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MCB CAMP LEJUENE  
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SUPPLEMENTAL ASSESSMENT REPORT FORMER UNDERGROUND STORAGE TANK  
1601 (UST 1601) ON FIR STREET MCB CAMP LEJEUNE NC  
7/1/2011  
CH2M HILL

**Supplemental Assessment Report  
Former UST-1601, Building 1601 on Fir Street**

**Marine Corps Base Camp Lejeune  
Jacksonville, Onslow County, North Carolina**

**Contract Number: N62470-08-D-1000**

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# Acronyms and Abbreviations

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AHEC	AH Environmental Consultants
asl	above sea level
Base	Marine Corps Base Camp Lejeune
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and total xylenes
Catlin	Richard Catlin & Associates, Inc.
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
COC	contaminant of concern
CSA	Comprehensive Site Assessment
CVOC	chlorinated volatile organic compound
DoD	Department of Defense
DOT	Department of Transportation
EPH	extractable petroleum hydrocarbons
FID	flame ionization detector
ft	foot/feet
Fm	formation
GCL	gross contamination level
HPIA	Hadnot Point Industrial Area
ID	inner diameter
IDW	investigation-derived waste
IRP	Installation Restoration Program
LUC	land use control
LTM	Long-term monitoring
MADEP	Massachusetts Department of Environmental Protection
MCB CamLej	Marine Corps Base Camp Lejeune
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
MSCC	maximum soil contamination concentration
NAVFAC	Naval Facilities Engineering Command Mid-Atlantic
NC	North Carolina
NCAC	North Carolina Administrative Code
NCDENR	North Carolina Department of Environment and Natural Resources
NCGWQS	North Carolina Groundwater Quality Standard
O&G	Oil & Grease
ONWASA	Onslow Water and Sewer Authority

ORP	oxidation reduction potential
OU	Operable Unit
PAH	polyaromatic hydrocarbons
Peele's	Peele's Pump and Tank Company
PID	photoionization detector
PSW	public supply well
ROD	Record of Decision
SIM	spectral identification method
SVOC	semivolatile organic compound
SAR	Supplemental Assessment Report
TCE	trichloroethene
TIC	tentatively identified compounds
TPH	total petroleum hydrocarbons
U.S.	United States
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound
VPH	volatile petroleum hydrocarbons
WHPP	Wellhead Protection Plan
WTP	water treatment plant

# Purpose of Investigation

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The purpose of this Supplemental Assessment Report (SAR) is to provide the North Carolina Department of Environment and Natural Resources (NCDENR) Underground Storage Tank (UST) section with the necessary information to classify the level of environmental risk associated with a potential petroleum release at UST Site 1601. This SAR was conducted by CH2M HILL for the Naval Facilities Engineering Command Mid-Atlantic (NAVFAC) in accordance with the December 2008, NCDENR *Guidelines for Assessment and Corrective Action for UST Releases (UST Guidelines)*, with updated regulatory standards in January 2010 (NCDENR, 2008), and the *Work Plan for Phase I Limited Site Assessments and Administrative Closure at UST/AST Sites* (CH2M HILL, 2010b).

SECTION 1

# Site Information

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## 1.1 Site Identification

**Date of Report:** July 2011

**Facility ID** 7-002740

**UST Incident #** 17608

**Site Name:** UST-1601, Building 1601 on Fir Street

**Location:** MCB CamLej, Onslow County, North Carolina

**Nearest City/Town:** Jacksonville

**UST Owner** Commanding General  
AC/S EMD/EPD  
PSC 20004  
MCB Camp Lejeune, NC 28542-0004  
910-451-5063

**UST Operator** Same As Above

**Property Owner** Same As Above

**Property Occupant** Marines Logistic Command building located between Fir Street and Gum Street

**Consultant/Contractor:** CH2M HILL, Inc.  
3201 Beechleaf Court, Suite 300  
Raleigh, NC 27604

## 1.2 Release Information

**Date Release Discovered:** 1993

**Estimated Quantity of Release:** Unknown

**Potential Source of Release:** Former UST

**Size and Content of UST:** (1) 1,500-gallon; waste oil

**Latitude and Longitude:** N 34° 40' 0.12"  
W 77°20' 21.12"

### 1.3 Certification

I, Daniel Hockett a certified Professional Engineer / Licensed Geologist (circle one) for CH2M HILL, do certify that the information contained in this report is correct and accurate to the best of my knowledge.



Daniel Hockett, P.G.  
NC License No. 2122



# Site History and Characterization

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## 2.1 Site Description

Marine Corps Base Camp Lejeune (MCB CamLej or Base) encompasses approximately 236 square miles of land in Onslow County, North Carolina (NC), adjacent to the southern boundary of the City of Jacksonville (**Figure 2-1**). Jacksonville is the largest city near MCB CamLej and contains approximately half of the county's total population. Since 1990, much of the MCB CamLej complex has been part of Jacksonville. The remaining areas adjacent to the Base are generally rural. The Base is bordered by the Atlantic Ocean to the south, U.S. Route 17 to the west, State Route 24 to the north, the town of Hubert, North Carolina, to the east, and is bisected by the New River, which flows into the Atlantic Ocean in a southeasterly direction.

UST-1601 was located on the north side of Building 1601 in the Hadnot Point Industrial Area (HPIA), on Fir Street between East Road and Gibb Road (**Figure 2-2**). The area surrounding the site is developed with administrative and maintenance buildings, asphalt, and landscaped grassy areas.

## 2.2 Environmental History of UST-1601

Site UST-1601 reportedly contained one 1,500-gallon UST installed in the mid 1940s and was used for waste oil storage (Peele's, 1993). Peele's Pump and Tank Company removed the waste oil UST (**Appendix A**) in 1993. The UST Closure Report indicated that Total Petroleum Hydrocarbons (TPH) Oil & Grease (O&G) were detected above the North Carolina action level of 250 milligrams per kilogram (mg/kg) in one of the soil samples collected from the base of the excavation. A Comprehensive Site Assessment (CSA) was conducted by Richard Catlin & Associates, Inc. (Catlin) to further assess soil and groundwater in the vicinity of the former waste oil UST (Catlin, 1997). The CSA described Building 1601 as the former Division Garage for motor transport and vehicle maintenance and that fuel dispensing islands were noted during site reconnaissance. TPH O&G and petroleum-related hydrocarbons were not detected in subsurface soil samples; however, several chlorinated volatile organic compounds (CVOCs) were detected in 6 of the 16 subsurface soil samples. Petroleum-related hydrocarbons and CVOCs were detected in groundwater samples collected during the CSA, however, the detections of petroleum-related hydrocarbons did not exceed the North Carolina Groundwater Quality Standards (NCGWQS) (Catlin, 1997).

The CSA report concluded that the CVOCs were likely associated with a much larger, multiple-source plume previously identified in the HPIA, and it recommended that groundwater impacts be addressed under the Installation Restoration Program (IRP). Therefore, on December 1, 2000, UST-1601 was transferred from the UST program to the IRP, to be included with the Site 78 IRP investigation.

There is a signed Record of Decision (ROD) for Operable Unit (OU) 1 (Site 78), which includes Long-term Monitoring (LTM) of groundwater, Land Use Controls (LUCs) to prevent exposure to soil and groundwater at the site, and operation of a groundwater treatment system (Baker, 1994). Active groundwater remediation is currently underway along the southeast side of Building 1601 as a part of the IRP OU1 Site 78 remedy. The annual LTM of the contaminants of concern (COCs, including benzene, toluene, ethylbenzene, and total xylenes) identified in the ROD includes collection of samples from monitoring well IR78-GW09-1, located in the vicinity of former UST-1601 (**Figure 2-2**).

# Risk Characterization

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This section presents a summary of the information necessary to assign a risk classification for the site. The questionnaire format was provided in the *UST Guidelines – Appendix B* (NCDENR, 2008).

## 3.1 Groundwater/Surface Water/Vapor Impacts

### 3.1.1 High Risk

1. *Has the release contaminated any water supply well, including any well used for non-drinking purposes?*

**NO:** The release has not contaminated any water supply well, either potable or non-potable.

2. *Is a water supply well used for drinking water located within 1,000 feet (ft) of the source area of the release?*

**NO:** There are no water supply wells within 1,000 ft of the source area, and the nearest supply well is an inactive public supply well (PSW), well PSW-HP603, located approximately 1,350 ft to the northwest.

3. *If YES, does the maximum groundwater contaminant concentration exceed the surface water quality standards and criteria found in 15A NCAC 2B .0200 by a factor of 10?*

N/A

4. *Is a water supply well not used for drinking water (e.g., irrigation, washing cars, industrial cooling water, filling swimming pools) located within 250 ft of the source area of the release?*

**NO:** There are no water supply wells located within 250 ft of the source area.

5. *Does groundwater within 500 ft of the source area of the release have the potential for future use (there is no other source of water supply other than the groundwater)?*

**NO:** Treated municipal water supply is available to the site and surrounding area from Onslow Water and Sewer Authority (ONWASA) or Base Water Treatment Plants (WTPs), both receiving their supply from PSWs. There are no PSWs located within 500 ft of the source area.

6. *Do vapors from the release pose a threat of explosion because of accumulation of the vapors in a confined space, or pose other threats to public health, public safety, or the environment?*

**NO:** Vapors from the source area do not pose a threat of explosion in a confined space or pose a threat to public health, public safety, or the environment.

7. *Are there any other factors that would cause the release to pose an imminent danger to public health, public safety, or the environment?*

**NO:** There are no other factors that would cause the release to pose an imminent danger to public health, public safety, or the environment.

### 3.1.2 Intermediate Risk

1. *Is a surface water body located within 500 ft of the source area of the release?*

**NO:** The nearest surface water body is a retention pond located approximately 1,250 ft southeast of the site.

2. *Is the source area of the release located within an approved or planned wellhead protection area as defined in 42 USC 300h-7(e)?*

**NO:** The source area is not located within an approved or planned wellhead protection area as defined in 42 USC 300h-7(e) (NCDENR, 2007). The nearest wellhead protection area is located adjacent to Sneads Ferry Road, approximately 0.5 miles east of the release area.

3. *Is the release located in the Coastal Plain physiographic region as designated on a map entitled "Geology of North Carolina" published by the Department in 1985?*

**YES:** MCB CamLej is located within the Atlantic Coastal Plain physiographic province.

4. *If YES, is the source area of the release located in an area in which there is recharge to an unconfined or semi-confined deeper aquifer that is being used or may be used as a source of drinking water?*

**NO:** Although the source area is located in an area where there is no confining unit separating the surficial aquifer from the deeper Castle Hayne aquifer, untreated groundwater from the Castle Hayne aquifer is not used aboard MCB CamLej as drinking water. Groundwater obtained from the Castle Hayne aquifer is the raw water source for the MCB CamLej potable water treatment facilities. There is not an active water supply well located within 1,000 ft of the potential source area.

5. *Do the levels of groundwater contamination for any contaminant exceed the gross contamination levels (GCLs) (see Table 9) established by the Department?*

**YES:** One semivolatile organic compound (SVOC), Indeno(1,2,3-cd)pyrene, exceeded the respective standard by less than one order of magnitude.

## 3.2 Land Use

### 3.2.1 Property Containing Source Area of Release

1. *Does the property contain one or more primary or secondary residences (permanent or temporary)?*

**NO:** The property does not contain any primary or secondary residences.

2. *Does the property contain a school, daycare center, hospital, playground, park, recreation area, church, nursing home, or other place of public assembly?*

**NO:** The property does not contain a school, daycare center, hospital, playground, park, recreation area, church, nursing home, or other place of public assembly.

3. *Does the property contain a commercial (e.g., retail, warehouse, office/business space, etc.) or industrial (e.g., manufacturing, utilities, industrial research and development, chemical/petroleum bulk storage, etc.) enterprise, an inactive commercial or industrial enterprise, or is the land undeveloped?*

**YES:** The property is used as the Marines Logistics Command building.

4. *Do children visit the property?*

**NO:** No children were noted to visit the property as it is an active military facility, and due to the nature of activities onsite, children are not expected to visit the property.

5. *Is access to the property reliably restricted consistent with its use (e.g., by fences, security personnel, or both)?*

**YES:** The property/site is located within the MCB CamLej military installation. There is a minimum of one layer of security designed to prohibit trespassers or other unauthorized access to facilities on the base. At the site, however, there are no additional restrictive access measures in place, but this is consistent with its use as a Logistic Command center.

6. *Do pavements, buildings, or other structures cap the contaminated soil?*

**YES:** A 4-inch thick concrete pad caps the location of the former UST.

7. *If YES, what mechanisms are in place or can be put into place to ensure the contaminated soil will remain capped in the foreseeable future?*

Although future use cannot be reliably predicted, the site is likely to remain capped by concrete for the foreseeable future. In addition, LUCs are in place to restrict access to soil and groundwater use within the former UST basin.

8. *What is the zoning status of the property?*

MCB CamLej is not subject to local zoning requirements; however, the site is consistent with Industrial/Commercial properties.

9. *Is the use of the property likely to change in the next 20 years?*

The area has historically been used for military administrative purposes and the use of the property is not likely to change in the next 20 years.

### 3.2.2 Property Surrounding Source Area of Release

1. *What is the distance from the source area of the release to the nearest primary or secondary residence (permanent or temporary)?*

The distance from the source area to the nearest primary residence (permanent or temporary) is approximately 1,500 ft as shown in **Figure 3-1**. The nearest primary residences are the barracks located on Cedar Street.

2. *What is the distance from the source area of the release to the nearest school, daycare center, hospital, playground, park, recreation area, church, nursing home, or other place of public assembly?*

The nearest place of public assembly is the Parade Grounds located 1,200 ft southwest of the site shown in **Figure 3-1**.

3. *What is the zoning status of properties in the surrounding area?*

MCB CamLej is not subject to local zoning requirements; however, the surrounding properties are consistent with Industrial/Commercial properties.

4. *Briefly characterize the use and activities of the land in the surrounding area.*

The surrounding area is developed and used for military administrative, supply, and maintenance activities.

# Receptor Information

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## 4.1 Water Supply Wells

There are no active water supply wells within 1,500 ft of Building 1601.

## 4.2 Public Water Supplies

There are no public water supply sources present within 1,500 ft of Building 1601 at MCB CamLej. The Base receives treated municipal water supply from both Base and ONWASA WTPs that withdraw groundwater from the Castle Hayne aquifer. The Base water supply is augmented by ONWASA.

## 4.3 Surface Water

The nearest surface water body is a retention pond located approximately 1,250 ft southeast of the UST-1601 **Figure 3-1**. Surface water runoff from the Base ultimately drains into the New River. The New River flows into the Atlantic Ocean via New River inlet (MCB Camp Lejeune, 2002).

## 4.4 Wellhead Protection Area

Based upon information provided by the Wellhead Protection Plan (WHPP) – 2002 Update (AHEC, 2002), there are no wellhead protection areas within 1,500 ft of Building 1601. The nearest wellhead protection area is located adjacent to Sneads Ferry Road, approximately 0.5 mile east of the site.

## 4.5 Deep Aquifers in the Coastal Plain Physiographic Region

Southeastern North Carolina and MCB CamLej are within the Tidewater region of the Atlantic Coastal Plain physiographic province. Within the MCB CamLej area, approximately 1,500 ft of sediment overlies the basement rock. These sediments contain seven aquifers and their associated confining units, including the surficial, Castle Hayne, Beaufort, Peedee, Black Creek, and Upper and Lower Cape Fear aquifers (Cardinell, et al., 1993).

Data were obtained from boring logs developed as part of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Site 78 investigations. Aquifers in the vicinity of the source area are summarized on **Table 4-1**.

TABLE 4-1  
 Deep Aquifers of the Coastal Plain  
 Former UST-1601 SAR Report  
 MCB CamLej, North Carolina

Hydrogeologic Unit	Approximate Depth Interval (ft bgs)
Surficial Unit	11 to 20
Castle Hayne Confining Unit	20 to 35
Castle Hayne Aquifer	35 to 175
Beaufort Confining Unit	175 to 185
Beaufort Aquifer	185

## 4.6 Subsurface Structures

Subsurface utilities are located in the vicinity of the source area, including water, sewer, and communication lines, as shown on **Figure 2-2**. There were no basement structures observed in the surrounding area. The threat of explosion due to the accumulation of vapors from an underground contaminant source to a confined space is not likely based on explosive gas measurements obtained during soil sampling.

## 4.7 Property Owners and Occupants

MCB CamLej is United States (U.S.) Government property that is owned and operated by the Department of Defense (DoD). A logistics command building, Building 1601 and current site area is located and wholly contained within the boundaries of MCB CamLej. **Table 4-2** lists the property owner and occupant information.

TABLE 4-2  
 Property Owners and Occupants  
 Former UST-1601 SAR Report  
 MCB CamLej, North Carolina

Tax Parcel Number	Owner/Occupant Name	Address
Unknown – 236 square miles of land within the Camp Lejeune Military Reservation	Commanding General – MCB CamLej, NC	I&E/EMD/EQD PSC 20004 MCB Camp Lejeune, NC 28542

# Geology and Hydrogeology

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## 5.1 Site Geology

The shallowest soils encountered within the HPIA belong to the undifferentiated Formation (Fm) and consist of beds of sand, clay, sandy clay, and silt. These typically extend from ground surface to a depth between 25 and 30 ft bgs. The undifferentiated Fm is underlain by the laterally discontinuous Belgrade Fm, which consist of clay lenses, that have been observed across the HPIA at depths of approximately 10 to 30 ft bgs. The Belgrade Fm overlies the River Bend and Castle Hayne Fms, which consist of fine to medium-grained sands with intermittent beds of partially cemented and shelly sand to approximately 180 ft bgs.

## 5.2 Site Hydrogeology

Investigations of Site 78 and UST-1601 have focused upon the surficial aquifer and underlying Castle Hayne aquifer which occur within the shallow deposits of the undifferentiated formation, and the River Bend and Castle Hayne Fms, respectively. These aquifers are occasionally separated by a discontinuous layer of clayey silt; however, it is not present under Building 1601.

During the November 2010 field event, depth to groundwater was 11.07 ft bgs. Groundwater flow in the surficial aquifer near UST 1601 is generally to the west and southwest. Groundwater flow in the Castle Hayne aquifer is generally to the west.

# Subsurface Investigation

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In order to assess the potential environmental impact resulting from the operation of UST 1601, samples of soil and groundwater were collected for laboratory analysis. The following sections describe the field activities and findings of this subsurface investigation.

## 6.1 Soil Sampling

The soil sampling location was selected to evaluate subsurface soil conditions beneath the former UST and associated piping. A soil boring was advanced in the former UST basin using a stainless steel hand auger, to a depth of roughly 9 feet bgs. Samples of the soil cuttings were placed in zip-top bags for field screening purposes. The bagged samples were field screened for the presence of volatile organic compounds (VOCs) using a flame-ionization detector (FID) and the readings were recorded in the field book and on the soil boring log (**Appendix B**). One soil sample was collected from 4 to 5 ft bgs, which was above the historic depth to water in nearby shallow monitoring wells.

The soil sample was analyzed by the following laboratory methods:

- VOCs (United States Environmental Protection Agency [USEPA] Method 8260)
- Semi-volatile organic compounds (SVOCs) (USEPA Method 8270)
- Volatile petroleum hydrocarbons (Massachusetts Department of Environmental Protection [MADEP] VPH)
- Extractable petroleum hydrocarbons (MADEP EPH)
- Total chromium and lead (EPA 3050C or 3051A prep)

A portion of the sample, intended for VOC analysis, was field preserved by field preparation method 5035 to limit volatilization of VOCs. The remaining soil sample was placed into a stainless steel bowl, homogenized, and then transferred into the appropriate bottleware. The soil samples were placed into an ice-filled sample cooler, accompanied by chain-of-custody, and shipped by overnight courier to Katahdin Analytical Services in Scarborough, Maine.

### 6.1.1 Soil Analytical Results

A summary of analytes detected in the soil sample collected from UST 1601 is presented in **Table 6-1**. The complete analytical laboratory report is in **Appendix D**.

One VOC, trichloroethene (TCE), was detected in the soil sample collected from UST 1601, however the concentration was below the Soil-to-Groundwater, Residential and Industrial/Commercial maximum soil contamination concentrations (MSCCs).

SVOCs were not detected in soil.

Chromium was detected at a concentration of 6.8 milligrams per kilogram (mg/kg), which exceeded the Soil-to-Groundwater MSCC of 5.4 mg/kg, though it was below the Residential and Industrial/Commercial MSCCs of 47 mg/kg and 1,226 mg/kg, respectively. The

detected concentration was also less than twice the mean Base background concentration of 14.5 mg/kg. Therefore, the chromium concentration detected in the soil sample collected from UST 1601 is consistent with naturally occurring background conditions. Lead was also detected but the concentration did not exceed any of the MSCCs.

Two VPH and EPH constituents, Aliphatics C9-C12 Unadjusted and Aromatics C9-C10, were detected in soil, but both were less than the most stringent Soil-to-Groundwater MSCCs.

## 6.2 Groundwater Sampling

A groundwater sample was collected from existing monitoring well IR78-GW09-1 (**Figure 2-2**) located approximately 18 ft from the UST basin. Well construction information for IR78-GW09-1 is summarized in **Table 6-2**.

Prior to sample collection, the monitoring well was under low flow conditions using a submersible bladder pump equipped with new 0.25-inch inner diameter (ID) polyethylene tubing. The pump intake was placed at the middle of the well screen. In order to assess the effectiveness of the purging activities, water quality parameters (pH, temperature, oxidation reduction potential (ORP), turbidity, and conductivity) were monitored using a calibrated YSI 556 multi-parameter flow-through cell and recorded on groundwater sampling data sheets (**Appendix C**). A summary of groundwater quality parameters is shown in **Table 6-3**.

Once the water quality parameters had stabilized, and at least one well volume had been removed, a sample was collected for the following laboratory analyses:

- VOCs (USEPA Method 6200B)
- SVOCs (EPA Method 8270C) and 10 tentatively identified compounds (TICs) (EPA Method 625 with PAHs by SIM)
- MADEP VPH
- MADEP EPH
- Total/dissolved chromium and lead (EPA Method 6010 with EPA Method 3030C prep).

The groundwater sample was placed into an ice-filled sample cooler, accompanied by chain-of-custody, and shipped by overnight courier to Katahdin Analytical Services in Scarborough, Maine.

### 6.2.1 Groundwater Analytical Results

A summary of target analytes detected in the groundwater sample collected from monitoring well IR78-GW09-1 is presented as **Table 6-4**. The complete analytical laboratory report is included as **Appendix D**.

As indicated in **Table 6-4**, four VOCs (1,1,1-trichloroethane, carbon disulfide, cis-1,2-dichloroethene, and TCE) were detected. TCE, was detected at a concentration of 53 micrograms per liter ( $\mu\text{g/L}$ ), exceeding the NCGWQS of 3  $\mu\text{g/L}$ , though no target analyte concentrations exceeded the GCLs. The remaining VOCs were detected at concentrations below their respective NCGWQS.

A total of 11 SVOCs (2-chloronaphthalene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(k)fluoranthene, chrysene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene) were detected in the groundwater sample collected from monitoring well IR78-GW09-1. Benzo(a)anthracene was detected at a concentration of 0.051J  $\mu\text{g/L}$ , which slightly exceeded the NCGWQS of 0.05  $\mu\text{g/L}$ . Also, indeno(1,2,3-cd)pyrene was detected at a concentration of 0.13J  $\mu\text{g/L}$ , which exceeded the NCGWQS and GCL. However, indeno(1,2,3-cd)pyrene was not detected in the duplicate groundwater sample collected from monitoring well IR78-GW09-1. The remaining SVOCs were detected below their respective NCGWQS.

Lead was the only metal detected in groundwater, but the concentration was below the NCGWQS and GCL.

Neither of the VPH/EPH hydrocarbon fractions were detected above method detection limits.

### 6.3 Free Product Investigation/Recovery

Free product was not detected in monitoring well IR78-GW09-1; therefore, this section is not applicable.

### 6.4 Investigation-derived Waster Management

Soil and water investigation-derived waste (IDW) generated during SAR field activities was containerized in Department of Transportation (DOT)-approved 55-gallon steel drums and staged at the temporary storage facility located at Mainside at MCB CamLej. IDW will be disposed offsite at an approved disposal facility in accordance with the 2010 Base Waste Management Plan.

# Conclusions and Recommendations

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## 7.1 Conclusions

Based on the results of this SAR for the former UST-1601 tank basin, the following conclusions are presented:

- There are no active water supply wells within 1,500 ft of UST-1601.
- Potable water near the property is supplied by the Base WTP.
- The former UST tank basin is not located in a designated wellhead protection area.
- There are no surface water bodies located within 500 ft of the source area.
- With the exception of one metal (chromium), laboratory analysis of a soil sample collected from UST 1601 did not detect target analytes at concentrations exceeding the Soil-to-Groundwater MSCCs, Residential MSCC, or the Industrial/Commercial MSCCs. The detected concentration of chromium was less than twice the mean Base background concentration, and is consistent with naturally occurring conditions
- Indeno(1,2,3-cd)pyrene was detected in the groundwater sample collected from IR78-GW09-1 at an estimated concentration (0.13 J  $\mu\text{g}/\text{L}$ ) that exceeded the NCGQWS and GCL of 0.05  $\mu\text{g}/\text{L}$ . However, indeno(1,2,3-cd)pyrene was not detected in the duplicate groundwater sample collected from monitoring well IR78-GW09-1.
- Free product has not been detected in monitoring well IR78-GW09-1.

Former UST-1601 is located within the boundary of IRP Site 78, and the area will undergo continued monitoring as part of the remedial actions at Site 78.

## 7.2 Recommendations

Based on the detection of indeno(1,2,3-cd)pyrene above the GCL at an estimated concentration of 0.13 J  $\mu\text{g}/\text{L}$ , the site does not qualify for low risk classification. It is recommended that additional groundwater samples be collected for analysis of SVOCs in one year. Upon completion of the additional sample collection, the risk classification of the site can be reevaluated.

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## Figures

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- Legend**
- Highways
  - LSA Site
  - IR Site Boundary
  - Installation Boundary

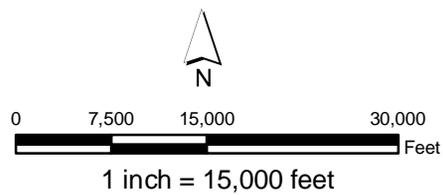


Figure 2-1  
Base Location Map  
Former UST-1601 UOJ Report  
MCB CamLej  
North Carolina





- Legend**
- Former Tank Removal
  - Soil Sampling Locations
  - Monitoring Well
  - Soil Sampling Location
  - Storm Sewer Line
  - Buried Communication Lines
  - Water Utilities
  - Electrical Cable Line
  - Heating/Cooling Utilities
  - Wastewater Utilities
  - Aquifer Use Control Boundary
  - Intrusive Activities Control Boundary (Groundwater)
  - IR Site Boundary
  - Site Features
  - Former Storage Tanks

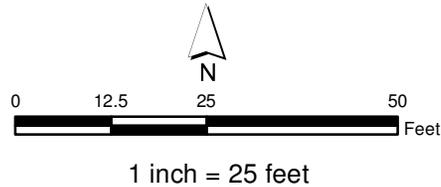
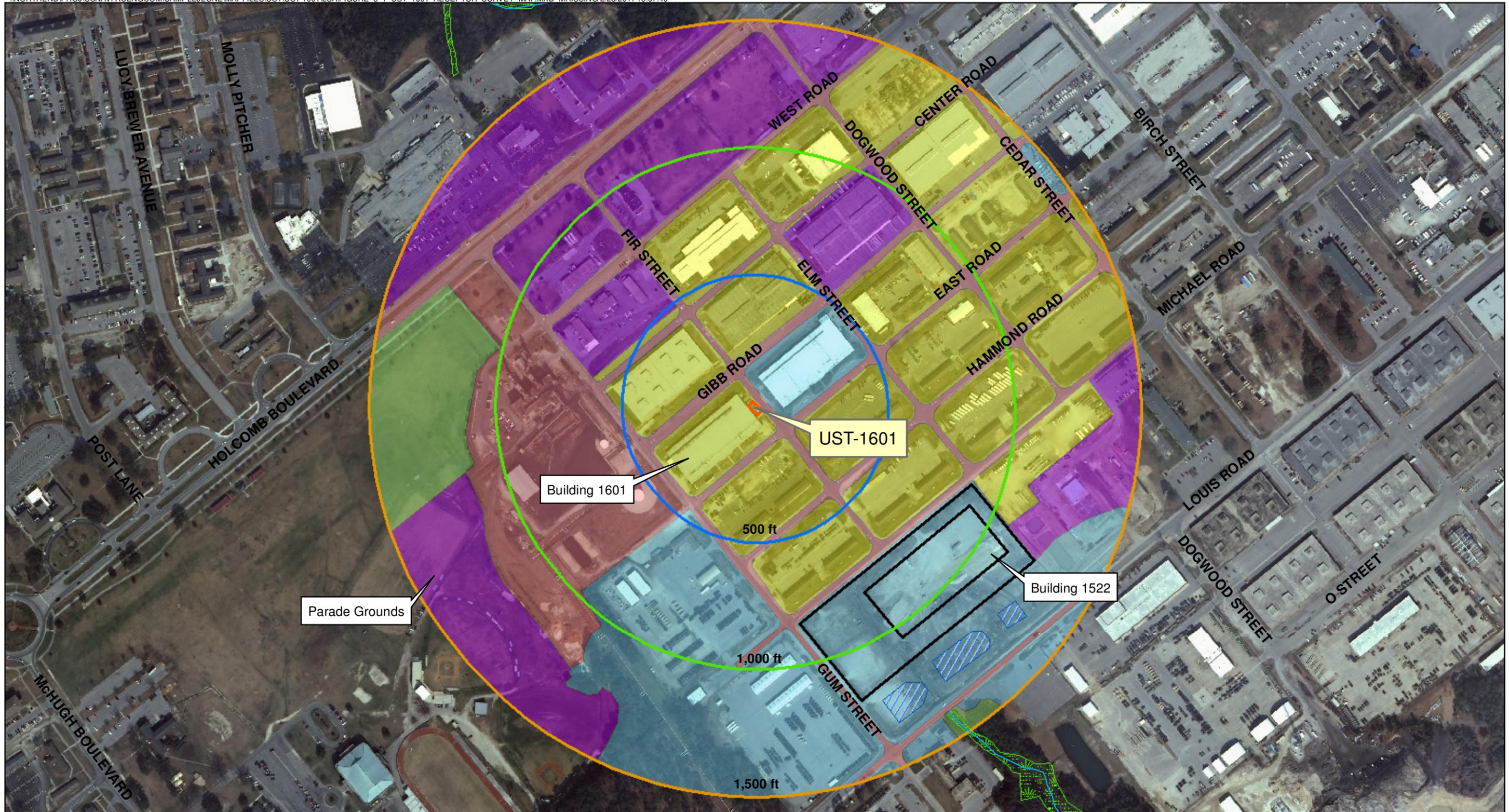


Figure 2-2  
Site Map  
Former UST-1601 LSA Report  
MCB CamLej  
North Carolina





- Legend**
- Inactive Public Supply Well
  - Surface Water Centerline
  - Jurisdictional Wetland Area
  - 500 foot radius
  - 1,000 foot radius
  - 1,500 foot radius
  - Former UST-1601 Tank Basin
  - Retention Ponds
  - Recent Construction
  - Land Use**
  - Housing and Community Facilities
  - Maintenance and Production Facilities
  - Operational and Training Facilities
  - Supply Facilities
  - Utilities and Ground Improvements

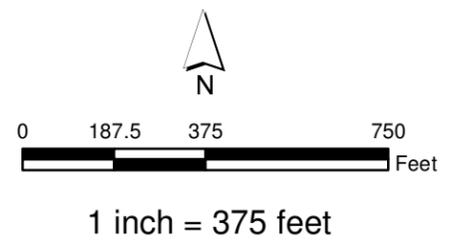
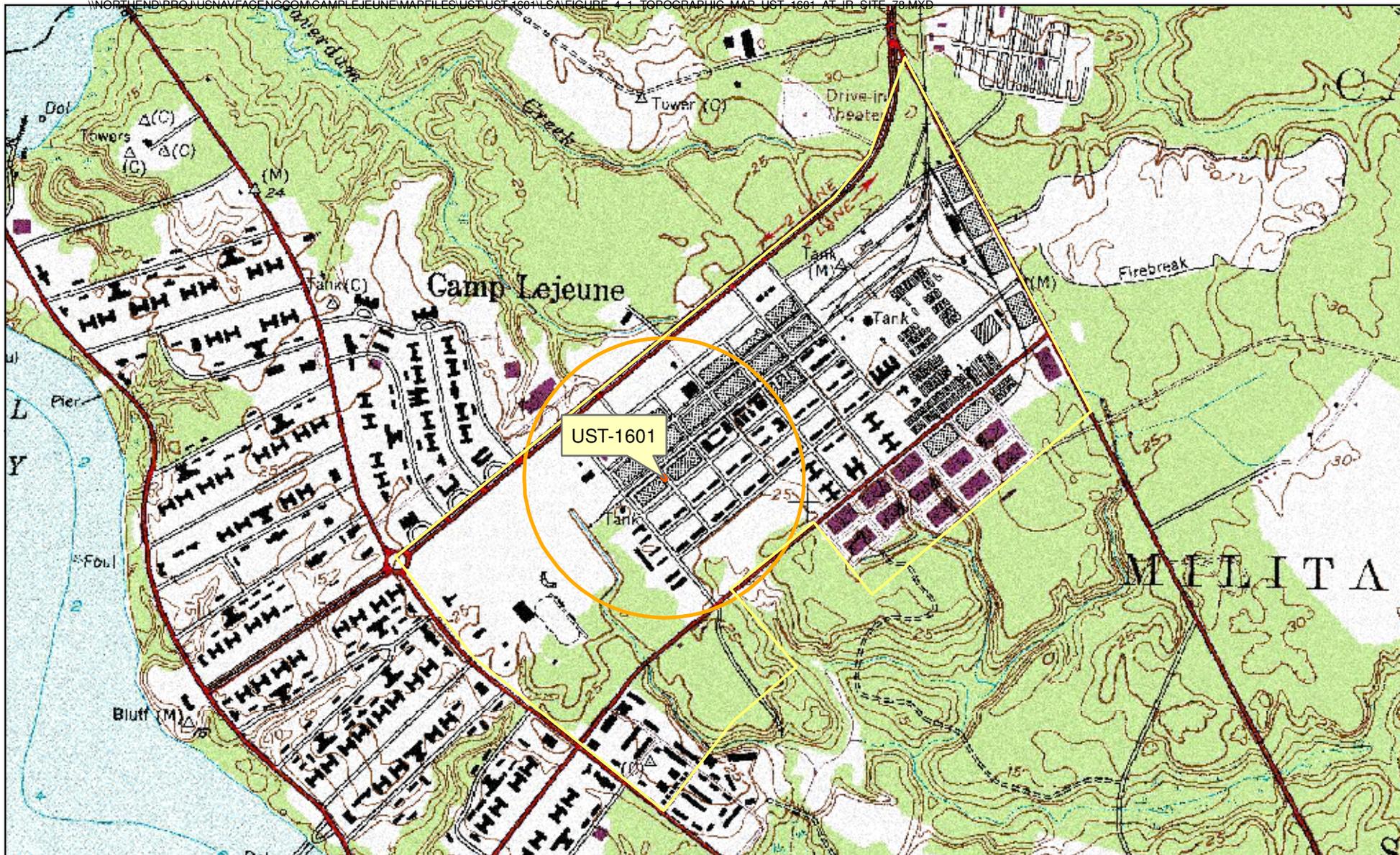
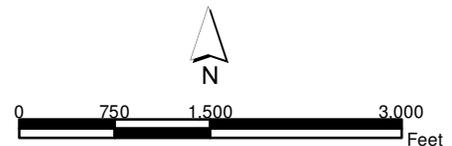


Figure 3-1  
 Receptor Survey Map  
 Former UST-1601 LSA Report  
 MCB CamLej  
 North Carolina





**Legend**  
 Yellow rectangle: IR Site 78 Boundary  
 Yellow circle: 1,500 foot radius



1 inch = 1,500 feet

Figure 4-1  
 Topographic Map  
 Former UST-1601 UIC Report  
 MCB CamLej  
 North Carolina



## Tables

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TABLE 6-1  
 Soil Analytical Results  
 Former UST-1601 SAR Report  
 MCB CamLej, North Carolina

Station ID	Soil-to-Groundwater MSCC	Residential MSCC	Industrial/Commercial MSCC	IR78-GW09-1	
				UST1601-SB01-4-5-10D	UST1601-SB01D-4-5-10D
Sample ID					
Sample Date				12/13/10	12/13/10
Chemical Name					
<b>Volatile Organic Compounds (µg/kg)</b>					
Trichloroethene	19	4,600	120,000	3.2 J	0.88 J
<b>Semivolatile Organic Compounds (µg/kg)</b>					
No Detections					
<b>Metals (mg/kg)</b>					
Chromium	5.4	47	1,226	<b>6.8</b>	<b>6.7</b>
Lead	270	400	400	4.9	3.9
<b>Wet Chemistry (pct)</b>					
% Solids	--	--	--	90	90
<b>Total Petroleum Hydrocarbons (µg/kg)</b>					
Aliphatics C9-C12 Unadjusted	540,000*	1,500,000*	40,000,000*	26,000 J	25,000 U
Aromatics C9-C10	31,000 <sup>+</sup>	469,000 <sup>+</sup>	12,264,000 <sup>+</sup>	24,000 J	25,000 U

**Notes:**

**Bold text indicates exceedance of Soil-to-Groundwater MSCC**

Underlined text indicates exceedance of Residential MSCC

**Bold box indicates exceedance of Industrial/Commercial MSCC**

MSCC- maximum soil contaminant concentration

J - Analyte present, value may or may not be accurate or precise

U - The material was analyzed for, but not detected

mg/kg - Milligrams per kilogram

pct - Percent

µg/kg - Micrograms per kilogram

\* - Aliphatics, C9-C18 is used as a surrogate

+ - Aromatics, C9-C22 is used as a surrogate

TABLE 6-2  
 Well Construction Details  
*Former UST-1601 SAR Report*  
*MCB CamLej, North Carolina*

Monitoring Well ID	Date Installed	Date Water Level Measured	Well Casing Depth (ft bgs)	Screened Interval (ft bgs)	TOC Elevation (ft amsl)	Well Depth (ft bgs)	Depth to water (ft btoc)	Water Elevation (ft amsl)
IR78-GW09-1	11/06/86	11/30/10	25.0	5 to 25	28.13	25.0	11.07	17.06

Notes:

- ft amsl - feet above mean sea level
- ft bgs - feet below ground surface
- ft btoc - feet below top of casing
- TOC - top of casing

TABLE 6-3

Groundwater Quality Parameters

Former UST-1601 SAR Report

MCB CamLej, Jacksonville, North Carolina

Monitoring Well ID	Date Sampled	Depth to Water (ft bgs)	pH (SU)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Temperature (Celsius)	Turbidity (NTU)	ORP (mV)
IR78-GW09-1	11/30/2010	11.07	6.09	0.238	3.86	22	4.72	130.5

Notes:

ft - feet

bgs- below ground wurface

SU- standard units

mS/cm- miliSiemens per centimeter

mg/L - milligram per liter

NTU - nepholometric turbidity units

mV - millivolts

TABLE 6-4

Groundwater Analytical Results  
Former UST-1601 SAR Report  
MCB CamLej, North Carolina

Station ID Sample ID Sample Date	NCGWQS (January, 2010) *	GCL	IR78-GW09-1	
			IR78-GW09-1-10D 11/30/10	IR78-GW09-1D-10D 11/30/10
<b>Chemical Name</b>				
<b>Volatile Organic Compounds (µg/l)</b>				
1,1,1-Trichloroethane	200	200,000	2.2	0.5 U
Carbon disulfide	700	590,000	2.7	0.5 U
cis-1,2-Dichloroethene	70	70,000	1.9	1.6
Trichloroethene	3	3,000	<b>53</b>	<b>51</b>
<b>Semivolatile Organic Compounds (µg/l)</b>				
2-Chloronaphthalene	NS	NS	0.072 J	0.1 U
Acenaphthylene	200	1,965	0.052 J	0.1 U
Anthracene	2,000	2,000	0.086 J	0.1 U
Benzo(a)anthracene	0.05	4.7	<b>0.051 J</b>	0.1 U
Benzo(k)fluoranthene	0.5	0.5	0.066 J	0.1 U
Chrysene	5	5	0.066 J	0.1 U
Fluoranthene	300	300	0.071 J	0.1 UJ
Fluorene	300	990	0.074 J	0.1 U
Indeno(1,2,3-cd)pyrene	0.05	0.05	<b>0.13 J</b>	0.1 U
Phenanthrene	200	410	0.082 J	0.1 U
Pyrene	200	200	0.057 J	0.1 U
<b>Total Metals (µg/l)</b>				
No Detections				
<b>Dissolved Metals (µg/l)</b>				
Lead	15	15,000	0.96 J	2.4 J
<b>Total Petroleum Hydrocarbons (µg/l)</b>				
No Detections				

**Notes:**

**Bold box indicates exceedance of NCGWQS or the more conservative MCL.**

**Bold text indicates exceedance of GCL**

NA - Not analyzed

NS - not specified

J - Analyte present, value may or may not be accurate or precise

U - The material was analyzed for, but not detected

µg/l - Micrograms per liter

\* - The MCL-Groundwater value is reported in place of the NCGWQS where the MCL is more conservative.

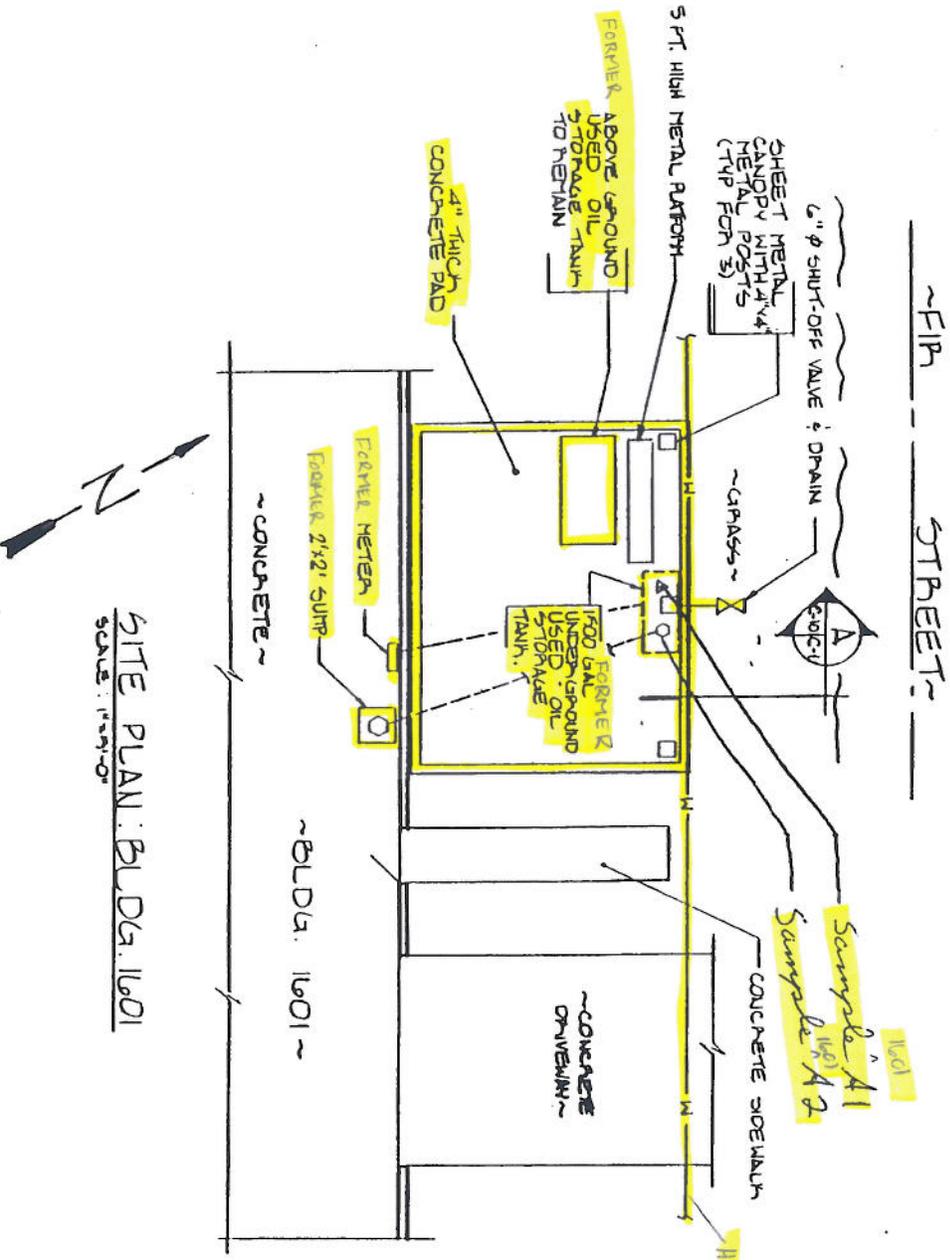
GCL- gross contaminant level

MCL - maximum contaminant level

NCGWQS - North Carolina groundwater quality standard

Appendix A  
Historical Underground Storage Tank  
Schematic

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SITE PLAN: BLDG. 1601  
 SCALE: 1"=10'-0"

FIGURE 1

**Appendix B**  
**Soil Boring Logs and Well Completion Records**



Boring No. H HPGW9 Location Coordinates N  
 Hole Size \_\_\_\_\_ Slot \_\_\_\_\_ E  
 Screen Size \_\_\_\_\_ Mat'l \_\_\_\_\_ Filter Materials \_\_\_\_\_  
 ( ) casing Size \_\_\_\_\_ Mat'l \_\_\_\_\_ Grout Type \_\_\_\_\_  
 Geologist \_\_\_\_\_ Development \_\_\_\_\_  
 Date Start \_\_\_\_\_ Finish \_\_\_\_\_ Static Water Level \_\_\_\_\_  
 Contractor \_\_\_\_\_ Top of Well Elevation \_\_\_\_\_  
 Driller \_\_\_\_\_ Drill Type \_\_\_\_\_

Depth (feet)	Sample	Sketch	Lithology, Color	USCS	SPT (BL/FT)
6-7.5			Silty Fine Sand, ~50% fairly clean loose sand, ~50% silty fine sand (~3% clay), med. dense, s. moist, mottled color 10YR 8/2 (white) and 10YR 6/6 (brnish yellow), silt in silty sand ~20-25%.	(SM)	3-5-8
17.5-9			Silty Fine Sand, silt ~20%, moist, med. dense, color 10YR 6/6 (brnish yellow), s. lighter mottling.	(SM)	5-7-5
9-10.5			Silty Fine Sand, moist, non-plast, med. dense, color 2.5Y 6/5 (light yellowish brn) mottled w/ light brnish gry and rdish yellow, cluster of fine black fibres noted (fragile) - old roots?	(SM)	5-6-9
14-15.5			Clayey Fine Sand, clay 5-10%, med. dense, strong, (brnish yellowish grey) mottled w/ (brnish yellow) color change to 10YR 8/2 (white) med. dense	(SP)	6-8-13

9-20.5 Fine Sand, ~5% fines, color 10YR 8/1 (white), saturated, v. foul odor (as above), uniform grain size, med. dense.

SP

24-25.5 Clayey fine sand, clay 45%, unif. grains, non-plast (slight in trace zones), v. foul odor (as above), med dense, color 10 YR 8/1 (white), uniform.

11/6/96

DATE

SIGNED

7:05 am Began drilling & sampling.

12:05 pm Last spoon. Began backing augers and pouring silica sand. Odor rising from hole. Casing installed. Odor resembles natural gas(?), solvent? \*

12:30 All augers out. Pouring sand. Hole open.

12:45 Bentonite in. Well complete.

Standard construction. Hole 27' deep. 4 bags silica sand used.

Driller back to w.w.t. plan to load up sand. Paul to Base Telephone to locate next site's cables. Also coordinate w/ other rig.

15 min. lunch Bk.

\* Driller did not notice any drilling difficulty. Geologist found no metal shavings or other indications of hitting pipeline. Propane tank ~30' away, but odor not exactly like propane. Observed no change in propane tank gauge.

Evident from soil gas results that the odor is probably from solvents.

Because of near completion of well and the odor level, judgement was made to quickly complete well.

DATE

SIGNED

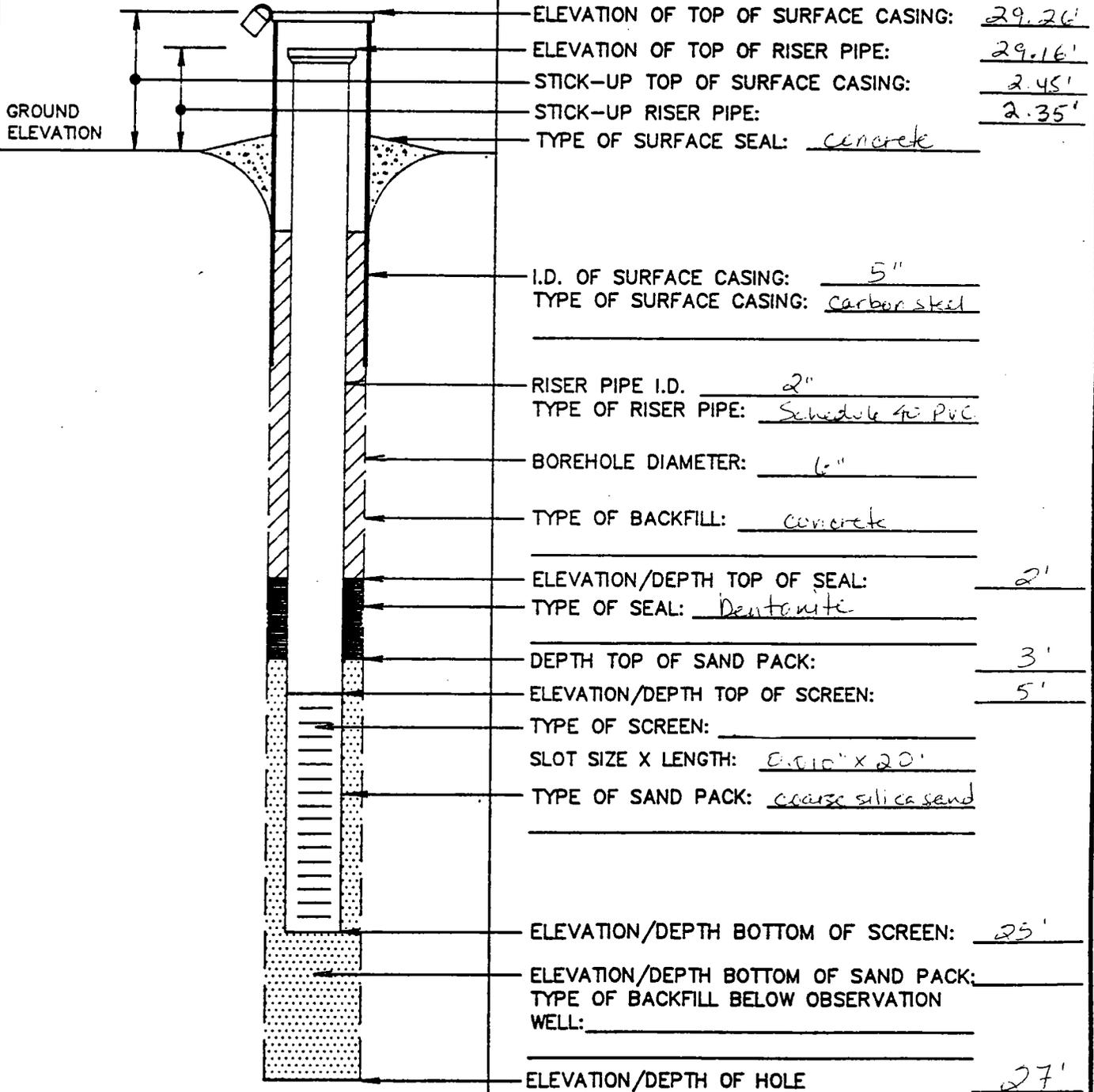
↑

## OVERBURDEN MONITORING WELL SHEET

WELL NO. HP-GW9-1

PROJECT Camp Lejeune - HP1A  
 PROJECT NO. 49-C2C36 BORING NO. HP-GW9-1  
 ELEVATION \_\_\_\_\_ DATE 11/6/86  
 FIELD GEOLOGIST Paul Conrad (ESE)

DRILLER Davis Drilling Co.  
 DRILLING METHOD Hollow Stem Auger  
 DEVELOPMENT METHOD \_\_\_\_\_



NOT TO SCALE

FOR OFFICE USE ONLY	
Quad. No. _____	Serial No. _____
Lat. _____	Long. _____ Pc _____
Minor Basin _____	
Basin Code _____	
Header Ent. _____	GW-1 Ent. _____

2009

**WELL CONSTRUCTION RECORD**

DRILLING CONTRACTOR Davis Drilling Co.  
 DRILLER REGISTRATION NUMBER Pending

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0135-WM-0141

1. WELL LOCATION: (Show sketch of the location below)  
 Nearest Town: Jacksonville, NC

County: Onslow

(Road, Community, or Subdivision and Lot No.)  
 2. OWNER US Navy  
 ADDRESS Camp Lejeune N.C.  
 (Street or Route No.) 28542  
 City or Town State Zip Code

Depth		DRILLING LOG
From	To	Formation Description
0.0	10.5	Silty Fine Sand
14.0	15.5	Clayey Fine Sand
19.0	20.5	Fine Sand
24.0	25.5	Clayey Fine Sand

3. DATE DRILLED 11/6/86 USE OF WELL monitor

4. TOTAL DEPTH 25.5' CUTTINGS COLLECTED  Yes  No

5. DOES WELL REPLACE EXISTING WELL?  Yes  No

6. STATIC WATER LEVEL: 15.63 FT.  above TOP OF CASING,  
 below TOP OF CASING IS 2.50 FT. ABOVE LAND SURFACE.

7. YIELD (gpm): \_\_\_\_\_ METHOD OF TEST \_\_\_\_\_

8. WATER ZONES (depth): \_\_\_\_\_

9. CHLORINATION: Type \_\_\_\_\_ Amount \_\_\_\_\_

10. CASING:

From	Depth	To	Diameter	Wall Thickness or Weight/Ft.	Material
*	2.5	5.0	2"	1/2"	PVC
From		To	Ft.		
From		To	Ft.		

11. GROUT:

From	Depth	To	Material	Method
From	0.0	2.0	Concrete	
From	2.0	3.0	Clay	

12. SCREEN:

From	Depth	To	Diameter	Slot Size	Material
From	-5.0	-25'	2"	0.01 in.	PVC
From		To	Ft.	in.	in.
From		To	Ft.	in.	in.

13. GRAVEL PACK:

From	Depth	To	Size	Material
From	-3.0	-25'	coarse	Sand
From		To	Ft.	

If additional space is needed use back of form.  
 LOCATION SKETCH  
 (Show direction and distance from at least two State Roads, or other map reference points)

See sketch attached to Fig. (2-5).

REMARKS: \_\_\_\_\_  
 I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.  
 SIGNATURE OF CONTRACTOR OR AGENT: [Signature] DATE: 2/10/87



# Boring Number: UST1601-SB01

Sheet: 1 of 1

**Client:** NAVFAC  
**Project:** CTO-WE31  
**Location:** MCB CamLej  
**Project Number:** 408943.FI.FS

**Driller:** Applied Resources Mgmt. (ARM)  
**Drilling Method:** Hand Auger  
**Sampling Method:** Hand Auger  
**Logged by:** Dan Brown/CLT  
**Start/Finish Date:** 12/13/10

Depth (ft)	Sample Information			Soil Log	Soil Description	FID (ppm)	Comments
	Sample #	Sample Type	Recovery (in)				
0					Ground Surface		
	HA-1	HA	60		<b>Silty Sand (SM)</b> Dark brown/red, dry, loose, fine grained	0.0	4'-5': Collected UST1601-SB01-4-5-10D @ 1350 for VOC, SVOC, EPH, VPH, and total chromium and lead analysis  Boring terminated at 9'  DTW @ 11.05 ft btoc
					<b>Sand (SP)</b> White/grey, moist, medium dense, fine grained		
5	HA-2	HA	48		<b>Silty Sand (SM)</b> Reddish brown, moist, loose, fine grained	0.0	
					Dark brown		
10							
15							
20							

**Appendix C**  
**Groundwater Sampling Data Sheet**

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GROUNDWATER SAMPLING DATA SHEET

Client: NAVFAC Mid-Atlantic  
 Location: MCB CAMP LEJEUNE  
 Event: CTO-WE31 SITES  
 Date: 11/30/10  
 Weather: cloudy, 60s, breezy

Project Number: 408943.FI.FS  
 Well ID: 1R78-GW09-1  
 Sample ID: 1R78-GW09-1-10D  
 Sampling Team: V. Cunningham / RDU  
D. Lubell / RDU

Total Depth: 22 FT.(BTOC)  
 Depth to water: (-) 11.07 FT.(BTOC)  
 Water Column: 10.93 FT.  
(X) 0.103 GAL/FT.  
 Well Volume: 1.73 GAL.  $\times 3 = 5.34$   
 Total Purge Vol.: 6 GAL.

Measuring Device: YSI 556 # 13076  
Hanna # 09010  
 Date and Time: See table below

Well Dia. (inches)	Volume (gallons/foot)
0.75	0.023
1	0.041
2	0.163
4	0.653
6	1.469

Purge Device: bladder pump

FIELD PARAMETERS

Time	Depth to Water (ft bgs)	Temp. °C	Cond. mS/cm	DO mg/L	pH SU	ORP mV	Turbidity NTU	Flow Rate (mL/min)	Color / Odor / Comments
Stabilization Criteria		± 10%	± 3%	± 10%	± 0.1	± 10 mV	± 10% or <10	(300-500)	
1630	11.12	21.70	0.347	4.74	7.40	72.3	15.8	450	
1640	11.21	21.97	0.236	3.96	6.52	109.4	10.2	"	
1650	11.32	21.95	0.238	4.38	6.32	113.0	26.8	"	
1655	11.22	21.97	0.238	3.93	6.24	116.0	17.1	"	
1700	11.20	21.98	0.239	3.95	6.21	113.6	14.6	"	
1705	11.26	21.99	0.239	3.75	6.19	121.8	10.6	"	
1710	11.31	22.00	0.238	3.65	6.15	124.5	8.57	"	
1715	11.46	22.00	0.238	3.58	6.12	128.6	6.03	"	
1720	11.44	22.01	0.238	4.27	6.11	127.6	5.87	"	
1725	11.44	22.00	0.238	3.86	6.09	130.5	4.72	"	

SAMPLE DATA

Date: <u>11/30/10</u>	Temp. °C	Cond. mS/cm	DO mg/L	pH SU	ORP mV	Turbidity NTU	Other: _____	Color / Odor / Comments
Time: <u>1725</u>								
Method: <u>low-flow</u>	<u>22.00</u>	<u>0.238</u>	<u>3.86</u>	<u>6.09</u>	<u>130.5</u>	<u>4.72</u>		

Sample information: method, container number, size, and type, preservative used.

Analysis	Preservative	Container requirements	No. of containers
VOCs	HCL	40 mL VOAs	3
<del>SVOCs (EPA 8270D)</del>	<del>NA</del>	<del>1 Liter Ambers</del>	
MADEP VPH	HCL	40 mL VOAs	2
MADEP EPH	HCL	1 Liter Ambers	2
EPA 625 BNA + 10 TICS	NA	1 Liter Ambers	2
LEAD & CHROMIUM	HNO3	250 mL or 500 mL Poly	2

Observations/Notes:  
 Total Volume Purged: 6 gal pump started at 1626 pump set at 20' FID=0.0 ppm initial reading FID battery too weak to stay on

MS/MSD: YES  NO  MS ID: \_\_\_\_\_ SD ID: \_\_\_\_\_

Duplicate:  YES  NO Duplicate ID: 1R78-GW09-1D-10D

Signature(s): Verd Ana Cing

Appendix D  
Soil and Groundwater Analytical Laboratory  
Reports

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## Report of Analytical Results

**Client:** CH2MHill  
**Lab ID:** SD7749-4RA  
**Client ID:** ST1601-SB01-4-5-10D  
**Project:** MCB Camp Lejeune CTO-WI  
**SDG:** WE31-1

**Sample Date:** 13-DEC-10  
**Received Date:** 15-DEC-10  
**Extract Date:** 17-DEC-10  
**Extracted By:** JSS  
**Extraction Method:** SW846 8260B  
**Lab Prep Batch:** WG86416

**Analysis Date:** 17-DEC-10  
**Analyst:** JSS  
**Analysis Method:** SW846 8260B  
**Matrix:** SL  
**% Solids:** 90.  
**Report Date:** 04-JAN-11

Compound	Qualifier	Result	Units	Dilution	LOQ	ADJ LOQ	ADJ MDL	ADJ LOD
Dichlorodifluoromethane	U	10.	ug/Kgdrywt	1	10	20.	1.8	10.
Chloromethane	U	10.	ug/Kgdrywt	1	10	20.	2.8	10.
Vinyl Chloride	U	10.	ug/Kgdrywt	1	10	20.	1.7	10.
Bromomethane	U	10.	ug/Kgdrywt	1	10	20.	2.2	10.
Chloroethane	U	10.	ug/Kgdrywt	1	10	20.	2.6	10.
Trichlorofluoromethane	U	10.	ug/Kgdrywt	1	10	20.	1.8	10.
1,1-Dichloroethene	U	5.0	ug/Kgdrywt	1	5	10.	1.9	5.0
<b>Carbon Disulfide</b>	J	2.3	ug/Kgdrywt	1	5	10.	1.6	5.0
Freon-113	U	5.0	ug/Kgdrywt	1	5	10.	1.8	5.0
Methylene Chloride	U	25.	ug/Kgdrywt	1	25	50.	16.	25.
<b>Acetone</b>		86.	ug/Kgdrywt	1	25	50.	10.	25.
trans-1,2-Dichloroethene	U	5.0	ug/Kgdrywt	1	5	10.	1.4	5.0
Methyl tert-butyl Ether	U	5.0	ug/Kgdrywt	1	5	10.	2.2	5.0
1,1-Dichloroethane	U	5.0	ug/Kgdrywt	1	5	10.	3.4	5.0
cis-1,2-Dichloroethene	U	5.0	ug/Kgdrywt	1	5	10.	1.8	5.0
Chloroform	U	5.0	ug/Kgdrywt	1	5	10.	0.70	5.0
Carbon Tetrachloride	U	5.0	ug/Kgdrywt	1	5	10.	2.6	5.0
1,1,1-Trichloroethane	U	5.0	ug/Kgdrywt	1	5	10.	0.84	5.0
2-Butanone	U	25.	ug/Kgdrywt	1	25	50.	12.	25.
Benzene	U	5.0	ug/Kgdrywt	1	5	10.	1.8	5.0
Cyclohexane	U	5.0	ug/Kgdrywt	1	5	10.	2.8	5.0
1,2-Dichloroethane	U	5.0	ug/Kgdrywt	1	5	10.	2.0	5.0
<b>Trichloroethene</b>	J	3.2	ug/Kgdrywt	1	5	10.	1.2	5.0
1,2-Dichloropropane	U	5.0	ug/Kgdrywt	1	5	10.	2.8	5.0
Bromodichloromethane	U	5.0	ug/Kgdrywt	1	5	10.	1.2	5.0
cis-1,3-Dichloropropene	U	5.0	ug/Kgdrywt	1	5	10.	1.4	5.0
Toluene	U	5.0	ug/Kgdrywt	1	5	10.	2.8	5.0
4-Methyl-2-Pentanone	U	25.	ug/Kgdrywt	1	25	50.	12.	25.
Tetrachloroethene	U	5.0	ug/Kgdrywt	1	5	10.	2.4	5.0
trans-1,3-Dichloropropene	U	5.0	ug/Kgdrywt	1	5	10.	1.7	5.0
1,1,2-Trichloroethane	U	5.0	ug/Kgdrywt	1	5	10.	1.9	5.0
Dibromochloromethane	U	5.0	ug/Kgdrywt	1	5	10.	2.0	5.0
1,2-Dibromoethane	U	5.0	ug/Kgdrywt	1	5	10.	2.4	5.0
2-Hexanone	U	25.	ug/Kgdrywt	1	25	50.	9.6	25.
Chlorobenzene	U	5.0	ug/Kgdrywt	1	5	10.	1.0	5.0

## Report of Analytical Results

**Client:** CH2MHill  
**Lab ID:** SD7749-4RA  
**Client ID:** ST1601-SB01-4-5-10D  
**Project:** MCB Camp Lejeune CTO-WI  
**SDG:** WE31-1

**Sample Date:** 13-DEC-10  
**Received Date:** 15-DEC-10  
**Extract Date:** 17-DEC-10  
**Extracted By:** JSS  
**Extraction Method:** SW846 8260B  
**Lab Prep Batch:** WG86416

**Analysis Date:** 17-DEC-10  
**Analyst:** JSS  
**Analysis Method:** SW846 8260B  
**Matrix:** SL  
**% Solids:** 90.  
**Report Date:** 04-JAN-11

Compound	Qualifier	Result	Units	Dilution	LOQ	ADJ LOQ	ADJ MDL	ADJ LOD
Ethylbenzene	U	5.0	ug/Kgdrywt	1	5	10.	1.3	5.0
Styrene	U	5.0	ug/Kgdrywt	1	5	10.	1.0	5.0
Bromoform	U	5.0	ug/Kgdrywt	1	5	10.	1.4	5.0
Isopropylbenzene	U	5.0	ug/Kgdrywt	1	5	10.	1.8	5.0
1,1,2,2-Tetrachloroethane	U	5.0	ug/Kgdrywt	1	5	10.	1.7	5.0
1,3-Dichlorobenzene	U	5.0	ug/Kgdrywt	1	5	10.	1.2	5.0
1,4-Dichlorobenzene	U	5.0	ug/Kgdrywt	1	5	10.	0.88	5.0
1,2-Dichlorobenzene	U	5.0	ug/Kgdrywt	1	5	10.	1.6	5.0
1,2-Dibromo-3-Chloropropane	U	5.0	ug/Kgdrywt	1	5	10.	3.0	5.0
1,2,4-Trichlorobenzene	U	5.0	ug/Kgdrywt	1	5	10.	1.6	5.0
Methyl Acetate	U	6.0	ug/Kgdrywt	1	5	10.	5.4	6.0
Methylcyclohexane	U	5.0	ug/Kgdrywt	1	5	10.	1.9	5.0
1,2,4-Trimethylbenzene	U	5.0	ug/Kgdrywt	1	5	10.	1.7	5.0
1,3,5-Trimethylbenzene	U	5.0	ug/Kgdrywt	1	5	10.	1.3	5.0
Di-isopropyl ether	U	5.0	ug/Kgdrywt	1	5	10.	4.2	5.0
n-Butylbenzene	U	5.0	ug/Kgdrywt	1	5	10.	1.8	5.0
sec-Butylbenzene	U	5.0	ug/Kgdrywt	1	5	10.	1.8	5.0
tert-Butylbenzene	U	5.0	ug/Kgdrywt	1	5	10.	1.8	5.0
m+p-Xylene	U	5.0	ug/Kgdrywt	1	5	10.	3.4	5.0
o-Xylene	U	5.0	ug/Kgdrywt	1	5	10.	2.6	5.0
Naphthalene	U	5.0	ug/Kgdrywt	1	5	10.	1.8	5.0
p-Bromofluorobenzene		103.	%					
Toluene-D8		114.	%					
1,2-Dichloroethane-D4		133.	%					
Dibromofluoromethane		122.	%					

## Report of Analytical Results

Client: CH2MHill  
 Lab ID: SD7749-5  
 Client ID: T1601-SB01D-4-5-10D  
 Project: MCB Camp Lejeune CTO-WJ  
 SDG: WE31-1

Sample Date: 13-DEC-10  
 Received Date: 15-DEC-10  
 Extract Date: 16-DEC-10  
 Extracted By: JSS  
 Extraction Method: SW846 8260B  
 Lab Prep Batch: WG86371

Analysis Date: 16-DEC-10  
 Analyst: JSS  
 Analysis Method: SW846 8260B  
 Matrix: SL  
 % Solids: 90.  
 Report Date: 04-JAN-11

Compound	Qualifier	Result	Units	Dilution	LOQ	ADJ LOQ	ADJ MDL	ADJ LOD
Dichlorodifluoromethane	U	6.0	ug/Kgdrywt	1	10	12.	1.1	6.0
Chloromethane	U	6.0	ug/Kgdrywt	1	10	12.	1.7	6.0
Vinyl Chloride	U	6.0	ug/Kgdrywt	1	10	12.	1.0	6.0
Bromomethane	U	6.0	ug/Kgdrywt	1	10	12.	1.3	6.0
Chloroethane	U	6.0	ug/Kgdrywt	1	10	12.	1.6	6.0
Trichlorofluoromethane	U	6.0	ug/Kgdrywt	1	10	12.	1.1	6.0
1,1-Dichloroethene	U	3.0	ug/Kgdrywt	1	5	6.0	1.1	3.0
Carbon Disulfide	U	3.0	ug/Kgdrywt	1	5	6.0	0.94	3.0
Freon-113	U	3.0	ug/Kgdrywt	1	5	6.0	1.1	3.0
Methylene Chloride	U	15.	ug/Kgdrywt	1	25	30.	9.5	15.
Acetone	J	11.	ug/Kgdrywt	1	25	30.	6.1	15.
trans-1,2-Dichloroethene	U	3.0	ug/Kgdrywt	1	5	6.0	0.85	3.0
Methyl tert-butyl Ether	U	3.0	ug/Kgdrywt	1	5	6.0	1.3	3.0
1,1-Dichloroethane	U	3.0	ug/Kgdrywt	1	5	6.0	2.0	3.0
cis-1,2-Dichloroethene	U	3.0	ug/Kgdrywt	1	5	6.0	1.1	3.0
Chloroform	U	3.0	ug/Kgdrywt	1	5	6.0	0.42	3.0
Carbon Tetrachloride	U	3.0	ug/Kgdrywt	1	5	6.0	1.6	3.0
1,1,1-Trichloroethane	U	3.0	ug/Kgdrywt	1	5	6.0	0.50	3.0
2-Butanone	U	15.	ug/Kgdrywt	1	25	30.	7.1	15.
Benzene	U	3.0	ug/Kgdrywt	1	5	6.0	1.1	3.0
Cyclohexane	U	3.0	ug/Kgdrywt	1	5	6.0	1.7	3.0
1,2-Dichloroethane	U	3.0	ug/Kgdrywt	1	5	6.0	1.2	3.0
Trichloroethene	J	0.88	ug/Kgdrywt	1	5	6.0	0.71	3.0
1,2-Dichloropropane	U	3.0	ug/Kgdrywt	1	5	6.0	1.7	3.0
Bromodichloromethane	U	3.0	ug/Kgdrywt	1	5	6.0	0.72	3.0
cis-1,3-Dichloropropene	U	3.0	ug/Kgdrywt	1	5	6.0	0.86	3.0
Toluene	U	3.0	ug/Kgdrywt	1	5	6.0	1.7	3.0
4-Methyl-2-Pentanone	U	15.	ug/Kgdrywt	1	25	30.	7.1	15.
Tetrachloroethene		7.4	ug/Kgdrywt	1	5	6.0	1.4	3.0
trans-1,3-Dichloropropene	U	3.0	ug/Kgdrywt	1	5	6.0	1.0	3.0
1,1,2-Trichloroethane	U	3.0	ug/Kgdrywt	1	5	6.0	1.2	3.0
Dibromochloromethane	U	3.0	ug/Kgdrywt	1	5	6.0	1.2	3.0
1,2-Dibromoethane	U	3.0	ug/Kgdrywt	1	5	6.0	1.4	3.0
2-Hexanone	U	15.	ug/Kgdrywt	1	25	30.	5.8	15.
Chlorobenzene	U	3.0	ug/Kgdrywt	1	5	6.0	0.61	3.0

## Report of Analytical Results

**Client:** CH2MHill  
**Lab ID:** SD7749-5  
**Client ID:** T1601-SB01D-4-5-10D  
**Project:** MCB Camp Lejeune CTO-WI  
**SDG:** WE31-1

**Sample Date:** 13-DEC-10  
**Received Date:** 15-DEC-10  
**Extract Date:** 16-DEC-10  
**Extracted By:** JSS  
**Extraction Method:** SW846 8260B  
**Lab Prep Batch:** WG86371

**Analysis Date:** 16-DEC-10  
**Analyst:** JSS  
**Analysis Method:** SW846 8260B  
**Matrix:** SL  
**% Solids:** 90.  
**Report Date:** 04-JAN-11

Compound	Qualifier	Result	Units	Dilution	LOQ	ADJ LOQ	ADJ MDL	ADJ LOD
Ethylbenzene	U	3.0	ug/Kgdrywt	1	5	6.0	0.78	3.0
Styrene	U	3.0	ug/Kgdrywt	1	5	6.0	0.61	3.0
Bromoform	U	3.0	ug/Kgdrywt	1	5	6.0	0.84	3.0
Isopropylbenzene	U	3.0	ug/Kgdrywt	1	5	6.0	1.1	3.0
1,1,2,2-Tetrachloroethane	U	3.0	ug/Kgdrywt	1	5	6.0	1.0	3.0
1,3-Dichlorobenzene	U	3.0	ug/Kgdrywt	1	5	6.0	0.74	3.0
1,4-Dichlorobenzene	U	3.0	ug/Kgdrywt	1	5	6.0	0.53	3.0
1,2-Dichlorobenzene	U	3.0	ug/Kgdrywt	1	5	6.0	0.94	3.0
1,2-Dibromo-3-Chloropropane	U	3.0	ug/Kgdrywt	1	5	6.0	1.8	3.0
1,2,4-Trichlorobenzene	U	3.0	ug/Kgdrywt	1	5	6.0	0.95	3.0
Methyl Acetate	U	3.6	ug/Kgdrywt	1	5	6.0	3.2	3.6
Methylcyclohexane	U	3.0	ug/Kgdrywt	1	5	6.0	1.2	3.0
1,2,4-Trimethylbenzene	U	3.0	ug/Kgdrywt	1	5	6.0	1.0	3.0
1,3,5-Trimethylbenzene	U	3.0	ug/Kgdrywt	1	5	6.0	0.80	3.0
Di-isopropyl ether	U	3.0	ug/Kgdrywt	1	5	6.0	2.5	3.0
n-Butylbenzene	U	3.0	ug/Kgdrywt	1	5	6.0	1.1	3.0
sec-Butylbenzene	U	3.0	ug/Kgdrywt	1	5	6.0	1.1	3.0
tert-Butylbenzene	U	3.0	ug/Kgdrywt	1	5	6.0	1.1	3.0
m+p-Xylene	U	3.0	ug/Kgdrywt	1	5	6.0	2.0	3.0
o-Xylene	U	3.0	ug/Kgdrywt	1	5	6.0	1.6	3.0
Naphthalene	U	3.0	ug/Kgdrywt	1	5	6.0	1.0	3.0
p-Bromofluorobenzene		91.1	%					
Toluene-D8		104.	%					
1,2-Dichloroethane-D4		112.	%					
Dibromofluoromethane		104.	%					

## Report of Analytical Results

**Client:** CH2MHill  
**Lab ID:** SD7749-4  
**Client ID:** ST1601-SB01-4-5-10D  
**Project:** MCB Camp Lejeune CTO-WI  
**SDG:** WE31-1

**Sample Date:** 13-DEC-10  
**Received Date:** 15-DEC-10  
**Extract Date:** 16-DEC-10  
**Extracted By:** KF  
**Extraction Method:** SW846 3550  
**Lab Prep Batch:** WG86318

**Analysis Date:** 20-DEC-10  
**Analyst:** WAS  
**Analysis Method:** SW846 8270C  
**Matrix:** SL  
**% Solids:** 90.  
**Report Date:** 03-JAN-11

Compound	Qualifier	Result	Units	Dilution	LOQ	ADJ LOQ	ADJ MDL	ADJ LOD
Bis(2-Chloroethyl) Ether	U	270	ug/Kgdrywt	1	330	360	87.	270
1,3-Dichlorobenzene	U	270	ug/Kgdrywt	1	330	360	84.	270
1,4-Dichlorobenzene	U	270	ug/Kgdrywt	1	330	360	92.	270
1,2-Dichlorobenzene	U	270	ug/Kgdrywt	1	330	360	95.	270
n-Nitroso-di-n-propylamine	U	270	ug/Kgdrywt	1	330	360	89.	270
Hexachloroethane	U	270	ug/Kgdrywt	1	330	360	100	270
Nitrobenzene	U	270	ug/Kgdrywt	1	330	360	98.	270
Isophorone	U	270	ug/Kgdrywt	1	330	360	81.	270
Bis(2-chloroethoxy)methane	U	270	ug/Kgdrywt	1	330	360	100	270
1,2,4-Trichlorobenzene	U	270	ug/Kgdrywt	1	330	360	87.	270
Hexachlorobutadiene	U	270	ug/Kgdrywt	1	330	360	89.	270
Dimethyl phthalate	U	270	ug/Kgdrywt	1	330	360	84.	270
2,6-Dinitrotoluene	U	270	ug/Kgdrywt	1	330	360	85.	270
2,4-Dinitrotoluene	U	270	ug/Kgdrywt	1	330	360	92.	270
Diethylphthalate	U	270	ug/Kgdrywt	1	330	360	86.	270
4-Chlorophenyl-phenylether	U	270	ug/Kgdrywt	1	330	360	84.	270
4-Bromophenyl-phenylether	U	270	ug/Kgdrywt	1	330	360	92.	270
Hexachlorobenzene	U	270	ug/Kgdrywt	1	330	360	88.	270
Anthracene	U	270	ug/Kgdrywt	1	330	360	90.	270
Di-n-butylphthalate	U	270	ug/Kgdrywt	1	330	360	110	270
Butylbenzylphthalate	U	270	ug/Kgdrywt	1	330	360	100	270
3,3'-Dichlorobenzidine	U	270	ug/Kgdrywt	1	330	360	120	270
Bis(2-ethylhexyl)phthalate	U	270	ug/Kgdrywt	1	330	360	100	270
Di-n-octylphthalate	U	270	ug/Kgdrywt	1	330	360	230	270
2-Fluorophenol		69.1						
Phenol-d6		71.3						
Nitrobenzene-d5		65.4						
2-Fluorobiphenyl		79.3						
2,4,6-Tribromophenol		73.2						
Terphenyl-d14		69.8						

## Report of Analytical Results

**Client:** CH2MHill  
**Lab ID:** SD7749-5RA  
**Client ID:** T1601-SB01D-4-5-10D  
**Project:** MCB Camp Lejeune CTO-WI  
**SDG:** WE31-1

**Sample Date:** 13-DEC-10  
**Received Date:** 15-DEC-10  
**Extract Date:** 16-DEC-10  
**Extracted By:** KF  
**Extraction Method:** SW846 3550  
**Lab Prep Batch:** WG86318

**Analysis Date:** 21-DEC-10  
**Analyst:** WAS  
**Analysis Method:** SW846 8270C  
**Matrix:** SL  
**% Solids:** 90.  
**Report Date:** 05-JAN-11

Compound	Qualifier	Result	Units	Dilution	LOQ	ADJ LOQ	ADJ MDL	ADJ LOD
Bis(2-Chloroethyl) Ether	U	260	ug/Kgdrywt	1	330	350	86.	260
1,3-Dichlorobenzene	U	260	ug/Kgdrywt	1	330	350	82.	260
1,4-Dichlorobenzene	U	260	ug/Kgdrywt	1	330	350	91.	260
1,2-Dichlorobenzene	U	260	ug/Kgdrywt	1	330	350	93.	260
n-Nitroso-di-n-propylamine	U	260	ug/Kgdrywt	1	330	350	88.	260
Hexachloroethane	U	260	ug/Kgdrywt	1	330	350	100	260
Nitrobenzene	U	260	ug/Kgdrywt	1	330	350	96.	260
Isophorone	U	260	ug/Kgdrywt	1	330	350	79.	260
Bis(2-chloroethoxy)methane	U	260	ug/Kgdrywt	1	330	350	100	260
1,2,4-Trichlorobenzene	U	260	ug/Kgdrywt	1	330	350	86.	260
Hexachlorobutadiene	U	260	ug/Kgdrywt	1	330	350	88.	260
Dimethyl phthalate	U	260	ug/Kgdrywt	1	330	350	82.	260
2,6-Dinitrotoluene	U	260	ug/Kgdrywt	1	330	350	83.	260
2,4-Dinitrotoluene	U	260	ug/Kgdrywt	1	330	350	90.	260
Diethylphthalate	U	260	ug/Kgdrywt	1	330	350	84.	260
4-Chlorophenyl-phenylether	U	260	ug/Kgdrywt	1	330	350	82.	260
4-Bromophenyl-phenylether	U	260	ug/Kgdrywt	1	330	350	90.	260
Hexachlorobenzene	U	260	ug/Kgdrywt	1	330	350	87.	260
Anthracene	U	260	ug/Kgdrywt	1	330	350	89.	260
Di-n-butylphthalate	U	260	ug/Kgdrywt	1	330	350	110	260
Butylbenzylphthalate	U	260	ug/Kgdrywt	1	330	350	98.	260
3,3'-Dichlorobenzidine	U	260	ug/Kgdrywt	1	330	350	120	260
<b>Bis(2-ethylhexyl)phthalate</b>	J	120	ug/Kgdrywt	1	330	350	100	260
Di-n-octylphthalate	U	260	ug/Kgdrywt	1	330	350	220	260
2-Fluorophenol		66.5						
Phenol-d6		68.2						
Nitrobenzene-d5		64.2						
2-Fluorobiphenyl		72.7						
2,4,6-Tribromophenol		71.0						
Terphenyl-d14		71.6						

## INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services

Client Field ID: ST1601-SB01-4-5-10D

Matrix: SOIL

SDG Name: WE31-1

Percent Solids: 89.9

Lab Sample ID: SD7749-004

Concentration Units : mg/Kgdrywt

CAS No.	Analyte	Concentration	C	Q	M	DF	ADJUSTED		
							LOQ	MDL	LOD
7440-47-3	CHROMIUM, TOTAL	6.8			P	1	1.4	0.03	0.38
7439-92-1	LEAD, TOTAL	4.9			P	1	0.47	0.10	0.38

Bottle ID: G

Comments:

## INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services

Client Field ID: T1601-SB01D-4-5-10D

Matrix: SOIL

SDG Name: WE31-1

Percent Solids: 89.5

Lab Sample ID: SD7749-005

Concentration Units : mg/Kgdrywt

CAS No.	Analyte	Concentration	C	Q	M	DF	ADJUSTED		
							LOQ	MDL	LOD
7440-47-3	CHROMIUM, TOTAL	6.7			P	1	1.3	0.03	0.34
7439-92-1	LEAD, TOTAL	3.9			P	1	0.43	0.09	0.34

Bottle ID: G

Comments:

## Report of Analytical Results

**Client:** Rebekha Shaw  
 CH2MHill  
 5700 Cleveland St.  
 Virginia Beach, VA 23462

**Lab Sample ID:** SD7749-4  
**Report Date:** 28-DEC-10  
**Client PO:** N62470-08-D-1000 942  
**Project:** MCB Camp Lejeune CTO  
**SDG:** WE31-1

Sample Description

ST1601-SB01-4-5-10D

<u>Matrix</u>	<u>Date Sampled</u>	<u>Date Received</u>
SL	13-DEC-10	15-DEC-10

<u>Parameter</u>	<u>Result</u>	<u>Adj LOQ</u>	<u>Adj LOD</u>	<u>Anal. Method</u>	<u>QC.Batch</u>	<u>Anal. Date</u>	<u>Prep. Method</u>	<u>Prep. Date</u>	<u>Footnotes</u>
Total Solids	90. %	1	N/A	SM2540G	WG86619	23-DEC-10 09:22:00	ASTM D2216	22-DEC-10	

## Report of Analytical Results

**Client:** Rebekha Shaw  
 CH2MHill  
 5700 Cleveland St.  
 Virginia Beach, VA 23462

**Lab Sample ID:** SD7749-5  
**Report Date:** 28-DEC-10  
**Client PO:** N62470-08-D-1000 942  
**Project:** MCB Camp Lejeune CTO  
**SDG:** WE31-1

Sample Description

T1601-SB01D-4-5-10D

<u>Matrix</u>	<u>Date Sampled</u>	<u>Date Received</u>
SL	13-DEC-10	15-DEC-10

<u>Parameter</u>	<u>Result</u>	<u>Adj LOQ</u>	<u>Adj LOD</u>	<u>Anal. Method</u>	<u>QC.Batch</u>	<u>Anal. Date</u>	<u>Prep. Method</u>	<u>Prep. Date</u>	<u>Footnotes</u>
Total Solids	90. %	1	N/A	SM2540G	WG86619	23-DEC-10 09:22:00	ASTM D2216	22-DEC-10	

## Report of Analytical Results

**Client:** CH2MHill  
**Lab ID:** SD7749-4  
**Client ID:** ST1601-SB01-4-5-10D  
**Project:** MCB Camp Lejeune CTO-WI  
**SDG:** WE31-1

**Sample Date:** 13-DEC-10  
**Received Date:** 15-DEC-10  
**Extract Date:** 16-DEC-10  
**Extracted By:** KF  
**Extraction Method:** SW846 3550  
**Lab Prep Batch:** WG86319

**Analysis Date:** 21-DEC-10  
**Analyst:** JCG  
**Analysis Method:** SW846 M8270C  
**Matrix:** SL  
**% Solids:** 90.  
**Report Date:** 23-DEC-10

Compound	Qualifier	Result	Units	Dilution	LOQ	ADJ LOQ	ADJ MDL	ADJ LOD
Naphthalene	U	11.	ug/Kgdrywt	1	20	22.	2.8	11.
2-Methylnaphthalene	U	11.	ug/Kgdrywt	1	20	22.	2.4	11.
Acenaphthylene	U	11.	ug/Kgdrywt	1	20	22.	1.3	11.
Acenaphthene	U	11.	ug/Kgdrywt	1	20	22.	1.6	11.
Fluorene	U	11.	ug/Kgdrywt	1	20	22.	3.4	11.
Phenanthrene	J	4.5	ug/Kgdrywt	1	20	22.	1.9	11.
Fluoranthene	U	11.	ug/Kgdrywt	1	20	22.	1.9	11.
Pyrene	U	11.	ug/Kgdrywt	1	20	22.	2.3	11.
Benzo (a) anthracene	U	11.	ug/Kgdrywt	1	20	22.	2.0	11.
Chrysene	U	11.	ug/Kgdrywt	1	20	22.	1.8	11.
Benzo (b) Fluoranthene	U	11.	ug/Kgdrywt	1	20	22.	2.6	11.
Benzo(k)fluoranthene	U	11.	ug/Kgdrywt	1	20	22.	3.3	11.
Benzo(a)pyrene	U	11.	ug/Kgdrywt	1	20	22.	3.6	11.
Indeno (1,2,3-cd) pyrene	U	11.	ug/Kgdrywt	1	20	22.	2.0	11.
Dibenzo (a,h) anthracene	U	11.	ug/Kgdrywt	1	20	22.	1.9	11.
Benzo(g,h,i)perylene	U	11.	ug/Kgdrywt	1	20	22.	2.2	11.
2-Chloronaphthalene	U	11.	ug/Kgdrywt	1	20	22.	3.9	11.
2-Methylnaphthalene-D10		52.2	%					
Fluorene-D10		46.2	%					
Pyrene-D10		82.2	%					

## Report of Analytical Results

**Client:** CH2MHill  
**Lab ID:** SD7749-5  
**Client ID:** T1601-SB01D-4-5-10D  
**Project:** MCB Camp Lejeune CTO-WI  
**SDG:** WE31-1

**Sample Date:** 13-DEC-10  
**Received Date:** 15-DEC-10  
**Extract Date:** 16-DEC-10  
**Extracted By:** KF  
**Extraction Method:** SW846 3550  
**Lab Prep Batch:** WG86319

**Analysis Date:** 22-DEC-10  
**Analyst:** JCG  
**Analysis Method:** SW846 M8270C  
**Matrix:** SL  
**% Solids:** 90.  
**Report Date:** 23-DEC-10

Compound	Qualifier	Result	Units	Dilution	LOQ	ADJ LOQ	ADJ MDL	ADJ LOD
Naphthalene	U	10.	ug/Kgdrywt	1	20	21.	2.7	10.
2-Methylnaphthalene	U	10.	ug/Kgdrywt	1	20	21.	2.3	10.
Acenaphthylene	U	10.	ug/Kgdrywt	1	20	21.	1.3	10.
Acenaphthene	U	10.	ug/Kgdrywt	1	20	21.	1.6	10.
Fluorene	U	10.	ug/Kgdrywt	1	20	21.	3.4	10.
<b>Phenanthrene</b>	J	4.4	ug/Kgdrywt	1	20	21.	1.9	10.
Fluoranthene	U	10.	ug/Kgdrywt	1	20	21.	1.9	10.
Pyrene	U	10.	ug/Kgdrywt	1	20	21.	2.2	10.
Benzo (a) anthracene	U	10.	ug/Kgdrywt	1	20	21.	2.0	10.
Chrysene	U	10.	ug/Kgdrywt	1	20	21.	1.8	10.
Benzo (b) Fluoranthene	U	10.	ug/Kgdrywt	1	20	21.	2.5	10.
Benzo(k)fluoranthene	U	10.	ug/Kgdrywt	1	20	21.	3.3	10.
Benzo(a)pyrene	U	10.	ug/Kgdrywt	1	20	21.	3.5	10.
Indeno (1,2,3-cd) pyrene	U	10.	ug/Kgdrywt	1	20	21.	2.0	10.
Dibenzo (a,h) anthracene	U	10.	ug/Kgdrywt	1	20	21.	1.9	10.
Benzo(g,h,i)perylene	U	10.	ug/Kgdrywt	1	20	21.	2.1	10.
2-Chloronaphthalene	U	10.	ug/Kgdrywt	1	20	21.	3.8	10.
2-Methylnaphthalene-D10	*	117.	%					
Fluorene-D10		43.7	%					
Pyrene-D10		51.8	%					

## Extractable Petroleum Hydrocarbon (EPH) Analysis

<b>Client:</b> CH2MHill	<b>SDG:</b> WE31-1
<b>Client Sample ID:</b> ST1601-SB01-4-5-10D	<b>Date Collected:</b> 13-DEC-10
<b>KAS Sample ID:</b> SD7749-4	<b>Date Received:</b> 15-DEC-10
<b>Analytical Method:</b> MA DEP EPH 04-1.1	<b>Date Extracted:</b> 20-DEC-10
<b>Prep Method:</b> SW846 3540	<b>Date Reported:</b> 05-JAN-11
<b>Matrix:</b> SL	<b>Percent Solids:</b> 90.

EPH Range Results	Results	PQL	LOD	MDL	Units	DF	Date Analyzed	Qual
Unadjusted C11-C22 Aromatics	14	19	14	9.6	mg/Kgdrywt	1	23-DEC-10	U
C9-C18 Aliphatics	14	19	14	9.6	mg/Kgdrywt	1	23-DEC-10	U
C19-C36 Aliphatics	14	19	14	9.6	mg/Kgdrywt	1	23-DEC-10	U
C11-C22 Aromatics	14	19	14	9.6	mg/Kgdrywt	1	23-DEC-10	U

EPH Surrogate Recoveries	Recovery	Acceptance Range	Date Analyzed	Qual
5-alpha androstane	75	40-140	23-DEC-10	
1-Chlorooctadecane	52	40-140	23-DEC-10	
o-Terphenyl	63	40-140	23-DEC-10	
2-Fluorobiphenyl	81	40-140	23-DEC-10	
2-Bromonaphthalene	72	40-140	23-DEC-10	

**\* Fractionation Surrogates.**

1 Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.

2 C11-C22 Aromatic Hydrocarbons exclude the concentration of Target PAH Analytes.

3 Diesel PAH Analytes.

## Extractable Petroleum Hydrocarbon (EPH) Analysis

<b>Client:</b> CH2MHill	<b>SDG:</b> WE31-1
<b>Client Sample ID:</b> T1601-SB01D-4-5-10D	<b>Date Collected:</b> 13-DEC-10
<b>KAS Sample ID:</b> SD7749-5	<b>Date Received:</b> 15-DEC-10
<b>Analytical Method:</b> MA DEP EPH 04-1.1	<b>Date Extracted:</b> 20-DEC-10
<b>Prep Method:</b> SW846 3540	<b>Date Reported:</b> 05-JAN-11
<b>Matrix:</b> SL	<b>Percent Solids:</b> 90.

EPH Range Results	Results	PQL	LOD	MDL	Units	DF	Date Analyzed	Qual
Unadjusted C11-C22 Aromatics	16	21	16	11	mg/Kgdrywt	1	23-DEC-10	U
C9-C18 Aliphatics	16	21	16	11	mg/Kgdrywt	1	23-DEC-10	U
C19-C36 Aliphatics	16	21	16	11	mg/Kgdrywt	1	23-DEC-10	U
C11-C22 Aromatics	16	21	16	11	mg/Kgdrywt	1	23-DEC-10	U

EPH Surrogate Recoveries	Recovery	Acceptance Range	Date Analyzed	Qual
5-alpha androstane	70	40-140	23-DEC-10	
1-Chlorooctadecane	80	40-140	23-DEC-10	
o-Terphenyl	72	40-140	23-DEC-10	
2-Fluorobiphenyl	82	40-140	23-DEC-10	
2-Bromonaphthalene	41	40-140	23-DEC-10	

\* Fractionation Surrogates.

1 Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.

2 C11-C22 Aromatic Hydrocarbons exclude the concentration of Target PAH Analytes.

3 Diesel PAH Analytes.

## Volatile Petroleum Hydrocarbon (VPH) Analysis

<b>Client:</b> CH2MHill	<b>SDG:</b> WE31-1
<b>Client Sample ID:</b> ST1601-SB01-4-5-10D	<b>Date Collected:</b> 13-DEC-10
<b>KAS Sample ID:</b> SD7749-4	<b>Date Received:</b> 15-DEC-10
<b>Analytical Method:</b> MA DEP VPH 04-1.1	<b>Date Extracted:</b> 17-DEC-10
<b>Prep Method:</b> SW846 5030B	<b>Date Reported:</b> 05-JAN-11
<b>Matrix:</b> SL	<b>Percent Solids:</b> 90.

VPH Range Results	Results	PQL	LOD	MDL	Units	DF	Date Analyzed	Qual
Unadjusted C5-C8 Aliphatics	25	36	25	18	mg/Kgdrywt	1	17-DEC-10	U
Unadjusted C9-C12 Aliphatics	26	36	25	18	mg/Kgdrywt	1	17-DEC-10	J
C5-C8 Aliphatics	25	36	25	18	mg/Kgdrywt	1	17-DEC-10	U
C9-C12 Aliphatics	25	36	25	18	mg/Kgdrywt	1	17-DEC-10	U
C9-C10 Aromatics	24	36	25	18	mg/Kgdrywt	1	17-DEC-10	J

VPH Surrogate Recoveries	Recovery	Acceptance Range	Date Analyzed	Qual
2,5-Dibromotoluene (FID)	95	70-130	17-DEC-10	
2,5-Dibromotoluene (PID)	94	70-130	17-DEC-10	

1 Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.

2 C5-C8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.

3 C9-C12 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range AND concentration of C9-C10 Aromatic Hydrocarbons.

## Volatile Petroleum Hydrocarbon (VPH) Analysis

<b>Client:</b> CH2MHill	<b>SDG:</b> WE31-1
<b>Client Sample ID:</b> T1601-SB01D-4-5-10D	<b>Date Collected:</b> 13-DEC-10
<b>KAS Sample ID:</b> SD7749-5	<b>Date Received:</b> 15-DEC-10
<b>Analytical Method:</b> MA DEP VPH 04-1.1	<b>Date Extracted:</b> 17-DEC-10
<b>Prep Method:</b> SW846 5030B	<b>Date Reported:</b> 05-JAN-11
<b>Matrix:</b> SL	<b>Percent Solids:</b> 90.

VPH Range Results	Results	PQL	LOD	MDL	Units	DF	Date Analyzed	Qual
Unadjusted C5-C8 Aliphatics	25	35	25	18	mg/Kgdrywt	1	17-DEC-10	U
Unadjusted C9-C12 Aliphatics	25	35	25	18	mg/Kgdrywt	1	17-DEC-10	U
C5-C8 Aliphatics	25	35	25	18	mg/Kgdrywt	1	17-DEC-10	U
C9-C12 Aliphatics	25	35	25	18	mg/Kgdrywt	1	17-DEC-10	U
C9-C10 Aromatics	25	35	25	18	mg/Kgdrywt	1	17-DEC-10	U

VPH Surrogate Recoveries	Recovery	Acceptance Range	Date Analyzed	Qual
2,5-Dibromotoluene (FID)	101	70-130	17-DEC-10	
2,5-Dibromotoluene (PID)	95	70-130	17-DEC-10	

1 Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.

2 C5-C8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.

3 C9-C12 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range AND concentration of C9-C10 Aromatic Hydrocarbons.