene and naphthalene, respectively. Sample 31SLB031112 also contained toluene, ethylbenzene, and total xylenes at concentrations below their RBSLs.

On site construction worker (utility) was identified as a potential future receptor. The RBSLs for benzene and naphthalene were evaluated for dermal, incidental ingestion, and inhalation exposures. Based on the RBSLs, Site-Specific Target Level (SSTL) were calculated for the subsurface soil for benzene and naphthalene leaching to groundwater. The soil leaching SSTL calculated for benzene is 0.974 milligrams per kilogram (mg/kg), which is well above the maximum benzene concentration, detected (0.010 mg/kg). The soil leaching SSTL for naphthalene is 182 mg/kg, which was greater than the maximum soil naphthalene concentration of 13.4 mg/kg. The calculated SSTLs for benzene and naphthalene indicates the constituents will not leach into the groundwater at concentrations above their RBSLs for a construction worker.

Groundwater analysis collected in July and August 1999, indicate no CoCs analytes were detected in groundwater at concentrations that exceed the SCDHEC RBSLs. No free product was detected in the groundwater.

Recommendation

Intrinsic Corrective Action is proposed for Site 31 since a surface water body is not located within 1,000 feet of the site and groundwater use receptors are not present in the immediate area. On-site construction worker (utility worker) was the only potential exposure pathway identified.

Groundwater sampling conducted during the RA indentified CoCs are at concentrations less than their RBSLs. Free product was not detected in any of the monitoring wells at Site 31.

Soil samples collected during the RA only identified benzene and naphthalene at concentrations above their RBSLs. Site-specific Target Levels (SSTLs) calculated for benzene and naphthalene

indicates the constituents will not leach into the groundwater at concentrations above their RBSLs and expose a construction worker from chemicals volatilizing from standing groundwater.

The intrinsic Corrective Action proposes that a short term groundwater monitoring be developed to monitor petroleum constituents overtime.

1.0 INTRODUCTION

Site 31 is a closed underground storage tank (UST) system which provided heating oil to Building 760 at the Charleston Naval Complex (CNC), Zone C in 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 32312 (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 29406 (telephone number 843-820-7307). Authorization to conduct the RA for the site was issued by NAVFAC under Contract Task Order (CTO) 0093. The RA was performed under the direction of the South Carolina Department of Health and Environmental Control (SCDHEC). Fieldwork necessary to complete the RA was performed May 13- 28, June 2-30, July 1-28, and August 7-19, 1999, by TtNUS.

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, current utilities, and vicinity surface drainage, is included as Figure 2.

Building 760, also known as the Naval Hospital Building NH-D, was constructed in 1917 and served as housing for Naval families until base closure. UST 760 was located on the southwest side of Building 76 and provided heating oil to the building (Figure 3). The UST at Building 760 had a 1,000-gallon capacity and was constructed of steel. It is unknown when the UST was installed but the system was deactivated in March 1998 [Supervisor of Ship Building, Conversion and Repair, United States Navy, Portsmouth, Virginia, Environmental Detachment Charleston (SPORTENDETCHASN), 1998].

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 combate ships and submarines of the U.S. Atlantic Fleet [Ensafe/Allan & Hoshall, Inc. (E/A&H), 1997].

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, 1997). With the scheduled closure of the base, operations were scaled back and environmental cleanup proceeded to make the property available for redevelopment after closure. As part of the environmental cleanup process, the UST at Building 760 was removed and the tank closure was completed on May 29, 1998.

On May 29, 1998, UST 760 was removed, cleaned, and recycled as scrap metal. At the time UST 760 was removed, no pitting or holes were found in the tank or fuel distirbution piping. Severe corrosion was identified where the tank's thin protective coasting was missing, but no holes were found. The steel fill pipe and the 2-inch diameter steel ventilation pipe were corroded throughout their length, but no holes were identified in either pipe. The ½-inch-diameter cooper fuel supply and return lines were reported in good condition. The fuel supply and return line for UST 760 traveled below ground for a distance of approximately 13 feet and entered the northwest side of the boiler house, which is located adjacent to Building 760 (SPORTENDETCHASN, 1998).

During the removal of UST 760, no petroleum-stained or -contaminated soils were found in the UST excavation or trenches. Soil grab samples collected during the UST excavation indicated concentrations of polynuclear aromatic hydrocarbon (PAH) compounds were detected. All soils excavated during removal of UST 760 was placed back in the tank bed excavation. No groundwater was encountered during the

removal of the UST 760 system. *The Underground Storage Tank Assessment Report* for UST 760 is included in Appendix A. (SPORTENDETCHASN, 1998).

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 760 study area. Specific information concerning the depth of utilities below land surface is currently unavailable. However, according to facility personnel, utility lines are typically located approximately 2 to 6 feet below land surface (bls) (SPORTENVDETCHASN, 1999). The following utility receptors were located:

- Sanitary sewer, water utility: Sanitary sewer line and water line extend east to west along Kenney Lane south of Building 760. The sanitary sewer line and water line enter Building 760 on the south side of the building. No hydraulically downgradient (with respect to groundwater) sanitary sewer lines or water lines were identified within 250 feet downgradient of UST 760.

- Electrical utility, gas utility: An electrical transformer station is located approximately 45 feet west of the site, which provides subsurface electrical feeds to the boiler house and Building 760. The electrical line leading from the transformer station to Building 760 is located approximately 20 feet north of UST 760. This is the nearest downgradient electrical line to the former UST location. The electrical feed to the boiler house is located approximately 5 feet south of UST 760. A primary electrical line extends east to west south of Kenney Lane and upgradient of UST 760. A gas main extends east to west south of Kenney Lane. A gas line also originates from the west side of Building 760 and extends toward the south. This gas main is located approximately 5 feet east of UST 760.

- Storm drain utility: The nearest storm drain utility is located approximately 35 feet south of UST 760. No downgradient storm drain utilities were identified within 250 feet of UST 760.

According to the *Final RCRA Facility Investigation Report for Zone H* (E/A&H, 1996a) a survey of groundwater users within a 7-mile radius of CNC was conducted by the South Carolina Water Resources Commission to ascertain the extent of any shallow groundwater usage. Results of the water use investigation revealed that no drinking water wells, which utilize the shallow aquifer, are located within a 4-mile radius of CNC. Irrigation wells were not identified within 1,000 feet of the site. Numerous monitoring wells are located within 1,000 feet of the site. The nearest surface water body to UST 670 is

Noisette Creek located approximately 2,000 feet to the north. No basements are located on the CNC property (E/A&H, 1996a).

There are no city, county, or state zoning ordinances as the property (CNC) is currently owned by the federal government. Information concerning zoning ordinances was obtained from the SOUTHDIV Remedial Project Manager located at 2155 Eagle Drive, North Charleston, South Carolina 29406 (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, 1997).

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, 1997). 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 including 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 feet thick (E/A&H, 1997).

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, 1997).

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 are usually less than 300 gpm (E/A&H, 1997).

2.0 ASSESSMENT INFORMATION

2.1 SITE-SPECIFIC GEOLOGY AND HYDROGEOLOGY

2.1.1 Site Geology

Nine direct push soil borings were advanced at Site 31 under the supervision of a TtNUS geologist from May 13 through May 15, 1999 and June 16, 1999 (Figure 3). Nine borings were advanced to 16 feet bls to provide soil samples to characterize the subsurface lithology. On June 17, 1999, five shallow monitoring wells were installed to a depth of 19 feet bls. During installation soil grab samples were collected to describe the subsurface lithology. On July 1 and July 7, 1999, a vertical delineation monitoring well was installed. During the drilling process, lithologic samples were collected using split-spoon samplers to characterize the subsurface lithology from the surface to a depth of 36 feet bls.

Based on lithologic descriptions from the soil borings and monitoring wells, the subsurface soil generally consists at the surface of a sandy silt underlained by an interbedded mixture of silty sand, sand, and silt deposits to a depth of 26 feet bls. A gray, plastic clay with occasional very fine sand stingers was encountered from 26 to 36 feet bls (Figures 4 and 5). Boring logs are presented in Appendix B

2.1.2 Site Hydrogeology

Five shallow water table monitoring wells, CNC31-MW01, CNC31-MW02, CNC31-MW03, CNC31-MW04, and CNC31-MW05, and one deep vertical delineation monitoring well, CNC31-MW6D, were installed as part of this RA investigation (see Figure 3). The shallow monitoring wells were completed to a depth of 19 feet bls. Each shallow monitoring well was completed using 10 feet of 2-inch diameter, 0.01-inch machine-slotted Schedule 40 polyvinyl chloride (PVC) screen that bracketed the water table. Monitoring well CNC31-MW6D was completed as a Type III monitoring well with 6-inch-diameter PVC surface casing grouted to a depth of 25 feet bls. After the grout for the surface casing cured for 24 hours, the borehole was advanced to a depth of 37 feet and a 2-inch-diameter PVC monitoring well was installed with a 5-foot, 0.01-inch machine-slotted PVC screen. Well construction logs for the RA monitoring wells are presented in Appendix B. At the completion of the well installations, a South Carolina registered professional surveyor surveyed each monitoring well location and the top of casing elevation.

Three temporary, small diameter, PVC piezometers, were installed at the site to determine the depth to groundwater at the site and evaluate the groundwater flow direction. Each piezometer was constructed

of 1-inch-diameter Schedule 40 PVC threaded casing and well screen. The screen section of each piezometer well was 10-feet in length installed to bracket the water table.

Groundwater in shallow wells at Site 31 was encountered at depths ranging from approximately 12 to 13 feet bls during the RA investigation. The recorded water-level data collected during the RA are presented in Table 1. Groundwater elevation measurements were recorded from the site monitoring wells on July 23, July 27 and July 28, August 9 and August 12, and October 13, 1999. Figure 6 presents the groundwater potentiometric surface recorded during the field event on October 13, 1999. The potentiometric surface map depicts a groundwater flow direction toward the north.

As part of the *Final RCRA Facility Investigation Report for Zone B* (E/A&H, 1996b), a tidal influence investigation was conducted to determine what effects tidal ranges in Noisette Creek and the Cooper River exhibit on groundwater flow within Zone B. The objective of the investigation was to measure water levels in the shallow aquifer during low, mid, and high tides in Zones A and B. Select wells in Zones C and E near the perimeter of Zone B were also measured to obtain additional data. Since Zone B is bordered by Noisette Creek to the north and is situated between Zone C and the Cooper River, results from the Zone B tidal influence investigation were used to evaluate effects of tidal influence on Site 31. Site 31 is located in Zone C of the RCRA Facility Investigation.

Measurements of tidal fluctuations identified that surface water elevations for Noisette Creek and the Cooper River varied greatly with tidal events; however, the tidal fluctuations produced less than 0.1 foot variations in all of the Zone B shallow wells. The results identified no significant change in groundwater flow direction in Zone B resulting from tidal fluctuations (E/A&H, 1996b). Since Site 31 is located farther inland from the Cooper River than the Zone B study area and further inland to the Noisette Creek tributary, the impact of tidal fluctuation on the shallow groundwater flow direction at Site 31 is considered negligible.

2.2 ASSESSMENT RESULTS

Nine soil borings were completed as part of the screening portion of the soil investigation at Site 31. Seven 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. 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 for organic vapor screening were collected from a maximum depth

of 14 feet bls. The soil and groundwater samples collected for mobile laboratory screening were analyzed for benzene, toluene, ethyl benzene, and xylenes (BTEX), naphthalene, and diesel range organics.

Soil samples for CoC evaluation were collected on May 28, 1999, and analyzed for BTEX, ethylene dibromide (EDB) and naphthalene using U.S. Environmental Protection Agency (USEPA) Method 8260; and 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) analysis using USEPA Method 9071, and grain size using sieve and hydrometer analysis. 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 2.3.1.

Groundwater sampling was conducted on July 23, July 27 and July 28, and August 8 and August 12, 1999. Groundwater sampling was conducted using a peristaltic pump and low flow, quiescent techniques. The monitoring wells were sampled in accordance with SCDHEC's guidance document *South Carolina Risk-Based Corrective Action for Petroleum Releases* (January 1998). Each well was purged of three 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 tertiary butyl ether (MTBE), EDB, 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. Groundwater natural attenuation data are summarized on Table 3.

2.3 FIELD SCREENING ASSESSMENT

2.3.1 Soil Vapor Assessment

Nine soil borings were completed to evaluate for soil vapors as part of the soil screening assessment at Site 31. Organic vapor analyzer (OVA) headspace measurements were recorded from select samples from the vadose zone soils to evaluate soil vapor concentrations. Table 4 summarizes the soil vapor screening results. Figure 3 presents the soil boring locations.

Low levels of soil vapors were detected in the soils at seven of the nine boring locations with vapor concentrations ranging from non detect to 15 parts per million (ppm). The highest soil vapor concentration was detected at 260 ppm at 12 to 13 feet bls at boring CNC31-B03, respectively.

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 Laboratory Results

One soil sample was collected from borings CNC31-B01 through CNC31-B07 and was analyzed by mobile laboratory for BTEX, naphthalene, and diesel range organics using USEPA Methods 8021B and 8015M. The soil samples were selected based on the soil vapor screening results with the additional criteria 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, BTEX and naphthalene consituents were detected in two of the mobile laboratory screening samples. The highest concentrations of benzene, toluene, ethylbenzene, and total xylenes were reported at 160 micrograms per kilogram (ug/kg), 700 ug/kg, 2400 ug/kg, and 14,800 ug/kg, respectively. The napthalene concentrations ranged from 4,500 ug/kg to 34,000 ug/kg. Diesel range organics were detected in three samples at concentrations of 21 milligrams per kilogram (mg/kg) to greater than 10,000 mg/kg. BTEX, naphthalene, and diesel range organics were reported below the laboratory detection limits in the remaining soil samples.

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 Laboratory Results

Groundwater samples were collected from soil boring locations CNC31-B01 through CNC31-B07 and analyzed by a mobile laboratory for BTEX, naphthalene, and diesel range organics using USEPA Methods 8021B and 8015M. Table 6 presents a summary of the analytical data from the mobile laboratory.

As indicated in Table 6, benzene was detected in two samples at concentrations of 4.2 micrograms per liter (ug/L) and 2.2 ug/L. Toluene, ethylbenzene, and total xylenes were detected in three samples. The highest concentrations of toluene, ethylbenzene, and total xylenes were reported at 14 ug/L, 98 ug/L, and 131 ug/L, respectively. Naphthalene was detected in three samples at relatively high concentrations

ranging from 1,600 ug/L to 8,700 ug/L. One sample contained naphthalene at a concentration of 94 ug/L. The remaining samples reported naphthalene below laboratory detection limits. Diesel range organics were detected in four samples at concentrations ranging form 3.4 milligrams per liter (mg/L) to 180 mg/L.

The mobile laboratory groundwater analysis was used as a screening method to assist in identifying locations for permanent groundwater monitoring wells.

2.4 CHEMICALS OF CONCERN IN SOIL AND GROUNDWATER

2.4.1 Chemicals of Concern in Soil

Seven subsurface soil samples (plus one duplicate sample) were collected from the Site 31 area for determination of CoCs. The soil boring locations are shown on Figure 3, and Table 7 summarizes the CoCs detected in the soil samples. Soil CoCs were detected in samples 31SLB041112 (naphthalene estimated concentration of 3 ug/kg), 31SLB071011 (naphthalene estimated concentration of 5 ug/kg), 31SLB021112D (xylenes and naphthalene estimated concentrations of 3 ug/kg), and 31SLB031112 (benzene 10 ug/kg, toluene 150 ug/kg, ethylbenzene 930 ug/kg, total xylenes 6,800 ug/kg, and naphthalene 13,400 ug/kg). Only the benzene concentration (10 ug/kg) and the naphthalene concentration (13,400 ug/kg) in sample 31SLB031112 exceeded the Risk Based Screening Level (RBSL) for CoCs in sandy soils with depth to groundwater less than 5 feet from the worst-case soil sample. The RBSL for sandy soil was based on a boring log soil descriptions and grain size analysis completed on sample 31SLB03112 (Boring CNC31-B03) indicating a silty sand soil matrix. Soil analytical data sheets and grain size analysis reports are provided in Appendix D. The areal distribution of benzene, toluene, ethylbenzene, total xylenes, and naphthalenes from the May 1999 soil sampling are presented on Figures 7 through 11, respectively.

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 July 27 and July 28, and August 1999, field events are presented in Appendix D. All groundwater CoCs were reported below the laboratory detection limits and below the RBSLs from groundwater samples collected from the shallow and vertical delineations monitoring wells.

2.5 ANALYTICAL DATA

Analytical data from the May 1998 *Underground Storage Tank Assessment Report* 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 soil and groundwater laboratory analytical data for this RA are included in Appendix D.

2.6 AQUIFER CHARACTERISTICS AND EVALUATION

Groundwater levels were measured from the site monitoring wells on October 13, 1999. The groundwater flow direction across the site is toward the north as illustrated on Figure 6. The hydraulic gradient between monitoring wells CNC31-MW03 and CNC31-MW04 on October 13, 1999 was 0.0119feet per foot (ft/ft), respectively.

As part of the *Final RCRA Facility Investigation Report for Zone C*, rising and falling head slug tests were conducted on nine shallow monitoring wells throughout Zone C to determine the hydraulic conductivity of the surficial aquifer (E/A&H, 1997). Slug tests were conducted by instantaneously adding (falling head) or removing (rising head) a volume (slug) of water from the well and measuring the recovering water level with a data logger. A hydraulic conductivity value was then calculated for the rising head test and 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 tendancy.

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 31. To make this determination the screened interval and proximity to the site were evaluated. Based on this evaluation, monitoring well NBCC510001 was selected as the most representative well. NBCC510001 is approximately 250 feet southwest of the site and is completed at a depth of approximately 22 feet bls with a 10-foot screened interval. The geometric mean of the rising and falling head conductivities for NBCC510001 was 9.18 feet per day. The boring log showing the well completion and soil lithology for NBCC510001 is provided in Appendix E.

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 the average linear groundwater velocity may be expressed as:

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

where:

V = average velocity

K = hydraulic conductivity = 9.1`8 ft/day

n = effective porosity = 0.45
(from sieve results of 60 % sand & 20 clay and Figure C1 in SCDHEC, 1998)

i = most recent hydraulic gradient measurement = 0.0119 ft/ft

therefore:

$$V = \left(\frac{9.18\ \mathrm{ft/day}}{0.45}\right) x\ 0.0119\ \mathrm{ft/ft}$$

$$V = 0.243\ \mathrm{ft/day}$$

In summary, the seepage velocity of the surficial aquifer was calculated to be approximately 89 feet per year based on a hydraulic conductivity of 9.18 feet per day, a hydraulic gradient of 0.0062 feet per foot, and a porosity of 45% for a sandy soil.

2.7 FATE AND TRANSPORT MODEL DESCRIPTION

No groundwater concentrations exceeded the SCDHEC RBSLs; therefore, fate and transport modeling is not required for Tier 1 evaluation.

2.8 PREDICTED MIGRATION AND ATTENUATION OF CHEMICALS OF CONCERN

Since fate and transport modeling was not performed, predicted migration and attenuation of CoCs were not evaluated.

3.0 TIER 1 AND 2 EVALUATION

3.1 COMPARISON OF ANALYTICAL RESULTS WITH RBSLs

Soil samples were collected on May 28, 1999. The samples were analyzed for BTEX and PAH. Benzene was detected in sample CNC31-B03/31SLB031112 at 10 µg/kg. This is above the SCDHEC RBSL of 5 µg/kg for leaching to groundwater in sandy soils. Toluene, ethylbenzene, and total xylenes were detected in CNC31-B03/31SLB03112; however, none of the detections exceeded their respective RBSLs. Naphthalene was also detected in sample CNC31-B03/31SLB031112 at 13,400 ug/kg exceeding the SCDHEC RBSL of 210 ug/kg. Estimated naphthalene concentrations were identified in duplicate sample CNC31-B02/31SLB021112D at 3 ug/kg and samples CNC31-B04/31SLB041112 and CNC31-B07/31SLB071011 at concentrations of 3 ug/kg and 5ug/kg, respecitvely. No other PAH compounds were detected in the subsurface soil at concentrations exceeding their respective RBSLs.

Groundwater sampling was conducted on July 27 and 28, 1999 and August 19, 1999. The samples were analyzed for BTEX, MTBE, and PAH. No COC concentrations were detected in the groundwater during the sampling events. A comparison of soil and groundwater concentrations to RBSLs is summarized in Table 9.

3.2 EXPOSURE SETTING CHARACTERIZATION

This section focuses on the current and future land use issues concerning the site. Figure 1 shows that the site is surrounded by the City of North Charleston and therefore is in an urban setting. Building 760 served as housing for Naval families at the time of base closure. The 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 closest surface water body is Noisette Creek located approximately 2,000 feet north of the site. Potable wells and irrigation wells were not identified within 1000 feet of the site Numerous monitoring wells are located within 1000 feet of the site (E/A&H 1996a).

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 a business employee who works in a commercial capacity at the site. Commercial use of the site in the future is a possibility; therefore, an on-site commercial worker was considered as a potential receptor. Incidental ingestion, inhalation of vapors, and dermal contact with impacted soil are expected to be negligible for commercial workers because they are located inside a building. Groundwater at the site is not impacted above the RBSLs; therefore, no groundwater pathways are complete. 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. Such a visitor would probably be a customer of the facility located at the 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 in the soil 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 vapors from volatiles, dermal contact, and incidental ingestion. Benzene and naphthalene concentrations in soil are not above its RBSL for ingestion or dermal contact. Inhalation of vapors from soil typically occurs while the soil is being removed by a back hoe which enhances volatilzation. Therefore soil volatization would occur before the construction worker enters the utility trench, thereby removing inhalation as a receptor. Groundwater at the site is not impacted above the RBSLs; therefore, no groundwater pathyways are complete.

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 be used for commercial and industrial purposes; therefore, this potential receptor was not considered further.

3.3.6 Surface Water

There are no surface waters within 1,000 feet of the site; therefore, this potential receptor was not considered further.

3.4 IDENTIFICATION OF DATA REQUIREMENTS

No additional data are required to calculate site-specific target levels (SSTLs) for the site.

3.5 SITE-SPECIFIC TARGET LEVELS

The only identified future potential receptor is the construction (utility) worker. Site soil concentrations were compared with RBSLs for ingestion or dermal contact with surficial soil. (Surficial soil was not impact at the site; however, for the construction worker pathway, exposure to subsurface soil is evaluated as surface soil because the worker is expected to have direct contact with the subsurface soil.)

Compound of Concern	Maximum Concentration (mg/kg)	RBSL for Ingestion or Dermal Contact with Soil - Commercial (mg/kg)	Exceed RBSL
Benzene	0.010	200	No
Naphthalene	13.4	41,000	No

Municipal water is supplied to the base, so shallow groundwater is not used for drinking water. Groundwater RBSLs provided by SDCHEC are for ingestion only, therefore, RBSLs for the construction worker were calculated for three pathways: dermal contact, incidental ingestion, and inhalation of volatiles. A target cancer risk of 1×10^{-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 (EPA 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^2, 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), EPA/540/1-89/002 (EPA 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 (EPA Region 4 1995).

Utility lines in the area are typically 2 to 6 feet deep. The depth to groundwater at the site is approximately 12 to13 feet bgs, below the estimated depth of the utility lines. As utility work can be expected to excavate a few feet below the line, this pathway was considered complete. 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:

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

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

The $RBSL_{AIR}$ for each chemical was calculated using the equation given in the American Society for Testing and Materials (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 following table summarizes the calculated RBSLs for the analyzed pathways and tabulates the minimum RBSL regardless of the pathway.

CoC	Dermal RBSL	Incidental Ingestion RBSL	Inhalation RBSL	Selected (Minimum) RBSL
	mg/L	mg/L	mg/L	mg/L
Benzene	0.85	68.52	0.15	0.15
Naphthalene	1.63	1135.56	2.63	1.63

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

SSTLs were calculated for benzene and naphthalene concentrations leaching from subsurface soil to groundwater using the SCDHEC Soil Leachability Model and Selected Minimum RSBLs. The input parameters for the leachability model were determined using the figures in the SCDHEC Risk-Based Corrective Action Guidelines (January 1998), soil quality and grain size data, and the Selected Minimum RBSLs calculated for the site. The soil leaching SSTLs calculated for benzene and naphthalene are provided in the following table.

CoC	Concentration in CNC31-B03/31SLB031112 (mg/kg)	Soil Leaching SSTL (mg/kg)
Benzene	0.010	0.974
Naphthalene	13.4	182

The soil leaching SSTL for benzene is 0.974 mg/kg, which is above the maximum benzene concentration detected (0.010 mg/kg), indicating the soil benzene levels will not leach into the groundwater at concentrations above the RBSL for a construction worker. The soil leaching SSTL calculated for naphthalene is 182 mg/kg which is well above the maximum naphthalene concentration detected (13.4 mg/kg) and indicates that naphthalene in subsurface soils will not leach into the groundwater above the RBSL for a construction worker.

Appendix G provides the leachability model calculations generating SSTL.

3.6 RECOMMENDATIONS

It is proposed that Intrinsic Corrective Action be implemented at Site 31 based on the following:

- Groundwater is not used as a drinking water source in the immediate area of Site 31;
- The nearest surface water body is located greater than 1,000 feet from Site 31;
- On-site construction worker (utility worker) was the only exposure pathway identified;
- Groundwater CoCs were reported less than the RBSLs and no free product was detected at the site during the RA investigation;
- Benzene and naphthalene were the only CoCs detected in the soil above their RBSLs; and
- SSTLs were calculated for the leaching of benzene and naphthalene from the soil into the groundwater indicating the constituents will not leach into the groundwater at concentrations above their RBSLs for exposure to a construction worker from chemicals volatilizing from standing groundwater.

The Intrinsic Corrective Action should develop a short-term groundwater-monitoring program to monitor benzene, naphthalene, and PAH parameters in the groundwater overtime.

4.0 REFERENCES

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TABLE 1

GROUNDWATER ELEVATIONS
SITE 31, BUILDING 760
ZONE C, CHARLESTON NAVAL BASE COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Well No.	Total Depth of Well, (ft)	Top of Casing Elevation, ft (MSL)	Date Measured	Depth to Free Product (BTOC)	Depth to Water, ft (BTOC)	Groundwater Elevation, ft (MSL)
CNC31-MW01	19	23.06	7/23/99	ND	12.91	10.15
			7/27/99	ND	13.01	10.05
			10/13/99	ND	13.11	9.95
CNC31-MW02	19	22.99	7/23/99	ND	12.78	10.21
			7/27/99	ND	12.89	10.10
			10/13/99	ND	13.00	9.99
CNC31-MW03	19	22.94	7/23/99	ND	13.10	9.84
			7/28/99	ND	13.24	9.70
			10/13/99	ND	13.32	9.62
CNC31-MW04	19	22.86	7/23/99	ND	12.32	10.54
			7/28/99	ND	12.47	10.39
			10/13/99	ND	12.49	10.37
CNC31-MW05	19	22.38	7/23/99	ND	12.10	10.28
			7/28/99	ND	12.21	10.17
			10/13/99	ND	12.26	10.12
CNC31-MW6D	37	23.22	8/9/99	ND	13.75	9.47
			8/12/99	ND	15.92	7.30
			10/13/00	ND	14.12	9.10

Notes:
MSL - Mean Sea Level
BTOC - Below Top of Casing
ft - feet
ND - Not Detected

TABLE 2

GROUNDWATER FIELD MEASUREMENTS
SITE 31, BUILDING 760
ZONE C, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Well I.D.	Date Sampled	Purge method	Volume (gallons)	Temp. (° C)	pH	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)
CNC31-MW01	07/23/99	PP	2.9	25.3	5.15	0.066	0	0.91
	07/27/99	PP	2.9	26.3	5.09	0.066	0	1.70
CNC31-MW02	07/23/99	PP	3.1	24.5	4.98	0.070	0	1.50
	07/27/99	PP	3.0	25.9	4.83	0.070	0	2.25
CNC31-MW03	07/23/99	PP	3.1	22.6	4.94	0.062	0	2.52
	07/28/99	PP	2.9	23.1	5.21	0.065	0	1.10
CNC31-MW04	07/23/99	PP	3.4	25.6	4.90	0.061	0	1.64
	07/28/99	PP	3.4	24.7	4.96	0.063	0	2.68
CNC31-MW05	07/23/99	PP	3.3	25.1	5.24	0.060	0	2.75
	07/28/99	PP	3.2	26.2	5.17	0.065	0	2.75
CNC31-MW6D	08/09/99	PP	10.5	22.7	6.86	0.253	0	1.20
	08/12/99	PP	10.0	21.9	6.91	0.264	1	1.09

Notes:
(° C) - Degrees Celsius
PP - Peristaltic pump, low flow technique
uMHOS/cm - Micro HOS per centimeter
NTU - Nephelometric turbidity units
mg/L - milligrams per liter

TABLE 3

GROUNDWATER NATURAL ATTENUATION FIELD MEASUREMENTS
SITE 31, BUILDING 760
ZONE C, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Well I.D.	Date Sampled	Dissolved Oxygen (mg/L)	Alkalinity (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 (ug/L)*
CNC31-MW01	7/23/99	2.0	4.7	37	0.01	0.07	0.024	0.3	<0.05	14	<5.2
CNC31-MW02	7/23/99	2.0	<10	45	0.01	0.05	0.026	0.1	<0.05	18	<5.2
CNC31-MW03	7/23/99	1.0	58	47	0.10	0.75	0.020	0.2	<0.05	12	5.9

Notes:
mg/L - Milligrams per liter
ug/L - Micrograms per liter
E- Estimated Concentration
* Fixed base laboratory analysis

TABLE 4

SUMMARY OF OVA SOIL SCREENING RESULTS
SITE 31, BUILDING 760
ZONE C, FORMER CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Depth (feet)	Total Organic Vapor Headspace Concentration
CNC31-B01	1-2	2
	2-3	2
	3-4	2
	7-8	2
	8-9	2
	13-14	15
CNC31-B02	3-4	4
	6-7	4
CNC31-B03	1-2	4
	2-3	4
	6-7	4
	9-10	4
	10-11	4
	11-12	4
	12-13	260
CNC31-B04	3-4	6
	6-7	4
	7-8	4
	11-12	ND
CNC31-B05	1-2	5
	2-3	5
	3-4	5
	4-5	5
	5-6	5
	6-7	5
	7-8	5
	8-9	5
	9-10	5
	10-11	5
	11-12	5
	12-13	5
CNC31-B06	1-2	5
	2-3	5
	3-4	5
	4-5	5
	5-6	5
	6-7	5
	7-8	5
	8-9	5
	9-10	5
	10-11	5
	11-12	5
	12-13	5

TABLE 4 (Continued)

SUMMARY OF OVA SOIL SCREENING RESULTS
SITE 31, BUILDING 760
ZONE C, FORMER CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Depth (feet)	Total Organic Vapor Headspace Concentration
CNC31-B07	4-5	5
	5-6	5
	6-7	5
	7-8	5
	8-9	5
	9-10	5
	10-11	5
	11-12	5
	12-13	5
CNC31-B08	1-2	ND
	2-3	ND
	3-4	ND
	4-5	ND
	6-7	ND
	7-8	ND
	8-9	ND
	9-10	ND
	11-12	ND
	12-13	ND
CNC31-B09	4-5	ND
	8-9	ND

Note:
OVA - organic vapor analyzer equipped with a flame ionization detector

TABLE 5

SUMMARY OF MOBILE LABORATORY SCREENING RESULTS FOR SOIL
SITE 31, BUILDING 760
ZONE C, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Identification	Sample Depth (feet)	Mobile Laboratory Screening Data (PPB) [1]					
			Benzene (ug/kg)	Toluene (ug/kg)	Ethylbenzene (ug/kg)	Total Xylenes (ug/kg)	Naph-thalene (ug/kg)	Diesel Range Organics (mg/kg)
CNC31B01	31SFB01-1112	11-12	<5.0	<5.0	<5.0	<5.0	<5.0	<19
CNC31-B02	31SFB02-1112	11-12	16	44	360	1670	4500	8300
CNC31-B03	31SFB03-1112	11-12	160	700	2400	14800	34000	>10000
CNC31-B04	31SFB04-1112	11-12	<5.0	<5.0	<5.0	<5.0	<5.0	21
CNC31-B05	31SFB05-1112	11-12	<5.0	<5.0	<5.0	<5.0	<5.0	<10
CNC31-B06	31SFB06-1112	11-12	<5.0	<5.0	<5.0	<5.0	<5.0	<10
CNC31-B07	31SFB07-1011	10-11	<5.0	<5.0	<5.0	<5.0	<5.0	<10

NOTES:
[1] Mobile laboratory screening data was analyzed using USEPA Method 8021/8015M. Compounds not detected are reported as less than the instrument detection limit.

ug/kg Micrograms per kilogram
mg/kg Milligrams per kilogram

TABLE 6

SUMMARY OF MOBILE LABORATORY SCREENING RESULTS FOR GROUNDWATER
SITE 31, BUILDING 760
ZONE C, FORMER CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Identification	Laboratory Screening [1]					
		Benzene (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	Total Xylenes (ug/L)	Naph-thalene (ug/L)	Diesel Range Organics (mg/L)
CNC31-B01	31GFB01-16	<1.0	<1.0	<1.0	<1.0	94	3.4
CNC31-B02	31GFB02-16	4.2	14	98	<1.0	1700	100
CNC31-B03	31GFB03-16	<1.0	4.6	25	131	1600	180
CNC31-B04	31GFB04-16	2.2	2.4	19	54	8700	10
CNC31-B05	31GFB05-15	<1.0	<1.0	<1.0	39	<1.0	<0.1
CNC31-B06	31GFB06-15	<1.0	<1.0	<1.0	<1.0	<1.0	<0.1
CNC31-B07	31GFB07-15	<1.0	<1.0	<1.0	<1.0	<1.0	<0.1

NOTES:
[1] Laboratory screening data were analyzed using USEPA Method 8020/8015M. Compounds not detected are reported as less than the instrument detection limit.

ug/L Micrograms per liter
mg/L Milligrams per liter

TABLE 7

SUMMARY OF FIXED-BASE LABORATORY ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN IN SOIL
SITE 31, BUILDING 760
ZONE C, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Soil Boring / Sample No.	Sample Date	Benzene (ug/kg)	Toluene (ug/kg)	Ethyl-benzene (ug/kg)	Xylenes (total) (ug/kg)	Benzo(a) anthracene (ug/kg)	Benzo(b) fluoranthene (ug/kg)	Benzo(k) fluoranthene (ug/kg)	Chrysene (ug/kg)	Dibenzo(a,h) anthracene (ug/kg)	Naphthalene (ug/kg)
RBSL [1]		5	1622	1260	42471	73084	29097	231109	12998	87866	210
CNC31-B01 / 31SLB011112	28-May-99	< 6	< 6	< 6	< 6	< 400	< 400	< 400	< 400	< 400	< 6
CNC31-B02 / 31SLB021112	28-May-99	< 6	< 6	< 6	< 6	< 400	< 400	< 400	< 400	< 400	< 6
CNC31-B02 / 31SLB021112D[2]	28-May-99	< 6	< 6	< 6	3 [J]	< 400	< 400	< 400	< 400	< 400	3 [J]
CNC31-B03 / 31SLB031112	28-May-99	10	150	930	6800	< 7900	< 7900	< 7900	< 7900	< 7900	13400
CNC31-B04 / 31SLB041112	28-May-99	< 5	< 5	< 5	< 5	< 7300	< 7300	< 7300	< 7300	< 7300	3 [J]
CNC31-B05 / 31SLB050910	28-May-99	< 6	< 6	< 6	< 6	< 360	< 360	< 360	< 360	< 360	< 6
CNC31-B06 / 31SLB061112	28-May-99	< 6	< 6	< 6	< 6	< 400	< 400	< 400	< 400	< 400	ND
CNC31-B07 / 31SLB071011	28-May-99	< 6	< 6	< 6	< 6	< 360	< 360	< 360	< 360	< 360	5 [J]
CNC31-TL[3] / 31TL00101	28-May-99	< 5	< 5	< 5	< 5	NA	NA	NA	NA	NA	< 5

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

NA - Not analyzed

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

[2] Duplicate sample

[3] Trip blank

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

TABLE 8

SUMMARY OF FIXED-BASE LABORATORY ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN IN GROUNDWATER
SITE 31, BUILDING 760
ZONE C, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Monitoring Well/ Sample No.	Sample Date	Benzene (ug/L)	Ethyl-benzene (ug/L)	Toluene (ug/L)	Xylenes (total) (ug/L)	MTBE (ug/L)	Naphthalene (ug/L)	Benzo(a) anthracene (ug/L)	Benzo(b) fluoranthene (ug/L)	Benzo(k) fluoranthene (ug/L)	Chrysene (ug/L)	Dibenzo(a,h) anthracene (ug/L)
RBSL[1]		5	700	1000	10000	40	10 [2]	10 [2]	10 [2]	10 [2]	10 [2]	10 [2]
CNC31-MW01 / 31GLM0101	27-Jul-99	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10
CNC31-MW01 / 31GLM0101D	27-Jul-99	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10
CNC31-MW02 / 31GLM0201	27-Jul-99	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10
CNC31-MW03 / 31GLM0301	28-Jul-99	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10
CNC31-MW04 / 31GLM0401	28-Jul-99	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10
CNC31-MW05 / 31GLM0501	28-Jul-99	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10
CNC31-MW6D / 31GLM0601	19-Aug-99	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10
CNC31TL[4] / 31TL01001	28-Jul-99	< 5	< 5	< 5	< 5	< 5	< 5	NA	NA	NA	NA	NA

All concentrations are in ug/L.

NA - Not analyzed

(1) South Carolina Department of Health and Environmental Control Risk Based Screening Levels for groundwater.

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

(3) Duplicate sample

(4) Trip blank

TABLE 9

COMPARISON OF MAXIMUM CONCENTRATIONS TO RBSLs
SITE 31, BUILDING 760
ZONE C, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Chemical of Concern	Maximum Concentration (Soil) (ug/kg)	RBSLs (Soil) (ug/kg)[a]	Maximum Concentration (GW) (ug/L)	RBSLs (GW) (ug/L)[b]
Benzene	**10**	5	<6	5
Toluene	150	1622	<5	1000
Ethylbenzene	930	1260	<5	700
Xylenes	6800	42471	<5	10000
MTBE	<650	NA	<5	40
Naphthalene	**13400**	210	<5	10
Benzo(a)anthracene	<7900	73084	<10	10
Benzo(a)pyrene	<7900	NA	<10	10
Benzo(b)fluoranthene	<7900	29097	<10	10
Benzo(k)fluoranthene	<7900	231109	<10	10
Benzo(g,h,i)perylene	<7300	NA	<10	10
Chrysene	<7900	12998	<10	10
Dibenzo(a,h)anthracene	<7900	87866	<10	10

Notes:
(a) - From Risk-Based Corrective Action for Petroleum Releases, Table B3, Depth to GW - <5 ft, SCDHEC RBCA Guidelines, 1998.
(b) - From Risk-Based Corrective Action for Petroleum Releases, Table B1, SCDHEC RBCA Guidelines, 1998.
GW - Groundwater
RBSLs - Risk Based Screening Levels
Bolded value indicates the concentration exceeded the RBSL.
NA = Not Available

TABLE 10

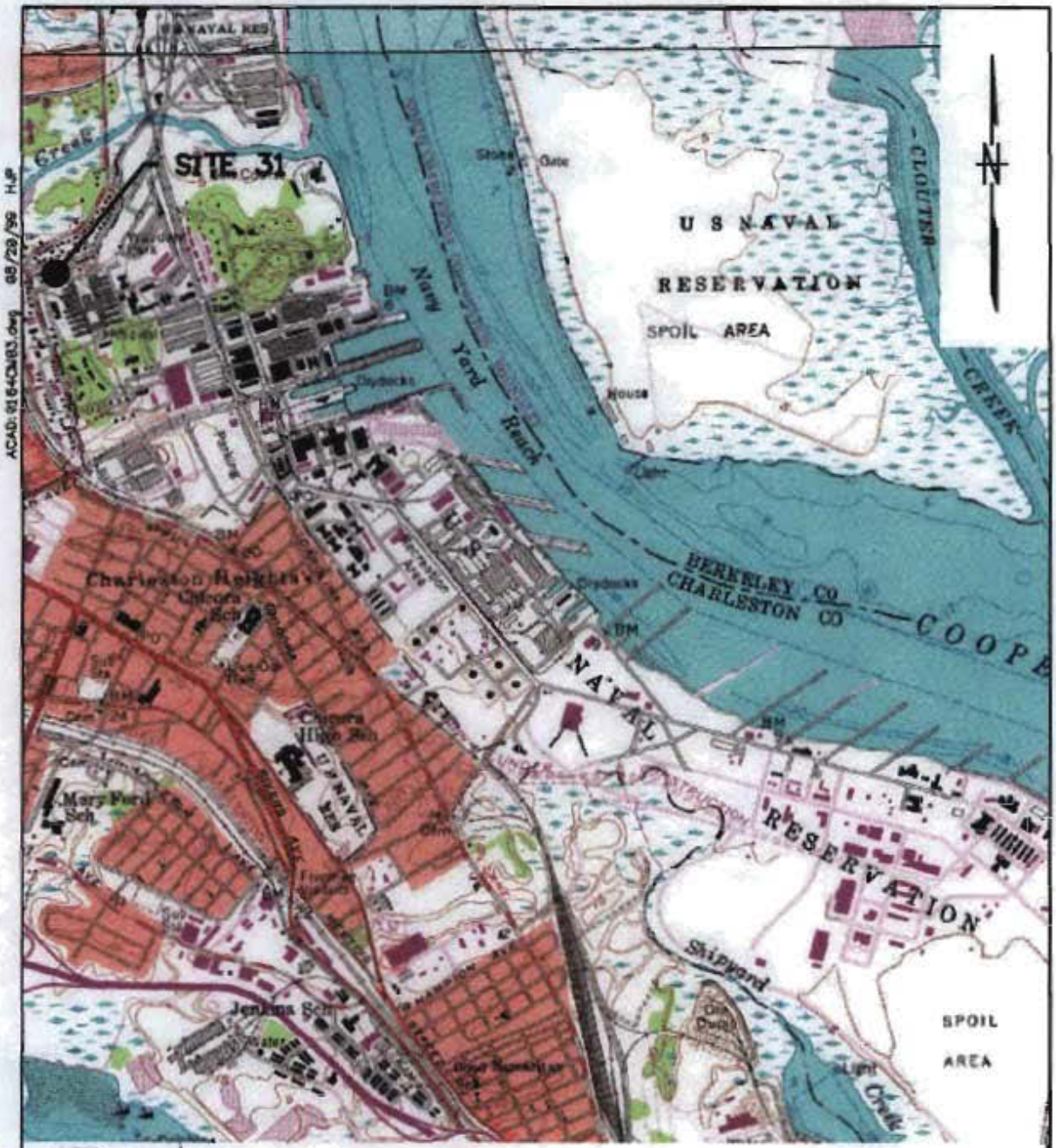
EXPOSURE PATHWAY ASSESSMENT – CURRENT LAND USE
SITE 31, BUILDING 760
ZONE C, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Media	Exposure Route	Pathway Selected for Evaluation? (Yes or No)	Exposure Point or Reason for Non-Selection	Data Requirements (If pathway selected)
Air	Inhalation Explosion Hazard	No No	Area of boilder house below grade is above water table and not expected to act as a basement. No explosion hazard.	
Groundwater	Ingestion Dermal contact Inhalation	No No No	No current groundwater pathways complete. Drinking water provided by city.	
Surface Water	Ingestion Dermal contact Inhalation	No No No	No surface water bodies within 1,000 feet	
Surficial Soil	Ingestion Dermal contact Inhalation	No No No	No surficial soil impact.	
Subsurface Soil	Ingestion Dermal contact Inhalation	No No No	No current complete pathways.	

TABLE 11

EXPOSURE PATHWAY ASSESSMENT - FUTURE LAND USE
SITE 31, BUILDING 760
ZONE C, 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 Explosion Hazard	No No	Area of boiler house below grade is above water table and not expected to act as a basement. No explosion hazard.	
Groundwater	Ingestion Dermal contact Inhalation	Yes Yes Yes	Groundwater exposure by potential construction worker (most likely in utility corridor). Both direct exposure and exposure by soil leaching to groundwater evaluated.	No additional data needed.
Surface Water	Ingestion Dermal contact Inhalation	No No No	No surface water bodies within 1,000 feet.	
Surficial Soil	Ingestion Dermal contact Inhalation	No No No	Soil exposure by potential construction worker (most likely in utility corridor). Although there is no surficial soil impact, subsurface soil evaluated as surface soil for construction worker as direct contact likely in utility trench. Volatization of CoCs will occur before receptor enters the trench to work.	No additional data needed.
Subsurface Soil	Ingestion Dermal contact Inhalation	YES YES No	Exposure evaluated as direct contact in utility trench (see above).	



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

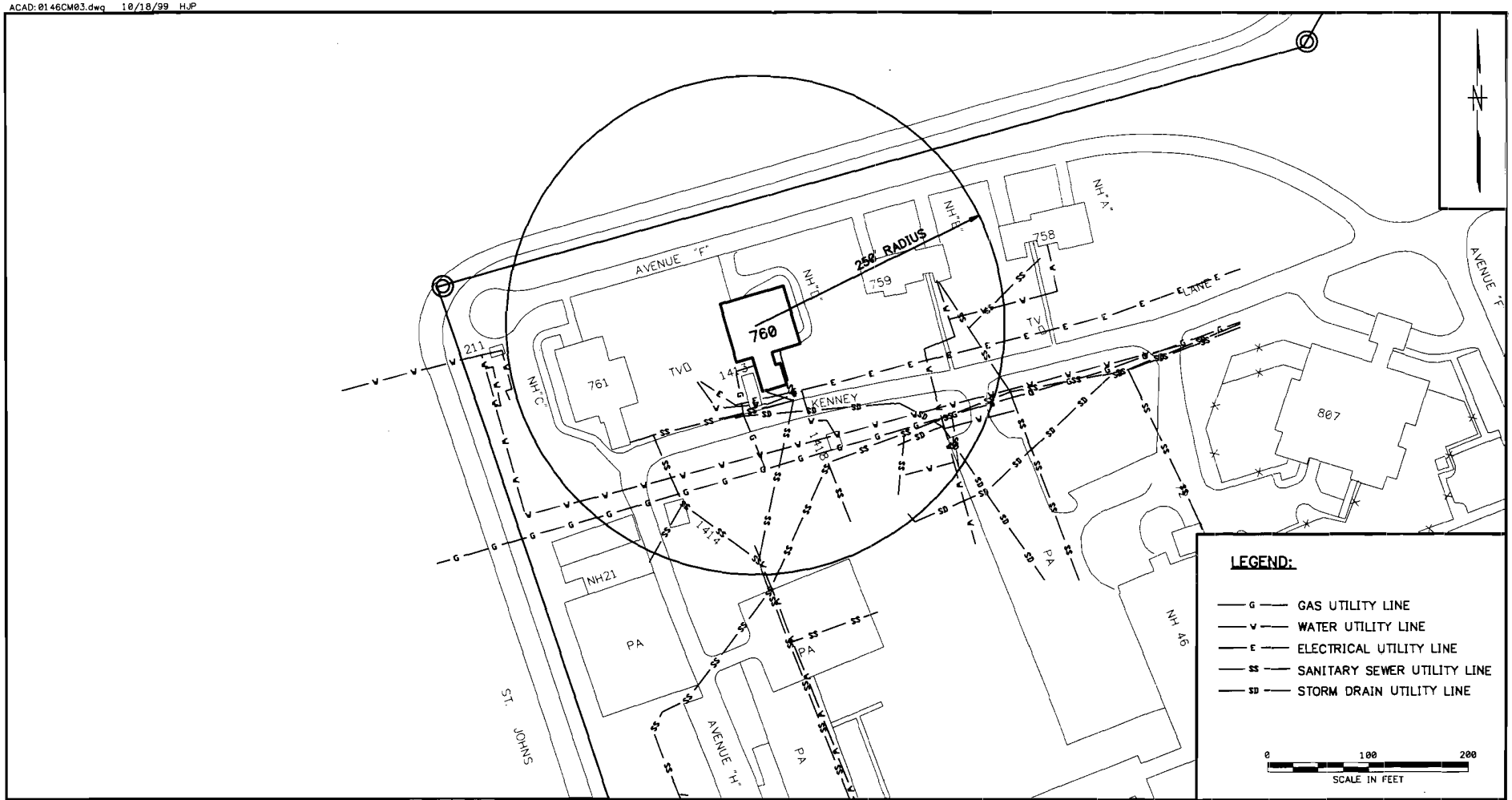
0 2000 4000
SCALE IN FEET

DRAWN BY HJP 8/20/99	DATE	SITE LOCATION MAP SITE 31, BUILDING 760 ZONE C, CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NO. N0164
CHECKED BY	DATE		APPROVED BY / DATE
COST/SCHED-AREA			APPROVED BY / DATE
SCALE AS NOTED			DRAWING NO. FIGURE 1 / REV. 0

FORM CADD NO. EDIV_AV.DWG - REV 0 - 1/26/99

FIGURES

ACAD:0146CM03.dwg 10/18/99 HJP



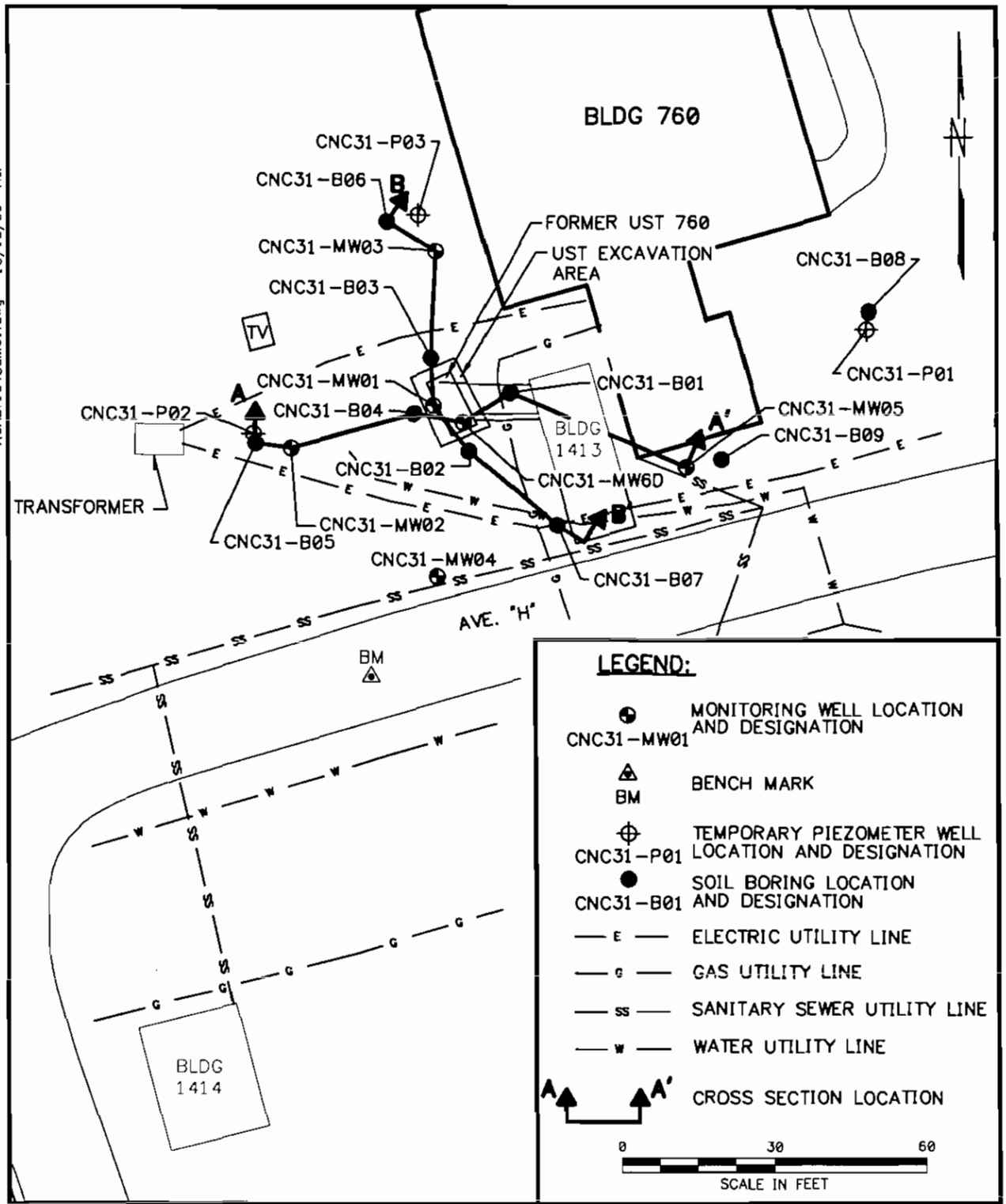
NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY DLT DATE 8/18/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

SITE VICINITY MAP
SITE 31, BUILDING 760
ZONE C, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0146
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 2
REV. 0

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

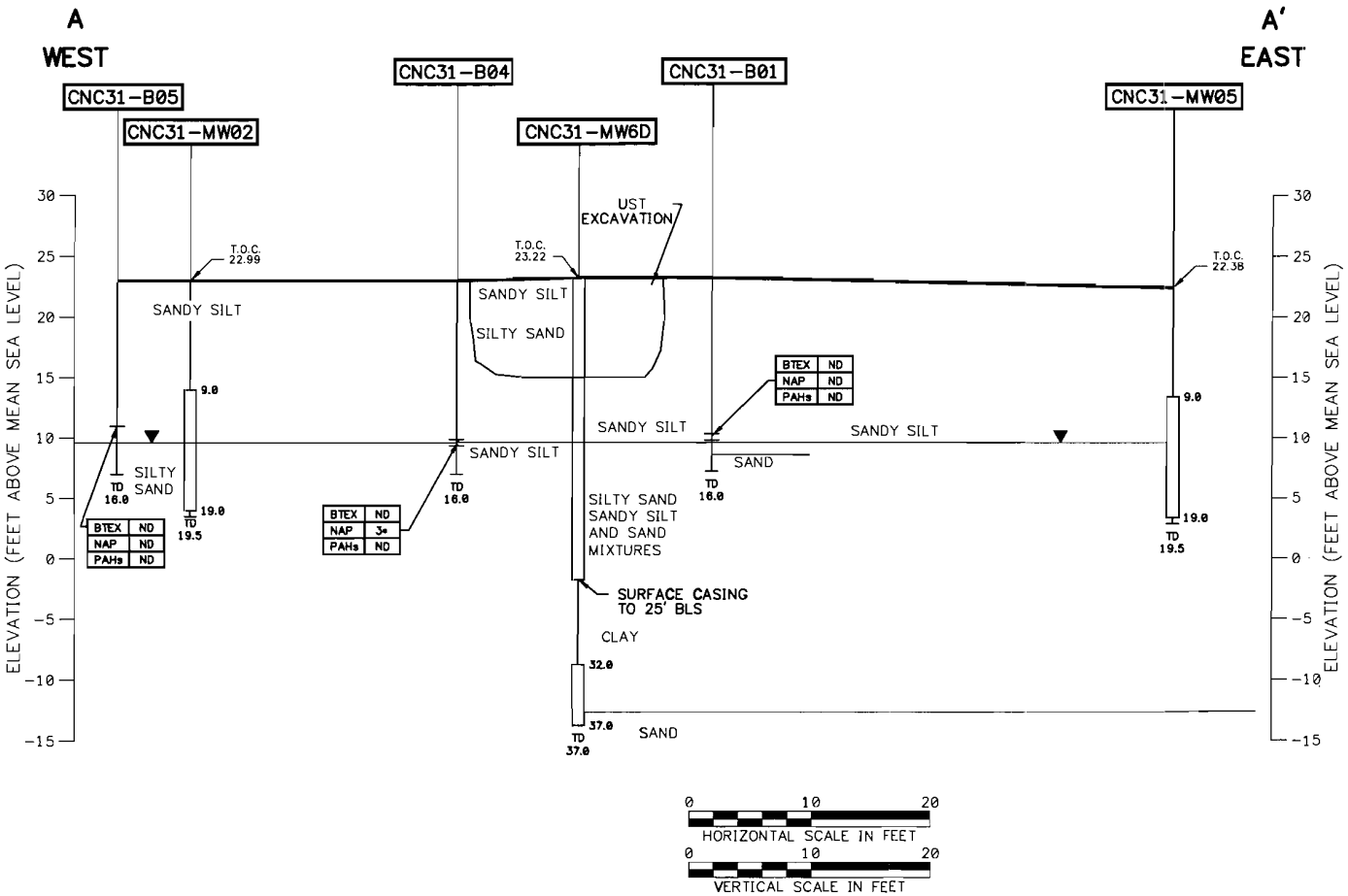


ACAD:1640CM01.dwg 10/18/99 HJP

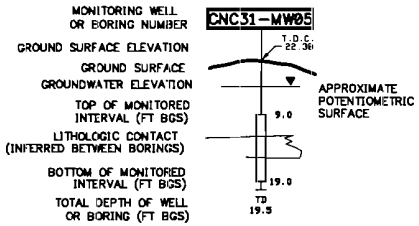
DRAWN BY HJP DATE 10/18/99		SITE MAP AND SAMPLING LOCATIONS SITE 31, BUILDING 760 ZONE C, CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NO. 1640
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 3 REV. 0

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

ACAD:1640cx01.dwg 10/18/99 HJP



LEGEND:



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

* ANALYTE AT CONCENTRATION LESS THAN THE REPORTING LIMIT AND GREATER THAN THE DETECTION LIMIT

BTEX	ND
NAP	3*
PAHs	ND

SOIL PARAMETER CONCENTRATIONS (ug/Kg) AT SAMPLE DEPTH

BTEX = BENZENE, TOLUENE, ETHYLBENZENE, AND TOTAL XYLENES

NAP = NAPHTHALENE

PAHs = POLYNUCLEAR AROMATIC HYDORCARBONS

ND = NOT DETECTED (BELOW LABORATORY DETECTION LIMITS)

NOTE:

GROUNDWATER BTEX, NAPHTHALENE, AND PAH PARAMETERS REPORTED BELOW LABORATORY DETECTION LIMITS IN MONITORING WELLS CNC31-MW02, CNC31-MW5, AND CNC31-MW6D.

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

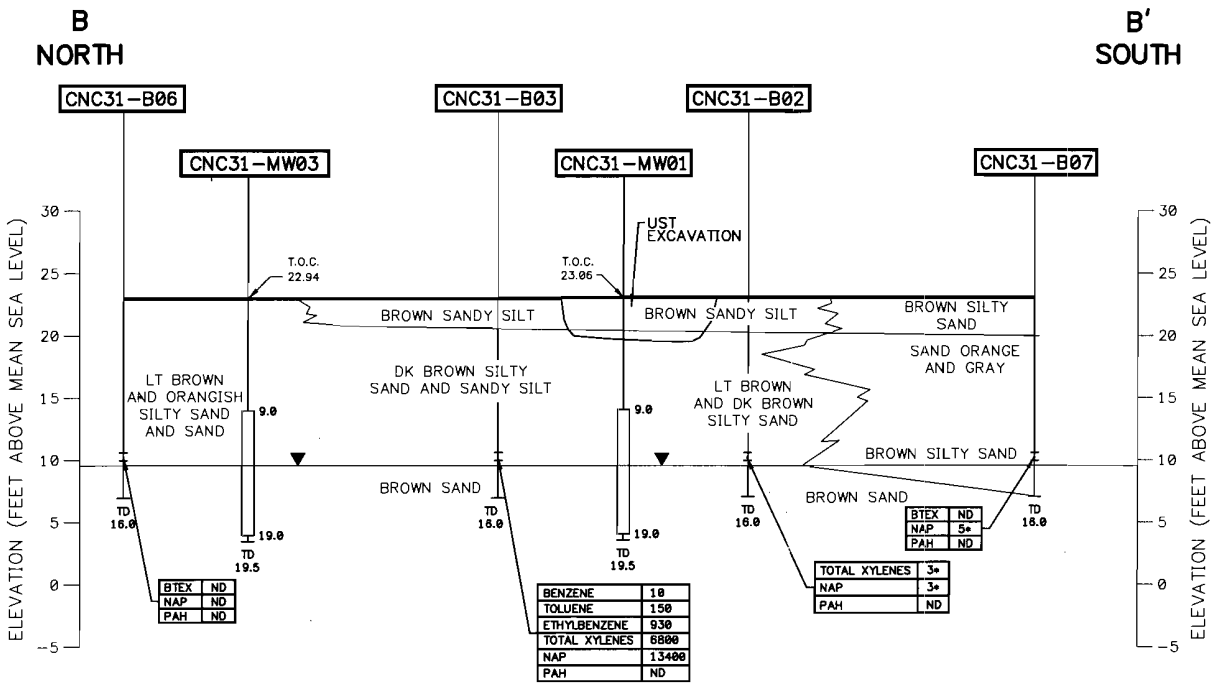
DRAWN BY HJP DATE 10/18/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

GEOLOGIC CROSS SECTION A-A'
SITE 31, BUILDING 760
ZONE C, CHARLESTON NAVAL COMPLEX
NORTH CHALRESTON, SOUTH CAROLINA

CONTRACT NO. 1640
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 4
REV. 0

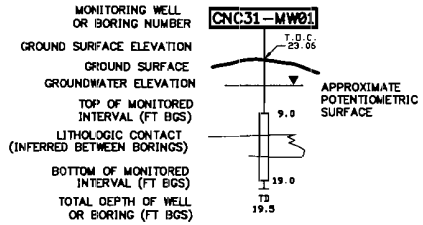
FORM CADD NO. SOUTH-BH.DGN - REV 0 - 9/9/98

ACAD:1640cx02.dwg 10/20/99 HJP



0 10 20
HORIZONTAL SCALE IN FEET
0 10 20
VERTICAL SCALE IN FEET

LEGEND:



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

BTEX	ND
NAP	5*
PAH	ND

SOIL PARAMETER CONCENTRATIONS (ug/Kg) AT SAMPLE DEPTH

BTEX = BENZENE, TOLUENE, ETHYLBENZENE, AND TOTAL XYLENES

NAP = NAPHTHALENE

PAH = NOT DETECTED (BELOW LABORATORY DETECTION LIMITS

NOTE:

GROUNDWATER BTEX, NAPHTHALENE, AND PAH PARAMETERS REPORTED BELOW LABORATORY DETECTION LIMITS IN MONITORING WELLS CNC31-MW01 AND CNC31-MW02.

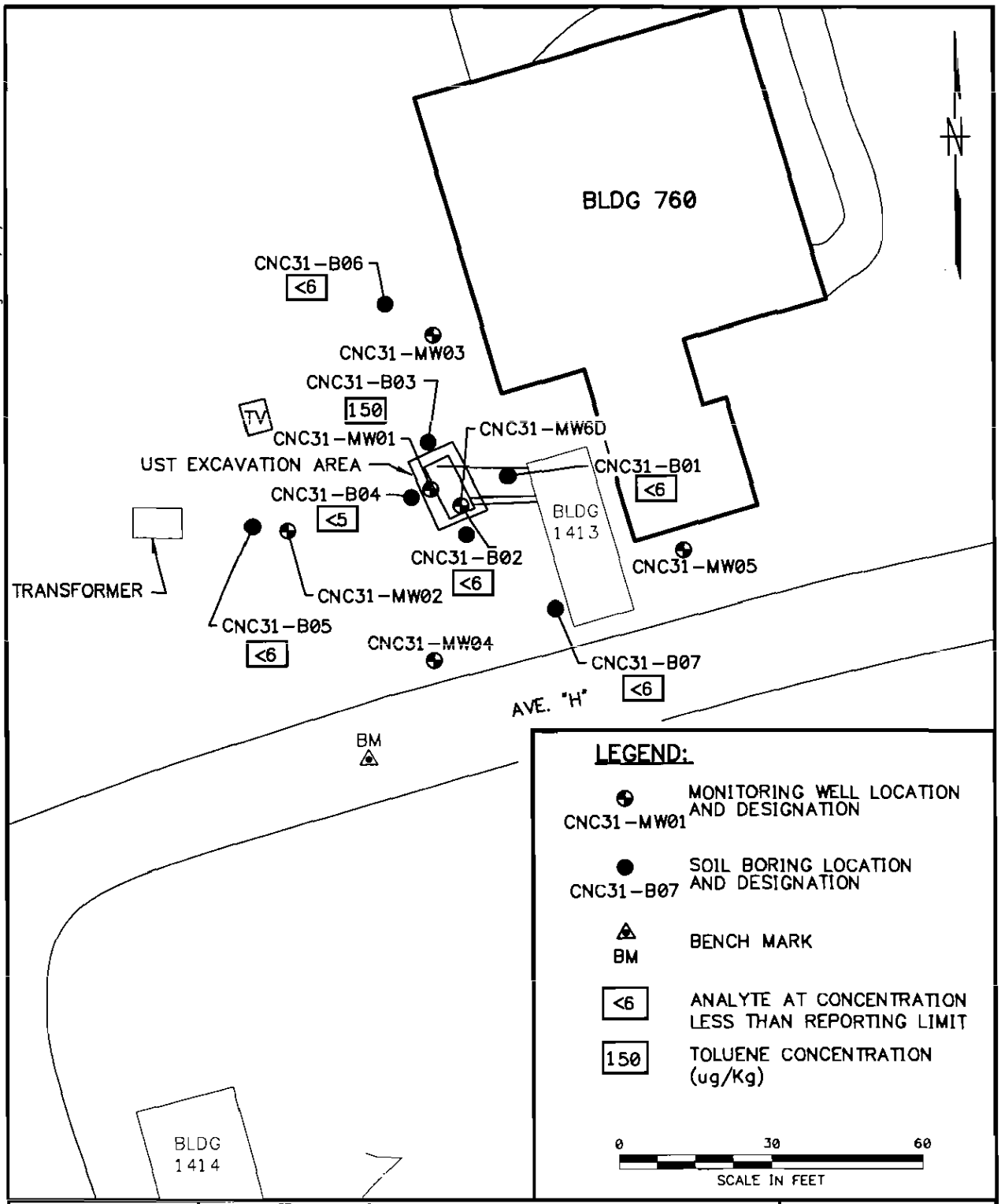
NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY HJP DATE 10/18/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

GEOLOGIC CROSS SECTION B--B'
SITE 31, BUILDING 760
ZONE C, CHARLESTON NAVAL COMPLEX
NORHT CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 1640
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 5
REV. 0

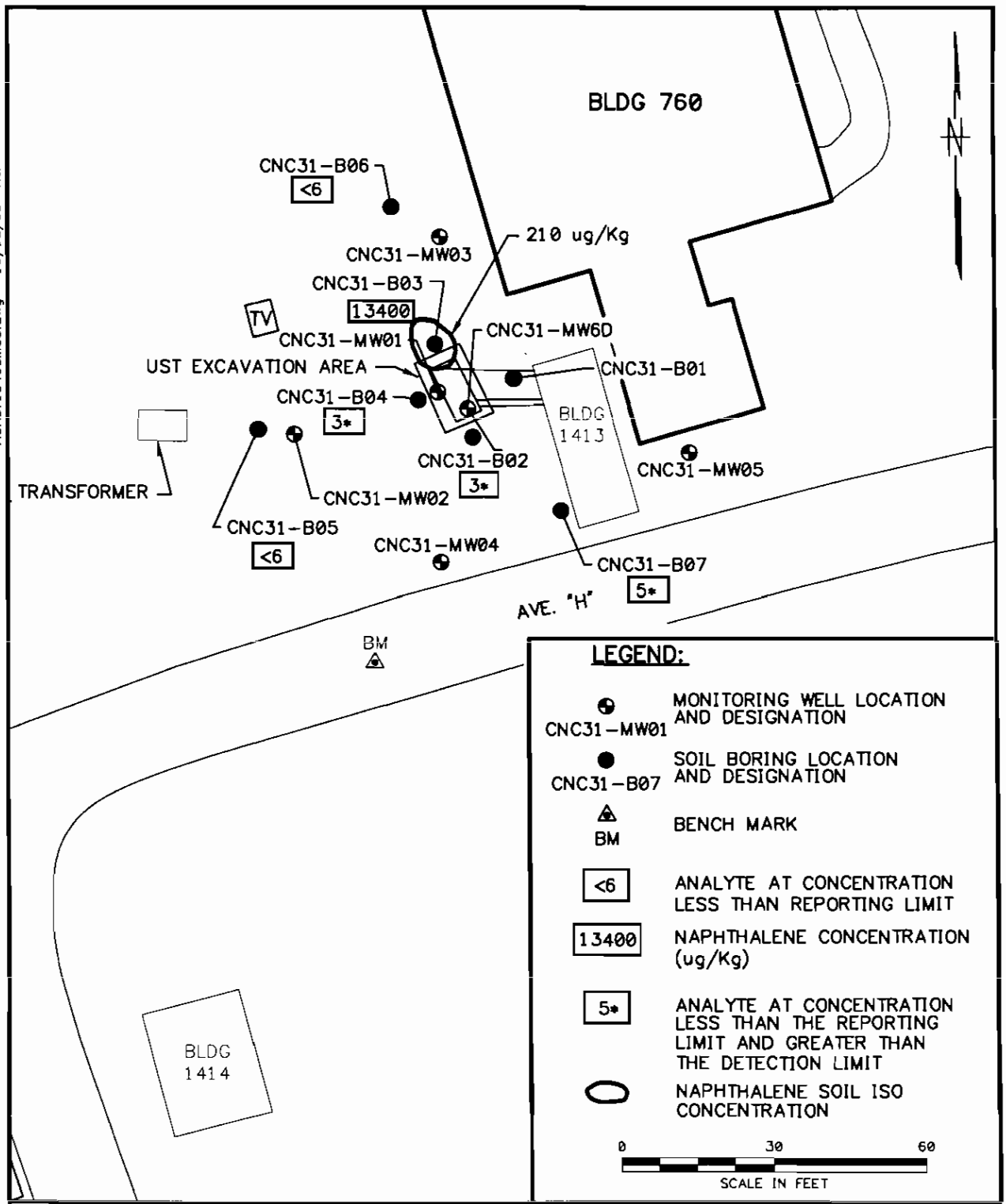
FORM CADD NO. SOUTH-BH.DGN - REV 0 - 9/9/98



ACAD:1640GM02.dwg 10/18/99 HJP

DRAWN BY HJP DATE 10/18/99	SOIL TOLUENE CONCENTRATION MAP (MAY 1999) SITE 31, BUILDING 760 ZONE C, CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NO. 1640	
CHECKED BY DATE		APPROVED BY DATE	
COST/SCHED-AREA		APPROVED BY DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 8	REV. 0

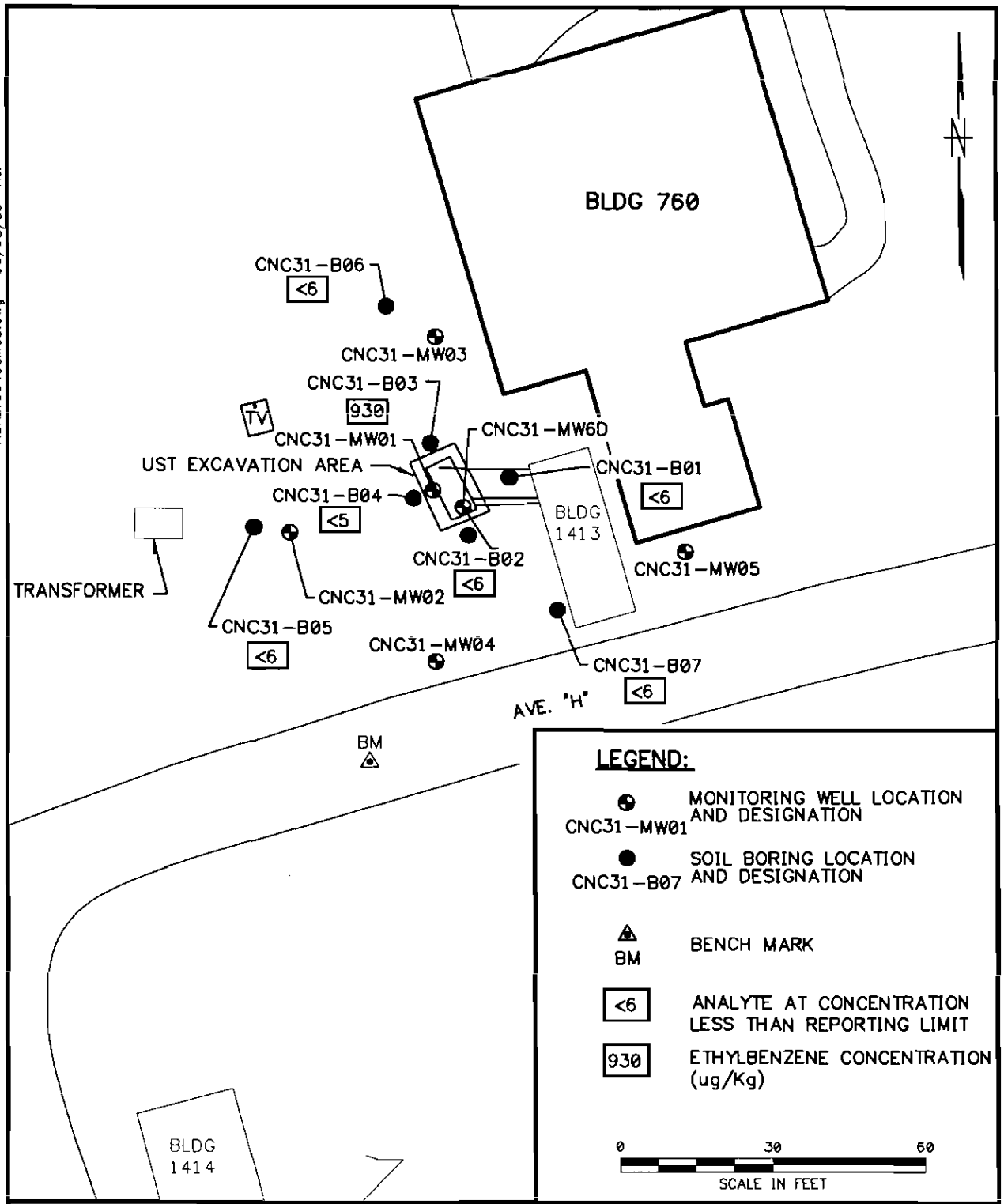
FORM CADD NO. SDIV_AV.DWG – REV 0 – 1/20/98



ACAD:1640GM05.dwg 10/18/99 HJP

DRAWN BY HJP DATE 10/18/99	DEPARTMENT OF THE NAVY SOUTHERN DIV FACILITIES ENGINEERING COMD	SOIL NAPHTHALENE CONCENTRATION MAP (MAY 1999) SITE 31, BUILDING 760 ZONE C, CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NO. 1640
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 11 REV. 0

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

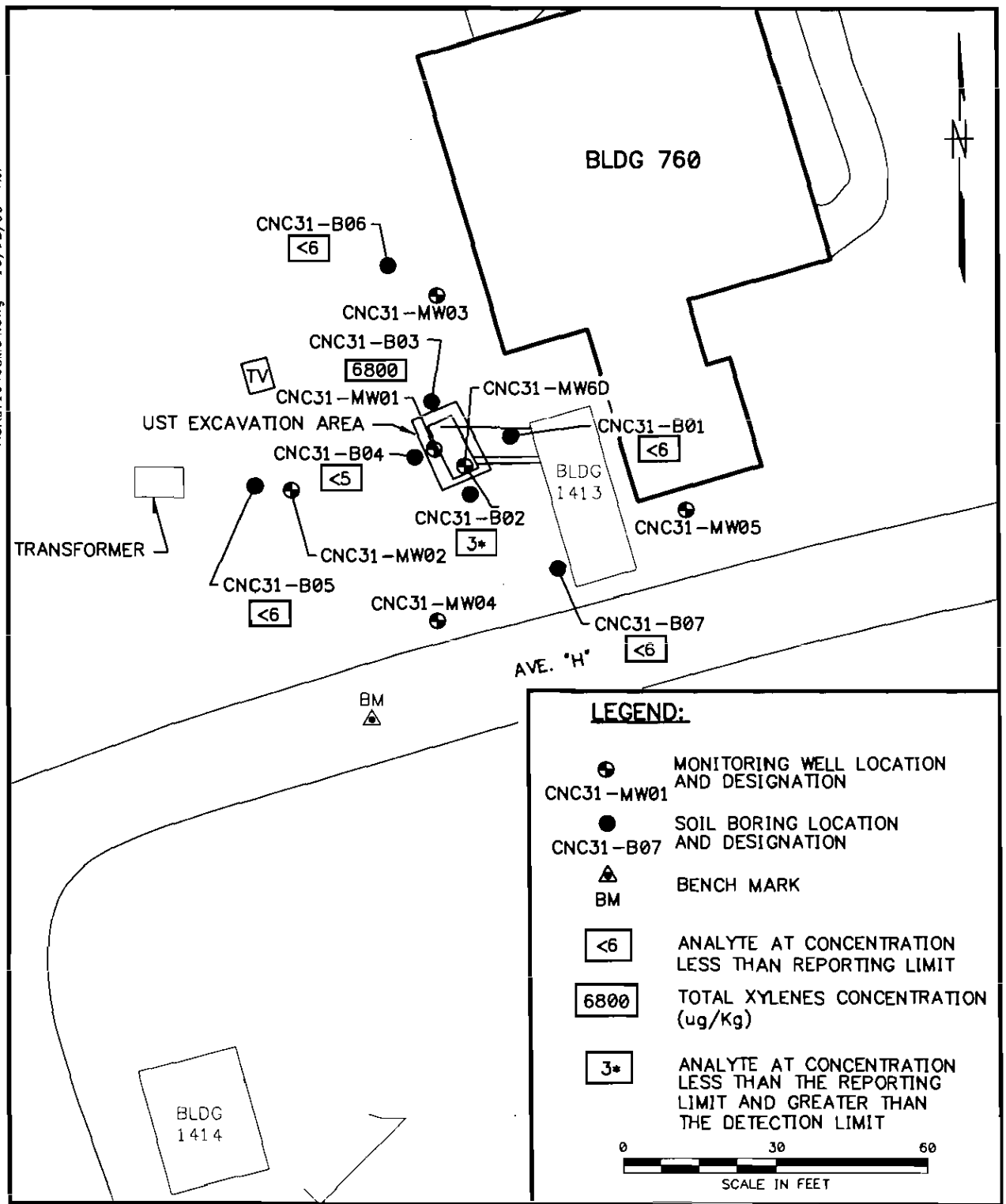


ACAD:1640GM03.dwg 10/18/99 HJP

DRAWN BY HJP DATE 10/18/99	SOIL ETHYLBENZENE CONCENTRATION MAP (MAY 1999) SITE 31, BUILDING 760 ZONE C, CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NO. 1640	
CHECKED BY DATE		APPROVED BY DATE	
COST/SCHED-AREA		APPROVED BY DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 9	REV. 0

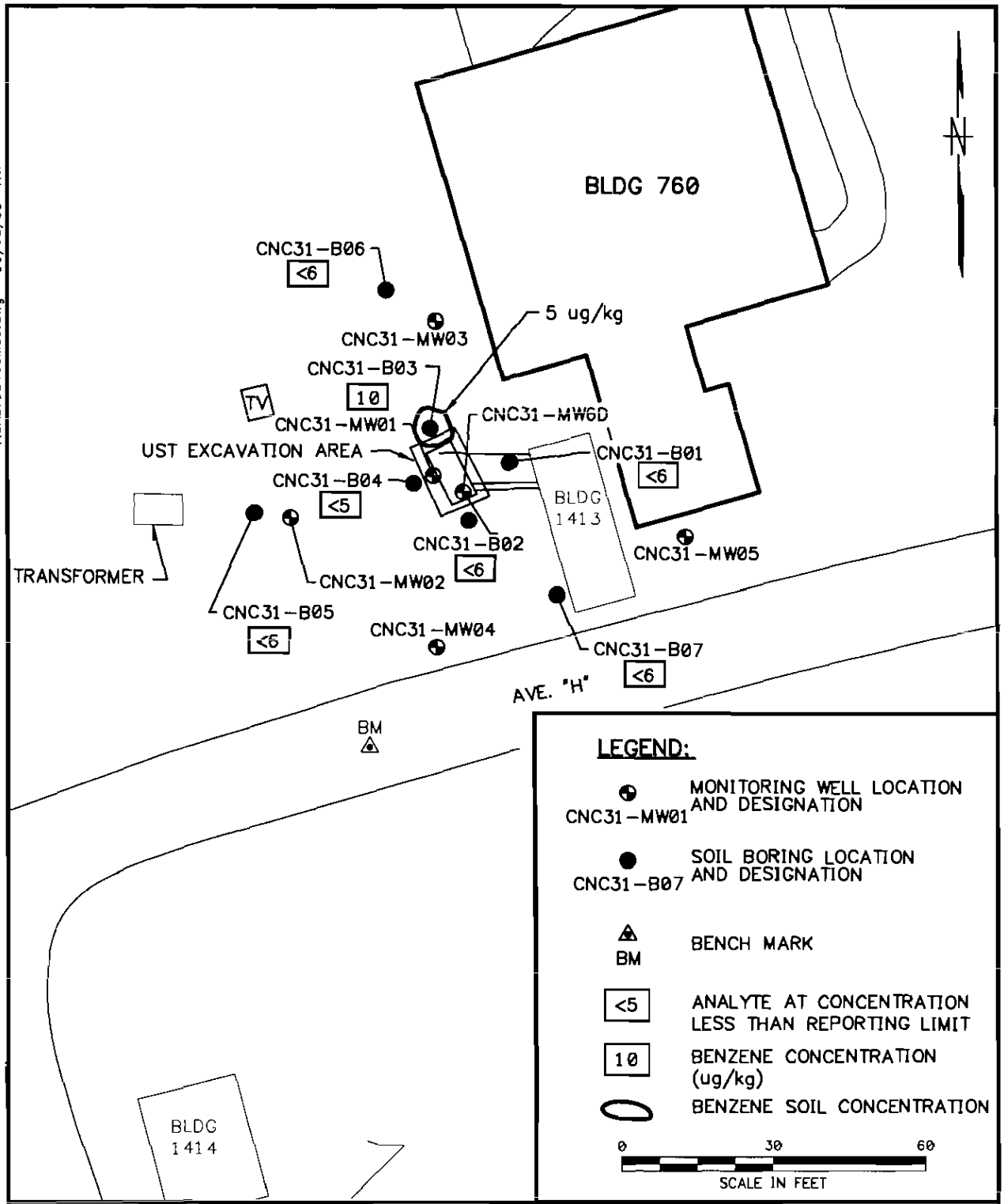
FORM CADD NO. SOIV_AV.DWG – REV 0 – 1/20/98

ACAD:1640GM04.dwg 10/18/99 HJP



DRAWN BY HJP 10/18/99	DEPARTMENT OF THE NAVY SOUTHERN DIV FACILITIES ENGINEERING COMD	SOIL TOTAL XYLENES CONCENTRATION MAP (MAY 1999) SITE 31, BUILDING 760 ZONE C, CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NO. 1640
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 10 / REV. 0

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



ACAD:1640GM01.dwg 10/18/99 HJP

DRAWN BY HJP DATE 10/18/99	DEPARTMENT OF THE NAVY SOUTHERN DIV FACILITIES ENGINEERING COMD	SOIL BENZENE CONCENTRATION MAP (MAY 1999) SITE 31, BUILDING 760 ZONE C, CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NO. 1640
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 7 REV. 0

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

APPENDIX A

UNDERGROUND STORAGE TANK ASSESSMENT REPORT - UST 760

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

Submit Completed Form to:

Date Received
State Use Only

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: 843 Telephone Number: 743-9985 Contact Person: Henry N. Shepard II, P. E.

II SITE IDENTIFICATION AND LOCATION

Site I.D. #: Unregulated

Facility Name: Charleston Naval Base Complex, NH46

Street Address: Turnbull Avenue

City: North Charleston, 29405-2413 County: Charleston

III CLOSURE INFORMATION

Closure Started: 24 Aug 1998 Closure Completed: 22 Sept 1998

Number of USTs Closed: 1

N/A — Consultant

SPORTENVDETCHASN — 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

Henry Shepard II, P. E.
Name (Type or Print)

Henry N. Shepard II P.E.
Signature

V. UST INFORMATION

		Tank 1	Tank 2	Tank 3	Tank 4	Tank 5
A.	Product.....	Fuel oil				
B.	Capacity.....	1,500 gal				
C.	Age.....	1941				
D.	Construction Material.....	Steel				
E.	Month/Year of Last Use.....	Unk.				
F.	Depth (ft.) To Base of Tank.....	6'				
G.	Spill Prevention Equipment Y/N.....	N				
H..	Overfill Prevention Equipment Y/N.....	N				
I.	Method of Closure Removed/Filled.....	R				
J.	Visible Corrosion or Pitting Y/N.....	Y				
K.	Visible Holes Y/N.....	N				

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

UST NH46-5 was removed, drained, cut open at both ends, and cleaned with a steam cleaner. It was 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)

The sludge, waste water, and residual fuel oil from UST NH46-5 were recycled.

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

UST NH46-5 was sound, although covered with rust which had not penetrated the sheet metal. However, the backhoe accidentally punctured the tank at 6 feet below ground surface level during the digging process. See Site Map 3.

VI. PIPING INFORMATION

	Tank 1	Tank 2	Tank 3	Tank 4	Tank 5
A. Construction Material.....	Steel & copper				
B. Distance from UST to Dispenser.....	26' See note 1				
C. Number of Dispensers.....	1 See note 1				
D. Type of System P/S.....	S				
E. Was Piping Removed from the Ground? Y/N....	Y				
F. Visible Corrosion or Pitting Y/N.....	Y				
G. Visible Holes Y/N.....	N				
H. Age.....	1941				

Note 1: UST NH46-5 provided heating fuel oil to Building NH46.

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

The piping was covered with surface rust throughout the run. One loose joint was found. See Site Map 2.

VII. BRIEF SITE DESCRIPTION AND HISTORY

Facility NH46 was constructed in 1941 and served as part of the Naval Hospital complex. UST NH46-5 provided fuel oil to the boilers and emergency generators of building NH46. The tank was abandoned at an unknown date.

UST NH46-5 was first identified as a possible location for an underground tank. The only evidence that was found for the tank was an open top pipe next to a stairway in an empty parking lot over 100 feet from the tank's actual location. The tank location was approximated through the use of a magnetometer and the Building NH 46 boiler room piping and vent. The asphalt, rock and soil covering the tank had to be removed to find it. The tank was full and could not be emptied until it was uncovered, due to the remote fill line. Unfortunately, during the excavation/search for the tank, the backhoe punctured the tank resulting in a spill of approximately 50 gallons of heating fuel oil that was in the tank (see Attachment I Photo 2).

The fluid, and the soil saturated by the spill was over excavated, and sampled for disposal. Additionally, a sample was taken from the soils below the area that was over excavated during the clean-up. Efforts to remove all soil affected by the spill were taken, but the sample of the area below the over excavation showed no significant difference in contamination levels from the saturated soil which was removed. Both areas had relatively high levels of volatiles (BETX/Naphthalene) and detection levels for semi-volatiles (PAHs) which were too high to for significant analysis.

VIII. SITE CONDITIONS

		Yes	No	Unk
A.	Were any petroleum-stained or contaminated soils found in the UST excavation, soil borings, trenches, or monitoring wells? If yes, indicate depth and location on the site map. **See note 1.**		X	
B.	Were any petroleum odors detected in the excavation, soil borings, trenches, or monitoring wells? If yes, indicate location on site map and describe the odor (strong, mild, etc.) **[beneath pipe run - mild]**	X		
C.	Was water present in the UST excavation, soil borings, or trenches? If yes, how far below land surface (indicate location and depth)? _____		X	
D.	Did contaminated soils remain stockpiled on site after closure? If yes, indicate the stockpile location on the site map. Name of DHEC representative authorizing soil removal: **See note 2.**		X	
E.	Was a petroleum sheen or free product detected on any excavation or boring waters? If yes, indicate location and thickness. **See note 3.**		N/A	

Notes:

1. The release within the UST excavation was an accident caused by DET personnel. It was not a condition of the subject tank/piping that was discovered .
2. Petroleum impacted soil has been drummed and segregated for disposal by a recycling facility.
3. No groundwater was encountered.

IX. SAMPLE INFORMATION

A. SCDHEC Lab Certification Number 10120

B.

Sample #	Location	Sample Type (Soil/Water)	Soil Type (Sand/Clay)	Depth*	Date/Time of Collection	Collected By	OVA#
SPORT 0784-1	Beneath fill pipe	Soil	Sand	3'	25 Aug 98 0800	M. Baker	Not Taken
SPORT 0784-2	Trip Blank.	-	-	-	-	-	-
SPORT 0784-3	Beneath fill pipe	Soil	Sand	3.5'	25 Aug 98 0900	M. Baker	Not Taken
SPORT 0784-4	Beneath fill pipe	Soil	Sand	3.5'	25 Aug 98 0900	M. Baker	Not Taken
SPORT 0788-1	Dirt pile	Soil	Sand	-	1 Sept 98 0841	M. Baker	Not Taken
SPORT 0788-2	Trip Blank.	-	-	-	-	-	-
SPORT 0788-3	UST excavation, south end	Soil	Sand	8'	1 Sept 98 0930	M. Baker	Not Taken
SPORT 0788-4	UST excavation, North end	Soil	Sand	8'	1 Sept 98 0920	M. Baker	Not Taken
SPORT 0788-5	Vent pipe	Soil	Sand	4'	1 Sept 98 0937	M. Baker	Not Taken
SPORT 0788-6	Beneath fill pipe	Soil	Sand	3.5'	1 Sept 98 0950	M. Baker	Not Taken

* = Depth Below the Surrounding Land Surface

X. SAMPLING METHODOLOGY

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

After the removal of UST NH46-5 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. Samples for volatiles were taken using the Encore sampler and T-handle.

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 SPORTENVDETCHASN until they were transferred to General Engineering Laboratories for analysis as documented in the attached Chain-of-Custody Record.

XI. RECEPTORS

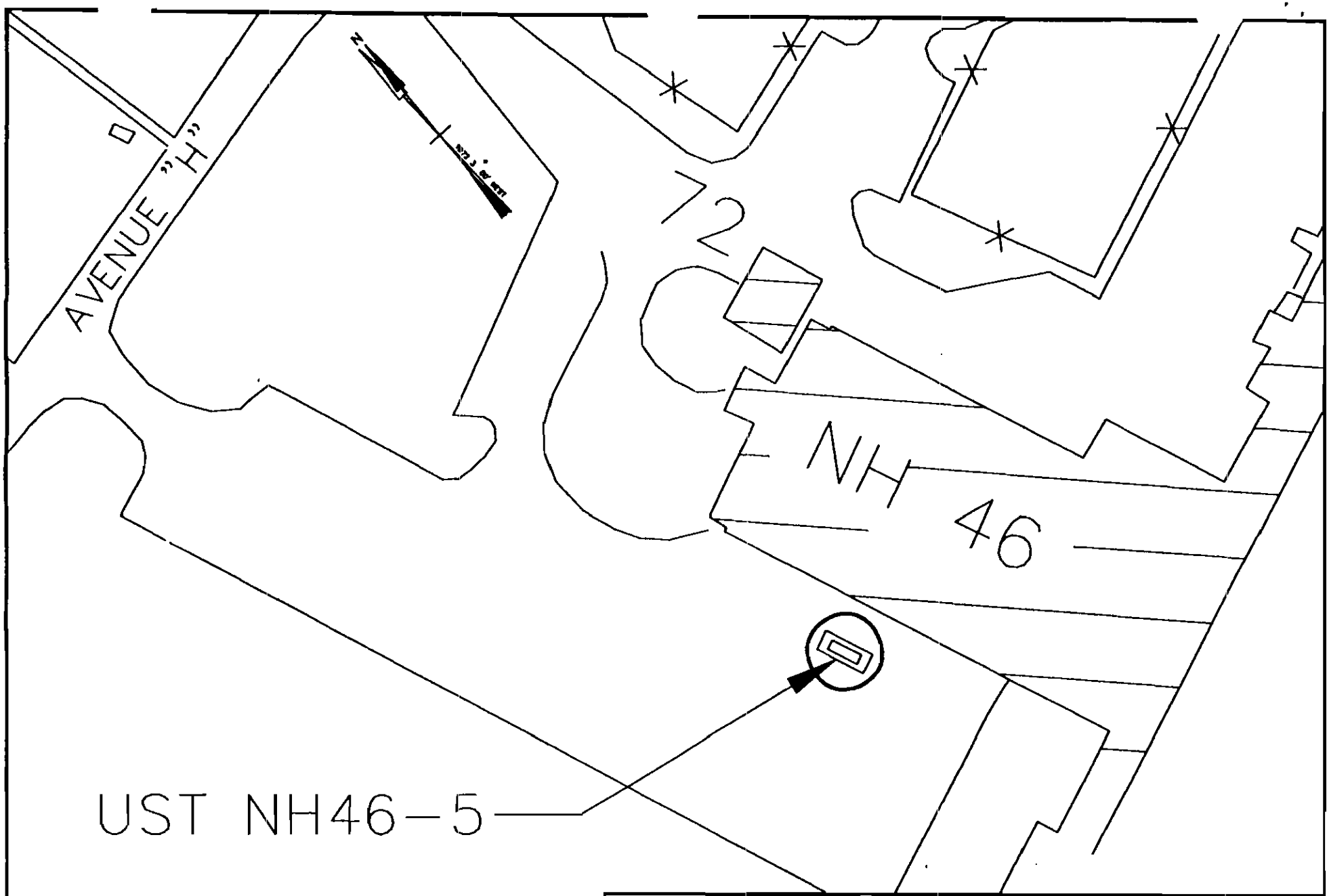
		Yes	No
A.	Are there any lakes, ponds, streams, or wetlands located within 1000 feet of the UST system? If yes, indicate type of receptor, distance, and direction on site map.		X
B.	Are there any public, private, or irrigation water supply wells within 1000 feet of the UST system? If yes, indicate type of well, distance, and direction on site map.		X
C.	Are there any underground structures (e.g., basements) located within 100 feet of the UST system? If yes, indicate the type of structure, distance, and direction on site map. **[Bldg NH46 - ground floor partially below GSL]**	X	
D.	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? If yes, indicate the type of utility, distance, and direction on the site map. **[storm drain]**	X	
E.	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? If yes, indicate the area of contaminated soil on the site map.		X

Attachment I

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, and 3
Photographs 1 thru 4



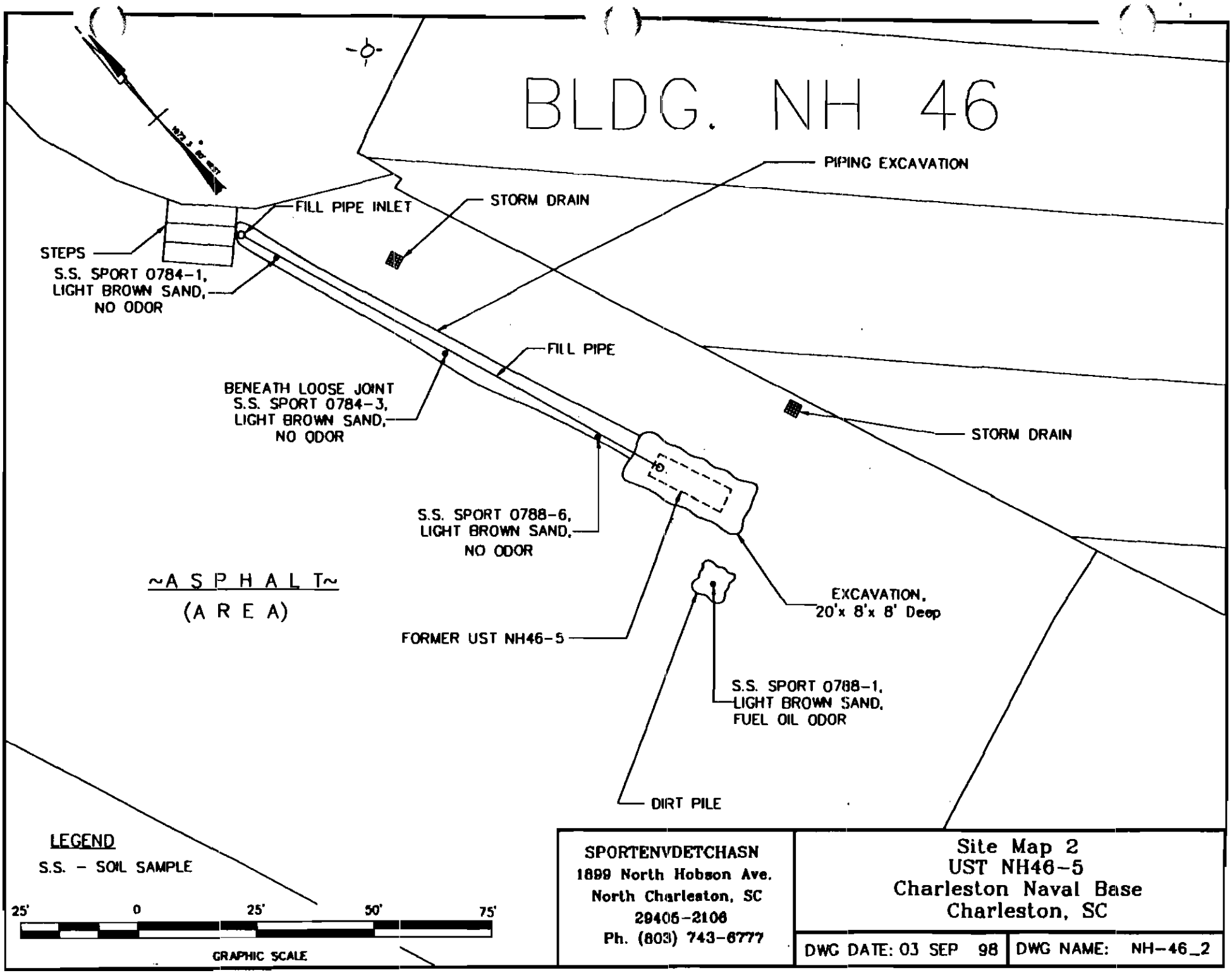
50' 0 50' 100' 150'

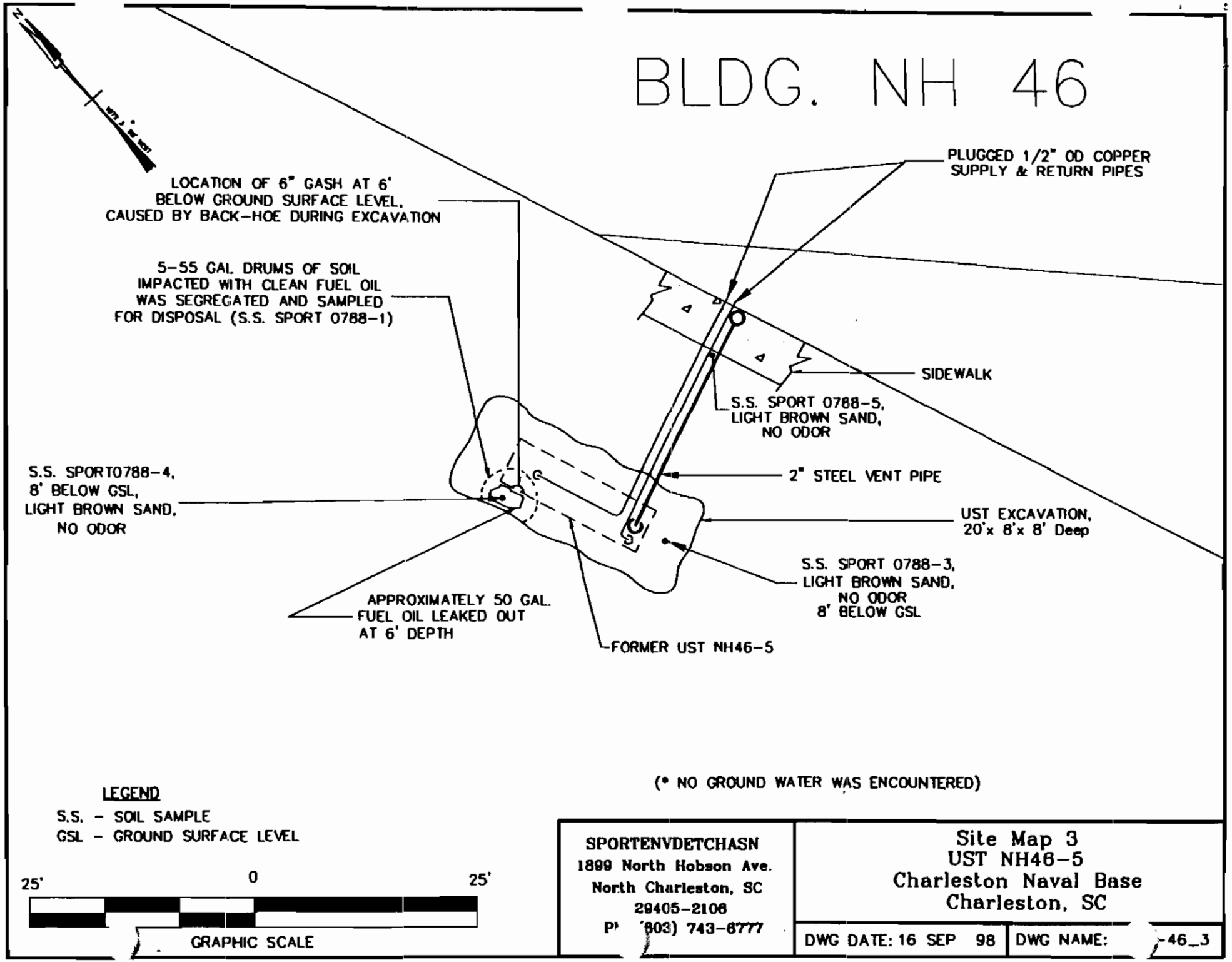
GRAPHIC SCALE

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

Site Map 1
UST NH46-5
Charleston Naval Base
Charleston, SC

DWG DATE: 01 SEP 98 | DWG NAME: NH _1


BLDG. NH 46
PIPING EXCAVATION
STORM DRAIN
FILL PIPE INLET
STEPS
S.S. SPORT 0784-1,
LIGHT BROWN SAND,
NO ODOR
FILL PIPE
BENEATH LOOSE JOINT
S.S. SPORT 0784-3,
LIGHT BROWN SAND,
NO ODOR
STORM DRAIN
S.S. SPORT 0788-6,
LIGHT BROWN SAND,
NO ODOR
~A S P H A L T~
(A R E A)
EXCAVATION,
20'x 8'x 8' Deep
FORMER UST NH46-5
S.S. SPORT 0788-1,
LIGHT BROWN SAND,
FUEL OIL ODOR
DIRT PILE
LEGEND
S.S. - SOIL SAMPLE
25' 0 25' 50' 75'
GRAPHIC SCALE
SPORTENVDETCHASN
1899 North Hobson Ave.
North Charleston, SC
29405-2106
Ph. (803) 743-6777
Site Map 2
UST NH46-5
Charleston Naval Base
Charleston, SC
DWG DATE: 03 SEP 98
DWG NAME: NH-46_2


BLDG. NH 46
PLUGGED 1/2" OD COPPER SUPPLY & RETURN PIPES
LOCATION OF 6" GASH AT 6' BELOW GROUND SURFACE LEVEL, CAUSED BY BACK-HOE DURING EXCAVATION
5-55 GAL DRUMS OF SOIL IMPACTED WITH CLEAN FUEL OIL WAS SEGREGATED AND SAMPLED FOR DISPOSAL (S.S. SPORT 0788-1)
SIDEWALK
S.S. SPORT 0788-5, LIGHT BROWN SAND, NO ODOR
2" STEEL VENT PIPE
S.S. SPORT0788-4, 8' BELOW GSL, LIGHT BROWN SAND, NO ODOR
UST EXCAVATION, 20'x 8'x 8' Deep
S.S. SPORT 0788-3, LIGHT BROWN SAND, NO ODOR 8' BELOW GSL
APPROXIMATELY 50 GAL. FUEL OIL LEAKED OUT AT 6' DEPTH
FORMER UST NH46-5
(* NO GROUND WATER WAS ENCOUNTERED)
LEGEND
S.S. - SOIL SAMPLE
GSL - GROUND SURFACE LEVEL
25'
0
25'
GRAPHIC SCALE
SPORTENVDETCHASN
1899 North Hobson Ave.
North Charleston, SC
29405-2106
P' '803) 743-6777
Site Map 3
UST NH46-5
Charleston Naval Base
Charleston, SC
DWG DATE: 16 SEP 98
DWG NAME:
-46_3

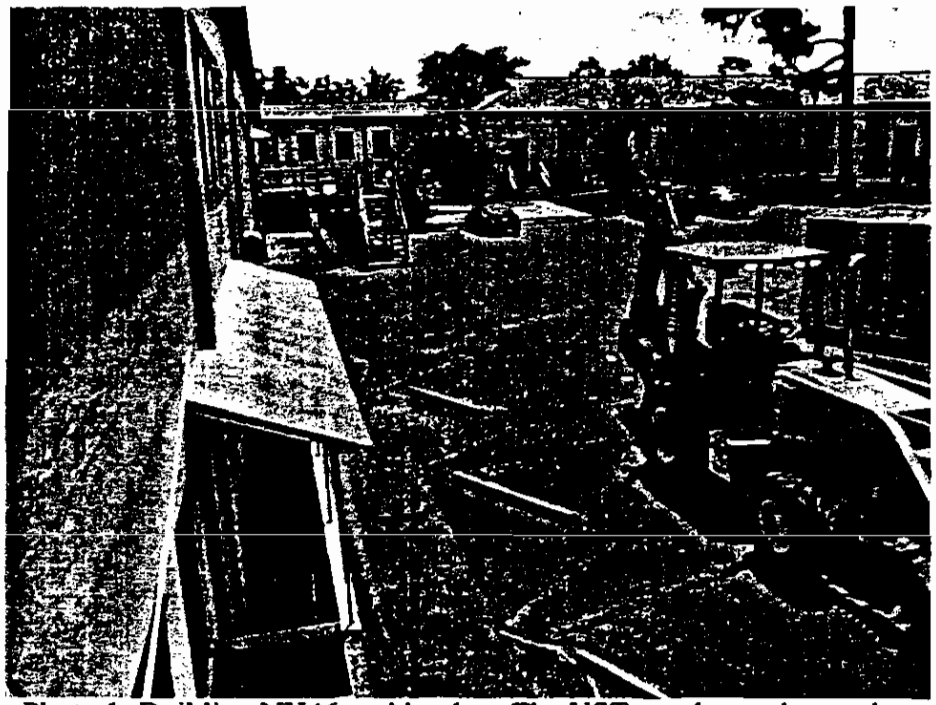


Photo 1: Building NH46 parking lot. The UST was located near the stairs.

Photo 2: Fuel oil spill.

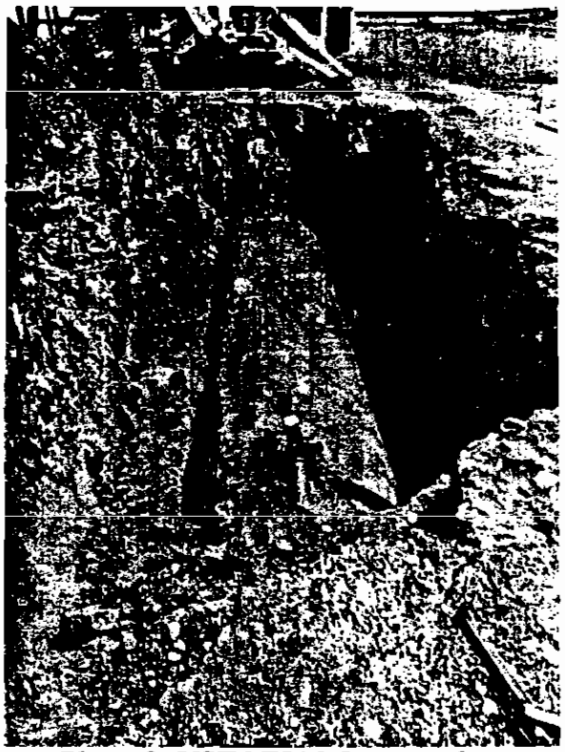


Photo 3: UST NH46-5 exposed.

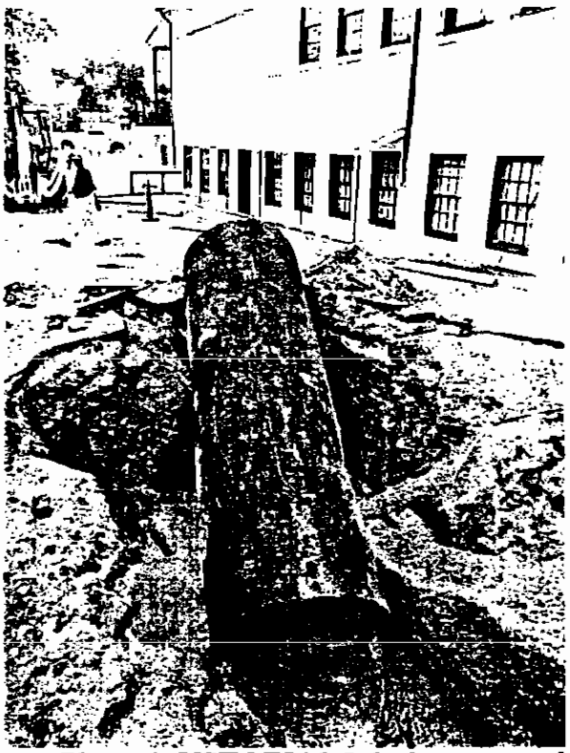


Photo 4: UST NH46-5 during removal.

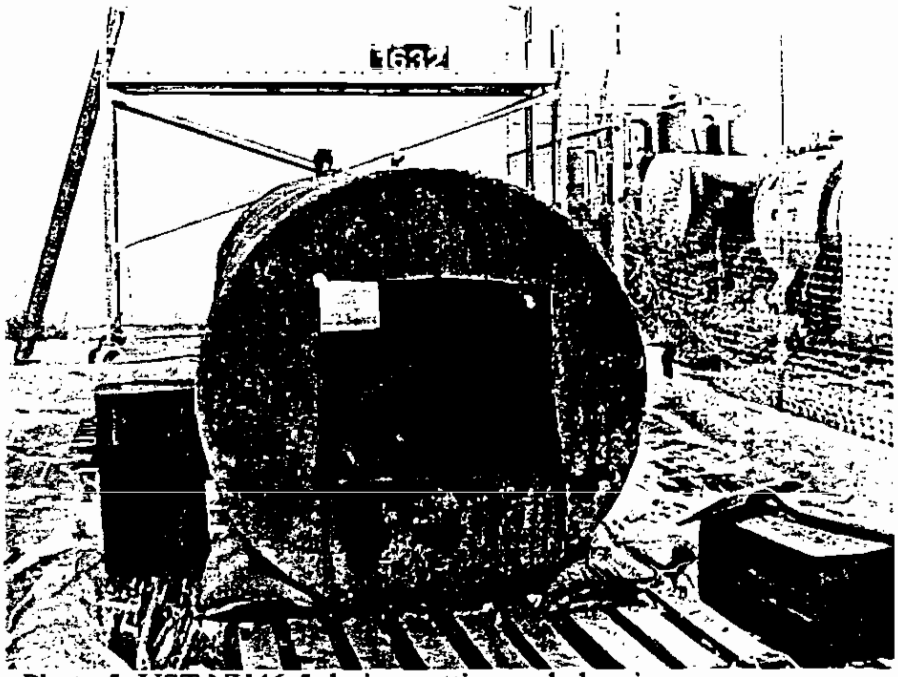


Photo 5: UST NH46-5 during cutting and cleaning.

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

GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87
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: NPWC00197 Report Date: September 02, 1998

Sample ID	: SPORT0784-1
Lab ID	: 9808866-01
Matrix	: Soil
Date Collected	: 08/25/98
Date Received	: 08/25/98
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX + NAPTH. - 5 items											
Benzene	U	ND	0.560	1.12	ug/kg	1.0	JEB	08/30/98	1552	129984	
Ethylbenzene	U	ND	0.336	1.12	ug/kg	1.0					
Naphthalene	U	ND	0.672	1.12	ug/kg	1.0					
Toluene	U	ND	1.01	1.12	ug/kg	1.0					
Xylenes (TOTAL)	U	ND	0.784	2.24	ug/kg	1.0					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	ND	158	330	ug/kg	1.0	RLC	08/28/98	1800	129634	2
Acenaphthylene	U	ND	145	330	ug/kg	1.0					
Anthracene	U	ND	85.8	330	ug/kg	1.0					
Benzo(a)anthracene	U	ND	66.0	330	ug/kg	1.0					
Benzo(a)pyrene	U	ND	72.6	330	ug/kg	1.0					
Benzo(b)fluoranthene	U	ND	142	330	ug/kg	1.0					
Benzo(ghi)perylene	U	ND	79.2	330	ug/kg	1.0					
Benzo(k)fluoranthene	U	ND	132	330	ug/kg	1.0					
Chrysene	U	ND	52.8	330	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	ND	82.5	330	ug/kg	1.0					
Fluoranthene	U	ND	66.0	330	ug/kg	1.0					
Fluorene	U	ND	112	330	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	ND	79.2	330	ug/kg	1.0					
Naphthalene	U	ND	155	330	ug/kg	1.0					
Phenanthrene	U	ND	59.4	330	ug/kg	1.0					
Pyrene	U	ND	72.6	330	ug/kg	1.0					

The following prep procedures were performed:

GC/MS Volatiles (8260 High Level) JEB 08/30/98 0900 129984 3

P O Box 30712 • Charleston, SC 29417 • 2040 Savage Road • 29414

(843) 556-8171 • Fax (843) 766-1178

9808866-01

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GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87
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: NPWC00197 Report Date: September 02, 1998

Sample ID : SPORT0784-1

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
GC/MS Base/Neutral Compounds							RDH	08/26/98	2015	129634	4

Comments:
Data reported in mass/mass units is reported 'as received'.

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	80.5	(30.0 - 115.)
Nitrobenzene-d5	M610	95.0	(23.0 - 120.)
p-Terphenyl-d14	M610	83.5	(37.3 - 128.)
Bromofluorobenzene	BTEX+NAP-8260B	74.5	(53.5 - 154.)
Dibromofluoromethane	BTEX+NAP-8260B	89.6	(63.4 - 136.)
Toluene-d8	BTEX+NAP-8260B	109.	(72.1 - 137.)

M = Method	Method-Description
M 1	SW846 8260B
M 2	EPA 8270
M 3	EPA 5035
M 4	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	E87156/87294	E87472/87
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: NPWC00197 Report Date: September 02, 1998

Sample ID : SPORT0784-1

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 Blakeney at (803) 769-7386.

Karen Blakeney
Reviewed By

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/874
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: NPWC00197 Report Date: September 02, 1998

Sample ID	: SPORT0784-2
Lab ID	: 9808866-02
Matrix	: Soil
Date Collected	: 08/25/98
Date Received	: 08/25/98
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX + NAPTH. - 5 items											
Benzene	U	ND	0.500	1.00	ug/kg	1.0	JEB	08/30/98	1520	129984	
Ethylbenzene	U	ND	0.300	1.00	ug/kg	1.0					
Naphthalene	U	ND	0.600	1.00	ug/kg	1.0					
Toluene	U	ND	0.900	1.00	ug/kg	1.0					
Xylenes (TOTAL)	U	ND	0.700	2.00	ug/kg	1.0					

The following prep procedures were performed:

GC/MS Volatiles (8260 High Level)	JEB	08/30/98	0900	129984	2

Comments:
Data reported in mass/mass units is reported 'as received'.

Surrogate Recovery	Test	Percent%	Acceptable Limits
Bromofluorobenzene	BTEX+NAP-8260B	83.3	(53.5 - 154.)
Dibromofluoromethane	BTEX+NAP-8260B	81.5	(63.4 - 136.)
Toluene-d8	BTEX+NAP-8260B	95.9	(72.1 - 137.)

M = Method	Method-Description
M 1	SW846 8260B
M 2	EPA 5035

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9808866-02

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GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87
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: NPWC00197 Report Date: September 02, 1998

Sample ID : SPORT0784-2

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 Blakeney at (803) 769-7386.

Karen Blakeney
Reviewed By

P O Box 30712 • Charleston, SC 29417 • 2040 Savage Road • 29414
(843) 556-8171 • Fax (843) 766-1178

9808866-02

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APPENDIX B

GEOLOGIC BORING LOGS

BORING LOG

PROJECT NAME: CNC Shipyard Site 31 BORING NUMBER: CNC31B01
PROJECT NUMBER: N0164 Bldg 760 DATE: 5-13-99
DRILLING COMPANY: Tidewater GEOLOGIST: SISCO
DRILLING RIG: Geoprobe 5400 DRILLER: ~~Point Catamount~~ Leroy Blake Clyde Gibson

Sample No. and Type or RQD	Depth (FL) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/FL) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	Ø												
	1			dk	brown		Sandy silt		dry	2			
	2			lt	br.		" "		moist	2			
	3				"		" "		moist	2			
	4		2'		"		" "		" "	—			
	5				"		" "		"	—			
	6				"		" "		"	—			
	7			tan			" "		"	2			
	8		2.2'	tan			" "		"	2			
	9				"		Sandy silt		"	—			
	10			reddish br.			" "		"	—			
X	11		dk	r ~~[illegible]~~ br.			" "		"	—			
X	12		4'	brown r ~~[illegible]~~ br.			" "		"	—			
	13						sandy silt w/ sand		wet	15		HS	
	14				dk br.		sand silt		saturated				
	15				dk br.		sand		saturated	-			
	16		4'		tan		sand		saturated	-			
				EOB									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area 2

Remarks:

Background (ppm):

Converted to Well: Yes ____ No X Well I.D. #:

BORING LOG

PROJECT NAME: CNC Site 31 Bldg 760
PROJECT NUMBER: N0164 Zone C
DRILLING COMPANY:
DRILLING RIG: 5400

BORING NUMBER: CNC31-B02
DATE: 5-13-99
GEOLOGIST: SISED
DRILLER: CLYDE GIBSON

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1				dk brown		sandy silt						
	2				lt brown		sandy silt		dry				
	3									4			
	4		1.5										
	5				lt brown		silty sand						
	6				lt brown		silty sand		moist	4			
	7				lt br.				moist				
	8		2'		lt br.				moist				
	9				lt br.		silty sand		moist				
	10				br.		" "		~~wet~~ moist				
X	11				dk br.		" "		~~wet~~ moist				
X	12		4'		dk br.		" "		~~wet~~ moist	25		45	
	13				dk br.		silty sand		wet		20	w/filter	
	14				dk br		silty sand		wet				
	15				lt br.		sand		saturated				
	16		4'		lt br.		sand		saturated				
				EOB									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 4

Remarks:

Converted to Well: Yes ____ No X Well I.D. #:

BORING LOG

PROJECT NAME: CNC Site 31 Bldg 760
PROJECT NUMBER: N0164 Zone C
DRILLING COMPANY:
DRILLING RIG: 5400

BORING NUMBER: CNC 31-B03
DATE: 9-13-99
GEOLOGIST: SISCO
DRILLER: CLYDE GIBSON

Sample No. and Type or RQD	Depth (FL) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/FL) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	Ø												
	1				dk br.		Sandy silt		dry	4			
	2				lt br.		Sand (silty)		dry	4			
	3				—		—			—			
	4		1.8'		—		—			—			
	5				orangish br.		silty sand		dry	—			
	6				lt br.		sand		dry	4			
	7				—		—			—			
	8		2.5'		—		—			—			
	9						sandy silt		moist	4			
	10				dk br		sandy silt		moist	4			
	11				dk br		sandy silt petro.		moist	4			
	12		4'		dk br		sandy silt	odor	moist	260		HS	
	13				br		silty sand		wet				
	14				br		sand/rock fragm		wet				
	15				lt br		sand/strong petro. odor		wet				
	16		4'		lt br.		sand " "		~~wet~~ saturated				
				EOB.									

n rock conng, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 4

Remarks:

Converted to Well: Yes ____ No X Well I.D. #:

BORING LOG

PROJECT NAME: CNC Site 31 Bldg 760
BORING NUMBER: CNC31-B04
PROJECT NUMBER: ND164 Zone C
DATE: 5-13-99
DRILLING COMPANY: tidewater
GEOLOGIST: SISCO
DRILLING RIG: 250 / 5400
DRILLER: C. GIBSON

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
	Ø												
	1				br.		Sandy silt						
	2				dk br		Sandy silt/woodpieces						
	3				br.		silty sand			6			
	4		31		—		~~Sa~~		—				
	5				brown		silty sand		moist				
	6				brown		silty sand		moist	4			
	7				lt brown		~~silty~~ sand w/		moist	4			
	8		31		—		~~+~~ pine tree root			—			
	9				dk br		sand silty		med. stiff/ moist				
	10				"		sand silty		med. stiff/ moist				
X	11				"		sand silty		" / moist				
X	12		41		"		sand silty		" /	Ø	(145)		
	13				dk br		silty sand		wet/ med stiff				
	14				dk br		" "		wet/ med stiff				
	15			▼	dk br.		" "		wet/ med stiff				
	16		41		dk br.		" "		saturated				
				EOB									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 4

Remarks:

Converted to Well: Yes ____ No X Well I.D. #: ____

BORING LOG

PROJECT NAME: CNC Site 31 Bldg 760
BORING NUMBER: CNC 31 - B05
PROJECT NUMBER: N0164 Zone C
DATE: 5/15/99
DRILLING COMPANY:
GEOLOGIST: Sisco
DRILLING RIG: 250/5400
DRILLER: Coleman

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1				dark br		grass sandy silt		~~dry~~ moist	5			
	2						sandy silt						
	3												
	4		2		light br								
	5				light br		sandy silt			5			
	6				orangish brown								
	7												
	8		2.5		tan		sand						
	9				tan		~~tan~~ sandy silt		moist	5			
	10				dark br								
Soil X	11												
	12		4										
	13				br		Sandy silt		wet	5			
	14						silty sandy		saturated				
GW X	15												
	16		4	EOB									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 5

Remarks:

Converted to Well: Yes ____ No ____ Well I.D. #: ____

BORING LOG

PROJECT NAME: CNC Site 31 Bldg 760
PROJECT NUMBER: N0164 Zone C
DRILLING COMPANY:
DRILLING RIG: 250/5400
BORING NUMBER: CNC 31 - 06
DATE: 5/15/99
GEOLOGIST: Sisco
DRILLER: Coleman

	Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
		1				br		grass		moist	5			
		2						silty sand		wet	5			
		3												
		4		1.5										
		5						silty sand						
		6				light br								
		7				orangish br								
		8		3		grey		sand						
		9				orangish br		silty sand		wet	5			
		10				br								
S	X	11												
		12		4										
		13			▽	orange br		silty sand		wet	5			
		14				darker		sand		sat				
GW	X	15												
		16		4	EOB									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 5

Remarks:

Completed to Well: Yes ___ No ___ Well I.D. #: ___

BORING LOG

PROJECT NAME: CNC Site 31 Bldg 760 BORING NUMBER: CNC31-B07
PROJECT NUMBER: N0164 Zone C DATE: 5/15/99
DRILLING COMPANY: GEOLOGIST: Sisco
DRILLING RIG: 250/5400 DRILLER: Coleman

	Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**	
		1				br		silty sand		moist					
		2													
		3													
		4		1.5											
		5				br		silty sand		moist	5				
		6				orange grey		sand		wet					
		7													
		8		3.5		br		silty sand		Wet					
		9				grey br		~~sand~~ silt		wet	5				
S	X	10				br		silty sand							
		11		3		dark br									med. stiff
		12			▼	br		silty sand			5				
		13								Sat					med. stiff
		14													
GW	X	15		3	EOB										

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: Slow recharge at 15 ft.

Drilling Area Background (ppm): 5

Converted to Well: Yes ____ No ____ Well I.D. #: ____

BORING LOG

PROJECT NAME: Site 31 Bldg 760
BORING NUMBER: CNC 31 - 08
PROJECT NUMBER: ~~0144~~ ND164 Zone C
DATE: 5/15/99
DRILLING COMPANY:
GEOLOGIST: Sisco
DRILLING RIG: 250/5400
DRILLER: Coleman

	Sample No. and Type or RQD	Depth (FL) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
		1									0			
		2									0			
		3									0			
634		4		11/4			Dk Brown	Fine Sand		Dry	0/0	0	0	0
		5												
		6									0			
		7									0			
643		8		2.33/4				Fine sand to			6			
		9					Lt. Brown	Silty Sand		Dry	0/0	0	0	0
		10					Dk Brown							
		11									0			
657		12		2.33/4			Dk Brown	Silty Sand		Moist 11-12'	0			
										Saturated 12'	0/0	0	0	0

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks:

Converted to Well: Yes ____ No ✓ Well I.D. #:

BORING LOG

PROJECT NAME: CWC Site 31 Bldg 760 BORING NUMBER: 31 B09
PROJECT NUMBER: ND164 Zone C DATE: 6/16/99
DRILLING COMPANY: Columbia GEOLOGIST:
DRILLING RIG: Stratoprobe DRILLER: R. Brown

	Sample No. and Type or RQD	Depth (FL) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample**	Sampler BZ**	Borehole**	Driller BZ**
		1				dk br		silty sand		dry				
		2				lt br		↓		moist				
		3						—		—				
0757		4		2.2/4'				—		—	0			
		5				tan		silty sand		moist				
		6				dk redish br.		↓ fine		moist				
		7						↓		↓				
0740		8		2.2/4'				—		—	0			
		9						silty sand		moist				
		10				dk br		silty clayey sand		↓				
	X	11				↓		↓ - fine		↓				
0743	X	12		4/4'	▼ 12.7			↓		↓				
		13				dk br		silty clayey sand		wet				
		14				↓		↓		saturated				
		15												
		16		4/4'		tan		silty sand		↓				
		17			EOB									
		18												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks:

Converted to Well: Yes ____ No ____ Well I.D. #: ____

BORING LOG

Page ___ of ___

PROJECT NAME: CNC Site 31 Bldg 760
PROJECT NUMBER: CNC31 / 0160d
DRILLING COMPANY: Custom Drilling
DRILLING RIG:

BORING NUMBER: CNC31-MW06D (outer casing)
DATE: 7/1/99
GEOLOGIST: Marty Ray
DRILLER: Rod

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler Bz.	Borehole**	Driller Bz.
#1	16	3/6			soft	brown	silty sand, vf grain						
		5/6	1.5/2				well sorted						
		6/6					moist to wet						
	18	7/6					0.0 ppm						
	18												
#2	18	2/6			soft		sandy silt vf grain						
		1/6				olive	well sorted						
		3/6					wet 0.0 ppm						
	20	4/6					Pale olive color						
#3	20	2/6			soft to slightly firm		silt, with some vf sand						
		1/6					wet well sorted						
		2/6					dark olive to grey						
	22	1/6											
#4	22	3/6			soft		vf sand some silt						
		2/6					well sorted dark grey to black						
		1/6					0.0 ppm						
	24	4/6											
#5	24	2/6			soft	black	top 6" silt, with silver metallic specs throughout						
		5/6					bottom 18" black vf sand with						
		6/6					silver metallic specs throughout						
	26	7/6					well sorted						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: ____

Converted to Well: Yes ____ No ____ Well I.D. #: ____

BORING LOG

Page ___ of ___

PROJECT NAME: CNC-Site 31 Bldg 760 BORING NUMBER: CNC31-MW06D (inner casing)
PROJECT NUMBER: N0164 Zone C DATE: ~~7/19/99~~ 7/19/99
DRILLING COMPANY: Custom Drilling GEOLOGIST: Mark Dannington
DRILLING RIG: Mobile B57 DRILLER: Rod Fuller.

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sample Bz	Borehole**	Drillers Bz
0	16-26				See Boring Log completed on 7/21/99 by M. Ray								
(1)	26	1/0	24/24		Grey		Clay, plastic, co-	CL	No petro. odor	4.9	\	0	0
		0/1					hesive, smooth, some		or discolor.				
							shell, saturated.						
	28	1/2		28									
(2)	28	2/1	24/24		Grey		Sandy Clay, plastic,	SC	No petro. odors	—			
		1/2		29	VF-F grain		cohesive, moist, No shells		or discolor.				
		2/3			Grey.		Clay-plastic, cohesive,	CL	No petro. odors	7.8	\	0	0
	30	89					smooth, moist.		or discolor.				
(3)	30	4/3			Grey		Clay (as above)	CL	No petro. odors	9.6	\	0	0
		4/3					except dry to damp		or discolor.				
							some VF sand stringers						
	32						@ bottom.						
(4)	32	3/4			Grey		Clay to stiff, sandy	CL	No petro.	15.1	\	0	0
		5/6					clay, plastic, but		odors				
				33.5	(SC)		clumpy, saturated,	SC	"				
	34						smooth, VF-F grain.						
(5)	34	0/1					Clay-clumpy, co-	CL	No petro. odors	4.1			
		3/2					hesive, smooth, very		or discolor				
							saturated, increasing						
	36						sand @ bottom 6"						
				(1)	Screened from 26'-36' (5' total)								
				(2)	Well bored (6" Φ) to 37 ft. bls.								
					S.I to be b/w 32'-37' (5 ft.)								

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: Clay interval b/w 32'-35' very clumpy, very saturated.

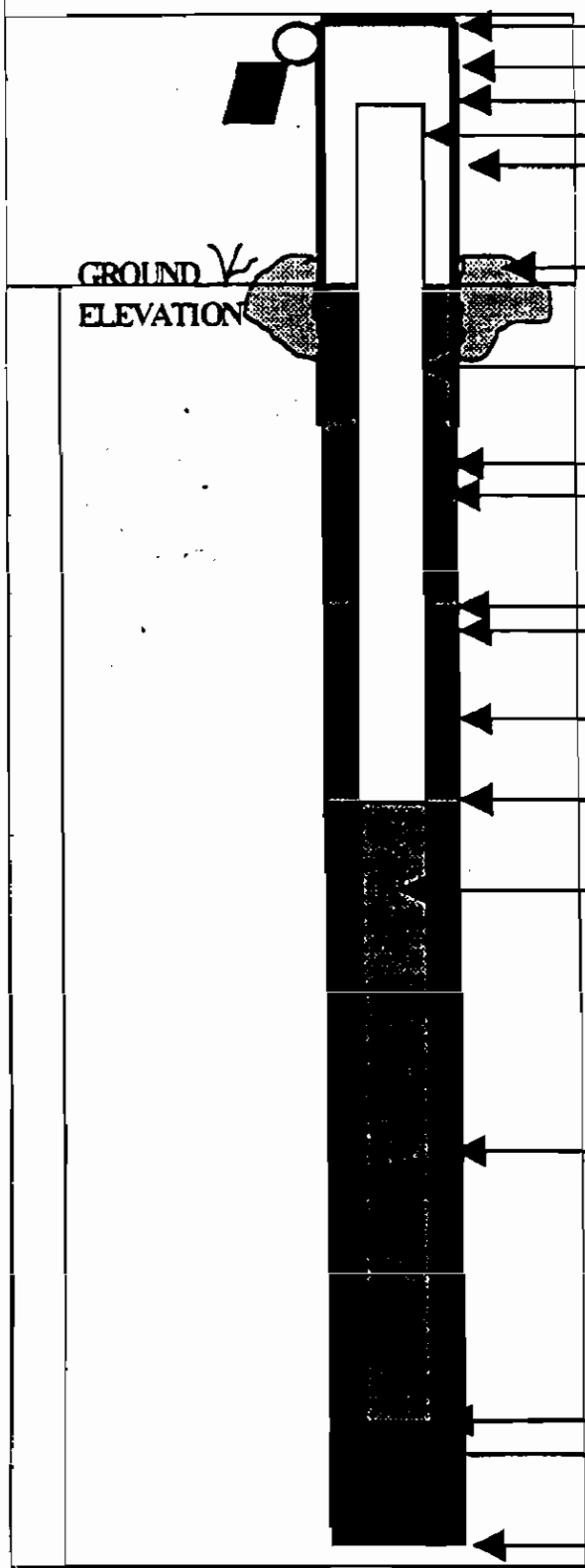
Drilling Area Background (ppm): 0.0

Converted to Well: Yes ✓ No _____ Well I.D. #: CNC31-MW06D

BORING NO.: CNC31-MW01

OVERBURDEN MONITORING WELL SHEET

PROJECT	CNC Site 31	LOCATION:	CNC31-MW01	DRILLER	Rod
PROJECT NO.	N0164 Bldg 760	BORING	CNC31-MW01	METHOD:	~~DPT~~
ELEVATION		DATE		DRILLING	HSA
FIELD GEOLOGIST	Marty Ray			DEVELOPMENT:	NA



ELEVATION OF TOP OF SURFACE CASING: Flush

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING: 2"

TYPE OF SURFACE CASING: Sch 40 PVC

TYPE OF SURFACE SEAL: concrete pad 2'x2'x6"

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: Sch 40 PVC

BOREHOLE DIAMETER:

TYPE OF SEAL: grout to 8" bls

ELEVATION / DEPTH OF SEAL: 6'

TYPE OS SEAL: 30/65 sand

DEPTH TOP OF SAND PACK: 8'

ELEVATION / DEPTH TOP OF SCREEN: 9'0"

TYPE OF SCREEN: Sch 40 PVC

SLOT SIZE X LENGTH: 10 slot

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30 sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 19'0"

ELEVATION / DEPTH BOTTOM OF SAND PACK: 19'6

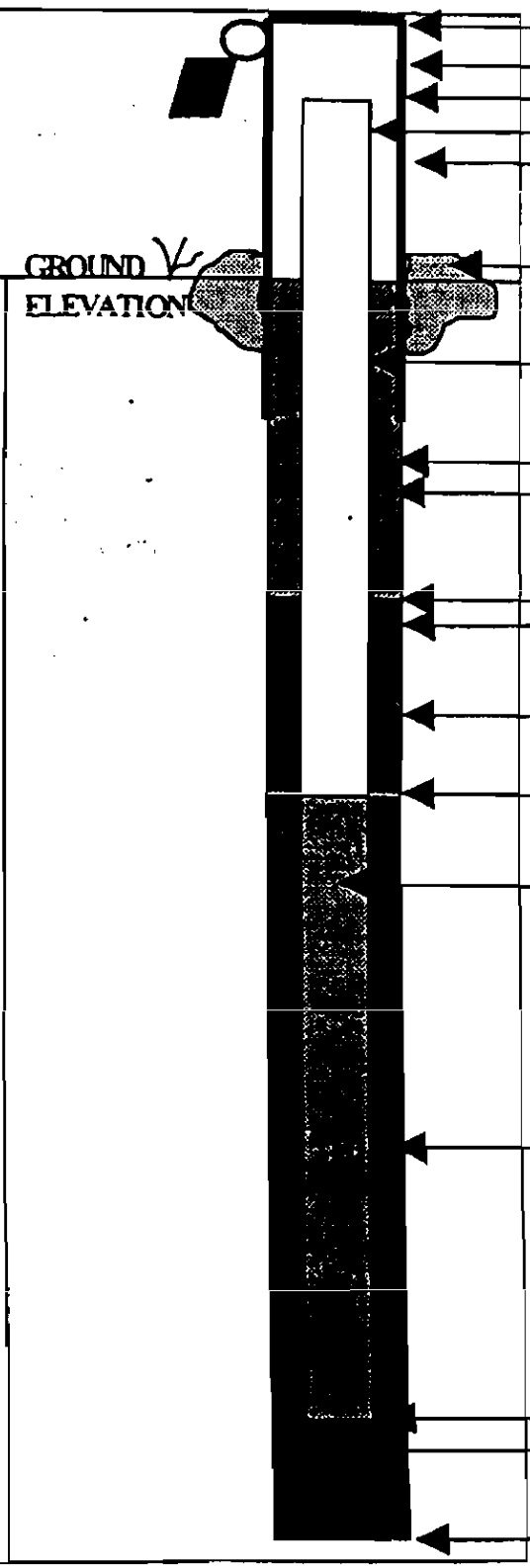
TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 sand

ELEVATION / DEPTH OF HOLE: 19'6"

BORING NO.: CNC31-MW02

OVERBURDEN MONITORING WELL SHEET

PROJECT	CNC Site 31	LOCATION:	CNC31-MW02	DRILLER	Rod
PROJECT NO.	N0164 Bldg 760	BORING	CNC31-MW02	METHOD:	~~DPT~~
ELEVATION		DATE	6/17/99	DRILLING	HSA
FIELD GEOLOGIST	Marty Ray			DEVELOPMENT: NA	



ELEVATION OF TOP OF SURFACE CASING: Flush

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING: 2"

TYPE OF SURFACE CASING: Sch 40 PVC

TYPE OF SURFACE SEAL: Concrete Pad 2'x2'x6"

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: Sch 40 PVC

BOREHOLE DIAMETER:

TYPE OF SEAL: grout to 10" b/s

ELEVATION / DEPTH OF SEAL: ~~[illegible]~~ MR 6'

TYPE OS SEAL: 30/65

DEPTH TOP OF SAND PACK: ~~[illegible]~~ MR 8'

ELEVATION / DEPTH TOP OF SCREEN: 9' ~~11'10"~~

TYPE OF SCREEN: Sch 40 PVC

SLOT SIZE X LENGTH: 10 slot

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30 sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 19'10"

ELEVATION / DEPTH BOTTOM OF SAND PACK: 19'6"

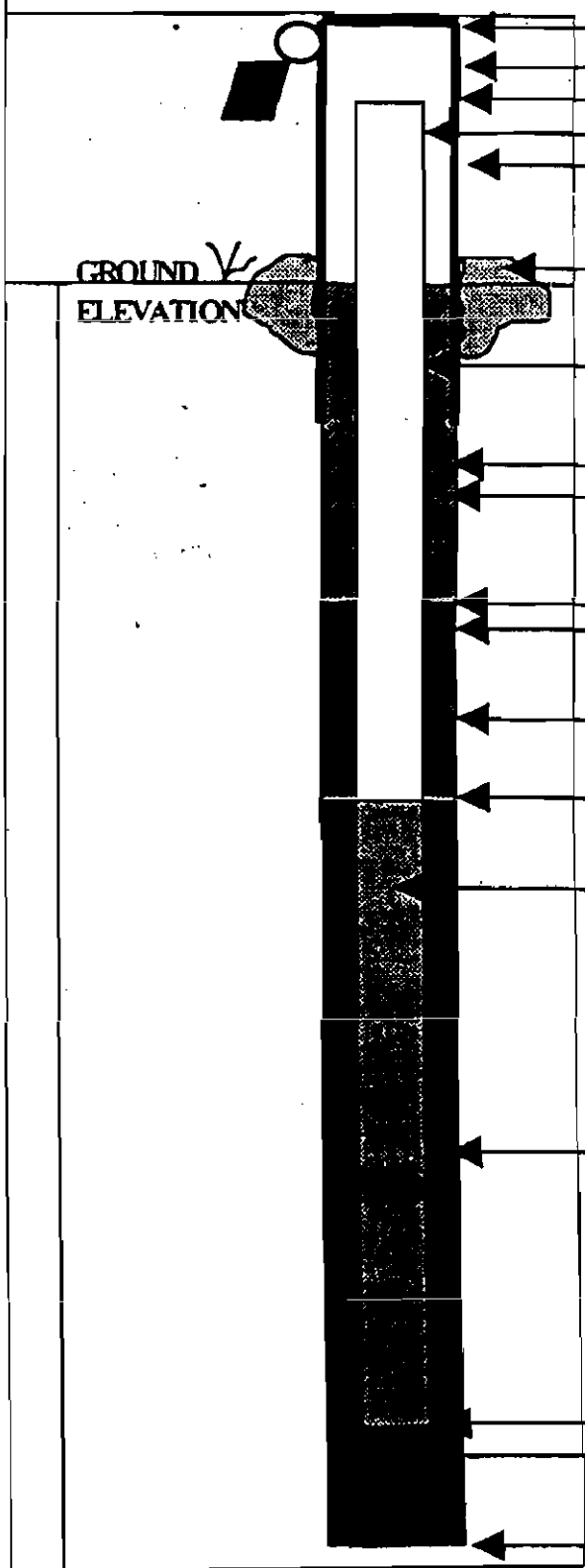
TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 Sand

ELEVATION / DEPTH OF HOLE: 19'6"

BORING NO.: CNC31-MW03

OVERBURDEN MONITORING WELL SHEET

PROJECT	CNC Site 31	LOCATION:	CNC31-MW03	DRILLER	Rod
PROJECT NO.	ND164 Bldg 760	BORING	CNC31-MW03	METHOD:	~~DPT~~
ELEVATION		DATE	6/17/97	DRILLING	HSA
FIELD GEOLOGIST	Marty Ray			DEVELOPMENT:	NA



ELEVATION OF TOP OF SURFACE CASING: Flush

ELEVATION OF TOP OF RISER PIPE:

STICK -UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING: 2"

TYPE OF SURFACE CASING: sch 40 PVC

TYPE OF SURFACE SEAL: concrete Pad 2'x2'x6"

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: Sch 40 PVC

BOREHOLE DIAMETER:

TYPE OF SEAL: grout

ELEVATION / DEPTH OF SEAL: 6'10"

TYPE OS SEAL: 30/65 sand

DEPTH TOP OF SAND PACK: 8'

ELEVATION / DEPTH TOP OF SCREEN: 9'10"

TYPE OF SCREEN: sch 40 PVC

SLOT SIZE X LENGTH: 10 slot

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30 sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 19'10"

ELEVATION / DEPTH BOTTOM OF SAND PACK: 19'15"

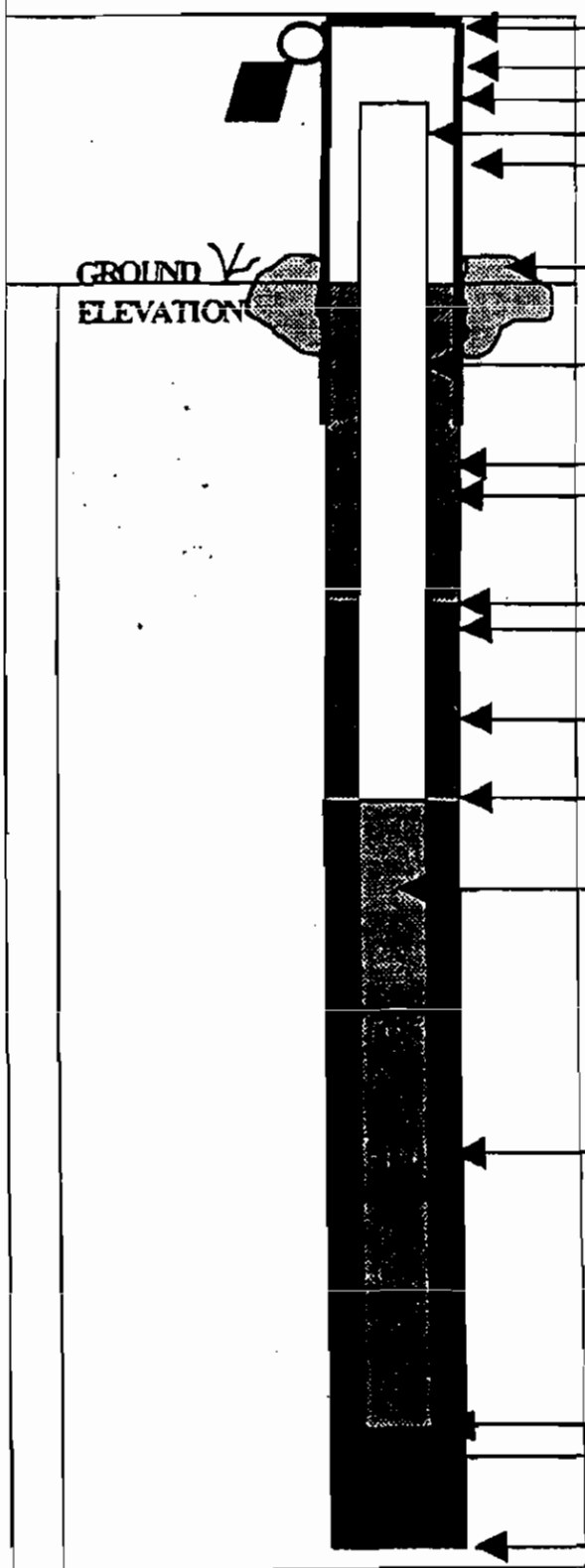
TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 sand

ELEVATION / DEPTH OF HOLE: 19'15"

BORING NO.: CNC31-MW04

OVERBURDEN MONITORING WELL SHEET

PROJECT	CNC Site 31	LOCATION:	CNC31-MW04	DRILLER	Rod
PROJECT NO.	N0164 Bldg 760	BORING	CNC31-MW04	METHOD: ~~DPT~~	
ELEVATION		DATE	6/17/99	DRILLING	HSA
FIELD GEOLOGIST	Marty Rey			DEVELOPMENT: NA	



ELEVATION OF TOP OF SURFACE CASING: Flush

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING: 2"

TYPE OF SURFACE CASING: sch 40 PVC

TYPE OF SURFACE SEAL: Concrete Pad 2'x2'x6"

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: sch 40 PVC

BOREHOLE DIAMETER:

TYPE OF SEAL: grout to 6" BS

ELEVATION / DEPTH OF SEAL: 6'

TYPE OS SEAL: 30/65 sand

DEPTH TOP OF SAND PACK: 8'

ELEVATION / DEPTH TOP OF SCREEN: 9'10"

TYPE OF SCREEN: sch 40 PVC

SLOT SIZE X LENGTH: 10 slot

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30 sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 19'0"

ELEVATION / DEPTH BOTTOM OF SAND PACK: 19'6"

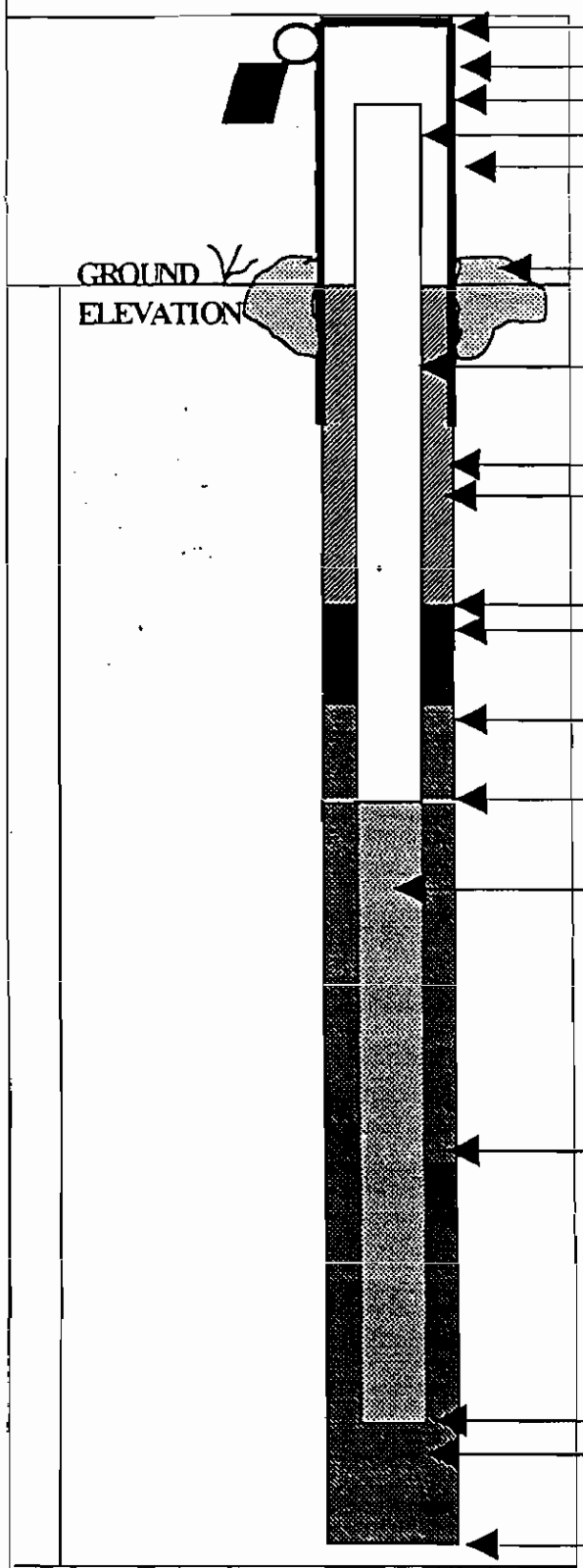
TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 sand

ELEVATION / DEPTH OF HOLE: 19'6"

BORING NO.: CNC31-MW05

OVERBURDEN MONITORING WELL SHEET

PROJECT	CNC Site 31 Bldg 760	LOCATION:	CNC31-MW05	DRILLER	Rod
PROJECT NO.	ND164 Zone C	BORING	CNC31-MW05	METHOD:	~~DPT~~
ELEVATION		DATE	6/17/99	DRILLING	HSA
FIELD GEOLOGIST	Marty Rai			DEVELOPMENT:	NA



ELEVATION OF TOP OF SURFACE CASING: Flush

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING: 2"

TYPE OF SURFACE CASING: sch 40 PVC

TYPE OF SURFACE SEAL: concrete Rod

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: sch 40 PVC

BOREHOLE DIAMETER:

TYPE OF SEAL: grout to 8" bls

ELEVATION / DEPTH OF SEAL: 6'

TYPE OS SEAL: 30/65 sand

DEPTH TOP OF SAND PACK: 8'

ELEVATION / DEPTH TOP OF SCREEN: 9'10"

TYPE OF SCREEN: sch 40 PVC

SLOT SIZE X LENGTH: 10 slot

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30 sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 19'0"

ELEVATION / DEPTH BOTTOM OF SAND PACK: 19'5"

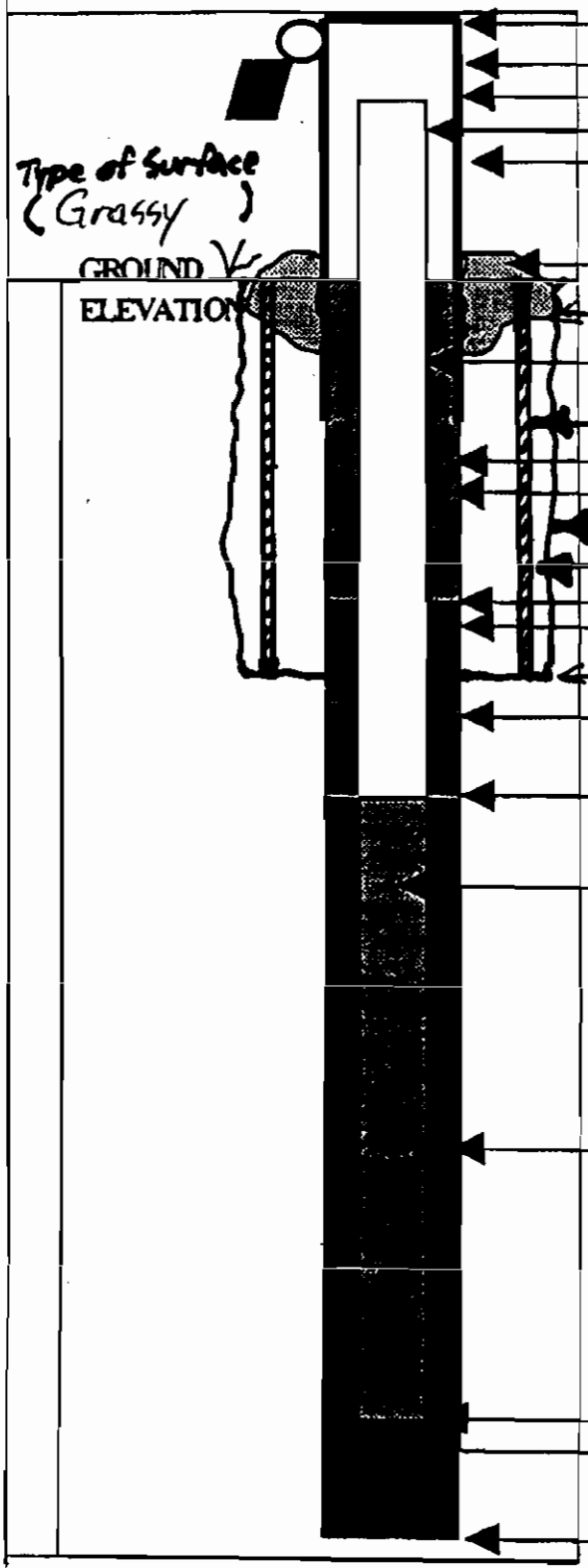
TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 sand

ELEVATION / DEPTH OF HOLE: 19'5"

BORING NO. CNC31-MW06D

OVERBURDEN MONITORING WELL SHEET

PROJECT CNC Site 31 Bldg 760	LOCATION: Site 31/Zone C	DRILLER Custom Drilling
PROJECT NO. (Zone C) W0164	BORING CNC31-MW06D	METHOD: [redacted] HSA & Mud Rot.
ELEVATION	DATE 7/6/99 & 7/9/99	DRILLING Rod Fuller.
FIELD GEOLOGIST M. Ray/M. Damington		DEVELOPMENT: [redacted]
Boring Methods: Surface Casing:	Inner Casing:	



ELEVATION OF TOP OF SURFACE CASING: _____

ELEVATION OF TOP OF RISER PIPE: _____

STICK-UP TOP OF SURFACE CASING: Flush

STICK-UP RISER PIPE: Flush.

I.D. OF SURFACE CASING: 8" ID x 10" OD

TYPE OF SURFACE CASING: Steel cover w/ Bolt on lid & Flush (PEMCO)

TYPE OF SURFACE SEAL: Concrete Pad (Quickrete) 2'x2'x6"

Seal for S.C.: Portland Cement Type I

RISER PIPE I.D.: 2 in.

TYPE OF RISER PIPE: PVC, Sch. 40, Flush Thread (F.T.)

Type of Surface Case (S.C.) PVC, Sch. 40 Dia. 6 in.

BOREHOLE DIAMETER: 6 in. (5 7/8 roller cone)

TYPE OF SEAL: Portland Cement Type I

Borehole Dia. 12.25 (4 1/8 25 @ HSAs)

Type of S.C. Seal Portland Cement Type I

ELEVATION / DEPTH OF SEAL: 126' ✓

TYPE OS SEAL: "Choke Sand" (30/65) VF sand

Depth of Surface Casing 25'

DEPTH TOP OF SAND PACK: 30'

ELEVATION / DEPTH TOP OF SCREEN: 132' ✓

TYPE OF SCREEN: PVC, Sch. 40, F.T.

SLOT SIZE X LENGTH: 0.010 in x 5 ft.

I.D. OF SCREEN: 2 in.

TYPE OF SAND PACK: (20/30) VF sand (standard sand co.) Qtz. sand.

ELEVATION / DEPTHBOTTOM OF SCREEN: 137'

ELEVATION / DEPTH BOTTOM OF SAND PACK: 137'

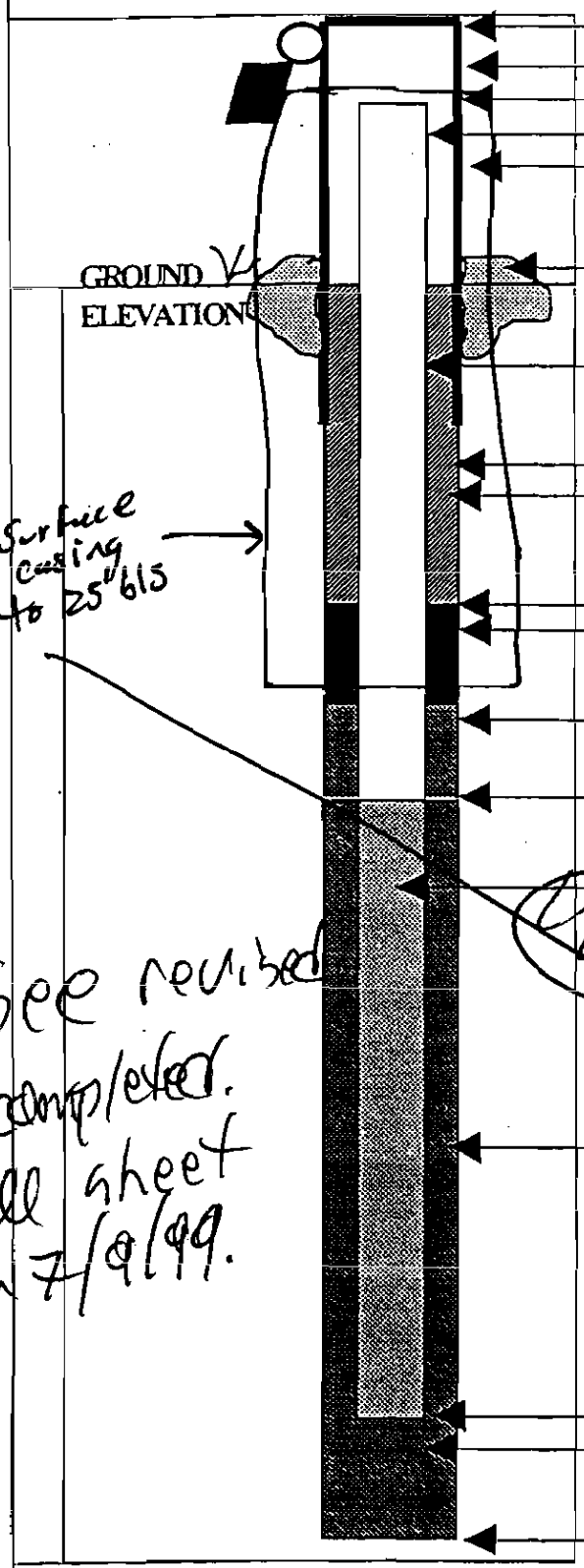
TYPE OF BACKFILL BELOW OBSERVATION WELL: Standard Sand (20/30)

ELEVATION / DEPTH OF HOLE: 137'

BORING NO.: CNC31-MW06D

OVERBURDEN MONITORING WELL SHEET

PROJECT	CNC Site 31 Bldg 760	LOCATION:	CNC31-MW06D	DRILLER	Custom Drilling
PROJECT NO.	CNC31 N0164	BORING	CNC31-MW06D	METHOD:	~~DPT~~
ELEVATION		DATE	7/1/99	DRILLING	HSA
FIELD GEOLOGIST	Marty Ray			DEVELOPMENT: NA	



ELEVATION OF TOP OF SURFACE CASING: Flush
ELEVATION OF TOP OF RISER PIPE:
STICK-UP TOP OF SURFACE CASING:
STICK-UP RISER PIPE:
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: Sch 40 PVC
TYPE OF SURFACE SEAL: grout
RISER PIPE I.D.:
TYPE OF RISER PIPE:
BOREHOLE DIAMETER: 8.25"
TYPE OF SEAL:
ELEVATION / DEPTH OF SEAL: /
TYPE OS SEAL:
DEPTH TOP OF SAND PACK:
ELEVATION / DEPTH TOP OF SCREEN: /
TYPE OF SCREEN:
SLOT SIZE X LENGTH:
I.D. OF SCREEN:
TYPE OF SAND PACK:
ELEVATION / DEPTHBOTTOM OF SCREEN: /
ELEVATION / DEPTH BOTTOM OF SAND PACK: /
TYPE OF BACKFILL BELOW OBSERVATION WELL:
ELEVATION / DEPTH OF HOLE: /

See revised & completed well sheet on 7/9/99.

APPENDIX C

FIELD SAMPLING DATA SHEETS

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: GNC31
Project No.:

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 31GLM0101
Sample Location: MW-1
Sampled By: RA/JA
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-23-99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1050	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method:								

PURGE DATA:

Date: 7-23-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Slow Purge	Initial	4.94	.147	23.3	Ø	265		
Monitor Reading (ppm):	1	4.78	.070	23.9	Ø	3.26		
Well Casing Diameter & Material	2	5.08	.068	24.6	Ø	0.76		
Type: PVC 2"	3	5.15	.066	25.3	Ø	0.91		
Total Well Depth (TD):	18.83							
Static Water Level (WL):	12.91							
One Casing Volume(gal/L):	.98							
Start Purge (hrs):	0844							
End Purge (hrs):	1005							
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
BTEX, MTBE, Naph., EDB	HCl	3x40 ml vials	7-23-99
Dissolved Methane	HCl	" " "	7-23-99
PAH	—	2x 1L amber	7-23-99
Anions	—	1x 500 ml. plastic	7-23-99

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): James R [illegible]

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: CNC31
Project No.:

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 31GLMØ1Ø1
Sample Location: MW-1
Sampled By: B.H.
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 7-27-99								
Time: 1055								
Method:	Clear							

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Date: 7-27-99								
Method: Slow Purge	Initial	4.84	.082	24.0	Ø	2.40		
Monitor Reading (ppm):	1	5.02	.067	24.9	Ø	2.14		
Well Casing Diameter & Material	2	5.06	.068	26.9	Ø	1.73		
Type: P.V.C. 2"	3	5.09	.066	26.3	Ø	1.70		
Total Well Depth (TD):	18.83							
Static Water Level (WL):	13.03							
One Casing Volume(gal/L):	.98							
Start Purge (hrs):	0846							
End Purge (hrs):	1032							
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
BTEX, Naph, MTBE, EDB	HCl	3 x 40 ml. vials	7-27-99
Dissolved Methane	HCl	" " "	7-27-99
Anions (NO3, SO4)	—	1 x 500 ml Plastic	7-27-99
PAH	—	2x 1 L amber	7-27-99

OBSERVATIONS / NOTES:

Duped BTEX, Naph, MTBE, EDB & PAH

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: CNC 31
Project No.:

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 31GW0201
Sample Location: MW-2
Sampled By: RH / JA
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-23-99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1115	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method:								

PURGE DATA:

Date: 7-23-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Slow Purge	Initial	4.85	.248	23.8	Ø	1.61		
Monitor Reading (ppm):	1	4.90	.077	24.4	Ø	1.11		
Well Casing Diameter & Material	2	4.94	.070	24.6	Ø	1.27		
Type: PVC 2"	3	4.98	.070	24.5	Ø	1.50		
Total Well Depth (TD):	18.96							
Static Water Level (WL):	12.78							
One Casing Volume(gal/L):	1.03							
Start Purge (hrs):	0840							
End Purge (hrs):	1007							
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
BTEX, Naph., MTBE, EDB	HCl	3 x 40 ml vials.	7-23-99
Dissolved Methane	HCl	" " "	"
PAH	—	2 x 1L amber	"
Anions		1 x 500 ml plastic	"

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): James Richards

GROUNDWATER SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: CNC 31
Project No.:

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 31GLM0201
Sample Location: MW-2
Sampled By: RN
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 7-27-99								
Time: 1050								
Method:	Clear							

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Date: 7-27-99								
Method: Slow Purge	Initial	4.45	.110	23.6	1	2.00		
Monitor Reading (ppm):	1	4.80	.070	24.3	Ø	2.69		
Well Casing Diameter & Material	2	4.81	.070	25.0	10	2.30		
Type: P.V.C. 2"	3	4.83	.070	25.9	Ø	2.25		
Total Well Depth (TD):	18.96							
Static Water Level (WL):	12.89							
One Casing Volume(gal/L):	0.996							
Start Purge (hrs):	0844							
End Purge (hrs):	1022							
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
BTEX, Naph, MTBE, EDB	HCl	3x 40 ml Vials	7-27-99
Dissolved Methane	HCl	" " "	7-27-99
Anions (NO3, SO4)	—	1x 500 ml plastic	7-27-99
PAH	—	2x 1 L amber	7-27-99

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: GNC 31
Project No.:

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 31GLM0301
Sample Location: MW-3
Sampled By: RH/JA
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-23-99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1215	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method:								
PURGE DATA:		5.08	.069	23.0	Ø	2.80		

Date: 7-23-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Slow Purge	Initial	~~4.94~~	~~.067~~	~~23.3~~	~~Ø~~	~~2.65~~		
Monitor Reading (ppm):	1	4.92	.064	22.4	Ø	2.57		
Well Casing Diameter & Material	2	4.95	.062	22.5	Ø	2.92		
Type: PVC 2"	3	4.94	.062	22.6	Ø	2.52		
Total Well Depth (TD):	19.28							
Static Water Level (WL):	13.10							
One Casing Volume(gal/L):	1.03							
Start Purge (hrs): 0859	~~13.10~~							
End Purge (hrs):	1023							
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
BTEX, Naph, MTBE, EDB	HCl	3x40 ml Vials	7-23-99
Dissolved Methane	HCl	" " " "	"
PAH	—	2x 1L amber	"
Anions	—	1x 500 ml plastic	"

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD

Duplicate ID No.: 31GLM0301D

Signature(s): James R Hell

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: GNC 31
Project No.:

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 31GLM03Ø1
Sample Location: MW-3
Sampled By: R.H
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-28-99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1040	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method:								

PURGE DATA:

Date: 7-28-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Slow Purge	Initial	5.25	.068	23.1	Ø	1.60		
Monitor Reading (ppm):	1	5.25	.064	22.6	Ø	1.75		
Well Casing Diameter & Material	2	5.21	.065	24.0	Ø	1.75		
Type: P.V.C. 2"	3	5.21	.065	23.1	Ø	1.10		
Total Well Depth (TD):	19.28							
Static Water Level (WL):	13.24							
One Casing Volume(gal/L):	.98							
Start Purge (hrs):	0844							
End Purge (hrs):	1025							
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
BTEX, Naph, MTBE, EDB	HCl	3x40 ml vials	7-28-99
Dissolved Methane	HCl	3x40 ml vials	"
PAH	—	2x1L ambers	"
Anions (NO3, SO4)	—	1x500 ml plastic	"

OBSERVATIONS / NOTES:

Circle If Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: CNC31
Project No.:

[] Domestic Well Data
[] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.:
Sample Location: MW-4
Sampled By:
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-23-99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1545	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method:								

PURGE DATA:

Date: 7-23-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Slow Purge	Initial	4.83	.059	26.8	Ø	1.33		
Monitor Reading (ppm):	1	4.92	.060	26.6	Ø	1.60		
Well Casing Diameter & Material	2	4.99	.060	26.1	Ø	1.75		
Type: PVC 2"	3	4.90	.061	25.6	Ø	1.64		
Total Well Depth (TD):	19.28							
Static Water Level (WL):	12.32							
One Casing Volume(gal/L):	1.14							
Start Purge (hrs):	1414							
End Purge (hrs):	1535							
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
BTEX, Naph, MTBE, EDB	HCl	3X 40 ml vials	7-23-99
PAH	—	2X 1 L amber	7-23-99

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): James R. H.

09/10/

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: CNG31
Project No.:

[] Domestic Well Data
[] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 31GLMØ4Ø1
Sample Location: MW-4
Sampled By: R.N
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-28-97	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1115	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method:								

PURGE DATA:

Date: 7-28-97	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Slow Purge	Initial	5.14	.064	23.9	Ø	3.30		
Monitor Reading (ppm):	1	5.01	.062	24.1	Ø	2.60		
Well Casing Diameter & Material	2	4.97	.061	25.5	Ø	3.16		
Type: P.V.C. 2"	3	4.96	.063	24.7	Ø	3.68		
Total Well Depth (TD):	19.28							
Static Water Level (WL):	12.47							
One Casing Volume(gal/L):	1.9							
Start Purge (hrs):	0847							
End Purge (hrs):	1031							
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
BTEX, Naph., MTBE, EDB	HCl	3 x 40 ml Vials	7-28-97
PAH	—	2x 1 L amber	"

OBSERVATIONS / NOTES:

~~Purged~~ well #31GLMØ4Ø1M
MS/MSD

Circle if Applicable:
MS/MSD
Duplicate ID No.: #31GLMØ4Ø1M

Signature(s): [signature]

GROUNDWATER SAMPLE LOG SHEET

Page___ of___

Project Site Name: CNC31
Project No.:

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 31GLMØ5Ø1
Sample Location: MW-5
Sampled By:
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 7-23-99								
Time: 1555								
Method:								

PURGE DATA:	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Date: 7-23-99								
Method: Slow Purge	Initial	5.17	.063	26.6	~10	2.96		
Monitor Reading (ppm):	1	5.20	.061	25.9	Ø	2.48		
Well Casing Diameter & Material	2	5.24	.060	25.4	Ø	2.53		
Type: PVC 2"	3	5.24	.060	25.1	Ø	2.75		
Total Well Depth (TD):	18.66							
Static Water Level (WL):	12.10							
One Casing Volume(gal/L):	1.1							
Start Purge (hrs):	1428							
End Purge (hrs):	1540							
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
BTEX, MTBE, Naph. EDB	HCl	3 x 40 ml Vials	7-23-99
PAH	—	2 x 1 L amber	

OBSERVATIONS / NOTES:

Circle if Applicable:
MS/MSD
Duplicate ID No.: 31GLMØ5Ø1M

Signature(s): James R. [illegible]

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: CNC31
Project No.:

[] Domestic Well Data
[] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 31GLM05XX
Sample Location: MW-5
Sampled By: R.G.
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-28-99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1200	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method:								

PURGE DATA:

Date: 7-28-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Slow Purge	Initial	5.12	.063	24.0	Ø	3.60		
Monitor Reading (ppm):	1	5.18	.065	24.1	Ø	3.65		
Well Casing Diameter & Material	2	5.16	.069	26.2	Ø	3.24		
Type: P.V.C. 2"	3	5.17	.065	26.2	Ø	3.75		
Total Well Depth (TD):	18.66							
Static Water Level (WL):	12.21							
One Casing Volume(gal/L): ~~[illegible]~~								
Start Purge (hrs):	0848							
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
BTEX, Naph, MTBE, EDB	HCl	3x40 ml vials	7-28-99
PAH	—	2x1L ambers	7-28-99

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: Zone C Site 31
Project No.: N0164 Bldg 760

[] Domestic Well Data
[] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 31GLM06Ø1
Sample Location: CNC31MW6D
Sampled By: JA
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8 19 99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1740	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method:								

PURGE DATA:

Date: 8 19 99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method:	Initial	6.40	.329	24.0	8	2.01		
Monitor Reading (ppm):	1	6.96	.256	22.5	1	1.55		
Well Casing Diameter & Material	2	6.97	.256	23.0	Ø	1.65		
Type:	3	6.86	.253	22.7	Ø	1.20		
Total Well Depth (TD): 35.35								
Static Water Level (WL): 13.75								
One Casing Volume(gal/L): 3.5								
Start Purge (hrs): 1615								
End Purge (hrs): 1740								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
BTEX/EDB	HCl	3 x 40ml	
PAH	—	2 x 1 ltr.	

OBSERVATIONS / NOTES:

Resample event due to FEDEX mix-up.

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: Zone: C Site 31
Project No.: ND164 Bldg 760

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 31GLM0601
Sample Location: CNC31MW06D
Sampled By: D. Anderson
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8-12-99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1640	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method: Low Flow								

PURGE DATA:

Date: 8-12-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Low Flow	Initial	7.32	.283	25.6	201	2.32	—	—
Monitor Reading (ppm):	1	7.10	.275	22.0	14	2.84	—	—
Well Casing Diameter & Material	2	6.63	.268	21.9	3	1.09	—	—
Type: 2" PVC	3	6.91	.264	21.9	1	1.09	—	—
Total Well Depth (TD): 36.64								
Static Water Level (WL): 15.92								
One Casing Volume(gal/L): ~~1.517~~ 3.32								
Start Purge (hrs): 1517								
End Purge (hrs): 1639								
Total Purge Time (min):								
Total Vol. Purged (gal/L): 10.0								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
BTEX / EDB	HCl	3 x 40 mL	
PAH	—	2 x 1 L	

OBSERVATIONS / NOTES:

20.72' = H_2O Column
3.32 = 1 volume

Replaced Horiba battery & recalibrated @ readings 42

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

Project Site Name: CNC31 Site 31
Project No.: Zone C N0164
Sampled By: JA/RH
Field Analyst:
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 31GLM01Ø1
Sample Location: Site 31-MW1
Duplicate: ☐
Blank: ☐

SAMPLING DATA:

Date: 7 23 99	Color	ORP (Eh)	S.C.	Temp.	Turbidity	DO	Sal.	pH
Time:	(Visual)	(+/- mv)	(mS/cm)	(°C)	(NTU)	(Meter, mg/l)	(%)	(SU)
Method:								

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Dissolved Oxygen:

Equipment: HACH Digital Titrator OX-DT CHEMetrics (Range: _____mg/L) Analysis Time: 1020

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	1-5 mg/L	200 ml	0.200 N	0.01
☐	2-10 mg/L	100 ml	0.200 N	0.02

Titration Count	Multiplier	Concentration
_____	x 0.01	= mg/L
_____	x 0.02	= mg/L

CHEMetrics: 2 mg/L

Notes:

Alkalinity:

Analysis Time: 1100

Equipment: HACH Digital Titrator AL-DT CHEMetrics (Range: _____mg/L) Filtered: ☐

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration
☒	10-40 mg/L	100 ml	0.1600 N	0.1	_____ & 47	x 0.1	= 4.7 mg/L
☐	40-160 mg/L	25 ml	0.1600 N	0.4	_____ & _____	x 0.4	= mg/L
☐	100-400 mg/L	100 ml	1.600 N	1.0	_____ & _____	x 1.0	= mg/L
☐	200-800 mg/L	50 ml	1.600 N	2.0	_____ & _____	x 2.0	= mg/L
☐	500-2000 mg/L	20 ml	1.600 N	5.0	_____ & _____	x 5.0	= mg/L
☐	1000-4000 mg/L	10 ml	1.600 N	10.0	_____ & _____	x 10.0	= mg/L

Parameter:	Hydroxide	Carbonate	Bicarbonate
Relationship:			

CHEMetrics: _____mg/L

Notes:

Standard Additions: ☐ Titrant Molarity:_____ Digits Required: 1st.:_____ 2nd.:_____ 3rd.:_____

Carbon Dioxide:

Equipment: HACH Digital Titrator CA-DT CHEMetrics (Range: _____mg/L) Analysis Time: 1118

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☒	10-50 mg/L	200 ml	0.3636 N	0.1
☐	20-100 mg/L	100 ml	0.3636 N	0.2
☐	100-400 mg/L	200 ml	3.636 N	1.0
☐	200-1000 mg/L	100 ml	3.636 N	2.0

Titration Count		Concentration
365	x 0.1	= 37 mg/L
_____	x 0.2	= mg/L
55	x 1.0	= mg/L
_____	x 2.0	= mg/L

CHEMetrics: _____mg/L

Notes:

Standard Additions: ☐ Titrant Molarity:_____ Digits Required: 1st.:_____ 2nd.:_____ 3rd.:_____

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

Page __ of __

Project Site Name: CNC 31 Bldg 760
Project No.: ND164 Zone C
Sampled By: 7 23 99
Field Analyst: JA
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 31G~~E~~FM01Ø1
Sample Location: MW1
Duplicate: ☐
Blank: ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Sulfide (S^{2-}):

Equipment: DR-700 DR-8 __ HS-C Color Chart HS-WR Color Wheel Analysis Time: 1138
Program/Module: 610nm 93 Other: _____

Concentration: Ø.Ø1 mg/L Filtered: ☐
Notes:

~~Sulfate (SO_4^{2-})~~:

Equipment: DR-700 DR-8 __ Other: _____ Analysis Time: _____
Program/Module: 91
Concentration: _____ mg/L Filtered: ☐

Standard Solution: ☐ Results: _____
Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____
Notes:

Nitrite (NO_2^--N):

Analysis Time: 12ØØ
Equipment: DR-700 DR-8 __ Other: _____ Filtered: ☐
Program/Module: 60
Concentration: 0.024 mg/L Reagent Blank Correction: ☐
Standard Solution: ☐ Results: ☐
Notes:

Nitrate (NO_3^--N):

Analysis Time: _____
Equipment: DR-700 DR-8 __ Other: _____ Filtered: ☐
Program/Module: 55
Concentration: _____ mg/L
Nitrite Interference Treatment: ☐
Standard Solution: ☐ Results: _____ Reagent Blank Correction: ☐
Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____
Notes:

Tetra Tech NUS, Inc.

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Page __ of __

Project Site Name: CNC31 Bldg 760
Project No.: N0164 Zone C
Sampled By: T 23 GA
Field Analyst:
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 31GLM0101
Sample Location: MW1
Duplicate: ☐
Blank: ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Manganese (Mn^{2+}):

Equipment: DR-700 DR-810 HACH MN-5 Other: _____ Analysis Time: 1220

Program/Module: 525nm 41

Concentration: 0.3 mg/L

Filtered: ☐

Digestion: ☐

Standard Solution: ☐ Results: _____ Reagent Blank Correction: ☐

Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____

Notes:

Ferrous Iron (Fe^{2+}):

Equipment: DR-700 DR-840 IR-18C Color Wheel Other: _____ Analysis Time: 1210

Program/Module: 500nm 33

Concentration: 0.07 mg/L

Filtered: ☐

Notes:

Hydrogen Sulfide (H_2S):

Equipment: HS-C Other: _____ Analysis Time: _____

Concentration: _____ mg/L Exceeded 5.0 mg/L range on color chart: ☐

Notes:

QA/QC Checklist:

All data fields have been completed as necessary: ☐

Correct measurement units are cited in the SAMPLING DATA block: ☐

Mulitplication is correct for each *Multiplier* table: ☐

Final calulated concentration is within the appropriate *Range Used* block: ☐

Alkalinity *Relationship* is determined appropriatly as per manufacturer instructions: ☐

QA/QC sample (e.g., Std. Additions, etc.) frequency is appropriate as per the project planning documents: ☐

Nitrite Interference treatment used for Nitrate test if Nitrite was detected: ☐

Title block is initialized by person who performed the QA/QC Ckecklist: ☐

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

Project Site Name: CNC31 Bldg 760
Project No.: ND164 Zone C
Sampled By: JA/RH
Field Analyst:
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 31GLM02Ø1
Sample Location: Site 31 MW1
Duplicate: ☐
Blank: ☐

SAMPLING DATA:

Date: 7 23 99	Color	ORP (Eh)	S.C.	Temp.	Turbidity	DO	Sal.	pH
Time:	(Visual)	(+/- mv)	(mS/cm)	(°C)	(NTU)	(Meter, mg/l)	(%)	(SU)
Method:								

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Dissolved Oxygen:

Equipment: HACH Digital Titrator OX-DT CHEMetrics (Range: _____mg/L) Analysis Time: 1Ø22

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	1-5 mg/L	200 ml	0.200 N	0.01
☐	2-10 mg/L	100 ml	0.200 N	0.02

Titration Count	Multiplier	Concentration
_____	x 0.01	= mg/L
_____	x 0.02	= mg/L

CHEMetrics: 2 mg/L

Notes:

Alkalinity:

Analysis Time: 11Ø4

Equipment: HACH Digital Titrator AL-DT CHEMetrics (Range: _____mg/L) Filtered: ☐

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration
☒	10-40 mg/L	100 ml	0.1600 N	0.1	_____ & 14	x 0.1	= 51Ø mg/L
☐	40-160 mg/L	25 ml	0.1600 N	0.4	_____ & _____	x 0.4	= mg/L
☐	100-400 mg/L	100 ml	1.600 N	1.0	_____ & _____	x 1.0	= mg/L
☐	200-800 mg/L	50 ml	1.600 N	2.0	_____ & _____	x 2.0	= mg/L
☐	500-2000 mg/L	20 ml	1.600 N	5.0	_____ & _____	x 5.0	= mg/L
☐	1000-4000 mg/L	10 ml	1.600 N	10.0	_____ & _____	x 10.0	= mg/L

Parameter:	Hydroxide	Carbonate	Bicarbonate
Relationship:			

CHEMetrics: _____mg/L

Notes:

Standard Additions: ☐ Titrant Molarity:_____ Digits Required: 1st.:_____ 2nd.:_____ 3rd.:_____

Carbon Dioxide:

Equipment: HACH Digital Titrator CA-DT CHEMetrics (Range: _____mg/L) Analysis Time: 112Ø

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☒	10-50 mg/L	200 ml	0.3636 N	0.1
☐	20-100 mg/L	100 ml	0.3636 N	0.2
☐	100-400 mg/L	200 ml	3.636 N	1.0
☐	200-1000 mg/L	100 ml	3.636 N	2.0

Titration Count		Concentration
45Ø	x 0.1	= 45 mg/L
_____	x 0.2	= mg/L
_____	x 1.0	= mg/L
_____	x 2.0	= mg/L

CHEMetrics: _____mg/L

Notes:

Standard Additions: ☐ Titrant Molarity:_____ Digits Required: 1st.:_____ 2nd.:_____ 3rd.:_____

Tetra Tech NUS, Inc.

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Page __ of __

Project Site Name: CNC31 Bldg 760
Project No.: N0164 Zone C
Sampled By: 7 23 99
Field Analyst: JA
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 31GM0201
Sample Location: MW2
Duplicate: ☐
Blank: ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Sulfide (S^{2-}):

Equipment: DR-700 DR-8 __ HS-C Color Chart HS-WR Color Wheel Analysis Time: 1139
Program/Module: 610nm 93 Other: _____

Concentration: 0.01 mg/L Filtered: ☐
Notes:

~~Sulfate (SO_4^{2-}):~~

Equipment: DR-700 DR-8 __ Other: _____ Analysis Time: _____
Program/Module: 91
Concentration: _____ mg/L Filtered: ☐

Standard Solution: ☐ Results: _____
Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____
Notes:

Nitrite (NO_2^--N): Analysis Time: 1201

Equipment: DR-700 DR-8 __ Other: _____ Filtered: ☐
Program/Module: 60
Concentration: 0.026 mg/L Reagent Blank Correction: ☐
Standard Solution: ☐ Results: ☐
Notes:

Nitrate (NO_3^--N): Analysis Time: _____

Equipment: DR-700 DR-8 __ Other: _____ Filtered: ☐
Program/Module: 55
Concentration: _____ mg/L
Nitrite Interference Treatment: ☐
Standard Solution: ☐ Results: _____ Reagent Blank Correction: ☐
Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____
Notes:

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

Page __ of __

Project Site Name: CNC 31 Bldg 760

Sample ID No.: 31GLM0201

Project No.: N0164 Zone C

Sample Location: MW2

Sampled By: 7 23 99

Duplicate: ☐

Field Analyst:

Blank: ☐

Field Form Checked as per QA/QC Checklist (initials):

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Manganese (Mn^{2+}):

Equipment: DR-700 DR-8 __ HACH MN-5 Other: _____ Analysis Time: 1221

Program/Module: 525nm 41

Concentration: 0.1 mg/L

Filtered: ☐

Digestion: ☐

Standard Solution: ☐ Results: _____

Reagent Blank Correction: ☐

Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____

Notes:

Ferrous Iron (Fe^{2+}):

Equipment: DR-700 DR-8 __ IR-18C Color Wheel Other: _____ Analysis Time: 1211

Program/Module: 500nm 33

Concentration: 0.05 mg/L

Filtered: ☐

Notes:

Hydrogen Sulfide (H_2S):

Equipment: HS-C Other: _____ Analysis Time: _____

Concentration: _____ mg/L Exceeded 5.0 mg/L range on color chart: ☐

Notes:

QA/QC Checklist:

All data fields have been completed as necessary: ☐

Correct measurement units are cited in the SAMPLING DATA block: ☐

Mulitplication is correct for each *Multiplier* table: ☐

Final calulated concentration is within the appropriate *Range Used* block: ☐

Alkalinity *Relationship* is determined appropriatly as per manufacturer instructions: ☐

QA/QC sample (e.g., Std. Additions, etc.) frequency is appropriate as per the project planning documents: ☐

Nitrite Interference treatment used for Nitrate test if Nitrite was detected: ☐

Title block is initialized by person who performed the QA/QC Checklist: ☐

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

Page __ of __

Project Site Name: CNC31 Bldg 760
Project No.: ND164 Zone C
Sampled By: JA/RH
Field Analyst:
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 31GLM03001 ~~GMC31~~
Sample Location: Site 31 MW1
Duplicate: ☐
Blank: ☐

SAMPLING DATA:

Date: 7 23 99	Color	ORP (Eh)	S.C.	Temp.	Turbidity	DO	Sal.	pH
Time:	(Visual)	(+/- mv)	(mS/cm)	(°C)	(NTU)	(Meter, mg/l)	(%)	(SU)
Method:								

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Dissolved Oxygen:

Equipment: HACH Digital Titrator OX-DT CHEMetrics (Range: _____mg/L) Analysis Time: 1024

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	1-5 mg/L	200 ml	0.200 N	0.01
☐	2-10 mg/L	100 ml	0.200 N	0.02

Titration Count	Multiplier	Concentration
_____	x 0.01	= mg/L
_____	x 0.02	= mg/L

CHEMetrics: 1 mg/L

Notes:

Alkalinity:

Analysis Time: 1107

Equipment: HACH Digital Titrator AL-DT CHEMetrics (Range: _____mg/L) Filtered: ☐

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration
☒	10-40 mg/L	100 ml	0.1600 N	0.1	_____ & 58	x 0.1	= 58 mg/L <10
☐	40-160 mg/L	25 ml	0.1600 N	0.4	_____ & _____	x 0.4	= mg/L
☐	100-400 mg/L	100 ml	1.600 N	1.0	_____ & _____	x 1.0	= mg/L
☐	200-800 mg/L	50 ml	1.600 N	2.0	_____ & _____	x 2.0	= mg/L
☐	500-2000 mg/L	20 ml	1.600 N	5.0	_____ & _____	x 5.0	= mg/L
☐	1000-4000 mg/L	10 ml	1.600 N	10.0	_____ & _____	x 10.0	= mg/L

Parameter:	Hydroxide	Carbonate	Bicarbonate
Relationship:			

CHEMetrics: _____mg/L

Notes:

Standard Additions: ☐ Titrant Molarity:_____ Digits Required: 1st.:_____ 2nd.:_____ 3rd.:_____

Carbon Dioxide:

Equipment: HACH Digital Titrator CA-DT CHEMetrics (Range: _____mg/L) Analysis Time: 1123

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☒	10-50 mg/L	200 ml	0.3636 N	0.1
☐	20-100 mg/L	100 ml	0.3636 N	0.2
☐	100-400 mg/L	200 ml	3.636 N	1.0
☐	200-1000 mg/L	100 ml	3.636 N	2.0

Titration Count		Concentration
470	x 0.1	= 47 mg/L
_____	x 0.2	= mg/L
_____	x 1.0	= mg/L
_____	x 2.0	= mg/L

CHEMetrics: _____mg/L

Notes:

Standard Additions: ☐ Titrant Molarity:_____ Digits Required: 1st.:_____ 2nd.:_____ 3rd.:_____

Tetra Tech NUS, Inc.

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Page __ of __

Project Site Name: CNC 31 Bldg 760
Project No.: N0164 Zone C
Sampled By: 7 23 99
Field Analyst: JA
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 31GFM03Ø1
Sample Location: MW3
Duplicate: ☐
Blank: ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Sulfide (S^{2-}):

Equipment: DR-700 DR-8 __ HS-C Color Chart HS-WR Color Wheel Analysis Time: 114Ø
Program/Module: 610nm 93 Other: _____

Concentration: Ø.1Ø mg/L Filtered: ☐
Notes:

~~Sulfate (SO_4^{2-}):~~

Equipment: DR-700 DR-8 __ Other: _____ Analysis Time: _____
Program/Module: 91
Concentration: _____ mg/L Filtered: ☐

Standard Solution: ☐ Results: _____
Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____
Notes:

Nitrite (NO_2^--N):

Analysis Time: 12Ø2
Equipment: DR-700 DR-8 __ Other: _____ Filtered: ☐
Program/Module: 60
Concentration: Ø.Ø2Ø mg/L Reagent Blank Correction: ☐
Standard Solution: ☐ Results: ☐
Notes:

Nitrate (NO_3^--N):

Analysis Time: _____
Equipment: DR-700 DR-8 __ Other: _____ Filtered: ☐
Program/Module: 55
Concentration: _____ mg/L
Nitrite Interference Treatment: ☐
Standard Solution: ☐ Results: _____ Reagent Blank Correction: ☐
Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____
Notes:

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

Project Site Name: CNC 31 Bldg 760
Sample ID No.: 31GLM0301
Project No.: N0164 Zone C
Sample Location: MW3
Sampled By: 7 23 92
Duplicate: ☐
Field Analyst:
Blank: ☐
Field Form Checked as per QA/QC Checklist (initials):

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Manganese (Mn^{2+}):

Equipment: DR-700 DR-8 __ HACH MN-5 Other: _____ Analysis Time: 1222

Program/Module: 525nm 41

Concentration: 0.2 mg/L Filtered: ☐

Digestion: ☐

Standard Solution: ☐ Results: _____ Reagent Blank Correction: ☐

Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____

Notes:

Ferrous Iron (Fe^{2+}):

Equipment: DR-700 DR-8 __ IR-18C Color Wheel Other: _____ Analysis Time: 1212

Program/Module: 500nm 33

Concentration: 0.75 mg/L Filtered: ☐

Notes:

Hydrogen Sulfide (H_2S):

Equipment: HS-C Other: _____ Analysis Time: _____

Concentration: _____ mg/L Exceeded 5.0 mg/L range on color chart: ☐

Notes:

QA/QC Checklist:

All data fields have been completed as necessary: ☐

Correct measurement units are cited in the SAMPLING DATA block: ☐

Mulitplication is correct for each *Multiplier* table: ☐

Final calulated concentration is within the appropriate *Range Used* block: ☐

Alkalinity *Relationship* is determined appropriatly as per manufacturer instructions: ☐

QA/QC sample (e.g., Std. Additions, etc.) frequency is appropriate as per the project planning documents: ☐

Nitrite Interference treatment used for Nitrate test if Nitrite was detected: ☐

Title block is initialized by person who performed the QA/QC Checklist: ☐

APPENDIX D

SOIL AND GROUNDWATER LABORATORY ANALYTICAL DATA

Katahdin
ANALYTICAL SERVICES

SDG NARRATIVE
KATAHDIN ANALYTICAL SERVICES
TETRA TECH NUS
CASE CNC CHARLESTON

Sample Receipt

The following samples were received on May 29, 1999 and were logged in under Katahdin Analytical Services work order number WP2689 for a hardcopy due date of June 28, 1999.

KATAHDIN Sample No.	TTNUS Sample Identification	GEL Sample No.
WP2689-1	31SLB011112	
WP2689-2	31SLB021112	
WP2689-3	31SLB041112	
WP2689-4	31SLB050910	
WP2689-5	31SLB061112	9905DEA-04
WP2689-6	31SLB071011	
WP2689-7	31SLB021112D	
WP2689-8	31SLB031112	9905DEA-03
WP2689-9	01F00102	9905DEA-02
WP2689-10	01E00102	9905DEA-01
WP2689-11	31TL00101	

The samples were logged in for the analyses specified on the chain of custody form. All problems encountered and resolved during sample receipt have been documented on the applicable chain of custody forms.

Sample analyses have been performed by the methods as noted herein.

Volatile Organic Analysis

Two aqueous and nine soil samples were received by the Katahdin Analytical Services, Inc. GC/MS laboratory on May 29, 1999 and were specified to be analyzed by USEPA method 8260B for the analytes benzene, toluene, ethylbenzene, xylenes, MTBE, naphthalene, and EDB.

Analyses for this workorder were performed on the 5972-S, 5972-F and 5972-Z instruments. A VSTD050 (50 ppb standard) was used for the continuing calibration standard. Internal standard and surrogate compounds were also spiked at 50 ug/l.

Batch QC (VBLK, and LCS) was performed in each twelve-hour window. Results are included in this data package. The LCS QC samples were spiked with the entire list of compounds quantitated for at 50 ppb. No matrix spike/matrix spike duplicate pair was specified to be analyzed in this workorder.

Method 8000B, section 7.5.1.2.1 (Revision 2, 12/96) states, "in those instances where the RSD for one or more analytes exceeds 20%, the initial calibration curve may still be acceptable if the mean of the RSD values for all analytes in the calibration is less than or equal to 20%." Method 8260B narrows this 20% maximum to 15%.

Three initial calibration curves are reported in this workorder. The calibrations had several analytes exceeding the maximum allowable 15% RSD. The average %RSD for the 5972-F was 13.4%, the 5972-Z was 13.4%, and the 5972-S had an average %RSD of 14.7%.

All soil samples were extruded outside of the 48 hour window as specified in the method. After notifying the client analysis proceeded. All samples were refrigerated in the Encore device at 4 degrees C plus or minus 2 prior to extrusion. By inference the results may have a low bias.

Sample WP2689-3 required reanalysis to confirm matrix interference, both analyses are included. Samples WP2689-8 was reanalyzed on dilution in order to bring target compounds into the instruments linear range, both diluted and undiluted results are provided.

Several manual integrations were performed due to split peaks; all have been flagged with a "M" (software-generated) on the pertinent quantitation reports. All "M" flags have been dated and initialed by the analyst performing the integration. In addition, all "M" flags have been reviewed and approved by the GC/MS supervisor. Copies of each manual integration are included in the pertinent quantitation reports.

No other protocol deviations were noted by the volatile organics staff.

Semivolatile Organic Analysis

Two aqueous and eight soil/sediment samples were received by Katahdin Analytical Services laboratory on May 29, 1999 for analysis in accordance with 8270C for the PAH list of analytes.

Extraction of the aqueous samples occurred following USEPA method 3510 on June 2, 1999. A laboratory control spike consisting of all PAH analytes spiked into organic free water, was extracted in the batch.

Extraction of soil samples WP2689 1-4 occurred on June 4, 1999, following USEPA method 3550. A laboratory control spike was extracted in the batch.

Extraction of soil samples WP2689 5-8 occurred on June 7, 1999, following USEPA method 3550. A laboratory control spike was extracted in the batch.

The initial calibration curves analyzed in this SDG had some of the target analyte %RSD values exceeding 15 %.

Method 8000B, section 7.5.1.2.1 (Revision 2, 12/96) states, "in those instances where the RSD for one or more analytes exceeds 20%, the initial calibration curve may still be acceptable if the

mean of the RSD values for all analytes in the calibration is less than or equal to 20%." Section 7.3.7.1 of method 8270C (revision 3, 12/96) narrows this 20% maximum to 15%.

In the calibration curves analyzed in this SDG, the average %RSD for all analytes was 9.4%, 8.5%, 11.5%, and 5.9%, making the curves acceptable.

Analyses of samples WP2689-3 and -8 were each performed at 1:20 dilutions due to the matrix, resulting in elevated reporting limits for each sample.

Analysis of aqueous sample WP2689-10 yielded a recovery of the surrogate 2-fluorobiphenyl at 44%, below the lower control limit. No laboratory action was taken.

Several manual integrations were performed due to split peaks; all have been flagged with a "M" by the data system. All manual integrations have been dated and initialed by the responsible analyst. Copies of each manual integration are included in the data package. All manual integrations have been reviewed and approved by the GC/MS supervisor.

No other protocol deviations were noted by the semivolatiles organics staff.

Wet Chemistry Analysis

For work order WP2689 the analyses for Total Combustible Organics (TCO) have been performed in accordance with the "Annual Book of ASTM Standards", 1987. Analyses for Solids-Total Residue (TS) for work order WP2689 samples have been performed in accordance with "Contract Laboratory Program Statement of Work for Inorganic Analysis".

All analyses were performed within analytical hold time. No protocol deviations were noted by the Wet Chemistry laboratory staff.

Subcontracted Analysis

Analyses for Total Petroleum Hydrocarbon and Grain Size were subcontracted to an outside laboratory. The data packages are included as separate sections.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager and/or his designee, as verified by the following signature.

_____
Authorized Signature

KATAHDIN ANALYTICAL SERVICES, INC.
SAMPLE RECEIPT CONDITION REPORT
Tel. (207) 874-2400
Fax (207) 775-4029

LAB (WORK ORDER) # WP 2689

PAGE: 1 OF 1

COOLER: 1 OF 1

CLIENT: ~~HNUS~~ TetraTech

PROJECT: CNC Charleston

COC# –
SDG# –
DATE / TIME RECEIVED: 052999 10:45
DELIVERED BY: FedEx
RECEIVED BY: KEITH TALON
LIMS ENTRY BY: Sa
LIMS REVIEW BY / PM: AJC

	YES	NO	EXCEPTIONS	COMMENTS	RESOLUTION
1. CUSTODY SEALS PRESENT / INTACT?	☑	☐	☐		
2. CHAIN OF CUSTODY PRESENT IN THIS COOLER?	☑	☐	☐		
3. CHAIN OF CUSTODY SIGNED BY CLIENT?	☑	☐	☐		
4. CHAIN OF CUSTODY MATCHES SAMPLES?	☑	☐	☐		
5. TEMPERATURE BLANKS PRESENT?	☑	☐	☐	TEMP BLANK TEMP (°C)= 5.0°	
6. SAMPLES RECEIVED AT 4°C +/- 2? ICE / ICE PACKS PRESENT (Y) or N?	☑	☐	☐	COOLER TEMP (°C)= NA (RECORD COOLER TEMP ONLY IF TEMP BLANK IS NOT PRESENT)	
7. VOLATILES FREE OF HEADSPACE?	☑	☐	☐		
8. TRIP BLANK PRESENT IN THIS COOLER	☑	☐	☐		
9. PROPER SAMPLE CONTAINERS AND VOLUME?	☑	☐	☐		
10. SAMPLES WITHIN HOLD TIME UPON RECEIPT?	☑	☐	☐		
11. SAMPLES PROPERLY PRESERVED[1]?	☑	☐	☐		
12. CORRECTIVE ACTION REPORT FILED?	☐	☑	N/A		

13. ANALYTICAL PROGRAMS (CIRCLE ONE) COMMERCIAL CLP HAZWRAP (NFESC) ACOE AFCEE OTHER (STATE OF ORIGIN):

LOG - IN NOTES[1]:

picked up @ FEDEX

000005

(1) Use this space (and additional sheets if necessary) to document samples that are received broken or compromised, C-O-C discrepancies, radiation checks, residual chlorine check, results of pH check if required. If samples required pH adjustment, record volume and type of preservative added.

Katahdin
ANALYTICAL SERVICES
340 County Road No. 5
P.O. Box 720
Westbrook, ME 04098
Tel: (207) 874-2400
Fax: (207) 775-4029

CHAIN of CUSTODY

PLEASE PRINT IN PEN

Page ____ of ____

Client: TetraTech NUS
Contact: Bryn Howze
Phone #: ( )
Fax #: ( )
Address: NH21 Ave H
City: N. Charleston
State: SC
Zip Code: 29405
Purchase Order #:
Proj. Name / No.:
Katahdin Quote #:
Bill (if different than above):
Address:
Sampler (Print / Sign): Rob Hill Jeff Alexander
Copies To:

LAB USE ONLY
WORK ORDER #: WP 2689
KATAHDIN PROJECT MANAGER:
REMARKS:
SHIPPING INFO: ☑ FED EX ☐ UPS ☐ CLIENT
AIRBILL NO: 8096096 5254
TEMP°C: ☐ TEMP BLANK ☐ INTACT ☐ NOT INTACT

ANALYSIS AND CONTAINER TYPE PRESERVATIVES

*	Sample Description	Date / Time coll'd	Matrix	No. of Cntrs.	Filt. ☐Y☐N PAH + Naph 8070C	Filt. ☐Y☐N BTEX/EDB 8260B 8074	Filt. ☐Y☐N Grain Size Hydrometer	Filt. ☐Y☐N	Filt. ☐Y☐N	Filt. ☐Y☐N	Filt. ☐Y☐N	Filt. ☐Y☐N	Filt. ☐Y☐N	Filt. ☐Y☐N FID Reading
	31SLB01112	5/28/1030	S	5	1	4								1
	31SLB02 1112	5/28/1045	S	5	1	4								4
	31SLB03 1112	5/28/1110	S	6	1	4	1							30
	1SLB04 1112	5/28/1010	S	5	1	4								4
	31SLB05 0910	5/28/0930	S	5	1	4								0
	31SLB06 1112	5/28/0915	S	5	1	4								0
	31SLB07 1011	5/28/0950	S	5	1	4								1
	31SLB02 1112D	5/28/1045	S	5	1	4								
	01FB01 02	5/28/1200	W	5	2	3			Field Blank					
	01EB01 02	5/28/1215	W	5	2	3			Rinsate					
	31TL0001	5/28/1230	W	3		3			TRIP Blank					
		/												
		/												
		/												
		/												
		/												

COMMENTS: PICKED UP @ FEDEX

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
[signature]	5/28 1230	8096096 5254			
Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
	5/29 10:45	Kath R. Talor			

ORDER NO WP-2689

Project Manager: Andrea J. Colby
ORDER DATE: 06/01/99
PHONE: 850/385-989
FAX: 850/385-986
DUE: 28 JUN
FAC.ID: CNC CHARLESTON

REPORT TO: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

INVOICE: ACCOUNTS PAYABLE
TETRA TECH NUS, INC.
661 ANDERSEN DRIVE, FOSTER PLAZA VII
PITTSBURGH, PA 15220-2745

PHONE: 412/921-7090
PO: N7912-P99264
PROJECT: CTO #68

SAMPLED BY: R. HILL DELIVERED BY: FEDEX DISPOSE: AFTER 31 JUL

ITEM	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
1	WP2689-1	31SLB011112	28 MAY 1030	29 MAY	SL
	WP2689-2	31SLB021112	28 MAY 1045		
	WP2689-3	31SLB041112	28 MAY 1010		
	WP2689-4	31SLB050910	28 MAY 0930		
	WP2689-6	31SLB071011	28 MAY 0950		
	WP2689-7	31SLB021112D	28 MAY 1045		

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
Polynuclear Aromatic Hydrocarbons	EPA 8270	6	135.00	810.00
Volatile Organics by 8260B	SW8260	6	85.00	510.00
Solids-Total Residue (TS)	CLP/CIP SO	6	0.00	0.00
TOTALS		6	220.00	1320.00

	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
2	WP2689-8	31SLB031112	28 MAY 1110	29 MAY	SL

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
Polynuclear Aromatic Hydrocarbons	EPA 8270	1	135.00	135.00
Volatile Organics by 8260B	SW8260	1	85.00	85.00
Solids-Total Residue (TS)	CLP/CIP SO	1	0.00	0.00
Wet Lab Subcontract		1	185.00	185.00
TOTALS		1	405.00	405.00

LABORATORY ORDER CONTINUED ON PAGE 2

0000007
RC 6/14/99

KATAHDIN ANALYTICAL SERVICES, INCORPORATED
New England-ME Laboratory (207) 874-2400
CONFIRMATION

ORDER NO WP-2689

Project Manager: Andrea J. Colby
ORDER DATE: 06/01/99
PHONE: 850/385-9899
FAX: 850/385-9860
DUE: 28 JUN
FAC.ID: CNC CHARLESTON

RE RT TO: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

INVOICE: ACCOUNTS PAYABLE
TETRA TECH NUS, INC.
661 ANDERSEN DRIVE, FOSTER PLAZA VII
PITTSBURGH, PA 15220-2745

PHONE: 412/921-7090
PO: N7912-P99264

PROJECT: CTO #68

SAMPLED BY: R. HILL DELIVERED BY: FEDEX DISPOSE: AFTER 31 JUL

	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
3	WP2689-9	01F00102	28 MAY 1200	29 MAY	AQ
	WP2689-10	01E00102	28 MAY 1215		

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
Polynuclear Aromatic Hydrocarbons	EPA 8270	2	125.00	250.00
Volatile Organics by 8260B	SW8260	2	75.00	150.00
Wet Lab Subcontract		2	55.00	110.00
TOTALS		2	255.00	510.00

	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
4	WP2689-11	31TL00101	28 MAY 1230	29 MAY	SL

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
Volatile Organics by 8260B	SW8260	1	85.00	85.00

	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
5	WP2689-5	31SLB061112	28 MAY 0915	29 MAY	SL

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
Polynuclear Aromatic Hydrocarbons	EPA 8270	1	135.00	135.00
Volatile Organics by 8260B	SW8260	1	85.00	85.00
Solids-Total Residue (TS)	CLP/CIP SO	1	0.00	0.00
Total Combustible Organics	ASTM D2974	1	30.00	30.00
Wet Lab Subcontract		1	60.00	60.00
TOTALS		1	310.00	310.00

LABORATORY ORDER CONTINUED ON PAGE 3

0000008

ORDER NO WP-2689

Project Manager: Andrea J. Colby
ORDER DATE: 06/01/99
PHONE: 850/385-989
FAX: 850/385-986
DUE: 28 JUN
FAC.ID: CNC CHARLESTON

REPORT TO: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

INVOICE: ACCOUNTS PAYABLE
TETRA TECH NUS, INC.
661 ANDERSEN DRIVE, FOSTER PLAZA VII
PITTSBURGH, PA 15220-2745

PHONE: 412/921-7090
PO: N7912-P99264

PROJECT: CTO #68

SAMPLED BY: R. HILL DELIVERED BY: FEDEX DISPOSE: AFTER 31 JUL

ORDER NOTE: QC-IV NFESC-D
DD(KAS007QC-DB3)
CNC CHARLESTON

REPORT COPY: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.
PITTSBURGH,PA 15220
REPORT & DISK

INVOICE: With Report

TOTAL ORDER AMOUNT $2,630.0
This is NOT an Invoi

AJC/BKR/WEST.AJC(dw)
06-14Please contact KATAHDIN ANALYTICAL SERVICES promptly if you have any questi

0000009

GENERAL ENGINEERING LABORATORIES
Meeting today's needs with a vision for tomorrow.

June 21, 1999

Ms. Andrea Colby
Katahdin Analytical
340 County Rd
Westbrook, ME 04092

Dear Ms. Colby:

Enclosed is a data package for samples from the former Charleston Naval Complex site. The samples were analyzed for general chemistry.

General Engineering Laboratories appreciates this opportunity to provide you with analytical results, and trusts that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171.

Yours very truly,

Valerie S. Davis
Project Manager

enclosure

P O Box 30712 • Charleston, SC 29417 • 2040 Savage Road • 29407
(843) 556-8171 • Fax (843) 766-1178
Printed on recycled paper.

CASE NARRATIVE
for
Katahdin Analytical
Westbrook, ME
Former Charleston Naval Complex Site
SDG #95DEA

June 21, 1999

Laboratory Identification:

General Engineering Laboratories, Inc. (GEL)

Mailing Address:

P.O. Box 30712
Charleston, SC 29417

Express Mail Delivery and Shipping Address:

2040 Savage Rd
Charleston, SC 29414

Telephone Number:

(843) 556-8171

Summary:

Sample receipt

The samples from the former Charleston Naval Complex site arrived at General Engineering Laboratories, Inc., Charleston, SC on May 28, 1999, for environmental analyses. All sample containers arrived without any visible signs of tampering or breakage. The samples were delivered with chain of custody documentation and signatures.

The following samples were received by the laboratory:

Laboratory Identification	Sample Description
9905DEA-01	01E00102
9905DEA-02	01F00102
9905DEA-03	31SLB031112
9905DEA-04	31SLB061112

Case Narrative

Sample analyses were conducted using methodology as outlined in General Engineering Laboratories Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are listed below by analytical parameter.

Internal Chain of Custody:

Custody was maintained for all samples.

Data Package:

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, and General Chemistry.

The following are definitions of reporting limits used at General Engineering Laboratories:

DL — Detection Limit: The minimum level of an analyte that can be determined (identified not quantified) with 99% confidence. The values are normally achieved by preparing and analyzing seven aliquots of laboratory water spiked 1 to 5 times the estimated MDL, taking the standard deviation and multiplying it against the one-tailed t-statistic at 99%. This computed value is then verified for reasonableness by repeating the study using the concentration found in the initial study, calculating an F-ratio, and computing the final limit. Sample specific preparation and dilution factors are applied to these limits when they are reported.

The detection limit is the minimum concentration of a substance that can be identified, measured, and reported with 99% confidence that the analyte concentration is above zero. It answers the question "Is It Present."

QL — Quantitation Limit: The lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. The QL is generally 5 to 10 times the MDL. However, it may be nominally chosen within these guidelines to simplify data reporting. For many analytes the QL analyte concentration is selected as the lowest non-zero standard in the calibration curve.

Sample QL's are highly matrix-dependent. Sample specific preparation and dilution factors are applied to these limits when they are reported.

The QL is always $\geq$ DL.

This data package, to the best of my knowledge, is in compliance with technical and administrative requirements.

Valerie S. Davis
Project Manager

fc:saic9905DEA%

Case Narrative for
KATA
SDG# 95DEA

TOTAL PETROLEUM HYDROCARBONS

Analytical Batch Number: 151317

Analytical Method: EPA SW846 9070

Laboratory Number	Sample Description
9905DEA-01	01E00102
9905DEA-02	01F00102
QC620138	Blank
QC620139	Laboratory Control Sample
QC620140	Laboratory Control Sample Duplicate

Instrument Calibration:

The balance was properly calibrated.

Holding Time:

All samples were analyzed within the required holding time.

Blanks:

No target analytes were detected in the method blank above the required acceptance limit.

Laboratory Control Samples:

All analyte recoveries in the laboratory control sample were within the required acceptance limits. All analytes in the laboratory control sample duplicate were within the required acceptance limits for relative percent difference.

Dilutions:

None of the samples were diluted.

Non Conformance Reports:

There were no Nonconformance Reports associated with this batch.

TOTAL PETROLEUM HYDROCARBONS

Analytical Batch Number: 150797

Analytical Method: EPA SW846 9071A

Laboratory Number	Sample Description
9905DEA-03	31SLB031112
QC618246	Blank
QC618247	Laboratory Control Sample
QC618248	Matrix Spike of 9905606-06
QC618249	Duplicate of 9905606-06

Instrument Calibration:

The balance was properly calibrated.

Holding Time:

All samples were analyzed within the required holding time.

Blanks:

No target analytes were detected in the method blank above the required acceptance limit.

Spike Analyses:

The matrix spike was run on the following Sample Number from another SDG.

9905606-06

All analyte recoveries in the matrix spike were within the required acceptance limits.

Laboratory Control Samples:

All analyte recoveries in the laboratory control sample were within the required acceptance limits.

Sample Duplicates:

All sample duplicate results were within the required acceptance limits.

Dilutions:

None of the samples were diluted.

Non Conformance Reports:

There were no Nonconformance Reports associated with this batch.

TOTAL ORGANIC CARBON

Analytical Batch Number: 150724

Analytical Method: SW846 9060 Modified

Laboratory Number	Sample Description
9905DEA-04	31SLB061112
QC617934	Blank
QC617935	Duplicate of 9906058-01
QC617936	Post Spike of 9906058-01
QC617937	Laboratory Control Sample

Sample Preparation:

All samples were prepared in accordance with accepted procedures. The method quoted is only for liquid samples. It is modified to handle soils analysis.

Instrument Calibration:

The instrument used was a Dohrmann DC-190 high temperature combustion TOC analyzer with a Dohrmann solids boat sampler. The instrument was properly calibrated on the day of the analysis.

Holding Time:

All samples were analyzed within the required holding time.

Blanks:

No target analytes were detected in the method blank above the required acceptance limit.

Spike Analyses:

The post spike was run on the following Sample Number.

9906058-01

All analyte recoveries in the post spike were within the required acceptance limits.

Laboratory Control Samples:

All analyte recoveries in the laboratory control sample were within the required acceptance limits.

Sample Duplicates:

All sample duplicate results were within the required acceptance limits.

Dilutions:

None of the samples were diluted.

Non Conformance Reports:

There were no Nonconformance Reports associated with this batch.

Additional Comments:

TOC solid samples are are tested to determine if inorganic carbon such as carbonates and bicarbonates are present in the sample. If so, the sample is acidified to remove the inorganic carbon, then dried in a low temperature oven. Because the sample portion is dried before analysis, the percent moisture correction is not applied to the TOC solid result.

The preceding narratives have been reviewed by:_____ Date:_____

General Engineering Laboratories, Inc.
2040 Savage Road
Charleston, South Carolina 29407
P.O. Box 30712
Charleston, South Carolina 29417
(803) 556-8171

CHAIN OF CUSTODY RECORD

9905DEA9

Client Name/Facility Name: Katahdin Analytical

Collected by/Company: Tetra Tech

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

	SAMPLE ID	DATE	TIME	WELL	SOIL	COMP	GRAB	# OF CONTAINERS	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	Coliform - specify type	TPH	Remarks
1.	Ø1EØØ1Ø2	5/28	1215																					2	H_2SO_4
2.	Ø1FØØ1Ø2	5/28	12ØØ																					2	H_2SO_4
3.	315LBØ31112	5/28	111Ø		X																			1	
4.	315LBØ61112	5/28	Ø915		X					1															

Relinquished by:	Date:	Time:	Received by:	Relinquished by:	Date:	Time:	Received by:
[signature]	5/28	13ØØ					

Relinquished by:	Date:	Time:	Received by lab by:	Date:	Time:	Remarks:
			[signature]	5/29	1308	

White mple collector Yellow = file Pink = with report

FEDERAL SAMPLE RECEIPT REVIEW

Client Kata Received by PAD Date 5/28/99

GEL COOLER___ GEL POLY COOLER___ CLIENT COOLER___ OTHER___

SAMPLE REVIEW CRITERIA	YES	NO	COMMENTS/QUALIFIERS
1. Were shipping containers received intact and sealed? If no, notify Project Manager	✓		
2. Was the Shipment screened following the radiochemistry survey procedure (EPI SOP S-007)?	✓		
Were the survey results negative? If no, notify Project Manager	✓		
Are any of the samples identified by the client as radioactive? If yes, did client provide RAD activity?		✓	
3. Were chain of custody documents included?	✓		
4. Were chain of custody documents completed correctly? (Ink, signed, match containers)	✓		
5. Were all sample containers properly labeled?	✓		
6. Were proper sample containers received?	✓		O&Grease
7. Preserved samples checked for pH?	—	—	TPH + Soils
8. Were samples preserved correctly? If no, list samples & tests	—	—	
9. Shipping container temperature checked?	✓		
10. Was shipping conatiner temperature within specifications (4°± 2° C) If no, notify Project Manager	✓		4°C
11. Is temperature documented on the Chain of Custody?		✓	
12. Were samples received within holding time? if No, notify Project Manger	✓		
13. Were VOA vials free of headspace?	—	—	
14. ARCOC# IF REQUIRED	—	—	
15. SDG# IF REQUIRED	—	—	

REVIEW P. Nauer DATE 5/28/99 SA - SEALS ATTACHED NSA - NO SEALS ATTACHED

Katahdin
ANALYTICAL SERVICES

July 31, 1999

RECEIVED
AUG - 4 1999
TETRA TECH NUS
TALLAHASSEE, FL

Mr. Paul Calligan
Tetra Tech NUS
1401 Oven Park Drive, Suite 102
Tallahassee, FL 32308

RE: Katahdin Lab Number: WP2689
Project ID: CNC Charleston
Project Manager: Ms. Andrea J. Colby
Sample Receipt Date: May 29, 1999

Dear Mr. Calligan:

Please find enclosed the following information:

* Results for Grain Size for the work order mentioned above.

Due to an error in the Data Management Department the original data package was submitted without this section. We apologize for any inconvenience our error may have caused you.

Should you have any questions or comments concerning this Report of Analysis, please do not hesitate to contact the project manager listed above. This cover letter is an integral part of the ROA.

We appreciate your continued use of our laboratory and look forward to working with you in the future. The following signature indicates technical review and acceptance of the data.

Sincerely,

KATAHDIN ANALYTICAL SERVICES

Hana Crouch
Authorized Signature

07/31/99
Date

340 County Road No. 5
P.O. Box 720, Westbrook, ME 04098
Tel: (207) 874-2400 Fax: (207) 775-4029

http://katahdinlab.com

210 West Road No. 5, Portsmouth, NH 03801
Tel: (603) 431-5777 Fax: (603) 436-3356

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-1
SDG: WP2689
Report Date: 7/2/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 86
Method: SW8260
Date Analyzed: 6/2/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31SLB011112	SL	5/28/99	5/29/99	6/2/99	KRT	5030	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<6	ug/Kg	1.2	6	5
TOLUENE	<6	ug/Kg	1.2	6	5
1,2-DIBROMOETHANE	<6	ug/Kg	1.2	6	5
ETHYLBENZENE	<6	ug/Kg	1.2	6	5
NAPHTHALENE	<6	ug/Kg	1.2	6	5
MTBE	<6	ug/Kg	1.2	6	5
TOTAL XYLENES	<6	ug/Kg	1.2	6	5
DIBROMOFLUOROMETHANE	96	%	1.2		
1,2-DICHLOROETHANE-D4	94	%	1.2		
TOLUENE-D8	87	%	1.2		
P-BROMOFLUOROBENZENE	77	%	1.2		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-2
SDG: WP2689
Report Date: 7/2/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 82
Method: SW8260
Date Analyzed: 6/2/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31SLB021112	SL	5/28/99	5/29/99	6/2/99	KRT	5030	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<6	ug/Kg	1.2	6	5
TOLUENE	<6	ug/Kg	1.2	6	5
1,2-DIBROMOETHANE	<6	ug/Kg	1.2	6	5
ETHYLBENZENE	<6	ug/Kg	1.2	6	5
NAPHTHALENE	<6	ug/Kg	1.2	6	5
MTBE	<6	ug/Kg	1.2	6	5
TOTAL XYLENES	<6	ug/Kg	1.2	6	5
DIBROMOFLUOROMETHANE	101	%	1.2		
1,2-DICHLOROETHANE-D4	100	%	1.2		
TOLUENE-D8	88	%	1.2		
P-BROMOFLUOROBENZENE	72	%	1.2		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-3
SDG: WP2689
Report Date: 7/2/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 89
Method: SW8260
Date Analyzed: 6/2/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31SLB041112	SL	5/28/99	5/29/99	6/2/99	KRT	5030	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/Kg	1.0	5	5
TOLUENE	<5	ug/Kg	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/Kg	1.0	5	5
ETHYLBENZENE	<5	ug/Kg	1.0	5	5
NAPHTHALENE	J3	ug/Kg	1.0	5	5
MTBE	<5	ug/Kg	1.0	5	5
TOTAL XYLENES	<5	ug/Kg	1.0	5	5
DIBROMOFLUOROMETHANE	129	%	1.0		
1,2-DICHLOROETHANE-D4	131	%	1.0		
TOLUENE-D8	79	%	1.0		
-BROMOFLUOROBENZENE	$51	%	1.0		

port Notes: J, $, O-13

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-3RA
SDG: WP2689
Report Date: 7/2/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 89
Method: SW8260
Date Analyzed: 6/4/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31SLB041112	SL	5/28/99	5/29/99	6/4/99	KMC	5030	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<6	ug/Kg	1.3	6	5
TOLUENE	<6	ug/Kg	1.3	6	5
1,2-DIBROMOETHANE	<6	ug/Kg	1.3	6	5
ETHYLBENZENE	<6	ug/Kg	1.3	6	5
NAPHTHALENE	<6	ug/Kg	1.3	6	5
MTBE	<6	ug/Kg	1.3	6	5
TOTAL XYLENES	<6	ug/Kg	1.3	6	5
DIBROMOFLUOROMETHANE	0	%	1.3		
1,2-DICHLOROETHANE-D4	0	%	1.3		
TOLUENE-D6	0	%	1.3		
P-BROMOFLUOROBENZENE	0	%	1.3		

Report Notes: ,Surrogates not spiked due to laboratory error

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-4
SDG: WP2689
Report Date: 7/2/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 89
Method: SW8260
Date Analyzed: 6/2/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31SLB050910	SL	5/28/99	5/29/99	6/2/99	KRT	5030	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<8	ug/Kg	1.3	6	5
TOLUENE	<6	ug/Kg	1.3	6	5
1,2-DIBROMOETHANE	<6	ug/Kg	1.3	8	5
ETHYLBENZENE	<6	ug/Kg	1.3	6	5
NAPHTHALENE	<6	ug/Kg	1.3	6	5
MTBE	<6	ug/Kg	1.3	6	5
TOTAL XYLENES	<6	ug/Kg	1.3	6	5
DIBROMOFLUOROMETHANE	85	%	1.3		
1,2-DICHLOROETHANE-D4	83	%	1.3		
TOLUENE-D8	67	%	1.3		
P-BROMOFLUOROBENZENE	92	%	1.3		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-5
SDG: WP2689
Report Date: 7/2/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 83
Method: SW8260
Date Analyzed: 6/2/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31SLB061112	SL	5/28/99	5/29/99	6/2/99	KRT	5030	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<6	ug/Kg	1.2	6	5
TOLUENE	<6	ug/Kg	1.2	6	5
1,2-DIBROMOETHANE	<6	ug/Kg	1.2	6	5
ETHYLBENZENE	<6	ug/Kg	1.2	6	5
NAPHTHALENE	<6	ug/Kg	1.2	6	5
MTBE	<6	ug/Kg	1.2	6	5
TOTAL XYLENES	<6	ug/Kg	1.2	6	5
DIBROMOFLUOROMETHANE	88	%	1.2		
1,2-DICHLOROETHANE-D4	84	%	1.2		
TOLUENE-D8	85	%	1.2		
P-BROMOFLUOROBENZENE	78	%	1.2		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-6
SDG: WP2689
Report Date: 7/2/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 88
Method: SW8260
Date Analyzed: 6/2/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31SLB071011	SL	5/28/99	5/29/99	6/2/99	KRT	5030	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<6	ug/Kg	1.2	6	5
TOLUENE	<6	ug/Kg	1.2	6	5
1,2-DIBROMOETHANE	<6	ug/Kg	1.2	6	5
ETHYLBENZENE	<6	ug/Kg	1.2	6	5
NAPHTHALENE	J5	ug/Kg	1.2	6	5
MTBE	<6	ug/Kg	1.2	6	5
TOTAL XYLENES	<6	ug/Kg	1.2	6	5
DIBROMOFLUOROMETHANE	85	%	1.2		
1,2-DICHLOROETHANE-D4	84	%	1.2		
TOLUENE-D8	87	%	1.2		
P-BROMOFLUOROBENZENE	85	%	1.2		

Report Notes: J

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-7
SDG: WP2689
Report Date: 7/2/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 83
Method: SW8260
Date Analyzed: 6/2/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31SLB021112D	SL	5/28/99	5/29/99	6/2/99	KRT	5030	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<6	ug/Kg	1.2	6	5
TOLUENE	<6	ug/Kg	1.2	6	5
1,2-DIBROMOETHANE	<6	ug/Kg	1.2	6	5
ETHYLBENZENE	<6	ug/Kg	1.2	6	5
NAPHTHALENE	J3	ug/Kg	1.2	6	5
MTBE	<6	ug/Kg	1.2	6	5
TOTAL XYLENES	J3	ug/Kg	1.2	6	5
DIBROMOFLUOROMETHANE	70	%	1.2		
1,2-DICHLOROETHANE-D4	68	%	1.2		
TOLUENE-D8	75	%	1.2		
P-BROMOFLUOROBENZENE	75	%	1.2		

Report Notes: J

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-8
SDG: WP2689
Report Date: 7/2/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 83
Method: SW8260
Date Analyzed: 6/2/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31SLB031112	SL	5/28/99	5/29/99	6/2/99	KRT	5030	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	10	ug/Kg	1.2	6	5
TOLUENE	150	ug/Kg	1.2	6	5
1,2-DIBROMOETHANE	<6	ug/Kg	1.2	6	5
ETHYLBENZENE	E1200	ug/Kg	1.2	6	5
NAPHTHALENE	E310	ug/Kg	1.2	6	5
MTBE	<6	ug/Kg	1.2	6	5
TOTAL XYLENES	6800	ug/Kg	1.2	6	5
DIBROMOFLUOROMETHANE	85	%	1.2		
1,2-DICHLOROETHANE-D4	91	%	1.2		
TOLUENE-D6	#52	%	1.2		
P-BROMOFLUOROBENZENE	#363	%	1.2		

Report Notes: E, #

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-8DL
SDG: WP2689
Report Date: 7/2/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 83
Method: SW8260
Date Analyzed: 6/4/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31SLB031112	SL	5/28/99	5/29/99	6/4/99	DJP	5030	DJP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<650	ug/Kgdrywt	130	650	5
TOLUENE	<650	ug/Kgdrywt	130	650	5
1,2-DIBROMOETHANE	<650	ug/Kgdrywt	130	650	5
ETHYLBENZENE	930	ug/Kgdrywt	130	650	5
NAPHTHALENE	4500	ug/Kgdrywt	130	650	5
MTBE	<650	ug/Kgdrywt	130	650	5
TOTAL XYLENES	6500	ug/Kgdrywt	130	650	5
DIBROMOFLUOROMETHANE	92	%	130		
1,2-DICHLOROETHANE-D4	97	%	130		
TOLUENE-D8	94	%	130		
P-BROMOFLUOROBENZENE	111	%	130		

Report Notes: O-1, O-2

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-9
SDG: WP2689
Report Date: 7/2/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 6/4/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
01F00102	AQ	5/28/99	5/29/99	6/4/99	DJP	5030	DJP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	92	%	1.0		
1,2-DICHLOROETHANE-D4	93	%	1.0		
TOLUENE-D8	94	%	1.0		
P-BROMOFLUOROBENZENE	85	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-10
SDG: WP2689
Report Date: 7/2/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 6/2/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
01E00102	AQ	5/28/99	5/29/99	6/2/99	DJP	5030	DJP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	104	%	1.0		
1,2-DICHLOROETHANE-D4	120	%	1.0		
TOLUENE-D8	108	%	1.0		
P-BROMOFLUOROBENZENE	106	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-11
SDG: WP2689
Report Date: 7/2/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: -
Method: SW8260
Date Analyzed: 6/2/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31TL00101	SL	5/28/99	5/29/99	6/2/99	DJP	5035	DJP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/Kgdrywt	1.0	5	5
TOLUENE	<5	ug/Kgdrywt	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/Kgdrywt	1.0	5	5
ETHYLBENZENE	<5	ug/Kgdrywt	1.0	5	5
NAPHTHALENE	<5	ug/Kgdrywt	1.0	5	5
MTBE	<5	ug/Kgdrywt	1.0	5	5
TOTAL XYLENES	<5	ug/Kgdrywt	1.0	5	5
DIBROMOFLUOROMETHANE	106	%	1.0		
1,2-DICHLOROETHANE-D4	123	%	1.0		
OLUENE-D8	108	%	1.0		
P-BROMOFLUOROBENZENE	105	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES

Summary of Report Notes

Report Note	Note Text
#	'#' flag denotes surrogate compound recovery is out of criteria.
$	'$' flag denotes surrogate compound recovery is out of criteria. Re-extraction or re-analysis confirmed matrix interference.
E	'E' flag indicates an estimated value. The analyte was detected in the sample at a concentration greater than the standard calibration range.
J	'J' flag denotes an estimated value less than the Laboratory's Practical Quantitation Level.
O-1	Sample dilution required due to matrix interference, sample viscosity or other matrix-related problem; therefore, standard laboratory Practical Quantitation Level (PQL) could not be achieved.
O-13	Internal standard area(s) are out of criteria. Reanalysis confirmedmatrix interference.
O-2	Sample dilution required for quantitation of one or more target analytes; therefore, standard laboratory Practical Quantitation Level (PQL) could not be achieved.

2A
WATER VOLATILE SYSTEM MONITORING COMPOUND RECOVERY

Lab Name: Katahdin Analytical Services SDG No.: WP2689

Matrix: WATER

Client Sample ID	Lab Sample ID	SMC1 (DFM) #	SMC2 (DCA) #	SMC3 (TOL) #	SMC4 (BFB) #	Total Out
LCSF03A	LCSF03A	92	90	94	97	0
VBLKF03B	VBLKF03B	91	92	93	87	0
01F00102	WP2689-9	92	93	94	85	0
LCSF04A	LCSF04A	91	95	93	96	0
VBLKF04A	VBLKF04A	92	98	94	88	0
LCSS02A	LCSS02A	104	119	109	110	0
VBLKS02A	VBLKS02A	105	125	108	106	0
01E00102	WP2689-10	104	120	108	106	0

QC LIMITS

SMC1	(DFM)	=	DIBROMOFLUOROMETHANE	(75-129)
SMC2	(DCA)	=	1,2-DICHLOROETHANE-D4	(65-135)
SMC3	(TOL)	=	TOLUENE-D8	(82-120)
SMC4	(BFB)	=	P-BROMOFLUOROBENZENE	(69-125)

Column to be used to flag recovery value

* Values are outside of QC limits

2A

SOIL VOLATILE SYSTEM MONITORING COMPOUND RECOVERY

Lab Name: Katahdin Analytical Services

SDG No.: WP2689

Matrix: SOIL

Client Sample ID	Lab Sample ID	SMC1 (DFM) #	SMC2 (DCA) #	SMC3 (TOL) #	SMC4 (BFB) #	Total Out
31SLB031112DL	WP2689-8DL	92	97	94	111	0
31TL00101	WP2689-11	106	123	106	105	0
LCSZ02A	LCSZ02A	90	94	97	94	0
VBLKZ02A	VBLKZ02A	110	110	112	97	0
31SLB011112	WP2689-1	96	94	87	77	0
31SLB021112	WP2689-2	101	100	88	72	0
31SLB041112	WP2689-3	129	131	79	51 *	1
31SLB050910	WP2689-4	85	83	87	92	0
31SLB061112	WP2689-5	88	84	85	78	0
31SLB031112	WP2689-8	85	91	52 *	363 *	2
31SLB071011	WP2689-6	85	84	87	85	0
31SLB021112D	WP2689-7	70	68	75	75	0
LCSZ04A	LCSZ04A	110	115	113	110	0
VBLKZ04A	VBLKZ04A	122	124	113	109	0
31SLB041112	WP2689-3RA	3.9 *	3.9 *	2.2 *	3.2 *	4

QC LIMITS

SMC1	(DFM)	=	DIBROMOFLUOROMETHANE	(69-148)
SMC2	(DCA)	=	1,2-DICHLOROETHANE-D4	(66-149)
SMC3	(TOL)	=	TOLUENE-D8	(68-147)
SMC4	(BFB)	=	P-BROMOFLUOROBENZENE	(64-152)

Column to be used to flag recovery value

* Values are outside of QC limits

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: VBLKS02A
SDG: WP2689
Report Date: 7/2/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 6/2/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
VBLKS02A	AQ	-	-	6/2/99	DJP	5030	DJP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	105	%	1.0		
1,2-DICHLOROETHANE-D4	125	%	1.0		
TOLUENE-D8	108	%	1.0		
P-BROMOFLUOROBENZENE	106	%	1.0		

Report Notes:

1000357

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: VBLKZ02A
SDG: WP2689
Report Date: 7/2/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 100
Method: SW8260
Date Analyzed: 6/2/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
VBLKZ02A	SL	-	-	6/2/99	KRT	5030	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/Kg	1.0	5	5
TOLUENE	<5	ug/Kg	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/Kg	1.0	5	5
ETHYLBENZENE	<5	ug/Kg	1.0	5	5
NAPHTHALENE	<5	ug/Kg	1.0	5	5
MTBE	<5	ug/Kg	1.0	5	5
TOTAL XYLENES	<5	ug/Kg	1.0	5	5
DIBROMOFLUOROMETHANE	110	%	1.0		
1,2-DICHLOROETHANE-D4	110	%	1.0		
TOLUENE-D8	112	%	1.0		
P-BROMOFLUOROBENZENE	97	%	1.0		

Report Notes:

1000364

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: VBLKF03B
SDG: WP2689
Report Date: 7/2/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 6/3/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
VBLKF03B	AQ	-	-	6/3/99	DJP	5030	DJP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	91	%	1.0		
1,2-DICHLOROETHANE-D4	92	%	1.0		
TOLUENE-D8	93	%	1.0		
P-BROMOFLUOROBENZENE	87	%	1.0		

Report Notes:

1000373

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: VBLKF04A
SDG: WP2689
Report Date: 7/2/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 6/4/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
VBLKF04A	AQ	-	-	6/4/99	DJP	5030	DJP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	92	%	1.0		
1,2-DICHLOROETHANE-D4	98	%	1.0		
TOLUENE-D8	94	%	1.0		
P-BROMOFLUOROBENZENE	88	%	1.0		

Report Notes:

1000378

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: VBLKZ04A
SDG: WP2689
Report Date: 7/2/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 100
Method: SW8260
Date Analyzed: 6/4/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
VBLKZ04A	SL	-	-	6/4/99	KMC	5030	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/Kg	1.0	5	5
TOLUENE	<5	ug/Kg	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/Kg	1.0	5	5
ETHYLBENZENE	<5	ug/Kg	1.0	5	5
NAPHTHALENE	<5	ug/Kg	1.0	5	5
MTBE	<5	ug/Kg	1.0	5	5
TOTAL XYLENES	<5	ug/Kg	1.0	5	5
DIBROMOFLUOROMETHANE	122	%	1.0		
1,2-DICHLOROETHANE-D4	124	%	1.0		
LUENE-D8	113	%	1.0		
BROMOFLUOROBENZENE	109	%	1.0		

port Notes:

1000387

Katahdin Analytical Services
8260 LCS Recovery Sheet

Lab File: S4891 **Sample ID: LCSS02A** **Date Run: 6/2/99**

Analyst: DJP **Time Injected 1:03:00 PM** **Matrix: AQ**

Compound Name	Spike Amt (ug/L)	Result (ug/L)	Rec (%)	Limits (%)
1,2-DIBROMOETHANE	50	44.3	89	60-140
BENZENE	50	49.6	99	60-140
ETHYLBENZENE	50	51.6	103	60-140
MTBE	50	44.8	90	60-140
NAPHTHALENE	50	38.6	77	60-140
TOLUENE	50	47.8	96	60-140
TOTAL XYLENES	150	147	98	60-140

*** Out of Limits** *1*

Katahdin Analytical Services

8260 LCS Recovery Sheet

Lab File: Z0937 **Sample ID: LCSZ02A** **Date Run: 6/2/99**

Analyst: KRT **Time Injected 7:15:00 AM** **Matrix: SL**

Compound Name	Spike Amt (ug/Kg)	Result (ug/Kg)	Rec (%)	Limits (%)
1,2-DIBROMOETHANE	50	51.0	102	60-140
BENZENE	50	51.0	102	60-140
ETHYLBENZENE	50	62.7	125	60-140
MTBE	50	51.1	102	60-140
NAPHTHALENE	50	54.0	108	60-140
TOLUENE	50	56.3	112	60-140
TOTAL XYLENES	150	192	128	60-140

*** Out of Limits** *1*

Katahdin Analytical Services
8260 LCS Recovery Sheet

Lab File: F0728 **Sample ID: LCSF03A** **Date Run: 6/3/99**

Analyst: DJP **Time Injected 10:33:00 PM** **Matrix: AQ**

Compound Name	Spike Amt (ug/L)	Result (ug/L)	Rec (%)	Limits (%)
1,2-DIBROMOETHANE	50	52.8	106	60-140
BENZENE	50	51.0	102	60-140
ETHYLBENZENE	50	49.8	100	60-140
MTBE	50	49.6	99	60-140
NAPHTHALENE	50	48.7	97	60-140
TOLUENE	50	51.3	103	60-140
TOTAL XYLENES	150	146	97	60-140

*** Out of Limits** *1*

Katahdin Analytical Services
8260 LCS Recovery Sheet

Lab File: F0744 **Sample ID: LCSF04A** **Date Run: 6/4/99**

Analyst: DJP **Time Injected 9:14:00 AM** **Matrix: AQ**

Compound Name	Spike Amt (ug/L)	Result (ug/L)	Rec (%)	Limits (%)
1,2-DIBROMOETHANE	50	54.1	108	60-140
BENZENE	50	51.2	102	60-140
ETHYLBENZENE	50	50.6	101	60-140
MTBE	50	50.1	100	60-140
NAPHTHALENE	50	49.3	99	60-140
TOLUENE	50	51.1	102	60-140
TOTAL XYLENES	150	146	98	60-140

*** Out of Limits**

Katahdin Analytical Services

8260 LCS Recovery Sheet

Lab File: Z0972 **Sample ID: LCSZ04A** **Date Run: 6/4/99**

Analyst: KMC **Time Injected 9:27:00 AM** **Matrix: SL**

Compound Name	Spike Amt (ug/Kg)	Result (ug/Kg)	Rec (%)	Limits (%)
1,2-DIBROMOETHANE	50	58.3	116	60-140
BENZENE	50	54.8	110	60-140
ETHYLBENZENE	50	65.9	132	60-140
MTBE	50	56.5	113	60-140
NAPHTHALENE	50	50.5	101	60-140
TOLUENE	50	59.1	118	60-140
TOTAL XYLENES	150	202	135	60-140

*** Out of Limits**

1

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-1
SDG: WP2689
Report Date: 7/27/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 86
Method: EPA 8270
Date Analyzed: 7/6/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31SLB011112	SL	5/28/99	5/29/99	6/4/99	DPD	EPA 3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<400	ug/Kg	1.2	400	330
2-METHYLNAPHTHALENE	<400	ug/Kg	1.2	400	330
ACENAPHTHYLENE	<400	ug/Kg	1.2	400	330
ACENAPHTHENE	<400	ug/Kg	1.2	400	330
FLUORENE	<400	ug/Kg	1.2	400	330
PHENANTHRENE	<400	ug/Kg	1.2	400	330
ANTHRACENE	<400	ug/Kg	1.2	400	330
FLUORANTHENE	<400	ug/Kg	1.2	400	330
PYRENE	<400	ug/Kg	1.2	400	330
ENZO[A]ANTHRACENE	<400	ug/Kg	1.2	400	330
RYSENE	<400	ug/Kg	1.2	400	330
BENZO[B]FLUORANTHENE	<400	ug/Kg	1.2	400	330
BENZO[K]FLUORANTHENE	<400	ug/Kg	1.2	400	330
BENZO[A]PYRENE	<400	ug/Kg	1.2	400	330
INDENO[1,2,3-CD]PYRENE	<400	ug/Kg	1.2	400	330
DIBENZ[A,H]ANTHRACENE	<400	ug/Kg	1.2	400	330
BENZO[G,H,I]PERYLENE	<400	ug/Kg	1.2	400	330
NITROBENZENE-D5	67	%	1.2		
2-FLUOROBIPHENYL	68	%	1.2		
TERPHENYL-D14	62	%	1.2		

ort Notes:

0000015

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-2
SDG: WP2689
Report Date: 7/27/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 82
Method: EPA 8270
Date Analyzed: 7/6/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31SLB021112	SL	5/28/99	5/29/99	6/4/99	DPD	EPA 3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<400	ug/Kg	1.2	400	330
2-METHYLNAPHTHALENE	<400	ug/Kg	1.2	400	330
ACENAPHTHYLENE	<400	ug/Kg	1.2	400	330
ACENAPHTHENE	<400	ug/Kg	1.2	400	330
FLUORENE	<400	ug/Kg	1.2	400	330
PHENANTHRENE	<400	ug/Kg	1.2	400	330
ANTHRACENE	<400	ug/Kg	1.2	400	330
FLUORANTHENE	<400	ug/Kg	1.2	400	330
PYRENE	<400	ug/Kg	1.2	400	330
BENZO[A]ANTHRACENE	<400	ug/Kg	1.2	400	330
CHRYSENE	<400	ug/Kg	1.2	400	330
BENZO[B]FLUORANTHENE	<400	ug/Kg	1.2	400	330
BENZO[K]FLUORANTHENE	<400	ug/Kg	1.2	400	330
BENZO[A]PYRENE	<400	ug/Kg	1.2	400	330
INDENO[1,2,3-CD]PYRENE	<400	ug/Kg	1.2	400	330
DIBENZ[A,H]ANTHRACENE	<400	ug/Kg	1.2	400	330
BENZO[G,H,I]PERYLENE	<400	ug/Kg	1.2	400	330
NITROBENZENE-D5	64	%	1.2		
2-FLUOROBIPHENYL	59	%	1.2		
TERPHENYL-D14	70	%	1.2		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-3
SDG: WP2689
Report Date: 7/27/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 89
Method: EPA 8270
Date Analyzed: 7/13/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31SLB041112	SL	5/28/99	5/29/99	6/4/99	DPD	EPA 3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<7300	ug/Kg	23	7300	330
2-METHYLNAPHTHALENE	<7300	ug/Kg	23	7300	330
ACENAPHTHYLENE	<7300	ug/Kg	23	7300	330
ACENAPHTHENE	<7300	ug/Kg	23	7300	330
FLUORENE	<7300	ug/Kg	23	7300	330
PHENANTHRENE	<7300	ug/Kg	23	7300	330
ANTHRACENE	<7300	ug/Kg	23	7300	330
FLUORANTHENE	<7300	ug/Kg	23	7300	330
PYRENE	<7300	ug/Kg	23	7300	330
BENZO[A]ANTHRACENE	<7300	ug/Kg	23	7300	330
CHRYSENE	<7300	ug/Kg	23	7300	330
BENZO[B]FLUORANTHENE	<7300	ug/Kg	23	7300	330
BENZO[K]FLUORANTHENE	<7300	ug/Kg	23	7300	330
BENZO[A]PYRENE	<7300	ug/Kg	23	7300	330
INDENO[1,2,3-CD]PYRENE	<7300	ug/Kg	23	7300	330
DIBENZ[A,H]ANTHRACENE	<7300	ug/Kg	23	7300	330
BENZO[G,H,I]PERYLENE	<7300	ug/Kg	23	7300	330
NITROBENZENE-D5	DL	%	23		
2-FLUOROBIPHENYL	DL	%	23		
TERPHENYL-D14	DL	%	23		

ort Notes: O-1, DL

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-4
SDG: WP2689
Report Date: 7/27/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 89
Method: EPA 8270
Date Analyzed: 7/6/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31SLB050910	SL	5/28/99	5/29/99	6/4/99	DPD	EPA 3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<360	ug/Kg	1.1	360	330
2-METHYLNAPHTHALENE	<360	ug/Kg	1.1	360	330
ACENAPHTHYLENE	<360	ug/Kg	1.1	360	330
ACENAPHTHENE	<360	ug/Kg	1.1	360	330
FLUORENE	<360	ug/Kg	1.1	360	330
PHENANTHRENE	<360	ug/Kg	1.1	360	330
ANTHRACENE	<360	ug/Kg	1.1	360	330
FLUORANTHENE	<360	ug/Kg	1.1	360	330
PYRENE	<360	ug/Kg	1.1	360	330
BENZO[A]ANTHRACENE	<360	ug/Kg	1.1	360	330
CHRYSENE	<360	ug/Kg	1.1	360	330
BENZO[B]FLUORANTHENE	<360	ug/Kg	1.1	360	330
BENZO[K]FLUORANTHENE	<360	ug/Kg	1.1	360	330
BENZO[A]PYRENE	<360	ug/Kg	1.1	360	330
INDENO[1,2,3-CD]PYRENE	<360	ug/Kg	1.1	360	330
DIBENZ[A,H]ANTHRACENE	<360	ug/Kg	1.1	360	330
BENZO[G,H,I]PERYLENE	<360	ug/Kg	1.1	360	330
NITROBENZENE-D5	70	%	1.1		
2-FLUOROBIPHENYL	64	%	1.1		
TERPHENYL-D14	83	%	1.1		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-5
SDG: WP2689
Report Date: 7/27/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 83
Method: EPA 8270
Date Analyzed: 7/6/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31SLB061112	SL	5/28/99	5/29/99	6/7/99	PMM	EPA 3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<400	ug/Kg	1.2	400	330
2-METHYLNAPHTHALENE	<400	ug/Kg	1.2	400	330
ACENAPHTHYLENE	<400	ug/Kg	1.2	400	330
ACENAPHTHENE	<400	ug/Kg	1.2	400	330
FLUORENE	<400	ug/Kg	1.2	400	330
PHENANTHRENE	<400	ug/Kg	1.2	400	330
ANTHRACENE	<400	ug/Kg	1.2	400	330
FLUORANTHENE	<400	ug/Kg	1.2	400	330
PYRENE	<400	ug/Kg	1.2	400	330
NZO[A]ANTHRACENE	<400	ug/Kg	1.2	400	330
HRYSENE	<400	ug/Kg	1.2	400	330
BENZO[B]FLUORANTHENE	<400	ug/Kg	1.2	400	330
BENZO[K]FLUORANTHENE	<400	ug/Kg	1.2	400	330
BENZO[A]PYRENE	<400	ug/Kg	1.2	400	330
INDENO[1,2,3-CD]PYRENE	<400	ug/Kg	1.2	400	330
DIBENZ[A,H]ANTHRACENE	<400	ug/Kg	1.2	400	330
BENZO[G,H,I]PERYLENE	<400	ug/Kg	1.2	400	330
NITROBENZENE-D5	54	%	1.2		
2-FLUOROBIPHENYL	55	%	1.2		
TERPHENYL-D14	76	%	1.2		

ort Notes:

0000019

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-6
SDG: WP2689
Report Date: 7/27/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 88
Method: EPA 8270
Date Analyzed: 7/6/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31SLB071011	SL	5/28/99	5/29/99	6/7/99	PMM	EPA 3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<360	ug/Kg	1.1	360	330
2-METHYLNAPHTHALENE	<360	ug/Kg	1.1	360	330
ACENAPHTHYLENE	<360	ug/Kg	1.1	360	330
ACENAPHTHENE	<360	ug/Kg	1.1	360	330
FLUORENE	<360	ug/Kg	1.1	360	330
PHENANTHRENE	<360	ug/Kg	1.1	360	330
ANTHRACENE	<360	ug/Kg	1.1	360	330
FLUORANTHENE	<360	ug/Kg	1.1	360	330
PYRENE	<360	ug/Kg	1.1	360	330
BENZO[A]ANTHRACENE	<360	ug/Kg	1.1	360	330
CHRYSENE	<360	ug/Kg	1.1	360	330
BENZO[B]FLUORANTHENE	<360	ug/Kg	1.1	360	330
BENZO[K]FLUORANTHENE	<360	ug/Kg	1.1	360	330
BENZO[A]PYRENE	<360	ug/Kg	1.1	360	330
INDENO[1,2,3-CD]PYRENE	<360	ug/Kg	1.1	360	330
DIBENZ[A,H]ANTHRACENE	<360	ug/Kg	1.1	360	330
BENZO[G,H,I]PERYLENE	<360	ug/Kg	1.1	360	330
NITROBENZENE-D5	63	%	1.1		
2-FLUOROBIPHENYL	61	%	1.1		
TERPHENYL-D14	108	%	1.1		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-7
SDG: WP2689
Report Date: 7/27/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 83
Method: EPA 8270
Date Analyzed: 7/6/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31SLB021112D	SL	5/28/99	5/29/99	6/7/99	PMM	EPA 3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<400	ug/Kg	1.2	400	330
2-METHYLNAPHTHALENE	<400	ug/Kg	1.2	400	330
ACENAPHTHYLENE	<400	ug/Kg	1.2	400	330
ACENAPHTHENE	<400	ug/Kg	1.2	400	330
FLUORENE	<400	ug/Kg	1.2	400	330
PHENANTHRENE	<400	ug/Kg	1.2	400	330
ANTHRACENE	<400	ug/Kg	1.2	400	330
FLUORANTHENE	<400	ug/Kg	1.2	400	330
PYRENE	<400	ug/Kg	1.2	400	330
NZO[A]ANTHRACENE	<400	ug/Kg	1.2	400	330
RYSENE	<400	ug/Kg	1.2	400	330
BENZO[B]FLUORANTHENE	<400	ug/Kg	1.2	400	330
BENZO[K]FLUORANTHENE	<400	ug/Kg	1.2	400	330
BENZO[A]PYRENE	<400	ug/Kg	1.2	400	330
INDENO[1,2,3-CD]PYRENE	<400	ug/Kg	1.2	400	330
DIBENZ[A,H]ANTHRACENE	<400	ug/Kg	1.2	400	330
BENZO[G,H,I]PERYLENE	<400	ug/Kg	1.2	400	330
NITROBENZENE-D5	65	%	1.2		
2-FLUOROBIPHENYL	63	%	1.2		
TERPHENYL-D14	85	%	1.2		

ort Notes:

0000021

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-8
SDG: WP2689
Report Date: 7/27/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 83
Method: EPA 8270
Date Analyzed: 7/15/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31SLB031112	SL	5/28/99	5/29/99	6/7/99	PMM	EPA 3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<7900	ug/Kg	24	7900	330
2-METHYLNAPHTHALENE	8900	ug/Kg	24	7900	330
ACENAPHTHYLENE	<7900	ug/Kg	24	7900	330
ACENAPHTHENE	<7900	ug/Kg	24	7900	330
FLUORENE	<7900	ug/Kg	24	7900	330
PHENANTHRENE	<7900	ug/Kg	24	7900	330
ANTHRACENE	<7900	ug/Kg	24	7900	330
FLUORANTHENE	<7900	ug/Kg	24	7900	330
PYRENE	<7900	ug/Kg	24	7900	330
BENZO[A]ANTHRACENE	<7900	ug/Kg	24	7900	330
CHRYSENE	<7900	ug/Kg	24	7900	330
BENZO[B]FLUORANTHENE	<7900	ug/Kg	24	7900	330
BENZO[K]FLUORANTHENE	<7900	ug/Kg	24	7900	330
BENZO[A]PYRENE	<7900	ug/Kg	24	7900	330
INDENO[1,2,3-CD]PYRENE	<7900	ug/Kg	24	7900	330
DIBENZ[A,H]ANTHRACENE	<7900	ug/Kg	24	7900	330
BENZO[G,H,I]PERYLENE	<7900	ug/Kg	24	7900	330
NITROBENZENE-D5	DL	%	24		
2-FLUOROBIPHENYL	DL	%	24		
TERPHENYL-D14	DL	%	24		

Report Notes: DL, O-1

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-9
SDG: WP2689
Report Date: 7/27/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: EPA 8270
Date Analyzed: 7/8/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
01F00102	AQ	5/28/99	5/29/99	6/2/99	PMM	EPA 3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.0	10	10
ACENAPHTHYLENE	<10	ug/L	1.0	10	10
ACENAPHTHENE	<10	ug/L	1.0	10	10
FLUORENE	<10	ug/L	1.0	10	10
PHENANTHRENE	<10	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
PYRENE	<10	ug/L	1.0	10	10
ZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
RYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	61	%	1.0		
2-FLUOROBIPHENYL	57	%	1.0		
TERPHENYL-D14	73	%	1.0		

rt Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2689-10
SDG: WP2689
Report Date: 7/27/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: EPA 8270
Date Analyzed: 7/7/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
01E00102	AQ	5/28/99	5/29/99	6/2/99	PMM	EPA 3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<11	ug/L	1.1	11	10
2-METHYLNAPHTHALENE	<11	ug/L	1.1	11	10
ACENAPHTHYLENE	<11	ug/L	1.1	11	10
ACENAPHTHENE	<11	ug/L	1.1	11	10
FLUORENE	<11	ug/L	1.1	11	10
PHENANTHRENE	<11	ug/L	1.1	11	10
ANTHRACENE	<11	ug/L	1.1	11	10
FLUORANTHENE	<11	ug/L	1.1	11	10
PYRENE	<11	ug/L	1.1	11	10
BENZO[A]ANTHRACENE	<11	ug/L	1.1	11	10
CHRYSENE	<11	ug/L	1.1	11	10
BENZO[B]FLUORANTHENE	<11	ug/L	1.1	11	10
BENZO[K]FLUORANTHENE	<11	ug/L	1.1	11	10
BENZO[A]PYRENE	<11	ug/L	1.1	11	10
INDENO[1,2,3-CD]PYRENE	<11	ug/L	1.1	11	10
DIBENZ[A,H]ANTHRACENE	<11	ug/L	1.1	11	10
BENZO[G,H,I]PERYLENE	<11	ug/L	1.1	11	10
NITROBENZENE-D5	45	%	1.1		
2-FLUOROBIPHENYL	#44	%	1.1		
TERPHENYL-D14	69	%	1.1		

Report Notes: #

KATAHDIN ANALYTICAL SERVICES

Summary of Report Notes

Report Note	Note Text
#	'#' flag denotes surrogate compound recovery is out of criteria.
DL	'DL' flag denotes inability to calculate surrogate recovery due to sample dilution.
O-1	Sample dilution required due to matrix interference, sample viscosity or other matrix-related problem; therefore, standard laboratory Practical Quantitation Level (PQL) could not be achieved.

2A

WATER SEMIVOLATILE SYSTEM MONITORING COMPOUND RECOVERY

Lab Name: Katahdin Analytical Services

SDG No.: WP2689

Matrix: WATER

Client Sample ID	Lab Sample ID	SMC1 (NBZ) #	SMC2 (FBP) #	SMC3 (TPH) #	Total Out
SBLK;060299	SBLK;060299	61	56	74	0
LCS;060299	LCS;060299	66	61	93	0
01E00102	WP2689-10	45	44*	69	1
01F00102	WP2689-9	61	57	73	0

QC LIMITS

SMC1	(NBZ)	=	NITROBENZENE-D5	(36-117)
SMC2	(FBP)	=	2-FLUOROBIPHENYL	(47-114)
SMC3	(TPH)	=	TERPHENYL-D14	(35-126)

Column to be used to flag recovery value

* Values are outside of QC limits

FORM II SVOA-1

2A

SOIL SEMIVOLATILE SYSTEM MONITORING COMPOUND RECOVERY

Lab Name: Katahdin Analytical Services

SDG No.: WP2689

Matrix: SOIL

Client Sample ID	Lab Sample ID	SMC1 (NBZ) #	SMC2 (FBP) #	SMC3 (TPH) #	Total Out
SBLK;060799	SBLK;060799	69	64	58	0
31SLB011112	WP2689-1	67	68	62	0
31SLB021112	WP2689-2	64	59	70	0
31SLB050910	WP2689-4	70	64	83	0
31SLB061112	WP2689-5	54	55	76	0
31SLB071011	WP2689-6	63	61	108	0
31SLB021112D	WP2689-7	65	63	85	0
31SLB041112	WP2689-3	DL	DL	DL	0
LCS;060499	LCS;060499	68	77	80	0
SBLK;060499	SBLK;060499	61	70	74	0
SBLKA;060799	SBLKA;060799	69	75	82	0
LCS;060799	LCS;060799	73	75	82	0
31SLB031112	WP2689-8	DL	DL	DL	0

QC LIMITS

SMC1	(NBZ)	=	NITROBENZENE-D5	(14-107)
SMC2	(FBP)	=	2-FLUOROBIPHENYL	(32-109)
SMC3	(TPH)	=	TERPHENYL-D14	(26-116)

Column to be used to flag recovery value

* Values are outside of QC limits

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: SBLK;060299
SDG: WP2689
Report Date: 7/27/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: EPA 8270
Date Analyzed: 7/3/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
SBLK;060299	AQ	-	-	6/2/99	PMM	EPA 3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.0	10	10
ACENAPHTHYLENE	<10	ug/L	1.0	10	10
ACENAPHTHENE	<10	ug/L	1.0	10	10
FLUORENE	<10	ug/L	1.0	10	10
PHENANTHRENE	<10	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
PYRENE	<10	ug/L	1.0	10	10
BENZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
CHRYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	61	%	1.0		
2-FLUOROBIPHENYL	56	%	1.0		
TERPHENYL-D14	74	%	1.0		

Report Notes:

2000512

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: SBLK;060799
SDG: WP2689
Report Date: 7/27/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 100
Method: EPA 8270
Date Analyzed: 7/6/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
SBLK;060799	SL	-	-	6/7/99	PMM	EPA 3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<330	ug/Kg	1.0	330	330
2-METHYLNAPHTHALENE	<330	ug/Kg	1.0	330	330
ACENAPHTHYLENE	<330	ug/Kg	1.0	330	330
ACENAPHTHENE	<330	ug/Kg	1.0	330	330
FLUORENE	<330	ug/Kg	1.0	330	330
PHENANTHRENE	<330	ug/Kg	1.0	330	330
ANTHRACENE	<330	ug/Kg	1.0	330	330
FLUORANTHENE	<330	ug/Kg	1.0	330	330
PYRENE	<330	ug/Kg	1.0	330	330
BENZO[A]ANTHRACENE	<330	ug/Kg	1.0	330	330
CHRYSENE	<330	ug/Kg	1.0	330	330
BENZO[B]FLUORANTHENE	<330	ug/Kg	1.0	330	330
BENZO[K]FLUORANTHENE	<330	ug/Kg	1.0	330	330
BENZO[A]PYRENE	<330	ug/Kg	1.0	330	330
INDENO[1,2,3-CD]PYRENE	<330	ug/Kg	1.0	330	330
DIBENZ[A,H]ANTHRACENE	<330	ug/Kg	1.0	330	330
BENZO[G,H,I]PERYLENE	<330	ug/Kg	1.0	330	330
NITROBENZENE-D5	69	%	1.0		
2-FLUOROBIPHENYL	64	%	1.0		
TERPHENYL-D14	58	%	1.0		

Report Notes:

2000520

Katahdin Analytical Services
8270 LCS Recovery Sheet

Lab File: Z1218 **Sample ID: LCS;060299** **Date Run: 7/4/99**

Analyst: KRT **Time Injected 12:01:00 AM** **Matrix: AQ**

Compound Name	Spike Amt (ug/L)	Result (ug/L)	Rec (%)	Limits (%)
2-METHYLNAPHTHALENE	50	28.0	*56	70-130
ACENAPHTHENE	50	30.6	*61	70-130
ACENAPHTHYLENE	50	31.8	*64	70-130
ANTHRACENE	50	30.8	*62	70-130
BENZO[A]ANTHRACENE	50	34.4	*69	70-130
BENZO[A]PYRENE	50	31.2	*62	70-130
BENZO[B]FLUORANTHENE	50	37.4	75	70-130
BENZO[G,H,I]PERYLENE	50	21.2	*42	70-130
BENZO[K]FLUORANTHENE	50	33.4	*67	70-130
CHRYSENE	50	31.1	*62	70-130
DIBENZ[A,H]ANTHRACENE	50	26.1	*52	70-130
FLUORANTHENE	50	29.0	*58	70-130
FLUORENE	50	30.5	*61	70-130
INDENO[1,2,3-CD]PYRENE	50	22.0	*44	70-130
NAPHTHALENE	50	29.5	*59	70-130
PHENANTHRENE	50	34.0	*68	70-130
PYRENE	50	41.3	82	70-130

*** Out of Limits** *1*

Katahdin Analytical Services
8270 LCS Recovery Sheet

Lab File: X2201 **Sample ID: LCS;060499** **Date Run: 7/13/99**

Analyst: KRT **Time Injected 10:59:00 PM** **Matrix: SL**

Compound Name	Spike Amt (ug/Kg)	Result (ug/Kg)	Rec (%)	Limits (%)
2-METHYLNAPHTHALENE	1667	1330	80	60-140
ACENAPHTHENE	1667	1300	78	60-140
ACENAPHTHYLENE	1667	1330	80	60-140
ANTHRACENE	1667	1300	78	60-140
BENZO[A]ANTHRACENE	1667	1220	73	60-140
BENZO[A]PYRENE	1667	1300	78	60-140
BENZO[B]FLUORANTHENE	1667	1280	77	60-140
BENZO[G,H,I]PERYLENE	1667	1370	82	60-140
BENZO[K]FLUORANTHENE	1667	1310	79	60-140
CHRYSENE	1667	1280	76	60-140
DIBENZ[A,H]ANTHRACENE	1667	1340	80	60-140
FLUORANTHENE	1667	1410	84	60-140
FLUORENE	1667	1350	81	60-140
INDENO[1,2,3-CD]PYRENE	1667	1580	95	60-140
NAPHTHALENE	1667	1220	73	60-140
PHENANTHRENE	1667	1340	80	60-140
PYRENE	1667	1170	70	60-140

*** Out of Limits**

Katahdin Analytical Services
8270 LCS Recovery Sheet

Lab File: Z1342 **Sample ID: LCS;060799** **Date Run: 7/12/99**

Analyst: KRT **Time Injected 8:41:00 PM** **Matrix: SL**

Compound Name	Spike Amt (ug/Kg)	Result (ug/Kg)	Rec (%)	Limits (%)
2-METHYLNAPHTHALENE	1667	1300	78	60-140
ACENAPHTHENE	1667	1310	79	60-140
ACENAPHTHYLENE	1667	1250	75	60-140
ANTHRACENE	1667	1270	76	60-140
BENZO[A]ANTHRACENE	1667	1210	73	60-140
BENZO[A]PYRENE	1667	1260	76	60-140
BENZO[B]FLUORANTHENE	1667	1210	72	60-140
BENZO[G,H,I]PERYLENE	1667	1540	92	60-140
BENZO[K]FLUORANTHENE	1667	1380	83	60-140
CHRYSENE	1667	1280	77	60-140
DIBENZ[A,H]ANTHRACENE	1667	1450	87	60-140
FLUORANTHENE	1667	1380	83	60-140
FLUORENE	1667	1380	82	60-140
INDENO[1,2,3-CD]PYRENE	1667	1720	103	60-140
NAPHTHALENE	1667	1250	75	60-140
PHENANTHRENE	1667	1360	82	60-140
PYRENE	1667	1210	72	60-140

*** Out of Limits** *1*

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-2689-1
Report Date: 07/28/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
31SLB011112	Solid	R. HILL	05/28/99	05/29/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	86.	wt %	1.0	0.10	CLP/CIP SOW	06/03/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 06/02/99 by JF

07/28/99

LJO/baeajc(dw)/msm
PF02TSS5
CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

Katahdin
ANALYTICAL SERVICES

Lab Number : WP-2689-2
Report Date: 07/28/99
PO No. : N7912-P99264
Project : CTO #68

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

WIC#: CNC CHARLESTON

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
31SLB021112	Solid	R. HILL	05/28/99	05/29/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	82.	wt %	1.0	0.10	CLP/CIP SOW	06/03/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 06/02/99 by JF

07/28/99

LJO/baeajc(dw)/msm
PF02TSS5
CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-2689-3
Report Date: 07/28/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
31SLB041112	Solid	R. HILL	05/28/99	05/29/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	78.	wt %	1.0	0.10	CLP/CIP SOW	06/03/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 06/02/99 by JF

07/28/99

LJO/baeajc(dw)/msm
PF02TSS5
CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-2689-4
Report Date: 07/28/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
31SLB050910	Solid	R. HILL	05/28/99	05/29/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	89.	wt %	1.0	0.10	CLP/CIP SOW	06/03/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 06/02/99 by JF

07/28/99

LJO/baeajc(dw)/msm
PF02TSS5
CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-2689-5
Report Date: 07/28/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
31SLB061112	Solid	R. HILL	05/28/99	05/29/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	83.	wt %	1.0	0.10	CLP/CIP SOW	06/03/99	JF	1
Total Combustible Organics	2.0	wt %	1.0	0.1	ASTM D2974-8	06/03/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 06/02/99 by JF

07/28/99

LJO/baeajc(dw)/msm
PF02TSS5
CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-2689-6
Report Date: 07/28/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
31SLB071011	Solid	R. HILL	05/28/99	05/29/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	89.	wt %	1.0	0.10	CLP/CIP SOW	06/03/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 06/02/99 by JF

07/28/99

LJO/baeajc(dw)/msm
PF02TSS5
CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-2689-7
Report Date: 07/28/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
31SLB021112D	Solid	R. HILL	05/28/99	05/29/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	83.	wt %	1.0	0.10	CLP/CIP SOW	06/03/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 06/02/99 by JF

07/28/99

LJO/baeajc(dw)/msm
PF02TSS5
CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-2689-8
Report Date: 07/28/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
31SLB031112	Solid	R. HILL	05/28/99	05/29/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	83.	wt %	1.0	0.10	CLP/CIP SOW	06/03/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 06/02/99 by JF

07/28/99

LJO/baeajc(dw)/msm
PF02TSS5
CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

[redacted]

Method Blank and Laboratory Control Sample Results

Client:	Tetra Tech NUS
Work Order:	WP2689

			METHOD BLANK RESULTS						LABORATORY CONTROL SAMPLE RESULTS					
Parameter	Date of Prep	Date of Analysis	Units		Concentration Measured in Blank		Acceptance Range	Practical Quantitation Level**	Units	True Value	Measured Value	Percent Recovered	Acceptance Range (%)	Acceptance Range (mg/kg)
TS -Total Residue	02-Jun-99	03-Jun-99	wt %	<	0.10	<	0.10	0.10	wt %	90	88.5	98	80-120	

** Practical quantitation level is the lowest concentration measurable for samples with normal chemical and physical composition during routine laboratory operations.

DATA QUALITY COMMENTS:
Results of all quality control measurements are within the laboratory and method specified acceptance range except as noted.

5000003

[redacted]

Duplicate and Matrix Spike/Matrix Spike Duplicate Results

Client:	Tetra Tech NUS
Work Order:	WP2689

			DUPLICATE RESULTS					*MATRIX SPIKE/MATRIX SPIKE DUPLICATE RESULTS*									
			Sample Measurements				Acceptance Range	Concentration or Quantity				Matrix Spike Recovery (%)					
Parameter	Sample No	Units	Rep 1	Rep 2	Mean Conc	RPD (%)	for RPD (%)	Units	Sampl Only	Spike Added	Sample +Spike Dup 1	Sample +Spike Dup 2	Sample +Spike Dup 1	Sample +Spike Dup 2	Acceptance Range (%)	RPD (%)	Acceptance Range (%)
TS	WP2689-1	wt%	86.3	85.9	86.1	0.5	0-20	MS/MSD Not Applicable for this Parameter									
TCO	WP2689-5	%	2.0	2.0	2.0	0.0	0-20	MS/MSD Not Applicable for this Parameter									

RPD = Relative percent difference, which is the absolute value of the difference between two replicate results divided by the mean concentration then multiplied by 100%.

DATA QUALITY COMMENTS:

Results of all quality control measurements are within the laboratory or contract specified acceptance range except as noted. The laboratory does not use the sample duplicate and matrix spike acceptance ranges as acceptance criteria for a specific analysis. Sample duplicate and matrix spike data are used to evaluate method performance in the environmental sample matrix only. Please refer to LCS data for assessment of quality control for each parameter.

5000004

Client:	Katahdin Analytical 340 County Road Westbrook, Maine 04092
Contact:	Ms. Andrea Colby
Project Description:	Former Naval Complex

cc: KATA00199 Report Date: June 22, 1999

Sample ID	: 01E00102
Lab ID	: 9905DEA-01
Matrix	: Water
Date Collected	: 05/28/99
Date Received	: 05/28/99
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
General Chemistry											
Total Rec. Petro. Hydrocarbons	J	1.70	1.22	5.00	mg/l	1.0	AAT	06/14/99	1130	151317	1

M = Method	Method-Description
M 1	SW846 9070

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, Valerie Davis at (843) 769-7391.

Reviewed By

Client:	Katahdin Analytical 340 County Road Westbrook, Maine 04092
Contact:	Ms. Andrea Colby
Project Description:	Former Naval Complex

cc: KATA00199 Report Date: June 22, 1999

Sample ID	: 01F00102
Lab ID	: 9905DEA-02
Matrix	: Water
Date Collected	: 05/28/99
Date Received	: 05/28/99
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
General Chemistry											
Total Rec. Petro. Hydrocarbons	J	4.44	1.22	5.00	mg/l	1.0	AAT	06/14/99	1130	151317	1

M = Method	Method-Description
M 1	SW846 9070

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, Valerie Davis at (843) 769-7391.

Reviewed By

Client:	Katahdin Analytical 340 County Road Westbrook, Maine 04092
Contact:	Ms. Andrea Colby
Project Description:	Former Naval Complex

cc: KATA00199 Report Date: June 21, 1999

Sample ID	: 31SLB031112
Lab ID	: 9905DEA-03
Matrix	: Soil
Date Collected	: 05/28/99
Date Received	: 05/28/99
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
General Chemistry											
Total Rec. Petro. Hydrocarbons		9600	118	236	mg/kg	1.0	AAT	06/11/99	1030	150797	1
Evaporative Loss @ 105 C		15.0	1.00	1.00	wt%	1.0	GJ	06/01/99	1445	150422	2

M = Method	Method-Description
M 1	SW846 9071A
M 2	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.

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

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

Client:	Katahdin Analytical 340 County Road Westbrook, Maine 04092
Contact:	Ms. Andrea Colby
Project Description:	Former Naval Complex

cc: KATA00199 Report Date: June 21, 1999

Sample ID	: 31SLB061112
Lab ID	: 9905DEA-04
Matrix	: Soil
Date Collected	: 05/28/99
Date Received	: 05/28/99
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
General Chemistry											
Evaporative Loss @ 105 C		10.0	1.00	1.00	wt%	1.0	GJ	06/01/99	1445	150422	1
Total Organic Carbon		3570	43.1	100	mg/kg	1.0	LS	06/18/99	1655	150724	2

M = Method	Method-Description
M 1	EPA 3550
M 2	SW846 9060 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'.

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

QC Summary Report

Project Description: Former Naval Complex

cc: KATA00199 Lab. Sample ID: 9905DEA% Report Date: June 21, 1999

Sample/Parameter	Type	Batch	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Analyst	Date	Time
General Chemistry													
QC618246	BLANK	150797											
Total Rec. Petro. Hydrocarbons						150	mg/kg				AAT	06/11/99	1030
QC620138	BLANK	151317											
Total Rec. Petro. Hydrocarbons						0.00	mg/l				AAT	06/14/99	1130
QC618249	9905606-06DUP	150797											
Total Rec. Petro. Hydrocarbons				233		267	mg/kg	13.3			AAT	06/11/99	1030
QC618247	LCS	150797											
Total Rec. Petro. Hydrocarbons			11200			10700	mg/kg		95.3	(70.0 - 116.)			
QC620139	LCS	151317											
Total Rec. Petro. Hydrocarbons			203			154	mg/l		76.0	(64.3 - 121.)	AAT	06/14/99	1130
QC620140	LCS DUP	151317											
Total Rec. Petro. Hydrocarbons			234			200	mg/l	11.6	85.5	(0.00 - 30.0)			
QC618248	9905606-06MS	150797											
Total Rec. Petro. Hydrocarbons			13400	233		11500	mg/kg		84.2	(70.0 - 130.)	AAT	06/11/99	1030
QC616773	BLANK	150422											
Evaporative Loss @ 105 C						0.00	wt%				GJ	06/01/99	1445
QC616771	9905888-01DUP	150422											
Evaporative Loss @ 105 C				15.0		14.0	wt%	6.90					
QC616772	9905DEA-04DUP	150422											
Evaporative Loss @ 105 C				10.0		10.0	wt%	0.00					
QC617934	BLANK	150724											
Total Organic Carbon						-2.83	mg/kg				LS	06/18/99	1628
QC617935	9906058-01DUP	150724											
Total Organic Carbon				6780		6830	mg/kg	0.764			LS	06/18/99	1740
QC617937	LCS	150724											
Total Organic Carbon			3750			4420	mg/kg		118	(88.0 - 130.)	LS	06/18/99	1612
QC617936	9906058-01PS	150724											
Total Organic Carbon			10000	6780		16200	mg/kg		94.2	(73.0 - 129.)	LS	06/18/99	1747

Notes:
The qualifiers in this report are defined as follows:
J indicates presence of analyte < RL (Report Limit)
U indicates presence of analyte < DL (Detect Limit)

n/a indicates that spike recovery limits do not apply when
sample concentration exceeds spike conc by a factor of 4 or more

S. W. COLE ENGINEERING, INC.

R E P O R T O F G R A D A T I O N
ASTM C-117, C-136

Project No. 99008
Date 06/07/1999

Project MISCELLANEOUS

Client KATAHDIN ANALYTICAL

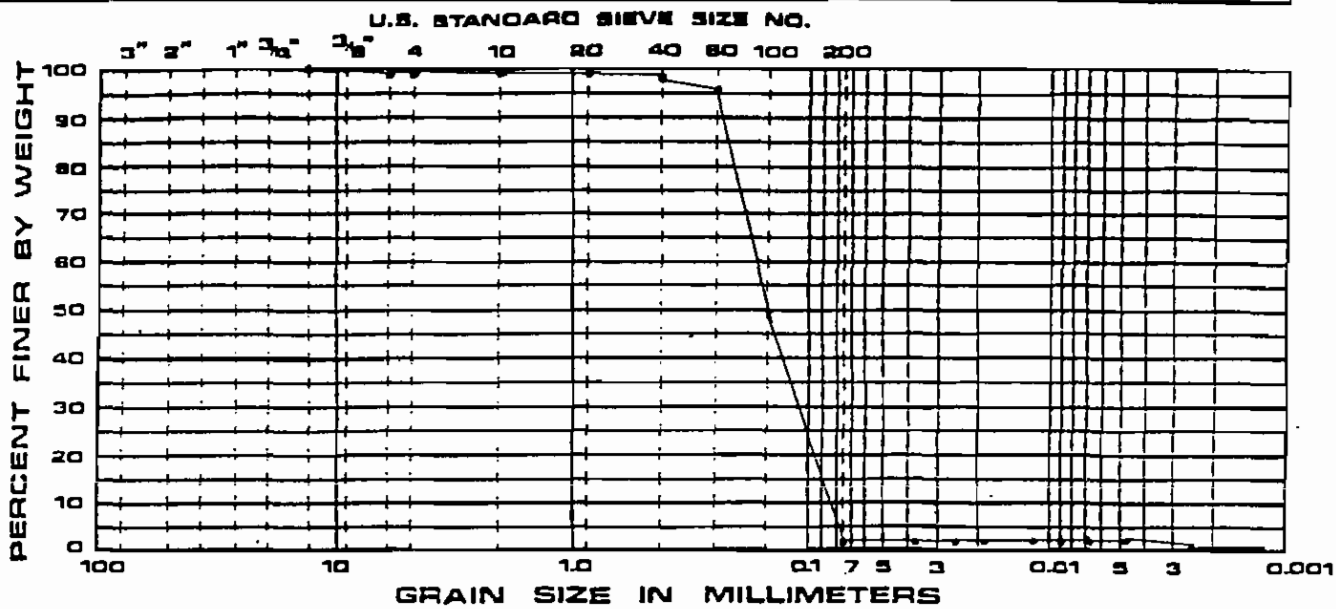
Sample No. 22, SILTY SAND, WP2689-8

Sieve Size	Percent Passing	PROJECT Specifications %
# 4	100.0	
# 10	99.9	
# 20	99.9	
# 40	99.8	
# 60	97.4	
# 100	52.5	
# 200	2.9	

JOB NO: 2770

GRAIN SIZE ANALYSIS

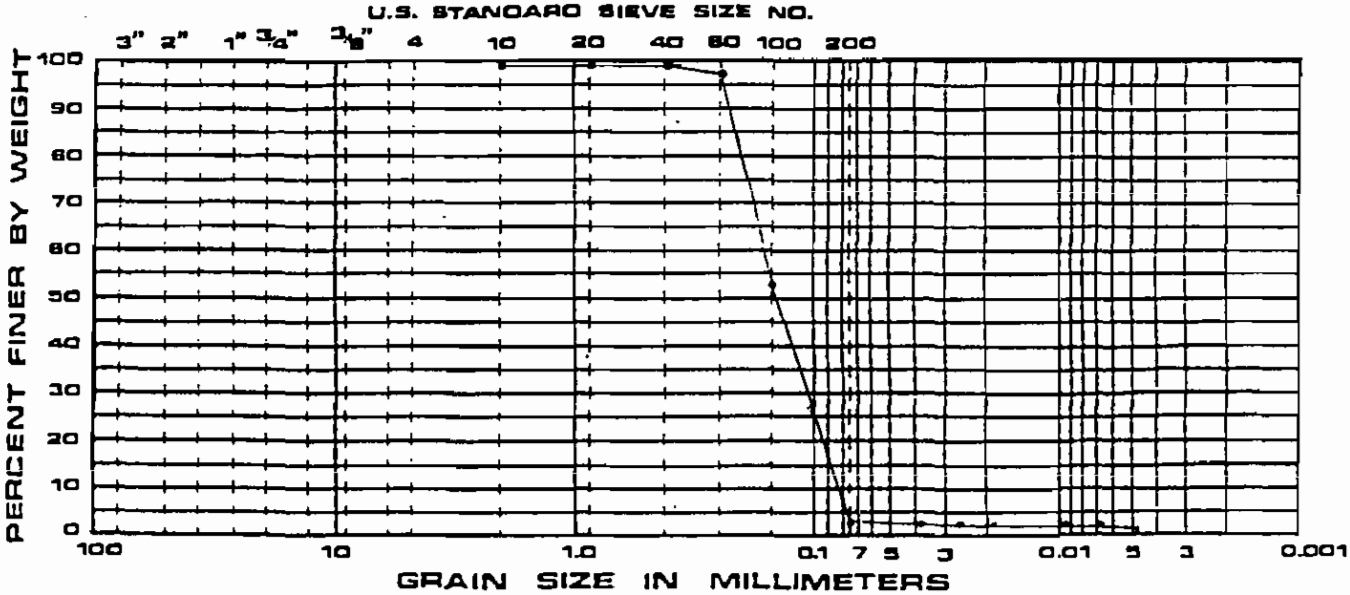
COBBLE	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COA.	MEDIUM	FINE	



PLOT	SOURCE	SAMP.	DEPTH	CLASSIFICATION		W
•	WB2770 3-10	21				

GRAIN SIZE ANALYSIS

COBBLE	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COA.	MEDIUM	FINE	



PLOT	SOURCE	SAMP.	DEPTH	CLASSIFICATION		W
•		22				

Katahdin
ANALYTICAL SERVICES

August 31, 1999

Mr. Paul Calligan
Tetra Tech Nus
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

RE: Katahdin Lab Number: WP3417
Project ID: CNC Charleston
Project Manager: Ms. Andrea J.Colby
Sample Receipt Date(s): 7/28/99

Dear Mr. Calligan:

Please find enclosed the following information:

* Report of Analysis
* Quality Control Data Summary
* Chain of Custody
* Confirmation

Should you have any questions or comments concerning this Report of Analysis, please do not hesitate to contact the project manager listed above. This cover letter is an integral part of the ROA.

We appreciate your continued use of our laboratory and look forward to working with you in the future. The following signature indicates technical review and acceptance of the data.

Sincerely,

KATAHDIN ANALYTICAL SERVICES

Mary S. Monill
Authorized Signature

8·31·99
Date

340 County Road No. 5
P.O. Box 720, Westbrook, ME 04098
Tel: (207) 874-2400 Fax: (207) 775-4029

http://katahdinlab.com

210 West Road No. 5, Portsmouth, NH 03801
Tel: (603) 431-5777 Fax: (603) 436-3356

Katahdin
ANALYTICAL SERVICES

SDG NARRATIVE
KATAHDIN ANALYTICAL SERVICES
TETRA TECH NUS
CASE CNC CHARLESTON

Sample Receipt

The following samples were received on July 28, 1999 and were logged in under Katahdin Analytical Services work order number WP3417 for a hardcopy due date of August 27, 1999.

KATAHDIN Sample No.	TTNUS Sample Identification
WP3417-1	31GLM0201
WP3417-2	29GLM0301
WP3417-3	31GLM0101D
WP3417-4	30GLM1201
WP3417-5	12GLM0401
WP3417-6	29TL00901
WP3417-7	31GLM0101
WP3417-8	29GLM0701

The samples were logged in for the analyses specified on the chain of custody form. All problems encountered and resolved during sample receipt have been documented on the applicable chain of custody forms.

Sample analyses have been performed by the methods as noted herein.

Volatile Organic Analysis

Six aqueous samples were received by the Katahdin Analytical Services, Inc. GC/MS laboratory on July 28, 1999 and were specified to be analyzed by USEPA method 8260B for the analytes benzene, toluene, ethylbenzene, xylenes, MTBE, naphthalene, and EDB.

Analyses for this work order were performed on the 5972-S and 5970-Q instruments. A VSTD050 (50 ppb standard) was used for the continuing calibration standard. Internal standard and surrogate compounds were also spiked at 50 ug/l.

Batch QC (VBLK, and LCS) was performed in each twelve-hour window. Results are included in this data package. The LCS QC samples were spiked with the entire list of compounds quantitated for at 50 ppb. No matrix spike/matrix spike duplicate was performed on any of the samples in this work order.

Method 8000B, section 7.5.1.2.1 (Revision 2, 12/96) states, "in those instances where the RSD for one or more analytes exceeds 20%, the initial calibration curve may still be acceptable if the mean of the RSD values for all analytes in the calibration is less than or equal to 20%." Method 8260B narrows this 20% maximum to 15%.

In the calibration curves analyzed in this SDG, the average %RSD for all analytes was 13.7% and 15.0%, making the curves acceptable.

Several manual integrations were performed due to split peaks; all have been flagged with a "M" (software-generated) on the pertinent quantitation reports. All "M" flags have been dated and initialed by the analyst performing the integration. In addition, all "M" flags have been reviewed and approved by the GC/MS supervisor. Copies of each manual integration are included in the pertinent quantitation reports.

No other protocol deviations were noted by the volatile organics staff.

Semivolatile Organic Analysis

Six aqueous samples were received by Katahdin Analytical Services laboratory on July 28, 1999 for analysis in accordance with 8270C for a client specified PAH list of analytes.

Extraction of the samples occurred following USEPA method 3510 on July 29, 1999. A laboratory control spike, consisting of all PAH analytes spiked into organic free water, was extracted in the batch, along with a site specific MS/MSD pair on sample WP3417-8.

The initial calibration curve analyzed in this SDG had some of the target analyte %RSD values exceeding 15 %.

Method 8000B, section 7.5.1.2.1 (Revision 2, 12/96) states, "in those instances where the RSD for one or more analytes exceeds 20%, the initial calibration curve may still be acceptable if the mean of the RSD values for all analytes in the calibration is less than or equal to 20%." Section 7.3.7.1 of method 8270C (revision 3, 12/96) narrows this 20% maximum to 15%.

In the calibration curve analyzed in this SDG, the average %RSD for all analytes was 10.1%, making the curve acceptable.

Initial analysis of sample WP3417-3 yielded a low recovery of the surrogate 2-fluorobiphenyl. Reanalysis yielded two low base-neutral surrogate recoveries. Both sets of data for this sample are included in the data package.

Initial analysis of sample WP3417-8 yielded internal standard area recovery deviations. Reanalysis yielded similar results, confirming matrix interference. Both sets of data are included in this data package.

Analysis of the QC sample WP3417-8MS yielded a low recovery of the surrogate terphenyl-d14.

Several manual integrations were performed due to split peaks; all have been flagged with a "M" by the data system. All manual integrations have been dated and initialed by the responsible analyst. Copies of each manual integration are included in the data package. All manual integrations have been reviewed and approved by the GC/MS supervisor.

No other protocol deviations were noted by the semivolatiles organics staff.

Katahdin
ANALYTICAL SERVICES

Wet Chemistry Analysis

For work order WP3417 analyses for Nitrate (E300) and Sulfate (E300) were performed according to the U.S. EPA "Methods for the Determination of Inorganic Substances in Environmental Samples", EPA 600/R-93/100, August 1993. All samples were run within laboratory hold time. The wet chemistry staff noted no protocol deviations.

KATAHDIN ANALYTICAL SERVICES, INC.
SAMPLE RECEIPT CONDITION REPORT
Tel. (207) 874-2400
Fax (207) 775-4029

LAB (WORK ORDER) #: WP 3417

PAGE: 1 OF 2

COOLER: 1 OF 2

CLIENT: Tetra Tech

PROJECT: CMC

COC#: —
SDG#: —
DATE / TIME RECEIVED: 7-28-99 0905
DELIVERED BY: FedEx
RECEIVED BY: Sa
LIMS ENTRY BY: SAW
LIMS REVIEW BY / PM: AJC

	YES	NO	EXCEPTIONS	COMMENTS	RESOLUTION
1. CUSTODY SEALS PRESENT / INTACT?	☑	☐	☐		
2. CHAIN OF CUSTODY PRESENT IN THIS COOLER?	☐	☑	☐		
3. CHAIN OF CUSTODY SIGNED BY CLIENT?	☑	☐	☐	COC not signed by sampler	
4. CHAIN OF CUSTODY MATCHES SAMPLES?	☐	☑	☐		
5. TEMPERATURE BLANKS PRESENT?	☑	☐	☐	TEMP BLANK TEMP (°C)= 1.2	AJC notified Paul Calligan by fax 7/28/99
6. SAMPLES RECEIVED AT 4°C +/- 2?	☐	☑	☐	COOLER TEMP (°C)= NA	
(ICE) ICE PACKS PRESENT (Y) or N?				(RECORD COOLER TEMP ONLY IF TEMP BLANK IS NOT PRESENT)	
7. VOLATILES FREE OF HEADSPACE?	☑	☐	☐		
8. TRIP BLANK PRESENT IN THIS COOLER	☑	☐	☐		
9. PROPER SAMPLE CONTAINERS AND VOLUME?	☑	☐	☐		
10. SAMPLES WITHIN HOLD TIME UPON RECEIPT?	☑	☐	☐		
11. SAMPLES PROPERLY PRESERVED[1]?	☑	☐	☐		
12. CORRECTIVE ACTION REPORT FILED?	☐	☑	N/A		

13. ANALYTICAL PROGRAMS (CIRCLE ONE) COMMERCIAL CLP HAZWRAP (NFESC) ACOE AFCEE OTHER (STATE OF ORIGIN):

LOG - IN NOTES[1]:

Sample I.D.s:
- 31GLM0101
- 29GLM0701
- 29GLM0701M (MSMSD

} VOA VIALS NOT RECEIVED

→ CLIENT NOTIFIED PROJ. MNGR. ~ LOG-IN NOTIFIED PRJ. MNGR UPON RECEIPT.

(1) Use this space (and additional sheets if necessary) to document samples that are received broken or compromised, C-O-C discrepancies, radiation checks, residual chlorine check, results of pH check if required. If samples required pH adjustment, record volume and type of preservative added.

0000037

KATAHDIN ANALYTICAL SERVICES, INC.
SAMPLE RECEIPT CONDITION REPORT
Tel. (207) 874-2400
Fax (207) 775-4029

LAB (WORK ORDER) # WP3417

PAGE: 2 OF 2

COOLER: 2 OF 2

COC# —
SDG# —
DATE / TIME RECEIVED: 7.28.99 0905
DELIVERED BY: FedEx
RECEIVED BY: Sam
LIMS ENTRY BY: SAW
LIMS REVIEW BY / PM: KC

CLIENT: TetraTech

PROJECT: CNC

	YES	NO	EXCEPTIONS	COMMENTS	RESOLUTION
1. CUSTODY SEALS PRESENT / INTACT?	☑	☐	☐		
2. CHAIN OF CUSTODY PRESENT IN THIS COOLER?	☑	☐	☐		
3. CHAIN OF CUSTODY SIGNED BY CLIENT?	☑	☐	☐		
4. CHAIN OF CUSTODY MATCHES SAMPLES?	☐	☑	☐		
5. TEMPERATURE BLANKS PRESENT?	☑	☐	☐	TEMP BLANK TEMP (°C)= 0.8	KC notified Vonl Callipa by fax 7/28/99
6. SAMPLES RECEIVED AT 4°C +/- 2? ICE / ICE PACKS PRESENT (Y) or N?	☐	☑	☐	COOLER TEMP (°C)= NA (RECORD COOLER TEMP ONLY IF TEMP BLANK IS NOT PRESENT)	
7. VOLATILES FREE OF HEADSPACE?	☑	☐	☐		
8. TRIP BLANK PRESENT IN THIS COOLER	☐	☑	☐		
9. PROPER SAMPLE CONTAINERS AND VOLUME?	☑	☐	☐		
10. SAMPLES WITHIN HOLD TIME UPON RECEIPT?	☑	☐	☐		
11. SAMPLES PROPERLY PRESERVED[1]?	☑	☐	☐		
12. CORRECTIVE ACTION REPORT FILED?	☐	☑	N/A		

13. ANALYTICAL PROGRAMS (CIRCLE ONE) COMMERCIAL CLP HAZWRAP (NFESC) ACOE AFCEE OTHER (STATE OF ORIGIN): _____

LOG - IN NOTES[1]:

(1) Use this space (and additional sheets if necessary) to document samples that are received broken or compromised, C-O-C discrepancies, radiation checks, residual chlorine check, res[illegible] of pH check if re[illegible]d. If samples required pH adjustment, record volume and type of preservative ad[illegible]

Katahdin ANALYTICAL SERVICES
340 County Road No. 5
P.O. Box 720
Westbrook, ME 04098
Tel: (207) 874-2400
Fax: (207) 775-4029

CHAIN of CUSTODY

PLEASE PRINT IN PEN

Page ____ of ____

Client: Tetra Tech NUS Inc
Contact:
Phone #: (843)814-9080
Fax #: ( )
Address: NH 21 Ave H
City: N. Charleston
State: S.C.
Zip Code: 29405
Purchase Order #:
Proj. Name / No.:
Katahdin Quote #:
Bill (if different than above):
Address:
Sampler (Print / Sign):
Copies To:

LAB USE ONLY
WORK ORDER #: WP 3417 - *
KATAHDIN PROJECT MANAGER
REMARKS:
SHIPPING INFO: ☐ FED EX ☐ UPS ☐ CLIENT
AIRBILL NO:
TEMP°C ☐ TEMP BLANK ☐ INTACT ☐ NOT INTACT

ANALYSIS AND CONTAINER TYPE PRESERVATIVES

*	Sample Description	Date / Time coll'd	Matrix	No. of Cntrs.	BTEX, MTBE EDB, Naph (Filt. ☐Y☐N)	Dissolved Methane (Filt. ☐Y☐N)	PAH (Filt. ☐Y☐N)	Anions (Nitrate, Sulfate) (Filt. ☐Y☐N)	Filt. ☐Y☐N	Filt. ☐Y☐N	Filt. ☐Y☐N	Filt. ☐Y☐N	Filt. ☐Y☐N	Filt. ☐Y☐N
·	31GLMØ1Ø1	7-27-99/1055	GW	9	3	3	2	1						
	31GLMØ2Ø1	/1050		9	3	3	2	1						
	31GLMØ1Ø1D	/1055		5	3		2							
	9GLMØ3Ø1	/1010		9	3	3	2	1						
·	29GLMØ7Ø1	/1245		5	3		2							
·	29GLMØ7Ø1M	/1245		5	3		2			← MS/MSD				
	29GLMØ4Ø1	7/24/99/1605		3	3									
	3ØGLM12Ø1	7/27/99/1721		5	3		2							
	29TLØØ9Ø1	7/27/99/0730		3	3									
		/												
		/												
		/												
		/												
		/												
		/												
		/												

COMMENTS
* Sample #29GLMØ7Ø1M is an MS/MSD

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
[signature]	7/29/99	813402904543		7-28-990905	[signature]
Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)

KATAHDIN ANALYTICAL SERVICES, INCORPORATED
New England-ME Laboratory (207) 874-2400
CONFIRMATION

ORDER NO WP-3417

Project Manager: Andrea J. Colby
ORDER DATE: 07/28/99
PHONE: 850/385-98
FAX: 850/385-986
DUE: 27 AUG
FAC.ID: CNC CHARLESTON

REPORT TO: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

INVOICE: ACCOUNTS PAYABLE
TETRA TECH NUS, INC.
FOSTER PLAZA 7, 661 ANDERSEN DR.
PITTSBURGH, PA 15220

PHONE: 412/921-7090
PO: N7912-P99264

PROJECT: CTO #68

SAMPLED BY: CLIENT DELIVERED BY: FEDEX DISPOSE: AFTER 27 AUG

ITEM	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
1	WP3417-1	31GLM0201	27 JUL 1050	28 JUL	AQ
	WP3417-2	29GLM0301	27 JUL 1010		

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
Volatile Organics by 8260B	SW8260	2	75.00	150.00
GC Subcontract		2	95.00	190.00
Polynuclear Aromatic Hydrocarbons	EPA 8270	2	125.00	250.00
Nitrogen, Nitrate (as N)	E300	2	30.00	60.00
Sulfate (as SO4)	E300	2	0.00	0.00
TOTALS		2	325.00	650.00

	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATR.
2	WP3417-3	31GLM0101D	27 JUL 1055	28 JUL	AQ
	WP3417-4	30GLM1201	27 JUL 1721		

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
Volatile Organics by 8260B	SW8260	2	75.00	150.00
Polynuclear Aromatic Hydrocarbons	EPA 8270	2	125.00	250.00
TOTALS		2	200.00	400.00

	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
3	WP3417-5	12GLM0401	24 JUL 1605	28 JUL	AQ
	WP3417-6	29TL00901	27 JUL 0730		

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
Volatile Organics by 8260B	SW8260	2	75.00	150.00

LABORATORY ORDER CONTINUED ON PAGE 2

KATAHDIN ANALYTICAL SERVICES, INCORPORATED
New England-ME Laboratory (207) 874-2400
CONFIRMATION

ORDER NO WP-3417

Project Manager: Andrea J. Colby
ORDER DATE: 07/28/99
PHONE: 850/385-9899
FAX: 850/385-9860
DUE: 27 AUG
FAC.ID: CNC CHARLESTON

R RT TO: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

INVOICE: ACCOUNTS PAYABLE
TETRA TECH NUS, INC.
FOSTER PLAZA 7, 661 ANDERSEN DR.
PITTSBURGH, PA 15220

PHONE: 412/921-7090
PO: N7912-P99264

PROJECT: CTO #68

SAMPLED BY: CLIENT DELIVERED BY: FEDEX DISPOSE: AFTER 27 AUG

	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
4	WP3417-7	31GLM0101	27 JUL 1055	28 JUL	AQ

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
GC Subcontract		1	95.00	95.00
Polynuclear Aromatic Hydrocarbons	EPA 8270	1	125.00	125.00
Nitrogen, Nitrate (as N)	E300	1	30.00	30.00
Sulfate (as SO4)	E300	1	0.00	0.00
TOTALS		1	250.00	250.00

LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
WP3417-8	29GLM0701	27 JUL 1245	28 JUL	AQ

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
Polynuclear Aromatic Hydrocarbons	EPA 8270	1	125.00	125.00

ORDER NOTE: QC-IV NFESC
DD(KAS007QC-DB3)
CNC CHARLESTON

REPORT COPY: MS LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.
PITTSBURG, PA 15220

I ICE: With Report

TOTAL ORDER AMOUNT $1,575.00
This is NOT an Invoice

AJC/BKR
07-28Please contact KATAHDIN ANALYTICAL SERVICES promptly if you have any questi

9009041

KATAHDIN ANALYTICAL SERVICES

Summary of Report Notes

Report Note	Note Text
#	'#' flag denotes surrogate compound recovery is out of criteria.
O-13	Internal standard area(s) are out of criteria. Reanalysis confirmedmatrix interference.

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-3417-1
Report Date: 08/31/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
31GLM0201	Aqueous	CLIENT	07/27/99	07/28/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Nitrogen, Nitrate (as N)	<0.050	mg/L	1.0	0.050	E300	07/28/99	CF	
Sulfate (as SO4)	18	mg/L	1.0	1.0	E300	08/14/99	CF	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

08/31/99

LJO/baeajc(dw)/msm
PG28N3W1
CC: MS LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

340 Canny Road No. 5
P.O. Box 720, Westbrook, ME 04098
Tel: (207) 874-2400 Fax: (207) 775-4029

http://katahdinlab.com

210 West Road No. 5, Portsmouth, NH 03801
Tel: (603) 431-5777 Fax: (603) 436-3356

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3417-1
SDG: WP3417
Report Date: 8/26/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: EPA 8270
Date Analyzed: 8/10/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31GLM0201	AQ	7/27/99	7/28/99	7/29/99	DPD	EPA 3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.0	10	10
ACENAPHTHYLENE	<10	ug/L	1.0	10	10
ACENAPHTHENE	<10	ug/L	1.0	10	10
FLUORENE	<10	ug/L	1.0	10	10
PHENANTHRENE	<10	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
PYRENE	<10	ug/L	1.0	10	10
BENZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
CHRYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	57	%	1.0		
2-FLUOROBIPHENYL	57	%	1.0		
TERPHENYL-D14	44	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3417-1
SDG: WP3417
Report Date: 8/26/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 7/31/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31GLM0201	AQ	7/27/99	7/28/99	7/31/99	HMP	5030	HMP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	100	%	1.0		
1,2-DICHLOROETHANE-D4	101	%	1.0		
LUENE-D8	95	%	1.0		
P-BROMOFLUOROBENZENE	91	%	1.0		

port Notes:

0000008

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3417-3
SDG: WP3417
Report Date: 8/26/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: EPA 8270
Date Analyzed: 8/10/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31GLM0101D	AQ	7/27/99	7/28/99	7/29/99	DPD	EPA 3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.0	10	10
ACENAPHTHYLENE	<10	ug/L	1.0	10	10
ACENAPHTHENE	<10	ug/L	1.0	10	10
FLUORENE	<10	ug/L	1.0	10	10
PHENANTHRENE	<10	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
PYRENE	<10	ug/L	1.0	10	10
BENZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
CHRYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	44	%	1.0		
2-FLUOROBIPHENYL	#45	%	1.0		
TERPHENYL-D14	40	%	1.0		

Report Notes: #

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3417-3RA
SDG: WP3417
Report Date: 8/26/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: EPA 8270
Date Analyzed: 8/11/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31GLM0101D	AQ	7/27/99	7/28/99	7/29/99	DPD	EPA 3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.0	10	10
ACENAPHTHYLENE	<10	ug/L	1.0	10	10
ACENAPHTHENE	<10	ug/L	1.0	10	10
FLUORENE	<10	ug/L	1.0	10	10
PHENANTHRENE	<10	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
PYRENE	<10	ug/L	1.0	10	10
BENZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
CHRYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	37	%	1.0		
2-FLUOROBIPHENYL	#40	%	1.0		
TERPHENYL-D14	#33	%	1.0		

Report Notes: #

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3417-3
SDG: WP3417
Report Date: 8/26/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 8/2/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31GLM0101D	AQ	7/27/99	7/28/99	8/2/99	KMC	5030	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	125	%	1.0		
1,2-DICHLOROETHANE-D4	126	%	1.0		
TOLUENE-D8	114	%	1.0		
P-BROMOFLUOROBENZENE	90	%	1.0		

Report Notes:

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-3417-7
Report Date: 08/31/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
31GLM0101	Aqueous	CLIENT	07/27/99	07/28/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Nitrogen, Nitrate (as N)	<0.050	mg/L	1.0	0.050	E300	07/28/99	CF	
Sulfate (as SO4)	14.	mg/L	1.0	1.0	E300	08/14/99	CF	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

08/31/99

LJO/baeajc(dw)/msm
PG28N3W1
CC: MS LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3417-7
SDG: WP3417
Report Date: 8/26/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: EPA 8270
Date Analyzed: 8/10/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31GLM0101	AQ	7/27/99	7/28/99	7/29/99	DPD	EPA 3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.0	10	10
ACENAPHTHYLENE	<10	ug/L	1.0	10	10
ACENAPHTHENE	<10	ug/L	1.0	10	10
FLUORENE	<10	ug/L	1.0	10	10
PHENANTHRENE	<10	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
PYRENE	<10	ug/L	1.0	10	10
BENZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
CHRYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	62	%	1.0		
2-FLUOROBIPHENYL	61	%	1.0		
TERPHENYL-D14	60	%	1.0		

Report Notes:

Kentucky Analytical Services, Inc.
Quality Control Report

Method Blank and Laboratory Control Sample Results

Client:	Tetra Tech NUS
Work Order:	WP3417

			METHOD BLANK RESULTS						LABORATORY CONTROL SAMPLE RESULTS					
Parameter	Date of Prep	Date of Analysis	Units		Concentration Measured in Blank		Acceptance Range	Practical Quantitation Level**	Units	True Value	Measured Value	Percent Recovered	Acceptance Range (%)	Acceptance Range (mg/kg)
Nitrate-Nitrogen	28-Jul-99	28-Jul-99	mg/L	<	0.050	<	0.050	0.050	mg/L	2.5	2.47	98.8	80-120	
Sulfate	14-Aug-99	14-Aug-99	mg/L	<	1.0	<	1.0	1.0	mg/L	10	10.2	102.0	80-120	

** Practical quantitation level is the lowest concentration measurable for samples with normal chemical and physical composition during routine laboratory operations.

DATA QUALITY COMMENTS:
Results of all quality control measurements are within the laboratory and method specified acceptance range except as noted.

4B
SEMIVOLATILE ORGANICS METHOD BLANK SUMMARY

EPA SAMPLE NO.

SBLK;072999

Lab Name: Katahdin Analytical Services SDG No.: WP3417

Lab File ID: Z1692 Lab Sample ID: SBLK;072999

Instrument ID: 5972-Z Date Extracted: 7/29/99

GC Column: RTX-624 ID: 0.18 (mm) Date Analyzed: 08/10/99

Matrix: (soil/water) WATER Time Analyzed: 12:49

Level: (low/med) LOW

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, LCS'S, MS AND MSD'S

Client Sample ID	Lab Sample ID	Lab Data File	Date Injected	Time Injected
LCS;072999	LCS;072999	Z1693	8/10/99	1:34:00 PM
31GLM0201	WP3417-1	Z1694	8/10/99	2:20:00 PM
31GLM0101D	WP3417-3	Z1696	8/10/99	3:51:00 PM
30GLM1201	WP3417-4	Z1697	8/10/99	4:37:00 PM
31GLM0101	WP3417-7	Z1698	8/10/99	5:23:00 PM
29GLM0701	WP3417-8	Z1699	8/10/99	6:09:00 PM
29GLM0701MSD	WP3417-8MSD	Z1701	8/10/99	7:41:00 PM
29GLM0301	WP3417-2	Z1707	8/11/99	12:28:00 PM
31GLM0101D	WP3417-3RA	Z1708	8/11/99	1:14:00 PM
29GLM0701	WP3417-8RA	Z1709	8/11/99	2:00:00 PM
29GLM0701MS	WP3417-8MS	Z1710	8/11/99	2:45:00 PM

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: SBLK;072999
SDG: WP3417
Report Date: 8/26/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: EPA 8270
Date Analyzed: 8/10/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
SBLK;072999	AQ	-	-	7/29/99	DPD	EPA 3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.0	10	10
ACENAPHTHYLENE	<10	ug/L	1.0	10	10
ACENAPHTHENE	<10	ug/L	1.0	10	10
FLUORENE	<10	ug/L	1.0	10	10
PHENANTHRENE	<10	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
PYRENE	<10	ug/L	1.0	10	10
:NZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
CHRYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	60	%	1.0		
2-FLUOROBIPHENYL	61	%	1.0		
TERPHENYL-D14	96	%	1.0		

:port Notes:

0000025

Katahdin Analytical Services
8270 LCS Recovery Sheet

Lab File: Z1693 **Sample ID: LCS;072999** **Date Run: 8/10/99**

Analyst: KRT **Time Injected 1:34:00 PM** **Matrix: AQ**

Compound Name	Spike Amt (ug/L)	Result (ug/L)	Rec (%)	Limits (%)
2-METHYLNAPHTHALENE	50	34.8	*70	70-130
ACENAPHTHENE	50	36.8	74	70-130
ACENAPHTHYLENE	50	37.2	74	70-130
ANTHRACENE	50	45.3	90	70-130
BENZO[A]ANTHRACENE	50	42.2	84	70-130
BENZO[A]PYRENE	50	35.9	72	70-130
BENZO[B]FLUORANTHENE	50	34.4	*69	70-130
BENZO[G,H,I]PERYLENE	50	35.7	71	70-130
BENZO[K]FLUORANTHENE	50	40.4	81	70-130
CHRYSENE	50	43.4	87	70-130
DIBENZ[A,H]ANTHRACENE	50	32.8	*66	70-130
FLUORANTHENE	50	41.7	83	70-130
FLUORENE	50	37.0	74	70-130
INDENO[1,2,3-CD]PYRENE	50	35.0	70	70-130
NAPHTHALENE	50	34.6	*69	70-130
PHENANTHRENE	50	42.4	85	70-130
PYRENE	50	48.6	97	70-130

*** Out of Limits** *1*

Katahdin Analytical Services

MS/MSD Report

ımple	File Name	Date Acquired	Time inj	Analyst	Matrix	Method
WP3417-8	Z1699	8/10/99	6:09:00 PM	KRT	AQ	8270_99
WP3417-8MS	Z1710	8/11/99	2:45:00 PM	KRT	AQ	8270_99
WP3417-8MSD	Z1701	8/10/99	7:41:00 PM	KRT	AQ	8270_99

Compound Name	Native (ug/L)	MS Spk Amount (ug/L)	MSD Spk Amount (ug/L)	MS Result (ug/L)	MSD Result (ug/L)	MS REC (%)	MSD REC (%)	Recovery Limits (%)	RPD (%)	RPD Limit (%)
CHRYSENE	0	49	48	24.0	39.7	*49	83	60-140	*49	30
ACENAPHTHENE	0	49	48	29.3	35.3	60	73	60-140	18	30
ACENAPHTHYLENE	0	49	48	30.2	35.2	62	73	60-140	15	30
ANTHRACENE	0	49	48	30.9	42.0	63	88	60-140	30	30
BENZO[A]ANTHRACENE	0	49	48	22.8	38.0	*46	79	60-140	*50	30
BENZO[A]PYRENE	0	49	48	18.2	32.0	*37	67	60-140	*55	30
BENZO[B]FLUORANTHENE	0	49	48	16.6	29.5	*34	62	60-140	*56	30
2-METHYLNAPHTHALENE	0	49	48	28.2	33.2	*58	69	60-140	16	30
BENZO[K]FLUORANTHENE	0	49	48	23.0	38.8	*47	81	60-140	*51	30
PYRENE	0	49	48	30.4	45.0	62	94	60-140	*39	30
DIBENZ[A,H]ANTHRACENE	0	49	48	16.7	28.8	*34	60	60-140	*53	30
FLUORANTHENE	0	49	48	24.6	37.8	*50	79	60-140	*42	30
FLUORENE	0	49	48	27.8	34.1	*57	71	60-140	20	30
INDENO[1,2,3-CD]PYRENE	0	49	48	16.3	29.9	*33	62	60-140	*59	30
NAPHTHALENE	0	49	48	29.5	32.6	60	68	60-140	10	30
I[illegible]NTHRENE	0	49	48	29.4	38.8	60	81	60-140	28	30
BENZO[G,H,I]PERYLENE	0	49	48	17.6	31.8	*36	66	60-140	*57	30

RPD =[(ms res - msd res) / (ms res + msd res)/2] * 100

*** Out of Limits**

4A
VOLATILE ORGANICS METHOD BLANK SUMMARY

EPA SAMPLE NO.

VBLKQ31A

Lab Name: Katahdin Analytical Services SDG No.: WP3417

Lab File ID: Q6100 Lab Sample ID: VBLKQ31A

Date Analyzed: 07/31/99 Time Analyzed: 11:36

GC Column: RTX-502 ID: 0.53 (mm) Heated Purge: (Y/N) N

Instrument ID: 5970-Q

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, LCS'S, MS AND MSD'S

Client Sample ID	Lab Sample ID	Lab Data File	Date Injected	Time Injected
LCSQ31A	LCSQ31A	Q6099	7/31/99	10:44:00 AM
31GLM0201	WP3417-1	Q6113	7/31/99	8:23:00 PM
29GLM0301	WP3417-2	Q6114	7/31/99	9:02:00 PM

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: VBLKQ31A
SDG: WP3417
Report Date: 8/26/99
PO No.: N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 7/31/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
VBLKQ31A	AQ	-	-	7/31/99	HMP	5030	HMP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	95	%	1.0		
1,2-DICHLOROETHANE-D4	93	%	1.0		
TOLUENE-D8	96	%	1.0		
P-BROMOFLUOROBENZENE	95	%	1.0		

Report Notes:

Katahdin Analytical Services
8260 LCS Recovery Sheet

Lab File: Q6099 **Sample ID: LCSQ31A** **Date Run: 7/31/99**

Analyst: HMP **Time Injected 10:44:00 AM** **Matrix: AQ**

Compound Name	Spike Amt (ug/L)	Result (ug/L)	Rec (%)	Limits (%)
1,2-DIBROMOETHANE	50	48.2	96	60-140
BENZENE	50	47.9	96	60-140
ETHYLBENZENE	50	50.1	100	60-140
MTBE	50	50.8	102	60-140
NAPHTHALENE	50	45.5	91	60-140
TOLUENE	50	49.3	98	60-140
TOTAL XYLENES	150	137	91	60-140

*** Out of Limits** *1*

4A

VOLATILE ORGANICS METHOD BLANK SUMMARY

EPA SAMPLE NO.

VBLKS02A

Lab Name: Katahdin Analytical Services SDG No.: WP3417

Lab File ID: S5770 Lab Sample ID: VBLKS02A

Date Analyzed: 08/02/99 Time Analyzed: 9:50

GC Column: RTX-624 ID: 0.18 (mm) Heated Purge: (Y/N) N

Instrument ID: 5972-S

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, LCS'S, MS AND MSD'S

Client Sample ID	Lab Sample ID	Lab Data File	Date Injected	Time Injected
LCSS02A	LCSS02A	S5769	8/2/99	9:02:00 AM
31GLM0101D	WP3417-3	S5781	8/2/99	5:03:00 PM
30GLM1201	WP3417-4	S5782	8/2/99	5:41:00 PM

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: VBLKS02A
SDG: WP3417
Report Date: 8/26/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 8/2/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
VBLKS02A	AQ	-	-	8/2/99	KMC	5030	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	104	%	1.0		
1,2-DICHLOROETHANE-D4	102	%	1.0		
TOLUENE-D8	112	%	1.0		
P-BROMOFLUOROBENZENE	98	%	1.0		

Report Notes:

Katahdin Analytical Services
8260 LCS Recovery Sheet

Lab File: S5769 **Sample ID: LCSS02A** **Date Run: 8/2/99**

Analyst: KMC **Time Injected 9:02:00 AM** **Matrix: AQ**

Compound Name	Spike Amt (ug/L)	Result (ug/L)	Rec (%)	Limits (%)
1,2-DIBROMOETHANE	50	48.4	97	60-140
BENZENE	50	50.6	101	60-140
ETHYLBENZENE	50	59.4	119	60-140
MTBE	50	52.3	104	60-140
NAPHTHALENE	50	62.6	125	60-140
TOLUENE	50	54.4	109	60-140
TOTAL XYLENES	150	186	124	60-140

*** Out of Limits** *1*

ENSR
Air Toxics Specialty Laboratory
42 Nagog Park
Acton, MA 01720

DATE: August 26, 1999

TO: Andrea Colby
Katahdin Analytical
340 County Road No. 5
P.O. Box 720
Westbrook, ME 04098

Re: Organic Analyses of Aqueous Samples by Gas Chromatography Flame Ionization Detection (GC/FID)

PROJECT #: **8601-008-200**

LAB ID #: **990123**

ANALYTICAL PROCEDURE:

Three (3) aqueous samples were analyzed under the guidelines of EPA SW846 Method 3810.

A Hewlett Packard 5890 series II gas chromatograph (GC) equipped with a Hewlett Packard flame ionization detector (FID) was used for the analysis. A 1.0 mL headspace aliquot of each sample was injected into the column for analysis. The operating conditions of the GC/FID are listed in Table 1. A five point calibration was performed for the target analytes (methane, ethane, and ethylene).

No problems occurred during sample receipt or log-in.

QUALITY CONTROL:

1. A laboratory blank was analyzed daily in the same manner as the samples. Target analytes were not detected in the blank.

2. A Matrix Spike/MSD was performed on the following sample:
   WP3417-7

   All recoveries were within QC limits.

Date Samples Received by the Laboratory: 7/28/99

Date Analysis Started: 8/4/99

C:\My Documents\katrpt10.doc

SAMPLE LOG-IN & RECEIPT CHECKLIST

Client/Proj #: Katahdin WP 3417 / 8601-008-200

Proj Mgr: M Hoyt

Lab Pool #: 990123

Inspected & Logged in by: A MacDuff

Date Time: 7/29/99 1015

Sample Matrix	Number of Samples	Analysis Requested	Analyze by (date)	Storage Location
Aqueous	3	MEE	8/25/99	R1

Circle the appropriate response:

1) Shipped Hand delivered

2) COC present / not present on receipt

3) COC Tape present / not present on shipping container

4) Samples broken / intact on receipt

5) Samples ambient / chilled on receipt Temp blank = 5°C

6) Samples preserved correctly / incorrectly / none recommended

7) Received within / outside holding time

8) COC tapes present / not present on samples

9) Discrepancies / NO discrepancies noted between COCs and samples

Additional Comments: 3 VOAs per sample

Andrea Colby

Katahdin
ANALYTICAL SERVICES
340 County Road No. 5
P.O. Box 720
Westbrook, ME 04098
Tel: (207) 874-2400
Fax: (207) 775-4029

CHAIN of CUSTODY

990123

PLEASE PRINT IN PEN

Page ___ of ___

Client: KATAHDIN ANALYTICAL SERVICES
Contact: ANDREA COLBY
Phone #: ( )
Fax #: ( )
Address: SAME AS ABOVE
City:
State:
Zip Code:
Purchase Order #:
Proj. Name / No.:
Katahdin Quote #:
Bill (if different than above):
Address:
Sampler (Print / Sign):
Copies To:

LAB USE ONLY | WORK ORDER #:
KATAHDIN PROJECT MANAGER:

REMARKS: SUB. TO ENSK

SHIPPING INFO: X FED EX ☐ UPS ☐ CLIENT

AIRBILL NO.:

TEMP °C: ___ X TEMP BLANK ☐ INTACT ☐ NOT INTACT

ANALYSIS AND CONTAINER TYPE / PRESERVATIVES

*	Sample Description	Date / Time coll'd	Matrix	No. of Cntrs.	METHANE ETHENE ETHANE		Lab ID							
	WP3417-1	7/27/99 / 1050	AQ	3	X		990123-1							
	-2	/ 1010			X		-2							
	-3	/ 1055			X		-3							

COMMENTS: QC-IV NFESC ~~DD~~ (KAS007QC-DB3) Results Due 8-25-99

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
[signature]	7-28-99 1445				[signature]
Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
					9/27/99 1015

ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: _____ ENSR _____ Contract: _____ WP3417-1(H)

Lab Code: _____ Case No.: _____ SAS NO.: _____ SDG NO.: _____

Matrix: (soil/water) _____ water _____ Lab Sample ID: 990123-1

Sample wt / vol: ____ 32.5 ml _____ (g/ml) Lab File ID: ___ KTH_028_____

Level: (low/med) _____ low _____ Date Received:___7/29/99 _____

% Moisture: _____ NA _____ Date Analyzed:___8/4/99 _____

GC Column: _ Carboxen 1004 __ OD: ___ 1/16" ___ Dilution Factor:_____ 1 _____

Soil Extract Volume: _____ NA ____ (µl) Soil Aliquot Volume: ____ NA ____ (µl)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (µg/L or PPMv) __ µg/L __	Q
74-82-8	Methane	5.2	U
74-85-1	Ethene	9.0	U
74-84-0	Ethane	9.6	U

ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

WP3417-7(C)

Lab Name: _____ ENSR _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS NO.: _____ SDG NO.: _____

Matrix: (soil/water) _____ water _____ Lab Sample ID: 990123-3

Sample wt / vol: ____ 32.5 ml _____ (g/ml) Lab File ID: ___KTH_030_____

Level: (low/med) _____ low _____ Date Received:___7/29/99 _____

% Moisture: _____ NA _____ Date Analyzed:___8/4/99 _____

GC Column: _ Carboxen 1004 __ OD: ___ 1/16" ___ Dilution Factor:_____ 1 _____

Soil Extract Volume: _____ NA ____ (µl) Soil Aliquot Volume: ____ NA ____ (µl)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (µg/L or PPMv) __ µg/L __	Q
74-82-8	Methane	5.2	U
74-85-1	Ethene	9.0	U
74-84-0	Ethane	9.6	U

ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLK01

Lab Name: _____ ENSR _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS NO.: _____ SDG NO.: _____

Matrix: (soil/water) _____ water _____ Lab Sample ID: MB990123

Sample wt / vol: ____ 32.5 ml _____ (g/ml) Lab File ID: ___KTH_026_____

Level: (low/med) _____ low _____ Date Received:___NA _____

% Moisture: _____ NA _____ Date Analyzed:___8/4/99 _____

GC Column: _ Carboxen 1004 __ OD: ___ 1/16" ___ Dilution Factor:_____ 1 _____

Soil Extract Volume: _____ NA ____ (µl) Soil Aliquot Volume: ____ NA ____ (µl)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (µg/L or PPMv) __ µg/L __	Q
74-82-8	Methane	5.2	U
74-85-1	Ethene	9.0	U
74-84-0	Ethane	9.6	U

ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name. _____ ENSR _____ Contract: _____ LCS01

Lab Code: _____ Case No.: _____ SAS NO.: _____ SDG NO.: _____

Matrix: (soil/water) _____ water _____ Lab Sample ID: LCS990123

Sample wt / vol: ____ 32.5 ml _____ (g/ml) Lab File ID: ___KTH_027_____

Level: (low/med) _____ low _____ Date Received:___NA _____

% Moisture: _____ NA _____ Date Analyzed:__8/4/99 _____

GC Column: _ Carboxen 1004 __ OD: ___ 1/16" ___ Dilution Factor:_____ 1_____

Soil Extract Volume: _____ NA ____ (µl) Soil Aliquot Volume: ____ NA ____ (µl)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (µg/L or PPMv) __ µg/L __	Q
74-82-8	Methane	38	
74-85-1	Ethene	66	
74-84-0	Ethane	70	

ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: _____ ENSR _____ Contract: _____ WP3417-7(A)MS

Lab Code: _____ Case No.: _____ SAS NO.: _____ SDG NO.: _____

Matrix: (soil/water) _____ water _____ Lab Sample ID: 990123-3 MS

Sample wt / vol: ____ 32.5 ml _____ (g/ml) Lab File ID: ___KTH_031_____

Level: (low/med) _____ low _____ Date Received:___7/29/99 _____

% Moisture: _____ NA _____ Date Analyzed:__8/4/99 _____

GC Column: _ Carboxen 1004 __ OD: ___ 1/16" ___ Dilution Factor:_____ 1_____

Soil Extract Volume: _____ NA ____ (µl) Soil Aliquot Volume: ____ NA ____ (µl)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (µg/L or PPMv) __ µg/L __	Q
74-82-8	Methane	370	
74-85-1	Ethene	620	
74-84-0	Ethane	690	

ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

WP3417-7(B) MSD

Lab Name: ENSR Contract:

Lab Code: Case No.: SAS NO.: SDG NO.:

Matrix: (soil/water) water

Lab Sample ID: 990123-3 MSD

Sample wt / vol: 32.5 ml (g/ml)

Lab File ID: KTH_032

Level: (low/med) low

Date Received: 7/29/99

% Moisture: NA

Date Analyzed: 8/4/99

GC Column: Carboxen 1004 OD: 1/16"

Dilution Factor: 1

Soil Extract Volume: NA (µl)

Soil Aliquot Volume: NA (µl)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (µg/L or PPMv) µg/L	Q
74-82-8	Methane	280	
74-85-1	Ethene	480	
74-84-0	Ethane	530	

METHOD BLANK SUMMARY

EPA SAMPLE NO.

VBLK01

Lab Name: _____ ENSR _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS NO.: _____ SDG NO.: _____

Lab File ID: __KTH_026_____ Lab Sample I MB990123

Instrument ID: _____ HPGC#3_____ Date Analyzed:_8/4/99_____

Matrix: (soil/water) _____ water _____ Level: (low/med) _____ low _____

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES; MS AND MSD

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
01	LCS01	LCS990123	KTH_027	08/04/99
02	WP3417-1(H)	990123-1	KTH_028	08/04/99
03	WP3417-2(H)	990123-2	KTH_029	08/04/99
04	WP3417-7(C)	990123-3	KTH_030	08/04/99
05	WP3417-7(A) MS	990123-3 MS	KTH_031	08/04/99
06	WP3417-7(B) MSD	990123-3 MSD	KTH_032	08/04/99
07				
08				
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25				
26				

COMMENTS:

LABORATORY CONTROL SPIKE RECOVERY

Lab Name: ____ ENSR _____ Contract: _____

Lab Code. _____ Case NO.: _____ SAS NO.: _____ SDG NO.: _____

Laboratory Control Sample No: _____ LCS01 _____

COMPOUND	SPIKE ADDED (µg/L)	LCS CONCENTRATION (µg/L)	LCS % REC #	QC LIMITS REC.
Methane	41.03	38.28	93%	50 - 150
Ethene	71.04	65.55	92%	50 - 150
Ethane	77.69	70.18	90%	50 - 150

* - Values outside of QC limits.

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: ____ ENSR _____ Contract: _____

Lab Code: _____ Case NO.: _____ SAS NO.: _____ SDG NO.: _____

Matrix Spike - EPA Sample NO.: __WP3417-7 _____

COMPOUND	SPIKE ADDED (µg/L)	SAMPLE CONCENTRATION (µg/L)	MS CONCENTRATION (µg/L)	MS % REC #	QC LIMITS REC.
Methane	410.3	0	371.8	91%	50-150
Ethene	710.4	0	624.4	88%	50-150
Ethane	777.0	0	689.1	89%	50-150

COMPOUND	SPIKE ADDED (µg/L)	MSD CONCENTRATION (µg/L)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
Methane	410.3	283.9	69%	27%	50	50-150
Ethene	710.4	484.5	68%	25%	50	50-150
Ethane	777.0	530.4	68%	26%	50	50-150

Spike recovery: _____ 0 _____ out of ____ 6 ___ outside limits.
RPD: _____ 0 ____ out of ___ 3 ____ outside limits.

Comments:

SDG NARRATIVE
KATAHDIN ANALYTICAL SERVICES
TETRA TECH NUS
CASE CNC CHARLESTON

Sample Receipt

The following samples were received on July 29, 1999 and were logged in under Katahdin Analytical Services work order number WP3429 for a hardcopy due date of August 28, 1999.

KATAHDIN Sample No.	TTNUS Sample Identification
WP3429-1	31GLM0101
WP3429-2	29GLM0701
WP3429-3	31TL01001
WP3429-4	31GLM0301
WP3429-5	31GLM0401
WP3429-6	31GLM0501

The samples were logged in for the analyses specified on the chain of custody form. All problems encountered and resolved during sample receipt have been documented on the applicable chain of custody forms.

Sample analyses have been performed by the methods as noted herein.

Volatile Organic Analysis

Six aqueous samples were received by the Katahdin Analytical Services, Inc. GC/MS laboratory on July 29, 1999 and were specified to be analyzed by USEPA method 8260B for the analytes benzene, toluene, ethylbenzene, xylenes, MTBE, naphthalene, and EDB.

Analyses for this work order were performed on the 5972-M instrument. A VSTD050 (50 ppb standard) was used for the continuing calibration standard. Internal standard and surrogate compounds were also spiked at 50 ug/l.

Batch QC (VBLK, and LCS) was performed in each twelve-hour window. Results are included in this data package. The LCS QC samples were spiked with the entire list of compounds quantitated for at 50 ppb. A matrix spike/matrix spike duplicate was performed on sample WP3429-5.

Method 8000B, section 7.5.1.2.1 (Revision 2, 12/96) states, "in those instances where the RSD for one or more analytes exceeds 20%, the initial calibration curve may still be acceptable if the mean of the RSD values for all analytes in the calibration is less than or equal to 20%." Method 8260B narrows this 20% maximum to 15%.

In the calibration curves analyzed in this SDG, the average %RSD for all analytes was 11.3%,

making the curve acceptable.

Several manual integrations were performed due to split peaks; all have been flagged with a "M" (software-generated) on the pertinent quantitation reports. All "M" flags have been dated and initialed by the analyst performing the integration. In addition, all "M" flags have been reviewed and approved by the GC/MS supervisor. Copies of each manual integration are included in the pertinent quantitation reports.

No other protocol deviations were noted by the volatile organics staff.

Semivolatile Organic Analysis

Three aqueous samples were received by Katahdin Analytical Services laboratory on July 29, 1999 for analysis in accordance with 8270C for a client specified PAH list of analytes.

Extraction of the samples occurred following USEPA method 3510 on July 30, 1999. A laboratory control spike, consisting of all PAH analytes spiked into organic free water, was extracted in the batch, along with a site specific MS/MSD pair on sample WP3429-5.

The initial calibration curve analyzed in this SDG had some of the target analyte %RSD values exceeding 15 %.

Method 8000B, section 7.5.1.2.1 (Revision 2, 12/96) states, "in those instances where the RSD for one or more analytes exceeds 20%, the initial calibration curve may still be acceptable if the mean of the RSD values for all analytes in the calibration is less than or equal to 20%." Section 7.3.7.1 of method 8270C (revision 3, 12/96) narrows this 20% maximum to 15%.

In the calibration curve analyzed in this SDG, the average %RSD for all analytes was 10.1%, making the curve acceptable.

Several manual integrations were performed due to split peaks; all have been flagged with a "M" by the data system. All manual integrations have been dated and initialed by the responsible analyst. Copies of each manual integration are included in the data package. All manual integrations have been reviewed and approved by the GC/MS supervisor.

No other protocol deviations were noted by the semivolatiles organics staff.

Wet Chemistry Analysis

For work order WP3429 analyses for Nitrate (E300) and Sulfate (E300) were performed according to the U.S. EPA "Methods for the Determination of Inorganic Substances in Environmental Samples", EPA 600/R-93/100, August 1993. All samples were run within laboratory hold time. The wet chemistry staff noted no protocol deviations.

KATAHDIN ANALYTICAL SERVICES, INC.
SAMPLE RECEIPT CONDITION REPORT
Tel. (207) 874-2400
Fax (207) 775-4029

LAB (WORK ORDER) # WP 3429

PAGE: 1 OF 1

COOLER: 1 OF 1

CLIENT: Tetra Tech

PROJECT: CNC

COC# —
SDG# —
DATE / TIME RECEIVED: 7-29-99 0900
DELIVERED BY: Fed Ex
RECEIVED BY: Sa
LIMS ENTRY BY: SAW
LIMS REVIEW BY / PM: AJC

	YES	NO	EXCEPTIONS	COMMENTS	RESOLUTION
1. CUSTODY SEALS PRESENT / INTACT?	☑	☐	☐		
2. CHAIN OF CUSTODY PRESENT IN THIS COOLER?	☑	☐	☐		
3. CHAIN OF CUSTODY SIGNED BY CLIENT?	☑	☐	☐		
4. CHAIN OF CUSTODY MATCHES SAMPLES?	☑	☐	☐		
5. TEMPERATURE BLANKS PRESENT?	☑	☐	☐	TEMP BLANK TEMP (°C)= 1.0	AJC notified Dave Calligan by fax 7/29/99
6. SAMPLES RECEIVED AT 4°C +/- 2? ICE / ICE PACKS PRESENT Y or N?	☐	☑	☐	COOLER TEMP (°C)= NA (RECORD COOLER TEMP ONLY IF TEMP BLANK IS NOT PRESENT)	
7. VOLATILES FREE OF HEADSPACE?	☑	☐	☐		
8. TRIP BLANK PRESENT IN THIS COOLER	☑	☐	☐		
9. PROPER SAMPLE CONTAINERS AND VOLUME?	☑	☐	☐		
10. SAMPLES WITHIN HOLD TIME UPON RECEIPT?	☑	☐	☐		
11. SAMPLES PROPERLY PRESERVED[1]?	☑	☐	☐		
12. CORRECTIVE ACTION REPORT FILED?	☐	☑	N/A		

13. ANALYTICAL PROGRAMS (CIRCLE ONE) COMMERCIAL CLP HAZWRAP NFESC ACOE AFCEE OTHER (STATE OF ORIGIN):

LOG - IN NOTES[1]:

(1) Use this space (and additional sheets if necessary) to document samples that are received broken or compromised, C-O-C discrepancies, radiation checks, residual chlorine check, results of pH check if required. If samples required pH adjustment, record volume and type of preservative added.

Katahdin ANALYTICAL SERVICES
340 County Road No. 5
P.O. Box 720
Westbrook, ME 04098
Tel: (207) 874-2400
Fax: (207) 775-4029

CHAIN of CUSTODY

PLEASE PRINT IN PEN

Page ____ of ____

Client: Tetra Tech NUS Inc ~ | Contact: Paul Galligan | Phone #: (843) 554-4925 | Fax #: ( )

Address: NH-21 Ave H | City: N. Charleston | State: S.C. | Zip Code: 29405-2100

Purchase Order # | Proj. Name / No. | Katahdin Quote #

Bill (if different than above) | Address

Sampler (Print / Sign): James R. Hill / James R. Hill | Copies To:

LAB USE ONLY | WORK ORDER #: WP3429 | KATAHDIN PROJECT MANAGER

REMARKS:

SHIPPING INFO: ☐ FED EX ☐ UPS ☐ CLIENT

AIRBILL NO:

TEMP°C ____ ☐ TEMP BLANK ☐ INTACT ☐ NOT INTACT

ANALYSIS AND CONTAINER TYPE PRESERVATIVES

*	Sample Description	Date / Time coll'd	Matrix	No. of Cntrs.	BTEX, Naph MTBE, EDB	PAH	Dissolved Methane	Anions (NO3, SO4)						
	31GLMØ1Ø1	7/27/99/1055	GW	3	3									
	29GLMØ7Ø1	/1245		3	3									
	29GLMØ7Ø1M	/1245		3	3								MS/MSD	
	31GLMØ3Ø1	7/28/99/1040		9	3	2	3	1						
	31GLMØ4Ø1	/1115		5	3	2								
	31GLMØ4Ø1M	/1115		5	3	2							MS/MSD	
	31GLMØ5Ø1	/1200		5	3	2								
	~~31TLØ0 00Ø~~	/—												
	31TLØ1ØØ1	0800		2	2				Trip Blank					
		/												
		/												
		/												
		/												
		/												
		/												
		/												

COMMENTS

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
James R. Hill	7/29/99 1500	8134029045 32		7-29-99 0900	Shelly Wilkinson
Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)

FORMSOURCE INC. ☎ (207) 782-3311
FORM # CHN-OF-CSTDY

ORIGINAL

KATAHDIN ANALYTICAL SERVICES, INCORPORATED
New England-ME Laboratory (207) 874-2400
CONFIRMATION

ORDER NO WP-3429

Project Manager: Andrea J. Colby
ORDER DATE: 07/29/99
PHONE: 850/385-9899
FAX: 850/385-9860
DUE: 28 AUG
FAC.ID: CNC CHARLESTON

R RT TO: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

INVOICE: ACCOUNTS PAYABLE
TETRA TECH NUS, INC.
FOSTER PLAZA 7, 661 ANDERSEN DR.
PITTSBURGH, PA 15220

PHONE: 412/921-7090
PO: N7912-P99264

PROJECT: CTO #68

SAMPLED BY: J.R. HILL DELIVERED BY: FEDEX DISPOSE: AFTER 27 SEP

ITEM	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
1	WP3429-1	31GLM0101	27 JUL 1055	29 JUL	AQ
	WP3429-2	29GLM0701	27 JUL 1245		
	WP3429-3	31TL01001	28 JUL 0800		

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
Volatile Organics by 8260B	SW8260	3	75.00	225.00

	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
2	WP3429-4	31GLM0301	28 JUL 1040	29 JUL	AQ

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
Volatile Organics by 8260B	SW8260	1	75.00	75.00
Polynuclear Aromatic Hydrocarbons	EPA 8270	1	125.00	125.00
GC Subcontract		1	95.00	95.00
Sulfate (as SO4)	E300	1	30.00	30.00
Nitrogen, Nitrate (as N)	E300	1	0.00	0.00
TOTALS		1	325.00	325.00

	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
3	WP3429-5	31GLM0401	28 JUL 1115	29 JUL	AQ
	WP3429-6	31GLM0501	28 JUL 1200		

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
Volatile Organics by 8260B	SW8260	2	75.00	150.00
Polynuclear Aromatic Hydrocarbons	EPA 8270	2	125.00	250.00
TOTALS		2	200.00	400.00

LABORATORY ORDER CONTINUED ON PAGE 2

0000086 7/29/99

KATAHDIN ANALYTICAL SERVICES, INCORPORATED
New England-ME Laboratory (207) 874-2400
CONFIRMATION

ORDER NO WP-3429

Project Manager: Andrea J. Colby
ORDER DATE: 07/29/99
PHONE: 850/385-985
FAX: 850/385-9860
DUE: 28 AUG
FAC.ID: CNC CHARLESTON

REPORT TO: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

INVOICE: ACCOUNTS PAYABLE
TETRA TECH NUS, INC.
FOSTER PLAZA 7, 661 ANDERSEN DR.
PITTSBURGH, PA 15220

PHONE: 412/921-7090
PO: N7912-P99264

PROJECT: CTO #68

SAMPLED BY: J.R. HILL DELIVERED BY: FEDEX DISPOSE: AFTER 27 SEP

ORDER NOTE: QC-IV NFESC
DD(KAS007QC-DB3)
CNC CHARLESTON

REPORT COPY: MS.LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.
PITTSBURG,PA 15220
REPORT & DISK

INVOICE: With Report

TOTAL ORDER AMOUNT $950.0
This is NOT an Invoi...

AJC/BKR
07-29Please contact KATAHDIN ANALYTICAL SERVICES promptly if you have any questi

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Paul Calligan	Lab Number:	WP3429-1
	Tetra Tech NUS	SDG:	WP3429
	1401 Oven Park Dr.	Report Date:	8/27/99
	Suite 102	PO No. :	N7912-P99264
	Tallahassee, FL 32308	Project:	CTO #68
Proj. ID:	CNC CHARLESTON	% Solids:	N/A
		Method:	SW8260
		Date Analyzed:	8/3/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31GLM0101	AQ	7/27/99	7/29/99	8/3/99	DJP	5030	DJP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	102	%	1.0		
1,2-DICHLOROETHANE-D4	99	%	1.0		
TOLUENE-D8	101	%	1.0		
P-BROMOFLUOROBENZENE	98	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3429-3
SDG: WP3429
Report Date: 8/27/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 8/3/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31TL01001	AQ	7/28/99	7/29/99	8/3/99	DJP	5030	DJP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	102	%	1.0		
1,2-DICHLOROETHANE-D4	97	%	1.0		
TOLUENE-D8	102	%	1.0		
P-BROMOFLUOROBENZENE	98	%	1.0		

Report Notes:

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-3429-4
Report Date: 08/31/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
31GLM0301	Aqueous	J.R. HILL	07/28/99	07/29/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Nitrogen, Nitrate (as N)	<0.050	mg/L	1.0	0.050	E300	07/29/99	CF	
Sulfate (as SO4)	12.	mg/L	1.0	1.0	E300	08/24/99	CF	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

08/31/99

LJO/baeajc(dw)/msm
PG29N3W1
CC: MS.LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3429-4
SDG: WP3429
Report Date: 8/27/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: EPA 8270
Date Analyzed: 8/9/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31GLM0301	AQ	7/28/99	7/29/99	7/30/99	DPD	EPA 3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.0	10	10
ACENAPHTHYLENE	<10	ug/L	1.0	10	10
ACENAPHTHENE	<10	ug/L	1.0	10	10
FLUORENE	<10	ug/L	1.0	10	10
PHENANTHRENE	<10	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
PYRENE	<10	ug/L	1.0	10	10
BENZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
CHRYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	68	%	1.0		
2-FLUOROBIPHENYL	71	%	1.0		
TERPHENYL-D14	84	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3429-4
SDG: WP3429
Report Date: 8/27/99
PO No.: N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 8/3/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31GLM0301	AQ	7/28/99	7/29/99	8/3/99	DJP	5030	DJP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	102	%	1.0		
1,2-DICHLOROETHANE-D4	98	%	1.0		
TOLUENE-D8	103	%	1.0		
P-BROMOFLUOROBENZENE	99	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3429-5
SDG: WP3429
Report Date: 8/27/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: EPA 8270
Date Analyzed: 8/9/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31GLM0401	AQ	7/28/99	7/29/99	7/30/99	DPD	EPA 3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.0	10	10
ACENAPHTHYLENE	<10	ug/L	1.0	10	10
ACENAPHTHENE	<10	ug/L	1.0	10	10
FLUORENE	<10	ug/L	1.0	10	10
PHENANTHRENE	<10	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
PYRENE	<10	ug/L	1.0	10	10
BENZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
CHRYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	73	%	1.0		
2-FLUOROBIPHENYL	73	%	1.0		
TERPHENYL-D14	114	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Paul Calligan	Lab Number:	WP3429-5
	Tetra Tech NUS	SDG:	WP3429
	1401 Oven Park Dr.	Report Date:	8/27/99
	Suite 102	PO No. :	N7912-P99264
	Tallahassee, FL 32308	Project:	CTO #68
Proj. ID:	CNC CHARLESTON	% Solids:	N/A
		Method:	SW8260
		Date Analyzed:	8/3/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31GLM0401	AQ	7/28/99	7/29/99	8/3/99	DJP	5030	DJP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	103	%	1.0		
1,2-DICHLOROETHANE-D4	99	%	1.0		
TOLUENE-D8	101	%	1.0		
P-BROMOFLUOROBENZENE	97	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3429-6
SDG: WP3429
Report Date: 8/27/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: EPA 8270
Date Analyzed: 8/9/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31GLM0501	AQ	7/28/99	7/29/99	7/30/99	DPD	EPA 3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.0	10	10
ACENAPHTHYLENE	<10	ug/L	1.0	10	10
ACENAPHTHENE	<10	ug/L	1.0	10	10
FLUORENE	<10	ug/L	1.0	10	10
PHENANTHRENE	<10	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
PYRENE	<10	ug/L	1.0	10	10
BENZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
CHRYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	61	%	1.0		
2-FLUOROBIPHENYL	63	%	1.0		
TERPHENYL-D14	57	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

'ient: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3429-6
SDG: WP3429
Report Date: 8/27/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 8/3/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31GLM0501	AQ	7/28/99	7/29/99	8/3/99	DJP	5030	DJP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	106	%	1.0		
2-DICHLOROETHANE-D4	101	%	1.0		
OLUENE-D8	103	%	1.0		
P-BROMOFLUOROBENZENE	98	%	1.0		

Report Notes:

Centralite Analytical Services, Inc.
Quality Control Report

Method Blank and Laboratory Control Sample Results

Client: Tetra Tech NUS	
Work Order: WP3429	

			METHOD BLANK RESULTS						LABORATORY CONTROL SAMPLE RESULTS					
Parameter	Date of Prep	Date of Analysis	Units		Concentration Measured in Blank		Acceptance Range	Practical Quantitation Level**	Units	True Value	Measured Value	Percent Recovered	Acceptance Range (%)	Acceptance Range (mg/kg)
Nitrate-Nitrogen	29-Jul-99	29-Jul-99	mg/L	<	0.050	<	0.050	0.050	mg/L	2.50	2.34	93.6	80-120	
Sulfate	24-Aug-99	24-Aug-99	mg/L	<	1.0	<	1.0	1.0	mg/L	10	11.7	117.0	80-120	

** Practical quantitation level is the lowest concentration measurable for samples with normal chemical and physical composition during routine laboratory operations.

DATA QUALITY COMMENTS:
Results of all quality control measurements are within the laboratory and method specified acceptance range except as noted.

@ The laboratory uses the internally established statistical 99% confidence range as the acceptance range for this LCS.

Katahdin Analytical Services, Inc.
Quality Control Report

Duplicate and Matrix Spike/Matrix Spike Duplicate Results

Client:	Tetra Tech NUS
Work Order:	WP3429

			DUPLICATE RESULTS					*MATRIX SPIKE/MATRIX SPIKE DUPLICATE RESULTS*									
			Sample Measurements				Acceptance		Concentration or Quantity				Matrix Spike Recovery (%)				
Parameter	Katahdin Sample No	Units	Rep 1	Rep 2	Mean Conc	RPD (%)	Range for RPD (%)	Units	Sampl Only	Spike Added	Sample +Spike Dup 1	Sample +Spike Dup 2	Sample +Spike Dup 1	Sample +Spike Dup 2	Acceptance Range (%)	RPD (%)	Acceptance Range (%)
Nitrate - N	WP3429-4	mg/L	<0.050	<0.050	<0.050	0.0	0-20	mg/L	<0.050	2.0	1.79		89.5		75-125		0-20
Sulfate	WP3429-4	mg/L	12.368	12.362	12.365	0.1	0-20	mg/L							75-125		0-20

RPD = Relative percent difference, which is the absolute value of the difference between two replicate results divided by the mean concentration then multiplied by 100%.

DATA QUALITY COMMENTS:

Results of all quality control measurements are within the laboratory or contract specified acceptance range except as noted. The laboratory does not use the sample duplicate and matrix spike acceptance ranges as acceptance criteria for a specific analysis. Sample duplicate and matrix spike data are used to evaluate method performance in the environmental sample matrix only. Please refer to LCS data for assessment of quality control for each parameter.

4B
SEMIVOLATILE ORGANICS METHOD BLANK SUMMARY

EPA SAMPLE NO.

SBLK;073099

Lab Name: Katahdin Analytical Services SDG No.: WP3429

Lab File ID: Z1669

Lab Sample ID: SBLK;073099

Instrument ID: 5972-Z

Date Extracted: 7/30/99

GC Column: RTX-624 ID: 0.18 (mm)

Date Analyzed: 08/06/99

Matrix: (soil/water) WATER

Time Analyzed: 21:23

Level: (low/med) LOW

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, LCS'S, MS AND MSD'S :

Client Sample ID	Lab Sample ID	Lab Data File	Date Injected	Time Injected
LCS;073099	LCS;073099	Z1680	8/9/99	4:59:00 PM
31GLM0301	WP3429-4	Z1681	8/9/99	5:44:00 PM
31GLM0401	WP3429-5	Z1682	8/9/99	6:30:00 PM
31GLM0401MS	WP3429-5MS	Z1683	8/9/99	7:15:00 PM
31GLM0401MSD	WP3429-5MSD	Z1684	8/9/99	8:00:00 PM
31GLM0501	WP3429-6	Z1685	8/9/99	8:46:00 PM

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Paul Calligan Tetra Tech NUS 1401 Oven Park Dr. Suite 102 Tallahassee, FL 32308	Lab Number:	SBLK;073099
		SDG:	WP3429
		Report Date:	8/27/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	% Solids:	N/A
		Method:	EPA 8270
		Date Analyzed:	8/6/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
SBLK;073099	AQ	-	-	7/30/99	DPD	EPA 3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.0	10	10
ACENAPHTHYLENE	<10	ug/L	1.0	10	10
ACENAPHTHENE	<10	ug/L	1.0	10	10
FLUORENE	<10	ug/L	1.0	10	10
PHENANTHRENE	<10	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
PYRENE	<10	ug/L	1.0	10	10
BENZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
CHRYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	61	%	1.0		
2-FLUOROBIPHENYL	62	%	1.0		
TERPHENYL-D14	90	%	1.0		

Report Notes:

Katahdin Analytical Services

8270 LCS Recovery Sheet

Lab File: Z1680 **Sample ID: LCS;073099** **Date Run: 8/9/99**

Analyst: KRT **Time Injected 4:59:00 PM** **Matrix: AQ**

Compound Name	Spike Amt (ug/L)	Result (ug/L)	Rec (%)	Limits (%)
2-METHYLNAPHTHALENE	50	34.3	*68	70-130
ACENAPHTHENE	50	37.9	76	70-130
ACENAPHTHYLENE	50	37.8	76	70-130
ANTHRACENE	50	46.3	93	70-130
BENZO[A]ANTHRACENE	50	42.6	85	70-130
BENZO[A]PYRENE	50	35.5	71	70-130
BENZO[B]FLUORANTHENE	50	33.8	*68	70-130
BENZO[G,H,I]PERYLENE	50	29.6	*59	70-130
BENZO[K]FLUORANTHENE	50	44.1	88	70-130
CHRYSENE	50	44.8	90	70-130
DIBENZ[A,H]ANTHRACENE	50	28.1	*56	70-130
FLUORANTHENE	50	44.4	89	70-130
FLUORENE	50	37.8	76	70-130
INDENO[1,2,3-CD]PYRENE	50	28.2	*56	70-130
NAPHTHALENE	50	36.2	72	70-130
PHENANTHRENE	50	43.8	88	70-130
PYRENE	50	44.8	90	70-130

*** Out of Limits** *1*

Katahdin Analytical Services

MS/MSD Report

Sample	File Name	Date Acquired	Time inj	Analyst	Matrix	Method
WP3429-5	Z1682	8/9/99	6:30:00 PM	KRT	AQ	8270_99
WP3429-5MS	Z1683	8/9/99	7:15:00 PM	KRT	AQ	8270_99
WP3429-5MSD	Z1684	8/9/99	8:00:00 PM	KRT	AQ	8270_99

Compound Name	Native (ug/L)	MS Spk Amount (ug/L)	MSD Spk Amount (ug/L)	MS Result (ug/L)	MSD Result (ug/L)	MS REC (%)	MSD REC (%)	Recovery Limits (%)	RPD (%)	RPD Limit (%)
CHRYSENE	0	49	49	46.0	52.7	94	107	60-140	14	30
ACENAPHTHENE	0	49	49	39.5	40.1	81	82	60-140	1.5	30
ACENAPHTHYLENE	0	49	49	39.6	40.4	81	82	60-140	2.0	30
ANTHRACENE	0	49	49	48.0	54.8	98	112	60-140	13	30
BENZO[A]ANTHRACENE	0	49	49	45.1	49.9	92	102	60-140	10	30
BENZO[A]PYRENE	0	49	49	37.6	42.1	77	86	60-140	11	30
BENZO[B]FLUORANTHENE	0	49	49	35.1	40.1	72	82	60-140	13	30
2-METHYLNAPHTHALENE	0	49	49	37.5	34.7	76	71	60-140	7.8	30
BENZO[K]FLUORANTHENE	0	49	49	44.7	48.4	91	99	60-140	7.9	30
PYRENE	0	49	49	49.7	56.0	101	114	60-140	12	30
DIBENZ[A,H]ANTHRACENE	0	49	49	31.5	37.2	64	76	60-140	16	30
FLUORANTHENE	0	49	49	45.1	49.9	92	102	60-140	10	30
FLUORENE	0	49	49	39.7	42.0	81	86	60-140	5.6	30
INDENO[1,2,3-CD]PYRENE	0	49	49	34.2	40.2	70	82	60-140	16	30
N[illegible]HALENE	0	49	49	39.1	34.6	80	70	60-140	12	30
PH[illegible]ANTHRENE	0	49	49	46.7	50.6	95	103	60-140	8.0	30
BENZO[G,H,I]PERYLENE	0	49	49	33.8	40.4	69	82	60-140	18	30

RPD =[(ms res - msd res) / (ms res + msd res)/2] * 100

*** Out of Limits**

4A
VOLATILE ORGANICS METHOD BLANK SUMMARY

EPA SAMPLE NO.

VBLKM02A

Lab Name: Katahdin Analytical Services SDG No.: WP3429

Lab File ID: M1328 Lab Sample ID: VBLKM02A

Date Analyzed: 08/03/99 Time Analyzed: 16:01

GC Column: RTX-624 ID: 0.18 (mm) Heated Purge: (Y/N) N

Instrument ID: 5972-M

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, LCS'S, MS AND MSD'S

Client Sample ID	Lab Sample ID	Lab Data File	Date Injected	Time Injected
LCSM02A	LCSM02A	M1327	8/3/99	3:22:00 PM
31GLM0101	WP3429-1	M1333	8/3/99	7:14:00 PM
29GLM0701	WP3429-2	M1334	8/3/99	7:53:00 PM
31TL01001	WP3429-3	M1335	8/3/99	8:32:00 PM
31GLM0301	WP3429-4	M1336	8/3/99	9:12:00 PM
31GLM0401	WP3429-5	M1337	8/3/99	9:52:00 PM
31GLM0501	WP3429-6	M1338	8/3/99	10:30:00 PM
31GLM0401MS	WP3429-5MS	M1342	8/4/99	1:09:00 AM
31GLM0401MSD	WP3429-5MSD	M1343	8/4/99	1:47:00 AM

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

:nt: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: VBLKM02A
SDG: WP3429
Report Date: 8/27/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 8/3/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
VBLKM02A	AQ	-	-	8/3/99	DJP	5030	DJP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	98	%	1.0		
2-DICHLOROETHANE-D4	94	%	1.0		
TOLUENE-D8	101	%	1.0		
P-BROMOFLUOROBENZENE	99	%	1.0		

Report Notes:

Katahdin Analytical Services
8260 LCS Recovery Sheet

Lab File: M1327 **Sample ID: LCSM02A** **Date Run: 8/3/99**

Analyst: DJP **Time Injected 3:22:00 PM** **Matrix: AQ**

Compound Name	Spike Amt (ug/L)	Result (ug/L)	Rec (%)	Limits (%)
1,2-DIBROMOETHANE	50	49.6	99	60-140
BENZENE	50	51.8	104	60-140
ETHYLBENZENE	50	52.0	104	60-140
MTBE	50	48.7	97	60-140
NAPHTHALENE	50	48.8	98	60-140
TOLUENE	50	52.1	104	60-140
TOTAL XYLENES	150	153	102	60-140

*** Out of Limits** *1*

Katahdin Analytical Services

MS/MSD Report

Sample	File Name	Date Acquired	Time inj	Analyst	Matrix	Method
WP3429-5	M1337	8/3/99	9:52:00 PM	DJP	AQ	8260_99
WP3429-5MS	M1342	8/4/99	1:09:00 AM	DJP	AQ	8260_99
WP3429-5MSD	M1343	8/4/99	1:47:00 AM	DJP	AQ	8260_99

Compound Name	Native (ug/L)	MS Spk Amount (ug/L)	MSD Spk Amount (ug/L)	MS Result (ug/L)	MSD Result (ug/L)	MS REC (%)	MSD REC (%)	Recovery Limits (%)	RPD (%)	RPD Limit (%)
TOTAL XYLENES	0	150	150	130	128	87	86	60-140	1.6	20
TOLUENE	0	50	50	44.6	44.2	89	88	60-140	0.90	20
NAPHTHALENE	0	50	50	35.8	37.3	72	74	60-140	4.1	20
MTBE	0	50	50	42.9	43.0	86	86	60-140	0.23	20
ETHYLBENZENE	0	50	50	44.1	43.0	88	86	60-140	2.5	20
BENZENE	0	50	50	44.3	44.0	88	88	60-140	0.68	20
1,2-DIBROMOETHANE	0	50	50	43.2	44.5	86	89	60-140	3.0	20

RPD =[(ms res - msd res) / (ms res + msd res)/2] * 100

*** Out of Limits**

ENSR
Air Toxics Specialty Laboratory
42 Nagog Park
Acton, MA 01720

DATE: August 26, 1999

TO: Andrea Colby
Katahdin Analytical
340 County Road No. 5
P.O. Box 720
Westbrook, ME 04098

Re: Organic Analyses of Aqueous Samples by Gas Chromatography Flame Ionization Detection (GC/FID)

PROJECT #: **8601-008-200**

LAB ID #: **990126**

ANALYTICAL PROCEDURE:

One (1) aqueous sample was analyzed under the guidelines of EPA SW846 Method 3810.

A Hewlett Packard 5890 series II gas chromatograph (GC) equipped with a Hewlett Packard flame ionization detector (FID) was used for the analysis. A 1.0 mL headspace aliquot of each sample was injected into the column for analysis. The operating conditions of the GC/FID are listed in Table 1. A five point calibration was performed for the target analytes (methane, ethane, and ethylene).

No problems occurred during sample receipt or log-in.

QUALITY CONTROL:

1. A laboratory blank was analyzed daily in the same manner as the samples. Target analytes were not detected in the blank.

2. A Matrix Spike/MSD was performed on a sample from another Katahdin job:

   WP3417-7

   All recoveries were within QC limits.

Date Samples Received by the Laboratory: 7/29/99

Date Analysis Started: 8/4/99

C:\My Documents\katrpt12.doc

Katahdin ANALYTICAL SERVICES
340 County Road No. 3
P.O. Box 720
Westbrook, ME 04098
Tel. (207) 874-2400
Fax: (207) 775-4029

CHAIN of CUSTODY

990126

PLEASE PRINT IN PEN

Page ____ of ____

Client: KATAHDIN ANALYTICAL SERVICES | Contact: ANDREA J. COLBY | Phone #: ( ) | Fax #: ( )

Address: SAME AS ABOVE | City | State | Zip Code

Purchase Order # | Proj. Name / No. | Katahdin Quote #

Bill (if different than above) | Address

Sampler (Print / Sign) | Copies To:

LAB USE ONLY | WORK ORDER #:

KATAHDIN PROJECT MANAGER

REMARKS: SUB. TO ENSR

SHIPPING INFO: [X] FED EX [ ] UPS [ ] CLIENT

AIRBILL NO:

TEMP °C ____ [ ] TEMP BLANK [ ] INTACT [ ] NOT INTACT

ANALYSIS AND CONTAINER TYPE / PRESERVATIVES

*	Sample Description	Date / Time coll'd	Matrix	No. of Cntrs.	Yellow Energy	Filt. Y O N	Filt. Y O N	Filt. Y O N	Filt. Y O N	Filt. Y O N	Filt. Y O N	Filt. Y O N	Filt. Y O N	Filt. Y O N	Filt. Y O N
	WP3429-4	~~7-28-99~~ 7-28-99/1040	AQ	3	X	(Lab ID) 990126-1									
		7-28-99													
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COMMENTS

QC-I NFESC DD (KA5007QC-DB3)

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
[signature]	7-29-99 1445	[signature]			
Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
		7-30-99 @1005			

SAMPLE LOG-IN & RECEIPT CHECKLIST

lient/Proj #: Katahdin / 8601-008-200

Proj Mgr: M. Hoat

Lab Pool #: 990126

Inspected & Logged in by: A. MacDuff

Date Time: 7/30/99 1005

Sample Matrix	Number of Samples	Analysis Requested	Analyze by (date)	Storage Location
Aqueous	1	MEE	ASAP	R.1

Circle the appropriate response:

1) Shipped Hand delivered

2) COC present / not present on receipt

3) COC Tape present / not present on shipping container

4) Samples broken / intact on receipt

5) Samples ambient / chilled on receipt Temp blank = 20°C

6) Samples preserved correctly / incorrectly / none recommended Not at 4°C ± 2°C

7) Received within / outside holding time

8) COC tapes present / not present on samples

9) Discrepancies / NO discrepancies noted between COCs and samples

Additional Comments: 3 COPs

GC-I

ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

WP3429-4(G)

Lab Name: _____ ENSR _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS NO.: _____ SDG NO.: _____

Matrix: (soil/water) _____ water _____ Lab Sample ID: 990126-1

Sample wt / vol: ____ 32.5 ml _____ (g/ml) Lab File ID: ___KTH_042_____

Level: (low/med) _____ low _____ Date Received:___7/30/99 _____

% Moisture: _____ NA _____ Date Analyzed:__8/4/99 _____

GC Column: _ Carboxen 1004 __ OD: ___ 1/16" ___ Dilution Factor:_____ 1 _____

Soil Extract Volume: _____ NA ____ (µl) Soil Aliquot Volume: ____ NA ____ (µl)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (µg/L or PPMv) __ µg/L __	Q
74-82-8	Methane	5.9	
74-85-1	Ethene	9.0	U
74-84-0	Ethane	9.6	U

ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLK01

Lab Name: _____ ENSR _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS NO.: _____ SDG NO.: _____

Matrix: (soil/water) _____ water _____ Lab Sample ID: MB990123

Sample wt / vol: ____ 32.5 ml _____ (g/ml) Lab File ID: ___KTH_026_____

Level: (low/med) _____ low _____ Date Received:___NA _____

% Moisture: _____ NA _____ Date Analyzed:___8/4/99 _____

GC Column: _ Carboxen 1004 __ OD: ___ 1/16" ___ Dilution Factor:_____ 1 _____

Soil Extract Volume: _____ NA ____ (µl) Soil Aliquot Volume: ____ NA ____ (µl)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (µg/L or PPMv) __ µg/L __	Q
74-82-8	Methane	5.2	U
74-85-1	Ethene	9.0	U
74-84-0	Ethane	9.6	U

ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: _____ ENSR _____ Contract: _____ LCS01

Lab Code: _____ Case No.: _____ SAS NO.: _____ SDG NO.: _____

Matrix: (soil/water) _____ water _____ Lab Sample ID: LCS990123

Sample wt / vol: ____ 32.5 ml _____ (g/ml) Lab File ID: ___KTH_027_____

Level: (low/med) _____ low _____ Date Received:___NA _____

% Moisture: _____ NA _____ Date Analyzed:__8/4/99 _____

GC Column: _ Carboxen 1004 __ OD: ___ 1/16" ___ Dilution Factor:_____ 1_____

Soil Extract Volume: _____ NA ____ (µl) Soil Aliquot Volume: ____ NA ____ (µl)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (µg/L or PPMv) __ µg/L __	Q
74-82-8	Methane	38	
74-85-1	Ethene	66	
74-84-0	Ethane	70	

ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: _____ ENSR _____ Contract: _____ WP3417-7(A)MS

Lab Code: _____ Case No.: _____ SAS NO.: _____ SDG NO.: _____

Matrix: (soil/water) _____ water _____ Lab Sample ID: 990123-3 MS

Sample wt / vol: ____ 32.5 ml _____ (g/ml) Lab File ID: ___KTH_031_____

Level: (low/med) _____ low _____ Date Received:___7/29/99 _____

% Moisture: _____ NA _____ Date Analyzed:__8/4/99 _____

GC Column: _ Carboxen 1004 __ OD: ___ 1/16" ___ Dilution Factor:_____ 1_____

Soil Extract Volume: _____ NA ____ (µl) Soil Aliquot Volume: ____ NA ____ (µl)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (µg/L or PPMv) __ µg/L __	Q
74-82-8	Methane	370	
74-85-1	Ethene	620	
74-84-0	Ethane	690	

ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

WP3417-7(B) MSD

Lab Name: _____ ENSR _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS NO.: _____ SDG NO.: _____

Matrix: (soil/water) _____ water _____ Lab Sample ID: 990123-3 MSD

Sample wt / vol: ____ 32.5 ml _____ (g/ml) Lab File ID: ___KTH_032_____

Level: (low/med) _____ low _____ Date Received:___7/29/99 _____

% Moisture: _____ NA _____ Date Analyzed:___8/4/99 _____

GC Column: _ Carboxen 1004 __ OD: ___ 1/16" ___ Dilution Factor:_____1_____

Soil Extract Volume: _____ NA ____ (µl) Soil Aliquot Volume: ____ NA ____ (µl)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (µg/L or PPMv) __ µg/L __	Q
74-82-8	Methane	280	
74-85-1	Ethene	480	
74-84-0	Ethane	530	

LABORATORY CONTROL SPIKE RECOVERY

Lab Name: ____ ENSR _____ Contract: _____

Lab Code: _____ Case NO.: _____ SAS NO.: _____ SDG NO.: _____

Laboratory Control Sample No: _____ LCS01 _____

COMPOUND	SPIKE ADDED (µg/L)	LCS CONCENTRATION (µg/L)	LCS % REC #	QC LIMITS REC.
Methane	41.03	38.28	93%	50 - 150
Ethene	71.04	65.55	92%	50 - 150
Ethane	77.69	70.18	90%	50 - 150

* - Values outside of QC limits.

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: ____ ENSR _____ Contract: _____

Lab Code: _____ Case NO.: _____ SAS NO.: _____ SDG NO.: _____

Matrix Spike - EPA Sample NO.: __WP3417-7 _____

COMPOUND	SPIKE ADDED (µg/L)	SAMPLE CONCENTRATION (µg/L)	MS CONCENTRATION (µg/L)	MS % REC #	QC LIMITS REC.
Methane	410.3	0	371.8	91%	50-150
Ethene	710.4	0	624.4	88%	50-150
Ethane	777.0	0	689.1	89%	50-150

COMPOUND	SPIKE ADDED (µg/L)	MSD CONCENTRATION (µg/L)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
Methane	410.3	283.9	69%	27%	50	50-150
Ethene	710.4	484.5	68%	25%	50	50-150
Ethane	777.0	530.4	68%	26%	50	50-150

Spike recovery: _____ 0 _____ out of ____ 6 ___ outside limits.
RPD: _____ 0 ____ out of ___ 3 ____ outside limits.

Comments:

METHOD BLANK SUMMARY

EPA SAMPLE NO.

Lab Name: _____ ENSR _____ Contract: _____ VBLK01

Lab Code: _____ Case No.: _____ SAS NO.: _____ SDG NO.: _____

Lab File ID: __KTH_026_____ Lab Sample I MB990123

Instrument ID: _____ HPGC#3_____ Date Analyzed:_8/4/99_____

Matrix: (soil/water) _____ water _____ Level: (low/med) _____ low _____

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES; MS AND MSD

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
01	LCS01	LCS990123	KTH_027	08/04/99
02	WP3417-7(A) MS	990123-3 MS	KTH_031	08/04/99
03	WP3417-7(B) MSD	990123-3 MSD	KTH_032	08/04/99
04	WP3429-4(G)	990126-1	KTH_042	08/04/99
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07				
08				
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26				

COMMENTS:

Katahdin
ANALYTICAL SERVICES

September 27, 1999

Mr. Paul Calligan

Tetra Tech Nus

1401 Oven Park Dr., Suite 102

Tallahassee, FL 32308

RE: Katahdin Lab Number: WP3683

Project ID: CNC Charleston

Project Manager: Ms. Andrea J.Colby

Sample Receipt Date(s): 8/19/99 and 8/20/99

Dear Mr. Calligan:

Please find enclosed the following information:

* Report of Analysis
* Quality Control Data Summary
* Chain of Custody
* Confirmation

Should you have any questions or comments concerning this Report of Analysis, please do not hesitate to contact the project manager listed above. This cover letter is an integral part of the ROA.

We appreciate your continued use of our laboratory and look forward to working with you in the future. The following signature indicates technical review and acceptance of the data.

Sincerely,

KATAHDIN ANALYTICAL SERVICES

Patricia Homey
Authorized Signature

9/27/99
Date

340 County Road No. 5
P.O. Box 720, Westbrook, ME 04098
Tel: (207) 874-2400 Fax: (207) 775-4029

http://katahdinlab.com

210 West Road No. 5, Portsmouth, NH 03801
Tel: (603) 431-5777 Fax: (603) 436-3356

Katahdin
ANALYTICAL SERVICES

SDG NARRATIVE
KATAHDIN ANALYTICAL SERVICES
TETRA TECH NUS
CASE CNC CHARLESTON

Sample Receipt

The following samples were received on August 20, 1999 and were logged in under Katahdin Analytical Services work order number WP3683 for a hardcopy due date of September 19, 1999.

KATAHDIN Sample No.	TTNUS Sample Identification	GEL Sample Identification
WP3683-1	30TL00101	
WP3683-2	31GLM0601	
WP3683-3	28SLB030102	9908592-05
WP3683-4	30SLB330506	
WP3683-5	30SLB210708	
WP3683-6	30SLB200607	
WP3683-7	28SLB020102	
WP3683-8	28SLB030102D	9908592-06
WP3683-9	24SLB120102	
WP3683-10	24SLB110102	
WP3683-11	28SLB050203	

The samples were logged in for the analyses specified on the chain of custody form. All problems encountered and resolved during sample receipt have been documented on the applicable chain of custody forms.

Sample analyses have been performed by the methods as noted herein.

Volatile Organic Analysis

Nine soil/sediment and two aqueous samples were received by the Katahdin Analytical Services, Inc. GC/MS laboratory on August 20, 1999 and were specified to be analyzed by USEPA method 8260B for the analytes benzene, toluene, ethylbenzene, xylenes, MTBE, naphthalene, and EDB.

Analyses for this workorder were performed on the 5970-Q (aqueous and methanol soils) and the 5973-U (low level soil) instruments. A VSTD050 (50 ppb standard) was used for the continuing calibration standard. Internal standard and surrogate compounds were also spiked at 50 ppb.

Batch QC (VBLK, and LCS) was performed in each twelve-hour window. Results are included in this data package. The LCS QC samples were spiked with the entire list of compounds quantitated for at 50 ppb. A soil matrix spike/matrix spike duplicate pair was performed on sample WP3683-3.

Initial analyses of samples WP3683-3, -6, -8, -10, and -11 yielded internal standard area or surrogate recovery deviations. Reanalyses yielded similar results, confirming matrix interference. In the case of WP3683-3, analysis of the MS/MSD confirmed matrix interference in the parent sample. Both sets of data are included in this data package for each sample.

Initial analyses of samples WP3683-4 and -5 yielded target analyte concentrations over the upper limit of the calibration curve. Analysis of sample WP3683-5 also yielded internal standard area and surrogate recovery deviations. Reanalyses occurred using the methanol extruded samples. The methanol analysis of sample WP3683-5 still yielded concentrations over the upper limit of the curve; reanalysis occurred at a 1:2 dilution. All three sets of data for sample WP3683-5 and both sets of data for WP3683-4 are included in the data package.

Several manual integrations were performed due to split peaks; all have been flagged with a "M" (software-generated) on the pertinent quantitation reports. All "M" flags have been dated and initialed by the analyst performing the integration. In addition, all "M" flags have been reviewed and approved by the GC/MS supervisor. Copies of each manual integration are included in the pertinent quantitation reports.

No other protocol deviations were noted by the volatile organics staff.

Semivolatile Organic Analysis

One aqueous and nine soil/sediment samples were received by Katahdin Analytical Services laboratory on August 20, 1999 for analysis in accordance with 8270C for a client specified PAH list of analytes.

Extraction of the soil samples occurred following USEPA method 3550 on August 23, 1999. A laboratory control spike, consisting of all PAH analytes spiked into organic free sand, was extracted in the batch, along with a site-specific MS/MSD pair on sample WP3683-3. Extraction of the aqueous sample occurred following USEPA method 3510 on August 23, 1999. A laboratory control spike/laboratory control spike duplicate pair was extracted in the batch.

Initial analysis of sample WP3683-4 was performed at a 1:5 dilution due to the matrix, with target analytes over the upper limit of the calibration curve. Reanalysis occurred at a 1:10 dilution successfully. Both sets of data for this sample are included in the data package.

Sample WP3683-5 could only be concentrated to a final volume of 2 ml due to extract viscosity. Analysis occurred at a 1:10 dilution due to this viscosity, resulting in elevated reporting limits.

Several manual integrations were performed due to split peaks; all have been flagged with a "M" by the data system. All manual integrations have been dated and initialed by the responsible analyst. Copies of each manual integration are included in the data package. All manual integrations have been reviewed and approved by the GC/MS supervisor.

No other protocol deviations were noted by the semivolatiles organics staff.

Metals Analysis

The samples of Katahdin Work Order WP3683 were prepared and analyzed for metals in accordance with the "Test Methods for Evaluating Solid Waste", SW-846, November 1986, Third Edition.

Inductively-Coupled Plasma (ICP) Atomic Emission Spectroscopic Analysis

Soil-matrix Katahdin Sample Nos. WP3683-(9, 10) were digested for ICP analysis on 08/28/99 (QC Batch PH28ICS0) in accordance with USEPA Method 3050B. Katahdin Sample No. WP3683-9 was prepared with duplicate matrix-spiked aliquots. The measured aluminum (30.9 mg/kg dry wt.), calcium (63.6 mg/kg dry wt.), and magnesium (5.85 mg/kg dry wt.) concentrations of the preparation blank that is associated with this QC batch exceed the laboratory's acceptance limits for these elements. However, because the measured concentrations of these elements in all associated samples are more than ten times those of the preparation blank, no corrective action was required.

ICP analyses of Katahdin Work Order WP3683 sample digestates were performed in accordance with USEPA Method 6010B, using a Thermo Jarrell Ash (TJA) Trace ICP spectrometer and a TJA 61 ICP spectrometer. All samples were analyzed within holding times and all QC criteria were met with the following comments or exceptions:

Some of the results for run QC samples (ICV, ICB, CCV, CCB, ICSA, and ICSAB) included in the accompanying data package may have exceeded acceptance limits for some elements. Please note that all client samples and batch QC samples associated with out-of-control results for run QC samples were subsequently reanalyzed for the analytes in question.

Analysis of Mercury by Cold Vapor Atomic Absorption (CVAA) Spectrophotometry

Soil-matrix Katahdin Sample Nos. WP3683-(9, 10) were digested for mercury analysis on 08/24/99 (QC Batch PH24HGS0) in accordance with USEPA Method 7471A.

Mercury analyses of Katahdin Work Order WP3683 sample digestates were performed using a Leeman Labs PS200 automated mercury analyzer. All samples were analyzed within holding times and all run QC criteria were met.

Wet Chemistry Analysis

For work order WP3683 the analyses for Total Combustible Organics (TCO) have been performed in accordance with the "Annual Book of ASTM Standards", 1987. Analyses for Solids-Total Residue (TS) for work order WP3683 samples have been performed in accordance with "Contract Laboratory Program Statement of Work for Inorganic Analysis".

All analyses were performed within analytical hold time. No protocol deviations were noted by the Wet Chemistry laboratory staff.

KATAHDIN ANALYTICAL SERVICES, INC.
SAMPLE RECEIPT CONDITION REPORT

Tel. (207) 874-2400
Fax (207) 775-4029

LAB (WORK ORDER) # WP3683

PAGE: 1 OF 1

COOLER: 1 OF 1

COC# —
SDG# —
DATE / TIME RECEIVED: 08-20-99 - 0845
DELIVERED BY: FEDEX
RECEIVED BY: BKR
LIMS ENTRY BY: BER
LIMS REVIEW BY / PM: NL

CLIENT: Tetratech NUS

PROJECT: CNC CHARLESTON

	YES	NO	EXCEPTIONS	COMMENTS	RESOLUTION
1. CUSTODY SEALS PRESENT / INTACT?	✓			SAMPLER DID NOT SIGN COC.	
2. CHAIN OF CUSTODY PRESENT IN THIS COOLER?	✓				
3. CHAIN OF CUSTODY SIGNED BY CLIENT?		✓			
4. CHAIN OF CUSTODY MATCHES SAMPLES?		✓			
5. TEMPERATURE BLANKS PRESENT?	✓			TEMP BLANK TEMP (°C)= 4.1	
6. SAMPLES RECEIVED AT 4°C +/- 2? (CE) ICE PACKS PRESENT (Y) or N?	✓			COOLER TEMP (°C)= NA (RECORD COOLER TEMP ONLY IF TEMP BLANK IS NOT PRESENT)	
7. VOLATILES FREE OF HEADSPACE?	✓				
8. TRIP BLANK PRESENT IN THIS COOLER	✓				
9. PROPER SAMPLE CONTAINERS AND VOLUME?	✓				
10. SAMPLES WITHIN HOLD TIME UPON RECEIPT?	✓				
11. SAMPLES PROPERLY PRESERVED[1]?	✓				
12. CORRECTIVE ACTION REPORT FILED?		✓	N/A		

13. ANALYTICAL PROGRAMS (CIRCLE ONE) COMMERCIAL CLP HAZWRAP (NFESC) ACOE AFCEE OTHER (STATE OF ORIGIN):

LOG - IN NOTES[1]: ⇒ 24 SLB050203 extra sample (VOC & PAH) sent yet not on C.O.C. contacted proj. mngr. client notified
client requested that extra sample be put on COC as 28SLB050203

(1) Use this space (and additional sheets if necessary) to document samples that are received broken or compromised, C-O-C discrepancies, radiation checks, residual chlorine check, results of pH check if required. If samples required pH adjustment, record volume and type of preservative added.

TAT labels added to 24SLB120102 & 24SLB110102 8/23/99 by Bryan Hauze

0000085

Katahdin
ANALYTICAL SERVICES
340 County Road No. 5
P.O. Box 720
Westbrook, ME 04098
Tel: (207) 874-2400
Fax: (207) 775-4029

CHAIN of CUSTODY

PLEASE PRINT IN PEN

Client: Tetra Tech NUS
Contact: Bryn Howze
Phone #: (843) 554-4925
Fax #: ( )
Address: N#21 Ave. H
City: N. Charleston
State: SC
Zip Code:
Purchase Order #:
Proj. Name / No.:
Katahdin Quote #:
Bill (if different than above):
Address:
Sampler (Print / Sign):
Copies To:

LAB USE ONLY
WORK ORDER #: WP 3683
KATAHDIN PROJECT MANAGER:
REMARKS:
SHIPPING INFO: ☐ FED EX ☐ UPS ☐ CLIENT
AIRBILL NO: 813402904473
TEMP°C: ☐ TEMP BLANK ☐ INTACT ☐ NOT INTACT

ANALYSIS AND CONTAINER TYPE PRESERVATIVES

*	Sample Description	Date / Time coll'd	Matrix	No. of Cntrs.	BTEX, EDB, Naph (Filt. ☐Y☐N)	PAH (Filt. ☐Y☐N)	Grain size (Filt. ☐Y☐N)	FOC (Filt. ☐Y☐N)	TAL metals (Filt. ☐Y☐N)	(Filt. ☐Y☐N)	(Filt. ☐Y☐N)	(Filt. ☐Y☐N)	(Filt. ☐Y☐N)	(Filt. ☐Y☐N)
	30SLB330506	8/19/99/0915	soil	5	4	1						408 ppm		
	30SLB210708	8/19/99/1000	soil	5	4	1						1270 ppm		
	30SLB200607	8/19/99/1025	soil	5	4	1						8 ppm		
	28SLB020102	8/19/99/1325	soil	5	4	1						0 pp		
*	28SLB030102	8/19/99/1410	soil	6	4	1	1	✓				0 ppm		
*	28SLB030102D	8/19/99/	soil	5	4	1		✓				0 ppm		
*	28SLB030102M	8/19/99/1410	soil	5	4	1		✓	-MS/MSD			0 ppm		
	24SLB120102	8/19/99/1545	soil	5	4	1			✓			0 ppm		
	24SLB110102	8/19/99/1600	soil	5	4	1			✓			0 ppm		
	30TL00101	8/19/99/	aq	2	2									
	31GLM0601	8/19/99/1740	aq	5	3	2								
	28SLB050203	8/19/99/1545	soil	5	4	1								
		/												
		/												
		/												
		/												

COMMENTS
* These samples also need to be tested for FOC from the 4oz PAH jar.

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Sig)
		813402904473		8-20-99 0845	
Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)

KATAHDIN ANALYTICAL SERVICES, INCORPORATED
New England-ME Laboratory (207) 874-2400
CONFIRMATION

ORDER NO WP-3683

Project Manager: Andrea J. Colby
ORDER DATE: 08/20/99
PHONE: 850/385-9899
FAX: 850/385-9860
DUE: 19 SEP
FAC.ID: CNC CHARLESTON

R RT TO: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

INVOICE: ACCOUNTS PAYABLE
TETRA TECH NUS, INC.
FOSTER PLAZA 7, 661 ANDERSEN DR.
PITTSBURGH, PA 15220

PHONE: 412/921-7090
PO: N7912-P99264

PROJECT: CTO #68

SAMPLED BY: CLIENT DELIVERED BY: FEDEX DISPOSE: AFTER 19 OCT

ITEM	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
1	WP3683-1	30TL00101	19 AUG	20 AUG	AQ

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
Volatile Organics by 8260B	SW8260	1	75.00	75.00

	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
2	WP3683-2	31GLM0601	19 AUG 1740	20 AUG	AQ

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
Volatile Organics by 8260B	SW8260	1	75.00	75.00
Polynuclear Aromatic Hydrocarbons	EPA 8270	1	125.00	125.00
TOTALS		1	200.00	200.00

	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
3	WP3683-3	28SLB030102	19 AUG 1410	20 AUG	SL

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
Volatile Organics by 8260B	SW8260	1	85.00	85.00
Polynuclear Aromatic Hydrocarbons	EPA 8270	1	135.00	135.00
Grain Size Subcontract		1	110.00	110.00
Solids-Total Residue (TS)	CLP/CIP SO	1	0.00	0.00
Total Combustible Organics	ASTM D2974	1	30.00	30.00
TOC Subcontract		1	60.00	60.00
TOTALS		1	420.00	420.00

LABORATORY ORDER CONTINUED ON PAGE 2

0000087/90

KATAHDIN ANALYTICAL SERVICES, INCORPORATED
New England-ME Laboratory (207) 874-2400
CONFIRMATION

ORDER NO WP-3683

Project Manager: Andrea J. Colby
ORDER DATE: 08/20/9[illegible]
PHONE: 850/385-98[illegible]
FAX: 850/385-9860
DUE: 19 SEP
FAC.ID: CNC CHARLESTON

REPORT TO: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

INVOICE: ACCOUNTS PAYABLE
TETRA TECH NUS, INC.
FOSTER PLAZA 7, 661 ANDERSEN DR.
PITTSBURGH, PA 15220

PHONE: 412/921-7090
PO: N7912-P99264

PROJECT: CTO #68

SAMPLED BY: CLIENT DELIVERED BY: FEDEX DISPOSE: AFTER 19 OCT

	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
4	WP3683-4	30SLB330506	19 AUG 0915	20 AUG	SL
	WP3683-5	30SLB210708	19 AUG 1000		
	WP3683-6	30SLB200607	19 AUG 1025		
	WP3683-7	28SLB020102	19 AUG 1325		
	WP3683-11	28SLB050203	19 AUG 1345		

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
Volatile Organics by 8260B	SW8260	5	85.00	425.00
Polynuclear Aromatic Hydrocarbons	EPA 8270	5	135.00	675.00
Solids-Total Residue (TS)	CLP/CIP SO	5	0.00	0.00
TOTALS		5	220.00	1100.00

	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
5	WP3683-8	28SLB030102D	19 AUG	20 AUG	SL

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
Volatile Organics by 8260B	SW8260	1	85.00	85.00
Polynuclear Aromatic Hydrocarbons	EPA 8270	1	135.00	135.00
Solids-Total Residue (TS)	CLP/CIP SO	1	0.00	0.00
Total Combustible Organics	ASTM D2974	1	30.00	30.00
TOC Subcontract		1	60.00	60.00
TOTALS		1	310.00	310.00

LABORATORY ORDER CONTINUED ON PAGE 3

KATAHDIN ANALYTICAL SERVICES, INCORPORATED
New England-ME Laboratory (207) 874-2400
CONFIRMATION

ORDER NO WP-3683

Project Manager: Andrea J. Colby
ORDER DATE: 08/20/99
PHONE: 850/385-9899
FAX: 850/385-9860
DUE: 19 SEP
FAC.ID: CNC CHARLESTON

R ORT TO: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

INVOICE: ACCOUNTS PAYABLE
TETRA TECH NUS, INC.
FOSTER PLAZA 7, 661 ANDERSEN DR.
PITTSBURGH, PA 15220

PHONE: 412/921-7090
PO: N7912-P99264

PROJECT: CTO #68

SAMPLED BY: CLIENT DELIVERED BY: FEDEX DISPOSE: AFTER 19 OCT

	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
6	WP3683-9	24SLB120102	19 AUG 1545	20 AUG	SL
	WP3683-10	24SLB110102	19 AUG 1600		

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
Volatile Organics by 8260B	SW8260	2	85.00	170.00
Polynuclear Aromatic Hydrocarbons	EPA 8270	2	135.00	270.00
Solids-Total Residue (TS)	CLP/CIP SO	2	0.00	0.00
Target Analyte List Metals, Total		2	100.00	200.00
TOTALS		2	320.00	640.00

C ER NOTE: QC-II+ W/NARRATIVE
DD(KAS007QC-DB3)
CNC CHARLESTON

REPORT COPY: MS LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.
PITTSBURGH, PA 15220
REPORT AND DISK

: OICE: With Report

TOTAL ORDER AMOUNT $2,745.00
This is NOT an Invoice

AJC/BKR/WEST.AJC(dw)
08-23Please contact KATAHDIN ANALYTICAL SERVICES promptly if you have any questi

KATAHDIN ANALYTICAL SERVICES

Summary of Report Notes

Report Note	Note Text
$	'$' flag denotes surrogate compound recovery is out of criteria. Re-extraction or re-analysis confirmed matrix interference.
E	'E' flag indicates an estimated value. The analyte was detected in the sample at a concentration greater than the standard calibration range.
J	'J' flag denotes an estimated value less than the Laboratory's Practical Quantitation Level.
O-1	Sample dilution required due to matrix interference, sample viscosity or other matrix-related problem; therefore, standard laboratory Practical Quantitation Level (PQL) could not be achieved.
O-13	Internal standard area(s) are out of criteria. Reanalysis confirmedmatrix interference.
O-2	Sample dilution required for quantitation of one or more target analytes; therefore, standard laboratory Practical Quantitation Level (PQL) could not be achieved.

KATAHDIN ANALYTICAL SERVICES

Summary of Report Notes

Report Note	Note Text
DL	'DL' flag denotes inability to calculate surrogate recovery due to sample dilution.
E	'E' flag indicates an estimated value. The analyte was detected in the sample at a concentration greater than the standard calibration range.
J	'J' flag denotes an estimated value less than the Laboratory's Practical Quantitation Level.
O-1	Sample dilution required due to matrix interference, sample viscosity or other matrix-related problem; therefore, standard laboratory Practical Quantitation Level (PQL) could not be achieved.
O-2	Sample dilution required for quantitation of one or more target analytes; therefore, standard laboratory Practical Quantitation Level (PQL) could not be achieved.

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3683-2
SDG: WP3683
Report Date: 9/24/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: EPA 8270
Date Analyzed: 8/25/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31GLM0601	AQ	8/19/99	8/20/99	8/23/99	DPD	SW3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.0	10	10
ACENAPHTHYLENE	<10	ug/L	1.0	10	10
ACENAPHTHENE	<10	ug/L	1.0	10	10
FLUORENE	<10	ug/L	1.0	10	10
PHENANTHRENE	<10	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
PYRENE	<10	ug/L	1.0	10	10
BENZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
CHRYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	52	%	1.0		
2-FLUOROBIPHENYL	49	%	1.0		
TERPHENYL-D14	49	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3683-2
SDG: WP3683
Report Date: 9/23/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 8/23/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
31GLM0601	AQ	8/19/99	8/20/99	8/23/99	KMC	5030	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	98	%	1.0		
1,2-DICHLOROETHANE-D4	95	%	1.0		
TOLUENE-D8	100	%	1.0		
P-BROMOFLUOROBENZENE	101	%	1.0		

Report Notes:

0000009

4B

SEMIVOLATILE ORGANICS METHOD BLANK SUMMARY

EPA SAMPLE NO.

SBLK;082399A

Lab Name: Katahdin Analytical Services SDG No.: WP3683

Lab File ID: Z1828 Lab Sample ID: SBLK;082399A

Instrument ID: 5972-Z Date Extracted: 8/23/99

GC Column: RTX-5 ID: 0.25 (mm) Date Analyzed: 08/25/99

Matrix: (soil/water) WATER Time Analyzed: 0:04

Level: (low/med) LOW

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, LCS'S, MS AND MSD'S

Client Sample ID	Lab Sample ID	Lab Data File	Date Injected	Time Injected
LCS;082399A	LCS;082399A	Z1832	8/25/99	1:23:00 PM
LCSD;082399A	LCSD;082399A	Z1833	8/25/99	2:12:00 PM
31GLM0601	WP3683-2	Z1844	8/25/99	10:58:00 PM

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

ent: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: SBLK;082399A
SDG: WP3683
Report Date: 9/23/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: EPA 8270
Date Analyzed: 8/25/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
SBLK;082399A	AQ	-	-	8/23/99	DPD	SW3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.0	10	10
ACENAPHTHYLENE	<10	ug/L	1.0	10	10
ACENAPHTHENE	<10	ug/L	1.0	10	10
FLUORENE	<10	ug/L	1.0	10	10
PHENANTHRENE	<10	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
RENE	<10	ug/L	1.0	10	10
NZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
CHRYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	46	%	1.0		
2-FLUOROBIPHENYL	47	%	1.0		
TERPHENYL-D14	79	%	1.0		

Report Notes:

Katahdin Analytical Services

LCS/LCSD Report

Sample	File Name	Date Acquired	Time inj	Analyst	Matrix	Method
LCS;082399A	Z1832	8/25/99	13:23	KRT	AQ	8270
LCSD;082399A	Z1833	8/25/99	14:12	KRT	AQ	8270

Compound Name	Spk Amt ug/L	LCS Result ug/L	LCSD Result ug/L	LCS Rec (%)	LCSD Rec (%)	Rec. Limits (%)	RPD (%)	RPD Limit (%)
2-METHYLNAPHTHALENE	50	27.2	26.0	*54	*52	70-130	3.8	30
ACENAPHTHENE	50	31.0	29.5	*62	*59	70-130	5	30
ACENAPHTHYLENE	50	32.0	30.4	*64	*61	70-130	4.8	30
ANTHRACENE	50	39.1	35.7	78	71	70-130	9.4	30
BENZO[A]ANTHRACENE	50	35.9	32.6	72	*65	70-130	10	30
BENZO[A]PYRENE	50	34.8	31.7	70	*63	70-130	10	30
BENZO[B]FLUORANTHENE	50	34.2	30.1	*68	*60	70-130	12	30
BENZO[G,H,I]PERYLENE	50	38.0	38.2	76	76	70-130	0	30
BENZO[K]FLUORANTHENE	50	41.0	36.1	82	72	70-130	13	30
CHRYSENE	50	36.6	32.8	73	*66	70-130	10	30
DIBENZ[A,H]ANTHRACENE	50	35.0	35.5	70	71	70-130	1.4	30
FLUORANTHENE	50	33.4	31.3	*67	*63	70-130	6.2	30
FLUORENE	50	32.4	30.6	*65	*61	70-130	6.3	30
INDENO[1,2,3-CD]PYRENE	50	30.4	33.4	*61	*67	70-130	9.4	30
NAPHTHALENE	50	30.5	28.7	*61	*57	70-130	6.8	30
PHENANTHRENE	50	34.8	32.1	70	*64	70-130	9	30
PYRENE	50	43.7	36.8	87	74	70-130	16	30

RPD = (lcs rec - lcsd rec) /[(lcsd rec +lcsd rec)/2] * 100

*** Out of Limits**

4A
VOLATILE ORGANICS METHOD BLANK SUMMARY

EPA SAMPLE NO.

VBLKQ23A

Lab Name: Katahdin Analytical Services SDG No.: WP3683

Lab File ID: Q6436 Lab Sample ID: VBLKQ23A

Date Analyzed: 08/23/99 Time Analyzed: 10:14

GC Column: RTX-502 ID: 0.53 (mm) Heated Purge: (Y/N) N

Instrument ID: 5970-Q

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, LCS'S, MS AND MSD'S

Client Sample ID	Lab Sample ID	Lab Data File	Date Injected	Time Injected
LCSQ23A	LCSQ23A	Q6435	8/23/99	9:24:00 AM
30TL00101	WP3683-1	Q6444	8/23/99	3:39:00 PM
31GLM0601	WP3683-2	Q6445	8/23/99	4:18:00 PM

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: VBLKQ23A
SDG: WP3683
Report Date: 9/23/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 8/23/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
VBLKQ23A	AQ	-	-	8/23/99	KMC	5030	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	93	%	1.0		
1,2-DICHLOROETHANE-D4	86	%	1.0		
TOLUENE-D8	101	%	1.0		
P-BROMOFLUOROBENZENE	100	%	1.0		

Report Notes:

Katahdin Analytical Services
8260 LCS Recovery Sheet

Lab File: Q6435 **Sample ID: LCSQ23A** **Date Run: 8/23/99**

Analyst: KMC **Time Injected 9:24:00 AM** **Matrix: AQ**

Compound Name	Spike Amt (ug/L)	Result (ug/L)	Rec (%)	Limits (%)
1,2-DIBROMOETHANE	50	53.8	108	60-140
BENZENE	50	48.4	97	60-140
ETHYLBENZENE	50	57.9	116	60-140
MTBE	50	40.8	82	60-140
NAPHTHALENE	50	50.0	100	60-140
TOLUENE	50	51.7	103	60-140
TOTAL XYLENES	150	164	109	60-140

*** Out of Limits** *1*

Katahdin
ANALYTICAL SERVICES

August 31, 1999

Mr. Paul Calligan

Tetra Tech Nus

1401 Oven Park Dr., Suite 102

Tallahassee, FL 32308

RE: Katahdin Lab Number: WP3429

Project ID: CNC Charleston

Project Manager: Ms. Andrea J.Colby

Sample Receipt Date(s): 7/29/99

Dear Mr. Calligan:

Please find enclosed the following information:

* Report of Analysis
* Quality Control Data Summary
* Chain of Custody
* Confirmation

Should you have any questions or comments concerning this Report of Analysis, please do not hesitate to contact the project manager listed above. This cover letter is an integral part of the ROA.

We appreciate your continued use of our laboratory and look forward to working with you in the future. The following signature indicates technical review and acceptance of the data.

Sincerely,

KATAHDIN ANALYTICAL SERVICES

Mary S. Morrill
Authorized Signature

8·31·99
Date

340 County Road No. 5
P.O. Box 720, Westbrook, ME 04098
Tel: (207) 874-2400 Fax: (207) 775-4029

http://katahdinlab.com

210 West Road No. 5, Portsmouth, NH 03801
Tel: (603) 431-5777 Fax: (603) 436-3356

APPENDIX E

BORING LOG OF MONITORING WELL
USED IN AQUIFER CHARACTERIZATION EVALUATION

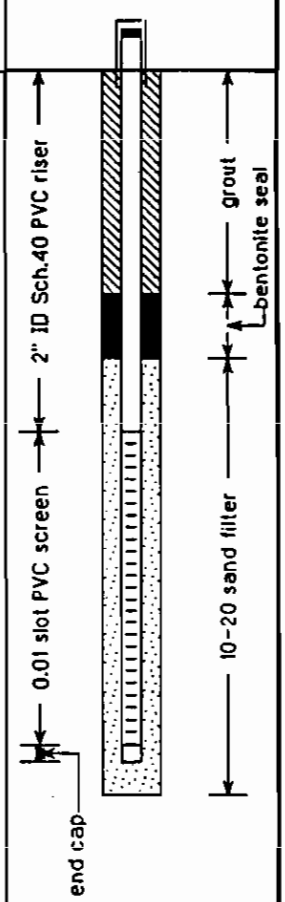
EnSafe/Allen & Hoshall

Monitoring Well NBCC510001

Project: *Zone C – Naval Base Charleston*	Coordinates: *2313655.36 E, 377529.9988 N N*
Location: *Charleston, SC*	Surface Elevation: *27.0 feet msl*
Started at *1500 on 4-4-95*	TOC Elevation: *29.16 feet msl*
Completed at *1625 on 4-4-95*	Depth to Groundwater: *17.82 feet TOC* Measured: *6-21-95*
Drilling Method: *4.25" ID (7.5" OD) HSA with split spoon*	Groundwater Elevation: *11.34 feet msl*
Drilling Company: *Alliance Environmental*	Total Well Depth: *21 feet bgs*
Geologist: *Peter Bayley*	Well Screen: *11 to 21 feet bgs*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
								Surface conditions: soil and grass	
							SP	Sand: brown to orange-brown, very fine to fine, dry to damp.	24 / 22.7
5			1	71	0				
							SP	Sand: buff to white to brown, very fine to fine, damp to moist.	19 / 17.7
10			2	71	0				
							SP	Sand: as above with very thin orange-brown laminae in basal 3", damp to moist, grading to dark brown, very fine sand, trace of silt, soft, wet.	14 / 12.3
15			3	83	0				
							SP	Sand: brown, very fine to fine, trace of silt, soft, wet.	9 / 7.8
20			4	58	0				7
			5	100	0		SP	Sand: brown to dark brown, very fine to medium, wet.	5
25									
30									
35									
40									

WELL DIAGRAM



APPENDIX F

RBSL CALCULATION SPREADSHEETS

Minimum Construction Worker RBSLs

	Dermal	Incidental Ingestion	Inhalation	Minimum
	RBSL	RBSL	RBSL	RBSL
	mg/L	mg/L	mg/L	mg/L
Benzene	0.85	68.52	0.15	0.15
Toluene	23.98	5677.78	5.38	5.38
Ethylbenzene	6.05	2838.89	14.50	6.05
Xylene	102.33	56777.78	NA*	102.33
Naphthalene	1.63	1135.56	2.63	1.63
MTBE	25.92	141.94	293.44	25.92

*No inhalation reference dose is available for xylenes; therefore, no inhalation RBSL can be calculated.

Prepared By: _____ Reviewed By: _____

Construction Worker Inhalation RBSLs

Chemical			Dair	Dwater	H	θ_{acap}	θ_{wcap}	θ_{as}	θ_{ws}	θ_T	Deff-cap	Deff-s
			cm^2/s	cm^2/s	cm^3/cm^3	cm^3/cm^3	cm^3/cm^3	cm^3/cm^3	cm^3/cm^3	cm^3/cm^3	cm^2/s	cm^2/s
Benzene			0.093	1.10E-05	2.26E-01	0.038	0.342	0.33	0.15	0.48	1.35E-05	1.01E-02
Toluene			0.085	9.40E-06	3.01E-01	0.038	0.342	0.33	0.15	0.48	1.07E-05	9.20E-03
Ethylbenzene			0.076	8.50E-06	2.80E-01	0.038	0.342	0.33	0.15	0.48	9.85E-06	8.22E-03
Xylenes			0.072	8.50E-06	2.78E-01	0.038	0.342	0.33	0.15	0.48	9.55E-06	7.79E-03
Naphthalene			0.072	9.40E-06	2.00E-03	0.038	0.342	0.33	0.15	0.48	5.79E-04	7.83E-03
MTBE			0.102	1.05E-05	4.16E-02	0.038	0.342	0.33	0.15	0.48	3.90E-05	1.10E-02

Chemical			hcap	hv	Deff-ws	Uair	δair	Lgw	W	VFwamb	TR (carc)	HI (nonc)
			cm	cm	cm^2/s	cm/sec	cm	cm	cm	$mg/m^3/mg/L$		
Benzene			5	117	3.18E-04	225	200	122	1500	1.97E-05	1.00E-06	NA
Toluene			5	117	2.54E-04	225	200	122	1500	2.09E-05	NA	1
Ethylbenzene			5	117	2.34E-04	225	200	122	1500	1.79E-05	NA	1
Xylenes			5	117	2.27E-04	225	200	122	1500	1.72E-05	NA	1
Naphthalene			5	117	5.17E-03	225	200	122	1500	2.83E-06	NA	1
MTBE			5	117	8.79E-04	225	200	122	1500	9.99E-06	NA	1

Chemical	TR (carc)	HI (nonc)	BWadult	AT	Sfi (carc)	RfD (nonc)	IR air	EF	ED	RBSLair	H	RBSLwater
			kg	yr	$[mg/kg\text{-}day]^{-1}$	[mg/kg-day]	m^3/day	day/yr	yr	mg/m^3	cm^3/cm^3	mg/L
Benzene	1.00E-06	NA	70	70	2.90E-02	NA	20	90	1	3.43E-02	2.26E-01	0.15
Toluene	NA	1	70	1	NA	1.14E-01	20	90	1	1.62E+00	3.01E-01	5.38
Ethylbenzene	NA	1	70	1	NA	2.86E-01	20	90	1	4.06E+00	2.80E-01	14.50
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	2.63
MTBE	NA	1	70	1	NA	8.60E-01	20	90	1	1.22E+01	4.16E-02	293.443

*No inhalation reference dose is available for xylenes; therefore, no RBSL can be calculated for xylene.

Construction Worker Inhalation RBSLs

Chemical	Dair	Dwater	H	θ_{acap}	θ_{wcap}	θ_{as}	θ_{ws}	θ_T	Deff-cap	Deff-s
	cm^2/s	cm^2/s	cm^3/cm^3	cm^3/cm^3	cm^3/cm^3	cm^3/cm^3	cm^3/cm^3	cm^3/cm^3	cm^2/s	cm^2/s
Benzene	0.093	1.10E-05	2.20E-01	0.038	0.342	0.33	0.15	0.48	1.36E-05	1.01E-02
Toluene	0.085	9.40E-06	2.60E-01	0.038	0.342	0.33	0.15	0.48	1.13E-05	9.20E-03
Ethylbenzene	0.076	8.50E-06	3.20E-01	0.038	0.342	0.33	0.15	0.48	9.39E-06	8.22E-03
Xylenes	0.072	8.50E-06	2.90E-01	0.038	0.342	0.33	0.15	0.48	9.40E-06	7.79E-03
Naphthalene	0.072	9.40E-06	4.90E-02	0.038	0.342	0.33	0.15	0.48	2.92E-05	7.79E-03

Chemical	hcap	hv	Deff-ws	Uair	δair	Lgw	W	VFwamb	TR (carc)	HI (nonc)
	cm	cm	cm^2/s	cm/aec	cm	cm	cm	$mg/m^3/mg/L$		
Benzene	5	117	3.22E-04	225	200	122	1500	1.94E-05	1.00E-06	NA
Toluene	5	117	2.68E-04	225	200	122	1500	1.90E-05	NA	1
Ethylbenzene	5	117	2.23E-04	225	200	122	1500	1.95E-05	NA	1
Xylenes	5	117	2.23E-04	225	200	122	1500	1.77E-05	NA	1
Naphthalene	5	117	6.55E-04	225	200	122	1500	8.77E-06	NA	1

Chemical	BWadult	AT	Sfi (carc)	RfD (nonc)	IR air	EF	ED	RBSLair	RBSLwater
	kg	yr	$[mg/kg\text{-}day]^{-1}$	[mg/kg-day]	m^3/day	day/yr	yr	mg/m^3	mg/L
Benzene	70	70	2.90E-02	NA	20	90	1	3.43E-02	1769.4
Toluene	70	1	NA	1.14E-01	20	90	1	1.62E+00	8.51E+04
Ethylbenzene	70	1	NA	2.86E-01	20	90	1	4.06E+00	2.08E+05
Xylenes	70	1	NA	NA*	20	90	1	NA*	NA*
Naphthalene	70	1	NA	3.71E-04	20	90	1	5.27E-03	6.00E+02

*No inhalation reference dose is available for xylenes; therefore, no RBSL can be celculated for xylene.

Volatilization Factor: Groundwater to Ambient Air (VFwamb)

Chemical	Dair	Dwater	H	θ_{acap}	θ_{wcap}	θ_{as}	θ_{ws}	θ_T	Deff-cap	Deff-s
	cm^2/s	cm^2/s	cm^3/cm^3	cm^3/cm^3	cm^3/cm^3	cm^3/cm^3	cm^3/cm^3	cm^3/cm^3	cm^2/s	cm^2/s
Benzene	0.093	1.10E-05	2.20E-01	0.038	0.342	0.33	0.15	0.48	1.36E-05	1.01E-02
Toluene	0.085	9.40E-06	2.60E-01	0.038	0.342	0.33	0.15	0.48	1.13E-05	9.20E-03
Ethylbenzene	0.076	8.50E-06	3.20E-01	0.038	0.342	0.33	0.15	0.48	9.39E-06	8.22E-03
Xylenes	0.072	8.50E-06	2.90E-01	0.038	0.342	0.33	0.15	0.48	9.40E-06	7.79E-03
Naphthalene	0.072	9.40E-06	4.90E-02	0.038	0.342	0.33	0.15	0.48	2.92E-05	7.79E-03

Chemical	hcap	hv	Deff-ws	Uair	δair	Lgw	W	VFwamb	TR (carc)	HI (nonc)
	cm	cm	cm^2/s	cm/sec	cm	cm	cm	$mg/m^3/mg/L$		
Benzene	5	117	3.22E-04	225	200	122	1500	1.94E-05	1.00E-06	NA
Toluene	5	117	2.68E-04	225	200	122	1500	1.90E-05	NA	1
Ethylbenzene	5	117	2.23E-04	225	200	122	1500	1.95E-05	NA	1
Xylenes	5	117	2.23E-04	225	200	122	1500	1.77E-05	NA	1
Naphthalene	5	117	6.55E-04	225	200	122	1500	8.77E-06	NA	1

Chemical	BWadult	AT	Sfi (carc)	RfD (nonc)	IR air	EF	ED	RBSLair	RBSLwater
	kg	yr	$[mg/kg\text{-}day]^{-1}$	[mg/kg-day]	m^3/day	day/yr	yr	mg/m^3	mg/L
Benzene	70	70	2.90E-02	NA	20	90	1	3.43E-02	1769.4
Toluene	70	1	NA	1.14E-01	20	90	1	1.62E+00	8.51E+04
Ethylbenzene	70	1	NA	2.86E-01	20	90	1	4.06E+00	2.08E+05
Xylenes	70	1	NA	NA*	20	90	1	NA*	NA*
Naphthalene	70	1	NA	3.71E-04	20	90	1	5.27E-03	6.00E+02

Reference: American Society for Testing and Materials (ASTM). 1997. *Standard Guide for Risk-Based Corrective Action Applied to Petroleum Release Sites.* Designation E 1739-95[ε1]

*No inhalation reference dose is available for xylenes; therefore, no RBSLs can be calculated.

= South Carolina value
= Site-specific value or based on site-specific value
= Calculated value
= ASTM default value
= Value from EPA Integrated Risk Information System
= Assumptions for construction worker scenario

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
Benzene	70	25550	0.01	1	90	1.00E-06	2.90E-02		6.85E+01
Toluene	70	365	0.01	1	90	1.0	NA	2.00E-01	5677.778
Ethylbenzene	70	365	0.01	1	90	1.0	NA	1.00E-01	2838.889
Xylene	70	365	0.01	1	90	1.0	NA	2.00E+00	56777.78
Naphthalene	70	365	0.01	1	90	1.0	NA	4.00E-02	1135.556
MTBE	70	365	0.01	1	90	1.0	NA	5.00E-03	141.9444

Prepared By: _____ Reviewed By: _____

Construction Worker Dermal RBSLs

	Kow	MW	Kp	B	τ_{event}	c	b	τ	t_{event}	DAevent
			cm/hr	unitless	hr/event			hr	hr/event	
Benzene	199.5262315	78.1	0.11551543	0.392637855	2.87E-01	6.32E-01	6.03E-01	6.90E-01	1	eq 3.3
Toluene	537.0317964	92.1	0.259561335	0.958068292	3.44E-01	1.13E+00	1.31E+00	1.33E+00	1	eq 3.2
Ethylbenzene	1412.537545	106.2	0.569219802	2.256154884	4.13E-01	2.36E+00	4.39E+00	1.70E+00	1	eq 3.2
Xylene*	1584.893192	106.2	0.638675123	2.531447415	4.13E-01	2.63E+00	5.31E+00	1.72E+00	1	eq 3.2
Naphthalene	1995.262315	128.2	0.605452393	2.636638957	5.48E-01	2.73E+00	5.69E+00	2.29E+00	1	eq 3.2
MTBE	15.136	88.15	0.00769788	0.027797704	3.27E-01	3.52E-01	3.20E-01	7.85E-01	1	eq 3.3

	BW	AT	EV	ED	EF	SA	CSF derm	Rfd derm	Target	RBSL	RBSL
	kg	day	events/day	yrs	days/yr	cm^2	$(mg/kg\text{-}day)^{-1}$	mg/kg-day	Risk or HQ	mg/L	mg/L
Benzene	70	25550	1	1	90	4500	2.99E-02	NA	1.00E-06		8.52E-01
Toluene	70	365	1	1	90	4500	NA	1.60E-01	1.0	2.40E+01	
Ethylbenzene	70	365	1	1	90	4500	NA	9.70E-02	1.0	6.05E+00	
Xylene*	70	365	1	1	90	4500	NA	1.84E+00	1.0	1.02E+02	
Naphthalene	70	365	1	1	90	4500	NA	3.20E-02	1.0	1.63E+00	
MTBE	70	365	1	1	90	4500	NA	5.00E-03	1.0	2.59E+01	

Factor A	Factor 1	Factor 2
	7.18E-01	0.782661
4.21E-01		
1.01E+00		
1.13E+00		
1.24E+00		
1.22E-02		

* Kow and MW values for xylene, m-

Prepared By: _____ Reviewed By: _____

APPENDIX G
SOIL LEACHABILITY MODEL

IN-SITU SOIL RISK EVALUATION

SOUTH CAROLINA
Department of Health and Environmental Control (DHEC)

Site Data

SITE ID #		COUNTY	Charleston
FACILITY NAME	Site 31, Building 760		
STREET ADDRESS	Charleston Naval Complex, North Charleston, SC		

Soil Risk Evaluation Data

					Figure
TPH		**9600**	mg/kg		
Soil % SAND (Estimated)		**60**	%		
Soil % CLAY (Estimated)		**20**	%		
Worst Case	Benzene	**0.01**	mg/kg	Cs	
Soil Analyses	Toluene		mg/kg	Cs	
	Ethylbenzene		mg/kg	Cs	
	Xylenes		mg/kg	Cs	
	Naphthalene	**13.4**	mg/kg	Cs	
	MTBE		mg/kg	Cs	
Natural Organic Carbon Content		**3570**	mg/kg	foc	
Average Annual Recharge		25	cm	Hw	
Distance from highest Soil Impact to water table		**30**	cm	L	
Bulk Density of Soil		1.55	g/cc	Bd	1
Wetting Front Suction		12	cm	Hf	2
Soil Hydraulic Conductivity		5.60E-04	cm/sec	Kf	3
Porosity		0.47	decimal %	Φ	4
Residual Water Content		0.05	decimal %	Wr	5

List possible human exposure pathways from surface soil.
Soil leaching to groundwater - utility trench

Bold indicates site specific data

IN-SITU SOIL RISK EVALUATION

SOIL LEACHABILITY MODEL FOR BENZENE

RISK-BASED CORRECTIVE ACTION FOR PETROLEUM RELEASES

SITE INFORMATION:

Site: [redacted]

Location: [redacted]

REFERENCES:

(1) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 1.
(2) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Table 2.
(3) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Input Parameters.
(4) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Table 1.
(5) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 2.
(6) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 3.
(7) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 4.
(8) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 5.

INPUT:

COC	Chemical of Concern		BENZENE
Bd	Soil Bulk Density (1)	g/cm3	1.55
Crsbl	Risk Based Screening Level	mg/L	0.15
Cs	Concentration of COC in soil	mg/kg	0.01
DAF	Dilution/Attenuation Factor (2)	unitless	8
foc	Organic Carbon Content in Soil (3)	mg/kg	3570
H'	Henry's Law Constant (4)	unitless	0.23
Hf	Wetting front suction head (always negative) (5)	cm	-12
Hw	Average Annual Recharge (3)	cm	25.00
Kf	Soil Hydraulic Conductivity (6)	cm/s	5.60E-04
Koc	Soil/Water Partioning Coefficient (2)	ml/g	81
L	Depth between soil sample with greatest COC concentration to groundwater.	cm	30
Φ	Porosity (7)	unitless	0.47
t1/2	Biodegradation "half life" (2)	days	16
TPH	Total Petroleum Hydrocarbons, EPA Method 3550	mg/kg	9600
Wr	Residual Water Content (8)	volume fraction	0.05

CALCULATIONS:

Equation Set I - Determine soil pore water concentration resulting from physical partioning (Cw).

Step 1 - Calculate the total organic carbon content (fcs) of the soil.

fcs = (foc +TPH/1.724)*1E-6 = 0.0091 decimal %

Step 2 - Calculate the concentration of COC in soil pore water (Cw) directly in contact with the contaminate soil.

Cw = Cs*((Wr *1g/cc+Bd)/((Bd*Koc*fcs)+Wr+((ø-Wr)*H'))) = 0.0124 mg/l

Equation Set II - Determine the velocity of the soil pore water (Vw)

Step 1 - Calculate the air filled porosity (f) in decimal percent.

f = Ø - Wr = 0.42 decimal %

Step 2 - Determine the time for water to percolate through the vadose zone soil (from depth of worst case soil sample to the water table at site).

t = (f/Kf)*(L-((Hw-Hf)*(ln((Hw+L-Hf)/(Hw-Hf))))) = 6,023 seconds

Step 3 - Determine the velocity of the water (Vw) in feet per year.

Vw = (L/30.48cm/ft)/(t/31,500,000sec/year) = 5,148 ft/year

Equation Set III - Determine the organic retardation effect (Vc) of the contaminant.

Step 1 - Calculate the soil/water distribution coefficient (Kd) (ml/g) for uncontaminated soil.

Kd = Koc*foc*1E-6 = 0.28917 ml/g

Step 2 - Calculate the retardation effect of natural soil organic matter on COC migration.

Vc = Vw/(1+((Bd*Kd)/ø)) = 2,635 ft/year

Equation Set IV - Determine biodegradation rates and provide final COC concentration (Cf) at depth of concern.

Step 1 - Calculate the time (Tc) in days required for the COC to reach groundwater.

Tc = 365 day/yr*((L/30.48cm/ft)/Vc) = 0.14 days

Step 2 - Calculate estimated concentration of COC in the soil pore water (Cp) necessary to protect groundwater.

Cp = 10^(log (Crsbl)+((Tc/2.3)*(0.693/t1/2))) = 0.1509 mg/l

COC concentration in soil pore water (Cp) is greater than concentration necessary to protect groundwater (Cw), therefore the SSTL must be calculated.

Equation Set V - Calculate the Site Specific Target Level (SSTL) for the COC in soil.

Cssti for BENZENE in soil = Cp*DAF*(((Bd*Koc*fcs)+Wr+(F*'H'''))/(Wr*1g/cc+Bd)) = 0.974928 mg/kg

PREPARED BY:_____

Date

CHECKED BY:_____

Date

IN-SITU SOIL RISK EVALUATION

SOUTH CAROLINA
Department of Health and Environmental Control (DHEC)

Site Data

SITE ID # 0
FACILITY NAME Site 31, Building 760

Instructions

Provide results, separately, for each constituent in the worst case soil analysis.

Data

List Constituent: BENZENE
(BTEX, Napth.)

				Table
Bioremediation "half-life"	16	days	t 1/2	1
Soil/water partitioning coefficient	81	ml/g	K oc	1

Results

				Equation Set	Step
Total Organic Carbon Content	0.0091	decimal %	f cs	I	1
Leachate Concentration	0.012	mg/l	C w	I	2
Air Filled Porosity	0.42	decimal %	f	II	1
Infiltration Rate Time	6,023	seconds	t	II	2
Velocity of Water	5,148	ft/year	V w	II	3
Soil/Water Distribution Coefficient	0.2892	ml/g	K d	III	1
Contaminant Percolation Rate	2,635	ft/year	V c	III	2
Time to Reach Groundwater	0.14	days	T c	IV	1
Concentration reaching Groundwater	0.1509	mg/l	C p	IV	2
Site Specific Target Level	**0.9749**	mg/kg	C sstl	V	

Conclusions

Does concentration of chemical of concern in soil exceed SSTL? NO

Risk of Human Exposure due to contaminated soil.

_____ **YES** x _____ **NO**

IN-SITU SOIL RISK EVALUATION

SOIL LEACHABILITY MODEL FOR NAPHTHALENE

RISK-BASED CORRECTIVE ACTION FOR PETROLEUM RELEASES

SITE INFORMATION:

Site:	Site 31, Building 760
Location:	Charleston Naval Complex, North Charleston, SC

REFERENCES:

(1) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 1.
(2) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Table 2.
(3) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Input Parameters.
(4) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Table 1.
(5) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 2.
(6) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B. Figure 3.
(7) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 4.
(8) SCDHEC, RBCA For Petroleum Releaaes, June 1995, Appendix B, Figure 5.

INPUT:

			NAPHTHALENE
COC	Chemical of Concern		
Bd	Soil Bulk Density (1)	g/cm3	1.55
Crsbl	Risk Based Screening Level	mg/L	1.63
Cs	Concentration of COC in soil	mg/kg	13.4
DAF	Dilution/Attenuation Factor (2)	unitless	8
foc	Organic Carbon Content in Soil (3)	mg/kg	3570
H'	Henry's Law Constant (4)	unitless	0.002
Hf	Wetting front suction head (always negative) (5)	cm	-12
Hw	Average Annual Recharge (3)	cm	25
Kf	Soil Hydraulic Conductivity (6)	cm/s	0.0006
Koc	Soil/Water Partioning Coefficient (2)	ml/g	1543
L	Depth between soil aample with greatest COC concentration to groundwater.	cm	30
Ø	Porosity (7)	unitless	0.47
t1/2	Biodegradation "half life" (2)	days	48
TPH	Total Petroleum Hydrocarbons, EPA Method 3550	mg/kg	9600
Wr	Residual Water Content (8)	volume fraction	0.05

CALCULATIONS:

Equation Set I - Determine soil pore water concentration resulting from physical partioning (Cw).

Step 1 - Calculate the total organic carbon content (fcs) of the soil.

fcs = (foc +TPH/1.724)*1E-6 = 0.0091 decimal %

Step 2 - Calculate the concentration of COC in soil pore water (Cw) directly in contact with the contaminate soil.

Cw = Cs*((Wr *1g/cc+Bd)/((Bd*Koc*fcs)+Wr+((ø-Wr)*H'))) = 0.05 mg/l

Equation Set II - Determine the velocity of the soil pore water (Vw)

Step 1 - Calculate the air filled porosity (f) in decimal percent.

f = Ø - Wr = 0.42 decimal %

Step 2 - Determine the time for water to percolate through the vadose zone soil (from depth of worst case soil sample to the water table at site).

t = (f/Kf)*(L-(Hw-Hf))*(ln(Hw+((L-Hf)/(Hw-Hf)))) = 6,023 seconds

Step 3 - Determine the velocity of the water (Vw) in feet per year.

Vw = (L/30.48cm/ft)/(t/31,500,000sec/year) = 5148 ft/year

Equation Set III - Determine the organic retardation effect (Vc) of the contaminant.

Step 1 - Calculate the soil/water distribution coefficient (Kd) (ml/g) for uncontaminated soil.

Kd = Koc*foc*1E-6 = 5.50851 ml/g

Step 2 - Calculate the retardation effect of natural soil organic matter on COC migration.

Vc = Vw*(1+((Bd*Kd)/ø)) = 269 ft/year

Equation Set IV - Determine biodegradation rates and provide final COC concentration (Cf) at depth of concern.

Step 1 - Calculate the time (Tc) in days required for the COC to reach groundwater.

Tc = 365 day/yr*((L/30.48cm/ft)/Vc) = 1.34 days

Step 2 - Calculate estimated concentration of COC in the soil pore water (Cp) necessary to protect groundwater.

Cp = 10^(log (Crsbl)+((Tc/2.3)*(0.693/t1/2))) = 1.66 mg/l

COC concentration in soil pore water (Cp) is greater than Crsbl, therefore the SSTL must be calculated.

Equation Set V - Calculate the Site Specific Target Level (SSTL) for the COC in soil.

Csstl for APHTHALENE in soil = Cp*DAF*(((Bd*Koc*fcs)+Wr+(F*'H'''))/(Wr*1g/cc+Bd)) = 182.025730 mg/kg

PREPARED BY:_____

Date

CHECKED BY:_____

Date

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Instructions

Provide results, separately, for each constituent in the worst case soil analysis.

Data

List Constituent: NAPHTHALENE
(BTEX, Napth.)

				Table
Bioremediation "half-life"	48	days	t 1/2	1
Soil/water partitioning coefficient	1543	ml/g	K oc	1

Results

				Equation Set	Step
Total Organic Carbon Content	0.0091	decimal %	f cs	I	1
Leachate Concentration	0.047	mg/l	C w	I	2
Air Filled Porosity	0.42	decimal %	f	II	1
Infiltration Rate Time	6,023	seconds	t	II	2
Velocity of Water	5,148	ft/year	V w	II	3
Soil/Water Distribution Coefficient	5.51	ml/g	K d	III	1
Contaminant Percolation Rate	269	ft/year	V c	III	2
Time to Reach Groundwater	1	days	T c	IV	1
Concentration reaching Groundwater	1.66	mg/l	C p	IV	2
Site Specific Target Level	**182**	mg/kg	C sstl	V	

Conclusions

Does concentration of chemical of concern in soil exceed SSTL? NO

Risk of Human Exposure due to contaminated soil.

_____ **YES** X _____ **NO**

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