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FINAL RCRA FACILITY INVESTIGATION REPORT SOLID WASTE MANAGEMENT UNIT 615 (SWMU 615) MCB CAMP LEJEUNE NC

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CH2M HILL

Final

RCRA Facility Investigation Report
SWMU 615

Marine Corps Base Camp Lejeune
North Carolina

Contract Task Order WE4A

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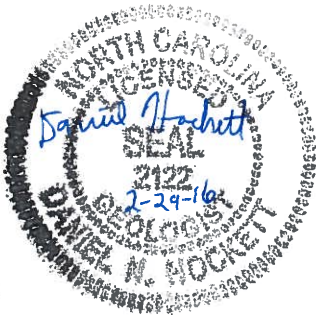

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Executive Summary

This document presents the investigation findings and conclusions of the Resource Conservation and Recovery Act Facility Investigation (RFI) of Solid Waste Management Unit (SWMU) 615 at Marine Corps Base Camp Lejeune, North Carolina. This RFI Report was prepared by CH2M HILL under the Naval Facilities Engineering Command, Mid-Atlantic Division, Comprehensive Long-term Environmental Action—Navy 8012 Contract N62470-11-D-8012, Contract Task Order WE4A. The purpose of the RFI is to evaluate the nature and extent of environmental contamination at SWMU 615. The objectives of this RFI report are as follows:

- Present the nature and extent of impacted soil and groundwater
- Evaluate potential risks to human health and the environment
- Provide recommendations for future site management

Background

The SWMU 615 investigation area consists of Building 133 and the associated parking area. The site is located west of the intersection of C Street and McHugh Boulevard. Building 133 is a one-story building divided into office spaces and a break room that has historically been used as a battalion warehouse and armory. SWMU 615 is located within the boundary of Installation Restoration Program (IRP) Site 88 – Former Building 25-Base Dry Cleaning Facility. Investigations have been conducted at Site 88 since 1996 and a chlorinated volatile organic compound (CVOC) groundwater plume extends approximately 0.5 miles west of Former Building 25. Research suggests that the sanitary sewer system near Site 88 acted as a mechanism to transport CVOC contaminants. The sewer flowed westward from Building 25 and crossed McHugh Boulevard before turning northwest as it passed slightly east and north of Building 133.

In October 2012, stained soil was discovered during Building 133 foundation repair activities which led to an initial soil and groundwater investigation under the Petroleum, Oil, and Lubricant Program. The analytical results of the initial investigation activities were a detection of total petroleum hydrocarbon (TPH)-gasoline-range organics (GRO) in one sample and detections of TPH- diesel-range organics (DRO) in two samples. The detected concentrations of TPH-GRO and TPH-DRO exceeded the North Carolina Department of Environment and Natural Resources action level of 10 mg/kg.

Based on the TPH exceedances in soil, Osage of Virginia conducted a remedial excavation and removed approximately 44 tons of impacted soil for off-site disposal (Core/Osage, 2013). Confirmation samples were collected after the removal action and results indicated the presence of volatile organic compound (VOCs). A temporary monitoring well (TW-1) was installed and a sample was collected for laboratory analysis of VOCs. Analytical data indicated that six VOCs were detected in the groundwater sample. However, only vinyl chloride was detected at a concentration (6.2 micrograms per liter) that exceeded the North Carolina Groundwater Quality Standard (NCGWQS).

Based on the results of the previous investigations, an RFI was recommended to delineate the CVOCs in soil and groundwater. The RFI was conducted in 2014 and included:

- Subsurface soil sampling
- Monitoring well installation
- Water level gauging
- Groundwater sampling
- Investigation-derived waste management

Conclusions

VOCs previously identified in soil adjacent to the southeastern corner of Building 133 were removed and although analytical data for the confirmatory soil samples indicated that soil exceeding the maximum soil contaminant concentration for tetrachloroethene (PCE) remained in place adjacent to the building and potentially beneath the

building that could not be addressed due to concerns about building stability, the results of subsequent subslab soil gas and subslab soil indicated that PCE was not present at concentrations above the North Carolina Soil Screening Levels and there was not a significant vapor intrusion pathway identified. The results of additional subsurface soil samples collected as part of the RFI indicate that VOCs are not present in subsurface soil at concentrations above regulatory criteria.

Two CVOCs, PCE and trichloroethene (TCE), are present in surficial aquifer groundwater, localized to the southeastern corner of SWMU 615, at concentrations that slightly exceeded the NCGWQS. CVOCs were not detected in samples collected from the deeper monitoring well installed in the upper Castle Hayne aquifer. The current distribution of CVOCs in groundwater at SWMU 615 appears related to IRP Site 88 dissolved-phase groundwater contaminant plume, likely following the route of the subsurface sewer system that connects the two sites. Although TCE was identified during the human health risk screening as a COPC in surficial aquifer groundwater, it is expected there would be no adverse human health risks due to the low detected groundwater concentrations, no exceedance of the maximum concentration level, and only slight exceedance of the NCGWQS.

Recommendations

Because the CVOCs identified in the surficial aquifer groundwater at SMWU 615 are located in the vicinity of the CVOC groundwater plumes at IRP Site 88, it is recommended that the NCGWQS exceedances of PCE and TCE be addressed as part of the Feasibility Study for Site 88 that is currently being conducted.

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Acronyms and Abbreviations

amsl	above mean sea level
bgs	below ground surface
BTV	Background Threshold Value
cis-1,2-DCE	cis-1,2-dichloroethene
CLEAN	Comprehensive Long-term Environmental Action—Navy
COPC	Contaminants of Potential Concern
CTO	Contract Task Order
CVOC	chlorinated volatile organic compound
DoD	Department of Defense
DPT	direct-push technology
DRO	diesel-range organics
ENCO	Environmental Conservation Laboratories
EPH	extractable petroleum hydrocarbon
ft	foot/feet
ft/day	feet per day
GRO	gasoline-range organics
HHRS	human health risk screening
HI	hazard index
HSWA	Hazardous and Solid Waste Amendment
ID	inner diameter
IDW	investigation-derived waste
IRP	Installation Restoration Program
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
MCB CAMLEJ	Marine Corps Base Camp Lejeune
MCL	maximum concentration level
mg/kg	milligrams per kilogram
MS/MSD	matrix spike/matrix spike duplicate
MSCC	maximum soil contaminant concentrations
NAVFAC	Naval Facilities Engineering Command
NC SSL	North Carolina Soil Screening Level
NCDENR	North Carolina Department of Environment and Natural Resources
NCDEQ	North Carolina Department of Environmental Quality
NCGWQS	North Carolina Groundwater Quality Standards
Osage	Osage of Virginia
PCE	tetrachloroethene
PID	photo-ionization detector
POL	petroleum, oil, and lubricant
PPE	personal protective equipment
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control

RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RSL	Regional Screening Level
SGSL	soil gas screening level
SPLP	synthetic precipitation leaching procedure
SOP	Standard Operating Procedure
SVOC	semi-volatile organic compound
SWMU	solid waste management unit
TCE	trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
TOC	total organic carbon
TPH	total petroleum hydrocarbon
UCH	Upper Castle Hayne
UCL	upper confidence limit
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride
VI	vapor intrusion
VOC	volatile organic compound
VPH	volatile petroleum hydrocarbon

SECTION 1

Introduction

This document presents the findings of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) for Solid Waste Management Unit (SWMU) 615 at Marine Corps Base Camp Lejeune (MCB CAMLEJ), North Carolina. SWMU 615 is located on the 'Mainside' of MCB CAMLEJ. SWMU 615 also lies within the boundaries of Installation Restoration Program (IRP) Site 88. **Figure 1-1** presents the location of SWMU 615.

The objectives of this RFI report are as follows:

- Present the nature and extent of impacted soil and groundwater
- Evaluate potential risks to human health and the environment
- Provide recommendations for future site management

This RFI report was prepared by CH2M HILL under the Naval Facilities Engineering Command (NAVFAC), Mid-Atlantic Division, Comprehensive Long-term Environmental Action—Navy (CLEAN) 8012 Contract N62470-11-D-8012, Contract Task Order (CTO) WE4A. The RFI was prepared for submittal to NAVFAC Mid-Atlantic, MCB CAMLEJ, and the North Carolina Department of Environmental Quality (NCDEQ). The field investigations were conducted in accordance with MCB CAMLEJ Master Project Plans (CH2M HILL, 2008a), herein referred to as the Master Project Plans, and the *RCRA Facility Investigation Work Plan SWMU 615* (CH2M HILL, 2014), herein referred to as the Work Plan.

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Legend
- SWMU 615
- Highways
- Installation Boundary

N

0 7,500 15,000
Feet

Figure 1-1
Base Location Map
SWMU 615 RFI Work Plan
MCB CAMLEJ
North Carolina

ch2m

SECTION 2

Site Background

This section describes general site conditions, including background information for MCB CAMLEJ and the RCRA Program.

2.1 Marine Corps Base Camp Lejeune

MCB CAMLEJ is a 156,000-acre facility located in Onslow County, North Carolina, adjacent to the southern side of the City of Jacksonville and consists of six geographical areas under the jurisdiction of the Base command. These areas are Camp Geiger, Montford Point, Courthouse Bay, Mainside, the Greater Sandy Run Area, and the Rifle Range Area. **Figure 1-1** depicts the location of SWMU 615 within the Base. MCB CAMLEJ is bisected by the New River, which flows into the Atlantic Ocean in a southeasterly direction. MCB CAMLEJ is bordered by the Atlantic Ocean to the east, United States Route 17 to the west and State Route 24 to the north. The mission of MCB CAMLEJ is to maintain combat-ready units for expeditionary deployment. MCB CAMLEJ is home to an active duty, dependent, retiree, and civilian population of approximately 150,000 personnel. The Base provides housing, training facilities, and logistical support for Fleet Marine Force units and other assigned units.

MCB CAMLEJ was issued a RCRA Part B Permit to operate a hazardous waste container storage facility in September 1984 prior to the enactment of the Hazardous and Solid Waste Amendment (HSWA) of 1984, which under Section 3004(u) empowers the United States Environmental Protection Agency (USEPA) to order corrective action at treatment, storage, and disposal facilities. This section of the HSWA requires corrective action for all releases of hazardous waste or hazardous constituents from any SWMU. A revised Hazardous Waste Management Permit was issued to MCB CAMLEJ on January 10, 1997, and included corrective actions for SWMUs. An updated Final Hazardous Waste Management Permit was issued on September 23, 2010.

2.2 SWMU 615 Setting and History

The SWMU 615 investigation area encompasses approximately 0.42 acres and consists of Building 133 and the associated asphalt-paved parking area. The site is located approximately 300 feet (ft) west of the intersection of C Street and McHugh Boulevard (**Figure 2-1**). Building 133 is a one-story brick structure divided into office spaces and a break room that has historically been used as a battalion warehouse and armory. In October 2012, stained soil was discovered during building foundation repair activities which led to an initial soil and groundwater investigation under the Underground Storage Tank (UST) Program that addresses potential petroleum, oil, and lubricant (POL) releases. Based on the chlorinated volatile organic compounds (CVOCs) detected during the initial investigation activities described in **Section 2.3** below, the site was assigned to the RCRA Program as SWMU 615 for investigation, and because CVOCs detected at SWMU 615 were also detected at IRP Site 88, the site was subsequently transferred to the IRP.

As previously stated, SWMU 615 is located within the boundary of IRP Site 88 – Former Building 25-Base Dry Cleaning Facility (**Figure 2-1**). Site 88 consists of chlorinated solvent plumes [predominantly tetrachloroethene (PCE) and daughter products] originating from the former Base dry cleaners. The Site 88 groundwater plume is located approximately 50 ft south of Building 133 in the upper Castle Hayne (UCH) (approximately 40 to 50 ft below ground surface [bgs]). Research suggests that waste dry cleaning solvents either leaked or spilled from the dry cleaning machines and material storage areas and impacted soil and groundwater beneath former Building 25, with some quantity apparently entering the sanitary sewer system. The sewer flowed westward from Building 25, past Buildings 43 and 3, and crossed McHugh Boulevard before turning northwest as it passed slightly east and north of Building 133. Consequently, an investigation of the section of sanitary sewer originating at Building 25 and extending westward across McHugh Boulevard was conducted. The tasks included a video inspection of the sewer between Buildings 25 and 3B, as well as several phases of groundwater sampling along the alignment of the sewer system, terminating in the vicinity of Building 133. The distribution of PCE and its daughter products in shallow groundwater indicates that the sewer system may have acted as an intermittent, preferential transport pathway of PCE through deteriorated, compromised sewer lines and/or through the sewer line trench, with

CVOCs leaking from loose joints, particularly manhole junctions. The most notable leak seemed to be located slightly east of Building 3B, where the highest concentrations of CVOCs are located in the Castle Hayne aquifer. Lower concentrations were detected in shallow groundwater close to the sewer line west of Building 3B, and McHugh Boulevard. The concentrations of CVOCs in shallow groundwater west of McHugh Boulevard showed significant attenuation, suggesting that the majority of the contaminant mass had leaked from the sewer piping between Building 25 and 3B.

Monitoring wells associated with Site 88 have been installed in the vicinity of SWMU 615, side gradient to the Site 88 plume, to depths of 40 ft bgs (IR88-MW32IW) and 85 ft bgs [IR88-MW32DW (**Figure 2-1**)]. Analytical data for samples collected from IR88-MW32IW and IR88-MW32DW indicate that concentrations of CVOCs have not been detected above method detection limits (CH2M HILL, 2012). A feasibility study is currently being conducted under the IRP at Site 88 to address the CVOCs in groundwater.

2.3 Previous Investigations

Summaries of the initial investigations and actions conducted under the UST Program are provided in the following subsections.

2.3.1 Initial Investigation (October 2012)

During foundation repair activities conducted at Building 133, stained and odorous soil was encountered beneath the southeast corner of the building. Osage of Virginia (Osage) collected three soil samples [PH-1, PH-2, and PH-3 (**Figure 2-2**)] from the area of stained soil. The samples were submitted for laboratory analysis of total petroleum hydrocarbons - gasoline range organics (TPH-GRO) and TPH-diesel range organics (TPH-DRO) in accordance with the NCDEQ UST Program investigation protocol. TPH-GRO was detected at a concentration of 381 milligrams per kilogram [mg/kg] in one sample, and TPH-DRO was detected in two samples at concentrations of 10.5 mg/kg and 4,790 mg/kg. The detected concentrations of TPH-GRO and TPH-DRO exceeded the NCDEQ action level of 10 mg/kg and 40 mg/kg, respectively.

A direct push technology (DPT) drill rig was used to collect subsurface soil samples from 10 soil borings (B-1 through B-10) around the southeast corner of Building 133. Subsurface soil samples were collected from each boring at depths ranging from approximately 3 to 10 ft bgs and submitted for laboratory analysis of TPH-GRO and TPH-DRO. TPH-GRO was not detected in the soil samples; however, TPH-DRO was detected in four samples at concentrations ranging from 17.2 mg/kg to 156 mg/kg.

2.3.2 Soil Removal and Confirmation Sampling (January-February 2013)

In January 2013, approximately 44 tons of impacted soil was excavated for off-site disposal (Core/Osage, 2013). Ten confirmatory soil samples were collected from the excavation and submitted for laboratory analysis of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), volatile petroleum hydrocarbons (VPH), and extractable petroleum hydrocarbons (EPH) (**Figure 2-2**).

Twelve VOCs, three EPH fractions, and one SVOC were detected in the soil samples; however, the concentrations of the EPH fractions and SVOCs were below their respective maximum soil contaminant concentrations (MSCCs). The analytical data indicated that PCE was detected in five soil samples at depths of 3 to 4 ft bgs. The concentration of PCE (20 micrograms per kilogram [μg/kg]) detected in sample SO20, collected from the northern sidewall of the excavation, exceeded the North Carolina Soil Screening Level (NC SSL) of 5 μg/kg. The analytical data for the confirmatory soil samples indicated that soil exceeding the MSCC for PCE remained in place adjacent to the building and potentially beneath the building; however, samples were not collected from beneath the building at that time due to concerns about building stability.

In February 2013, a temporary groundwater monitoring well (TW-1) was installed near the southeast corner of Building 133, to a depth of 15 ft bgs (**Figure 2-2**). A groundwater sample was collected and submitted for laboratory analysis of VOCs. Analytical data indicated that six VOCs were detected in the groundwater sample. However, only vinyl chloride (VC) was detected at a concentration (6.2 micrograms per liter [μg/L]) that exceeded the North Carolina Groundwater Quality Standard (NCGWQS) of 0.03 μg/L.

2.3.3 Vapor Intrusion Investigation (March-April 2013)

Based on the post-excavation confirmatory soil sampling and groundwater data, a vapor intrusion (VI) investigation was conducted to evaluate the potential for a VI pathway into Building 133 (CH2M HILL, 2013b and presented in **Appendix A**). Four sub-slab soil gas probes [SG01 through SG04 (**Figure 2-2**)] were installed in the area of impacted soil beneath Building 133, and soil gas samples were collected and submitted for laboratory analysis of VOCs. Although VOCs were detected in the soil gas samples, only PCE was detected at a concentration above the generic shallow soil gas screening level (SGSL). The concentration did not exceed the Base-specific SGSL (CH2M HILL, 2013b).

To further assess the extent of the PCE soil gas detections, five additional sub-slab soil gas probes (SG05 through SG09) were installed. Using a HAPSITE portable soil gas chromatography/mass spectrophotometer, each newly installed sub-slab soil gas probe was screened for the presence of PCE. To verify the results of the HAPSITE screening, one indoor air sample (IA01) was collected from the location of the highest PCE concentrations (SG06) and forwarded to the laboratory for analysis of PCE (**Figure 2-2**). PCE was detected in the indoor air sample at a concentration 37 times below the indoor air screening level. The results indicated there was not a significant VI pathway at Building 133 (CH2M HILL, 2013b).

2.3.4 Sub-slab Soil Sampling – June 2013

In June 2013, CH2M HILL collected sub-slab soil samples from three previous soil gas sampling locations (SG02, SG06, and SG07) to further assess the potential for soil contamination beneath the building (**Figure 2-2**). The sub-slab soil samples were collected from 0-1 ft bgs and 7-11 ft bgs and submitted for laboratory analysis of VOCs, VPH, EPH, SVOCs, and metals.

Concentrations of three VOCs (PCE, acetone, and methylene chloride), one SVOC (butylbenzylphthalate), and four metals (arsenic, barium, chromium, and lead) were detected above the laboratory detection limits. Of these detections, only methylene chloride and chromium exceeded their respective soil to groundwater MSCCs of 20 µg/kg and 5.4 mg/kg, respectively. These concentrations also exceeded the NC SSLs of 23 µg/kg and 3.8 mg/kg, respectively; however, the concentrations of chromium did not exceed the Base-specific background threshold value (BTV) of 23.1 mg/kg. The PCE, acetone, and butylbenzylphthalate detections did not exceed the NC SSLs.

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Legend

- Surficial Aquifer
- Upper Castle Hayne Aquifer
- Middle Castle Hayne Aquifer
- Lower Castle Hayne Aquifer
- Multi-Port
- Sanitary Sewer Flow Direction
- Wastewater Line
- Site 88 Boundary
- SWMU 615 Investigation Area

N

0 37.5 75 Feet

1 inch = 75 feet

Figure 2-1
SWMU 615 Site Map
SWMU 615 RFI Report
MCB CAMLEJ
North Carolina

ch2m

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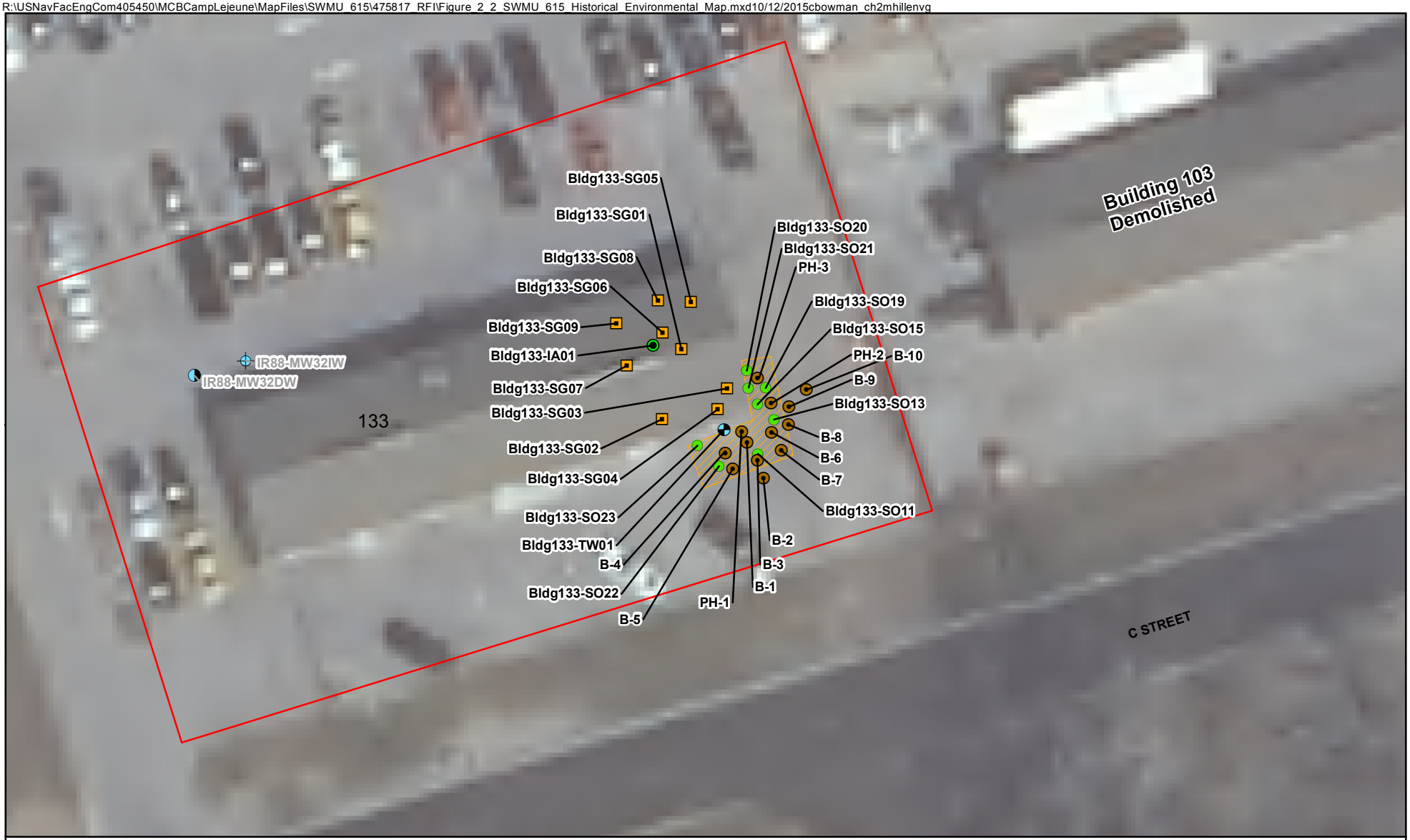

Legend

- Subsurface Soil Sample (Osage, 2012)
- Confirmatory Soil Sample (Osage, 2013)
- Indoor Air Sample (CH2M HILL, 2013)
- Soil Gas Sample (CH2M HILL, 2013)
- Temporary Well (Osage, 2013)
- Middle Castle Hayne Aquifer
- Upper Castle Hayne Aquifer
- SWMU 615
- Approximate Area of Excavation

N

0 15 30 Feet

1 inch = 30 feet

Figure 2-2
Previous Investigations Sample Locations
SWMU 615 RFI Report
MCB CAMLEJ
North Carolina

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SECTION 3

Field Investigation

Based on the results of the previous investigations, an RFI was recommended to delineate the CVOCs in soil and groundwater. This section presents a summary of the RFI field activities that were conducted in accordance with the Master Project Plans (CH2M HILL, 2008a) and the Standard Operating Procedures (SOPs) outlined in the RFI Work Plan (CH2M HILL, 2014).

The field activities included:

- Subsurface soil sampling[1]
- Monitoring well installation
- Water level gauging
- Groundwater sampling
- Investigation-derived waste (IDW) management

The initial field activities that included subsurface soil sampling, monitoring well installation, and groundwater sampling; were conducted in April 2014. To further evaluate the concentrations of CVOCs in groundwater, additional monitoring well installation (and associated subsurface soil sampling) and groundwater sampling of select wells was conducted in July 2014, October 2014, and/or December 2014. Detailed investigation activities conducted at SWMU 615 are summarized as follows.

3.1 Subsurface Soil Sampling

In April 2014, six DPT subsurface soil samples (SWMU615-MW01 through SWMU615-MW05, and SWMU615-SB01) were collected for VOC analysis using USEPA Method 8260B. Samples were also collected from the proposed screened intervals for monitoring wells SWMU615-MW01 through SWMU615-MW05 and SWMU615-MW03IW for grain size analysis, and total organic carbon (TOC) using the Lloyd Kahn method. In July 2014, three additional subsurface soil samples were collected (SWMU615-MW06 through SWMU615-MW08) for VOC analysis during the installation of monitoring wells to further delineate the extent of soil and groundwater contamination. Soil sampling locations are illustrated on **Figure 3-1**.

The borings were advanced to the terminating depth of the permanent monitoring wells being installed (ranging from 20 ft bgs for surficial aquifer wells to 50 ft bgs for the UCH well). Continuous soil cores were collected for lithological characterization and field-screened for the presence of organic vapors using a photo-ionization detector (PID). Boring logs are provided in **Appendix B**.

Vadose zone soil samples were field-screened with a PID to facilitate sample interval selection for laboratory analysis. Portions of the soil core were placed in re-sealable bags, disaggregated, and allowed to equilibrate with ambient conditions to promote volatilization of VOCs. The accumulated head space gases were screened with the PID and recorded on the boring log. If field screening indicated the presence of organic vapors, soil samples were collected from an undisturbed portion of the soil core for laboratory analysis. In the absence of measurable organic vapors, soil samples were collected from approximately 1 ft bgs and approximately 2 ft above the water table. Only unsaturated soil samples were collected for VOC analysis.

Additionally, to evaluate the potential for VOCs to leach from soil to groundwater, a subsurface soil sample was collected from 4 to 5 ft from the soil boring (SWMU615-SB01) adjacent to the northern boundary of the excavation area (**Figure 3-1**) near the side wall sample that contained PCE exceeding the NC SSL (Bldg133-S020, **Figure 2-2**). The subsurface soil sample from this boring was analyzed for VOCs by USEPA Method 8260B, and an aliquot was retained for possible synthetic precipitation leaching procedure (SPLP) analysis, pending the results of

[1] Since the site is a building and asphalt-paved parking lot, and soil from 3-10 ft bgs in the southeastern corner of the building was previously investigated and removed, only subsurface soil samples were collected.

the VOC analysis. However, VOCs were not detected at concentrations exceeding the NC SSLs, and therefore the SPLP analysis was not performed.

Soil samples were collected in laboratory-supplied sample containers. Quality assurance (QA)/Quality Control (QC) samples including field duplicates, matrix spike/matrix spike duplicates (MS/MSDs), equipment blanks, and trip blanks were collected in accordance with the Work Plan (CH2M HILL, 2014).

All samples containers were labeled, packed on ice in a cooler, and shipped under chain-of-custody via overnight delivery to the analytical laboratory.

3.2 Monitoring Well Installation

A total of nine permanent monitoring wells were installed in two mobilizations. The initial five monitoring wells were installed in April 2014. To refine the delineation of CVOCs in the groundwater, three additional monitoring wells were installed in October 2014. Eight permanent monitoring wells were screened in the surficial aquifer (SWMU615-MW01 through SWMU615-MW08) and one monitoring well was screened within the UCH aquifer (SWMU615-MW03IW). Monitoring well locations are illustrated on **Figure 3-2** and monitoring well construction diagrams are provided in **Appendix B**. One of the monitoring wells (SWMU615-MW03) was installed in the surficial aquifer in the vicinity of the former temporary monitoring well, Bldg133-TW01, to confirm the results of the previous investigation.

Boreholes for the shallow monitoring wells were advanced to approximately 20 ft bgs and were constructed to bracket the water table, while the borehole for the UCH aquifer monitoring well (SWMU615-MW03IW) was advanced to approximately 50 feet bgs. The screened interval for SWMU615-MW03IW was placed above a layer of cemented sand that was observed in the soil borings installed as part of the previous Site 88 investigations near Building 133.

Upon completion of the DPT soil boring, 4.25-inch inner diameter (ID) hollow stem augers were used to drill a nominal 8-inch diameter borehole. The monitoring wells were constructed using 2-inch ID, Schedule 40 polyvinyl chloride (PVC) casing, with 10 ft (surficial aquifer wells) or 5 ft (UCH aquifer well) of 0.010-inch factory slotted well screen. The annular space around the well screens were backfilled with a well-graded, fine to medium silica sand filter pack (commercially available 30/40 grain size or equivalent) to approximately 2 ft above the top of the well screen. Bentonite pellets were installed above the filter pack and hydrated to form a seal approximately 2 ft thick. A cement grout was placed into the annulus above the hydrated bentonite seal to approximately 1 ft bgs. All wells were completed as flush-mounted wells and have a water tight, locking cap installed on the PVC riser. Each well was developed using pumping and surging methods. Monitoring well details can be found on **Table 3-1**.

Following well construction, top of well casing and ground surface elevations were surveyed by a North Carolina-licensed surveyor.

3.3 Water Level Gauging

Water levels were gauged in July and October 2014. The depth to water measurements were referenced from a designated point on top of the well casing. **Table 3-2** summarizes the groundwater elevations calculated from the groundwater depth measurements.

3.4 Groundwater Sampling

Prior to sampling, monitoring wells were purged using peristaltic pumps and low-flow procedures, and VOC samples were collected using the straw method. Groundwater samples were collected in April 2014 and July 2014 from newly installed monitoring wells. The samples collected in April 2014 from monitoring wells SWMU615-MW03 and SWMU615-MW03IW contained elevated concentrations of PCE and trichloroethene (TCE). In order to confirm these elevated concentrations and to obtain potential time-trend data, additional samples were collected in October 2014 and December 2014. **Table 3-3** presents a summary of the sampling schedule. The groundwater sampling results are described in **Section 5.3.2**.

TABLE 3-3
SWMU 615 Groundwater Sampling Schedule - 2014
SWMU 615 RFI Report
MCB CAMLEJ

Month	Sampling Location
April	SWMU615-MW01, SWMU615-MW02, SWMU615-MW03, SWMU615-MW03IW, SWMU615-MW04, SWMU615-MW05
July	SWMU615-MW06, SWMU615-MW07, SWMU615-MW08
October	SWMU615-MW01, SWMU615-MW03, SWMU615-MW03IW, SWMU615-MW06, SWMU615-MW08
December	SWMU615-MW03

Water quality parameters, including pH, specific conductivity, temperature, oxidation-reduction potential, turbidity, and dissolved oxygen, were measured during well purging and are summarized in **Table 3-4**.

The groundwater samples were collected in laboratory-supplied sample containers. QA/QC samples including field duplicates, MS/MSDs, equipment blanks, and trip blanks were collected in accordance with the Work Plan (CH2M HILL, 2014).

All sample containers were labeled, packed on ice in a cooler, and shipped under chain-of-custody via overnight delivery to Environmental Conservation Laboratories (ENCO) in Orlando, Florida. All samples were analyzed for VOCs using EPA Method 8260B.

3.5 Investigation-derived Waste Management

IDW generated during the RFI field activities consisted of decontamination fluids, development and purge water, and soil cuttings. The IDW was containerized in 55-gallon steel drums. IDW was characterized and disposed of in accordance with the Base Investigation and Remediation Waste Management Plan (CH2M HILL, 2011b). Based on the results of the Toxicity Characteristic Leaching Procedure (TCLP) analysis, the soil cuttings generated in April 2014 were disposed as hazardous waste because TCLP PCE was detected at 900 µg/L which exceeded the limit of 700 µg/L from 40 CFR 261.24. The liquid IDW generated in April 2014 and the solid and liquid IDW from the July 2014 event were disposed as non-hazardous waste. The purge water generated during the October and December 2014 sampling events was disposed in the Lot 203 groundwater treatment system. Waste manifests are provided in **Appendix C**. Disposable items such as personal protective equipment (PPE), poly sheeting, and paper towels were disposed in MCB CAMLEJ trash receptacles.

TABLE 3-1

Monitoring Well Construction Details

SWMU 615 RFI Report

MCB CAMLEJ

Monitoring Well ID	Date Installed	Casing Diameter (inches)	Screened Interval (ft bgs)	Well Depth (ft bgs)	TOC Elevation (ft amsl)
SWMU615-MW01	04/16/14	2	10-20	20	23.29
SWMU615-MW02	04/17/14	2	10-20	20	22.34
SWMU615-MW03	04/15/14	2	12-22	23	23.13
SWMU615-MW03IW	04/15/14	2	38-43	50	23.13
SWMU615-MW04	04/17/14	2	10-20	20	23.72
SWMU615-MW05	04/16/14	2	10-20	20	23.82
SWMU615-MW06	07/01/14	2	8-18	20	23.21
SWMU615-MW07	07/01/14	2	9-19	20	23.07
SWMU615-MW08	07/01/14	2	12-22	25	22.06
IR88-MW08	5/7/1997	2	5-20	20.0	22.98
IR88-MW08IW	5/7/1997	2	45-50	50.0	22.91
IR88-MW09	5/5/1997	2	6-21	21.0	21.83
IR88-MW14	7/29/2003	2	5-20	20.0	21.40
IR88-MW15	7/29/2003	2	5-18	18.0	21.17
IR88-MW32IW	10/24/2005	2	45-50	50	24.73
IR88-MW32DW	10/24/2005	2	80-85	85	24.79

Notes:

ft amsl - feet above mean sea level

ft bgs - feet below ground surface

ft btoc - feet below top of casing

TABLE 3-2
Groundwater Gauging Data
SWMU 615 RFI Report
MCB CAMLEJ

Monitoring Well ID	TOC Elevation (ft amsl)	July 7, 2014		October 20, 2014	
		Depth to Water (ft btoc)	Water Elevation (ft amsl)	Depth to Water (ft btoc)	Water Elevation (ft amsl)
SWMU615-MW01	23.29	6.96	16.33	6.45	16.84
SWMU615-MW02	22.34	6.42	15.92	5.9	16.44
SWMU615-MW03	23.13	7.46	15.67	7.03	16.10
SWMU615-MW03IW	23.13	14.75	8.38	14.35	8.78
SWMU615-MW04	23.72	8.85	14.87	7.51	16.21
SWMU615-MW05	23.82	7.46	16.36	7.07	16.75
SWMU615-MW06	23.21	8.04	15.17	7.22	15.99
SWMU615-MW07	23.07	7.91	15.16	7.09	15.98
SWMU615-MW08	22.06	7.71	14.35	6.16	15.90

Notes:
ft amsl - feet above mean sea level
ft btoc - feet below top of casing

TABLE 3-4
Water Quality Parameters
SWMU 615 RFI Report
MCB CAMLEJ

Monitoring Well ID	Date Sampled	pH (SU)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Temperature (°Celsius)	Turbidity (NTU)	ORP (mV)
SWMU615-MW01	4/22/2014	4.30	0.353	3.33	19.87	4.21	66.9
SWMU615-MW02	4/21/2014	6.42	0.491	1.29	20.91	7.52	-14
SWMU615-MW03	4/21/2014	6.00	0.526	0.34	20.21	1.24	-104.9
SWMU615-MW03IW	4/22/2014	6.06	0.504	0.25	23.09	81.6	32.3
SWMU615-MW04	4/23/2014	3.79	0.405	1.40	19.72	6.61	-25.4
SWMU615-MW05	4/22/2014	3.92	0.77	3.30	19.52	4.88	58.7
SWMU615-MW06	7/8/2014	3.70	0.753	0.54	26.77	1.66	217.2
SWMU615-MW07	7/8/2014	3.54	0.324	1.04	24.37	3.40	391.6
SWMU615-MW08	7/8/2014	4.80	0.357	0.30	25.75	1.36	119.1
SWMU615-MW01	10/25/2014	4.29	0.350	0.35	22.84	0.20	177.9
SWMU615-MW03	10/25/2014	5.98	0.486	0.25	23.90	0.46	38.4
SWMU615-MW03IW	10/25/2014	5.23	0.242	0.24	21.88	6.19	40.3
SWMU615-MW06	10/25/2014	3.77	0.665	0.72	24.39	0.05	177.7
SWMU615-MW08	10/25/2014	5.47	0.345	0.37	22.33	0.48	44.3
SWMU615-MW03	12/17/2014	6.27	0.387	0.30	22.60	2.86	35.5

Notes:
SU - standard units
mS/cm - milliSiemens per centimeter
mg/L - milligram per liter
NTU - nephelometric turbidity units
mV - millivolts

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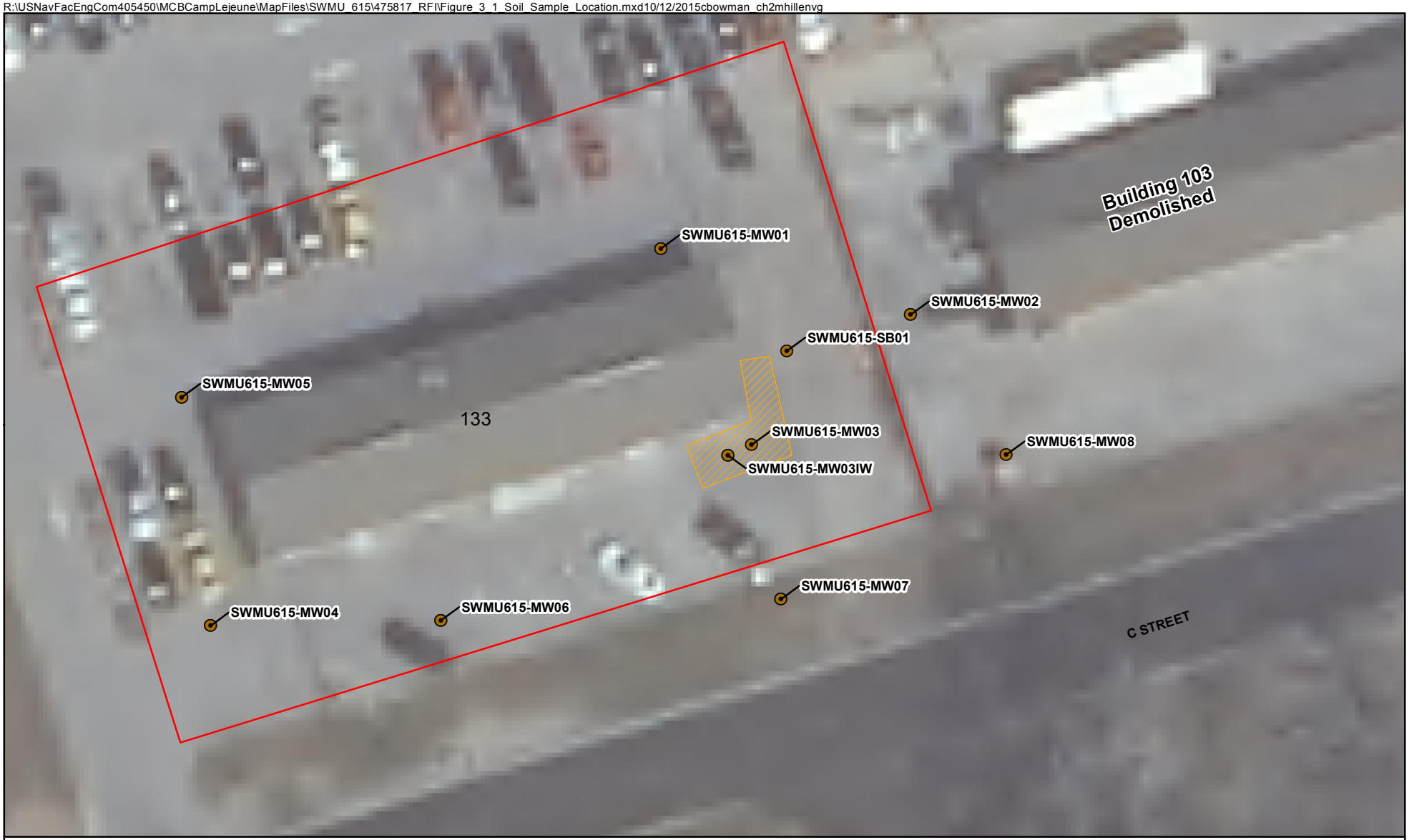

Legend

- Soil Boring
- Approximate Area of Excavation
- SWMU 615

N

0 15 30

Feet

1 inch = 30 feet

Figure 3-1
Soil Sampling Locations
SWMU 615 RFI Report
MCB CAMLEJ
North Carolina

ch2m

R:\USNAVFACENGCOM405450\MCBCAMPLEJEUNE\MAPFILES\SWMU_615\475817_RFI\FIGURE_3_2_MONITORING_WELL_LOCATIONS.MXD CBOWMAN CH2MHILLENVG 10/12/2015 1:53:17 PM

Legend

- Surficial Monitoring Well
- Upper Castle Hayne Monitoring Well
- Approximate Area of Excavation
- SWMU 615

N

0 15 30 Feet

1 inch = 30 feet

Figure 3-2
Monitoring Well Locations
SWMU 615 RFI Report
MCB CAMLEJ
North Carolina

ch2m

SECTION 4

Site Physical Characteristics

The section summarizes the physical characteristics of MCB CAMLEJ and SWMU 615.

4.1 Regional and Facility-wide Physiography, Climate, and Surface Water Hydrology

The MCB CAMLEJ facility lies within the Tidewater region of the Atlantic Coastal Plain Physiographic Province of North Carolina. The physiography of MCB CAMLEJ and the surrounding area consists of stepped terraces characterized by wide, gently eastward-sloping plains separated by linear, steeper, northward- and eastward-facing scarps. The surface topography within MCB CAMLEJ ranges from sea level to approximately 70 ft above mean sea level (amsl), with the majority of the Base ranging between 20 and 40 ft amsl.

Climatic conditions within the southeastern United States, including MCB CAMLEJ, are generally characterized by short, mild winters and long, hot summers. Average annual net precipitation is approximately 40 to 50 inches. Ambient air temperatures generally range between 20 and 60 degrees Fahrenheit (°F) in the winter months and between 75°F and 95°F during the summer months (National Oceanic and Atmosphere Administration [NOAA], 2013).

4.2 SWMU 615 Topography and Surface Features

SWMU 615 is generally flat and encompasses approximately 0.42 acres. The site consists of Building 133 and the associated parking area located 300 ft west of the intersection of C Street and McHugh Boulevard (**Figure 2-1**). As a result of site being completely covered by asphalt or concrete, infiltration is limited at the site and the surface water drainage is conveyed through a series of storm sewers to the New River.

4.3 Geologic and Hydrogeologic Setting

The following sections discuss the regional and site-specific geology and hydrogeology.

4.3.1 Regional Geologic and Hydrogeologic Setting

MCB CAMLEJ is underlain by an eastward-thickening wedge of marine and non-marine sediments ranging in age from early Cretaceous to Holocene. These sediments extend from the Fall Line (western boundary of Atlantic Coastal Plain Physiographic Province) and dip to the southeast toward the coast. Along the coastline, several thousand feet of interlayered sediments consisting of gravel, sand, silt, clay deposits, calcareous clays, shell beds, sandstone, and limestone mantle the pre-Cretaceous crystalline basement rock. Minor amounts of detrital carbonate shells and secondary minerals such as glauconite, siderite, and chlorite often distinguish these sedimentary units.

Coastal Plain sedimentation and deposition were controlled by fluctuations in sea level on a subsiding continental margin in marine and near-shore environments. Confining units associated with specific aquifers within the Coastal Plain region are composed of less-permeable beds of clay and silt. Within Onslow County, the surficial, Castle Hayne, Beaufort, Peedee, Black Creek, upper Cape Fear, and lower Cape Fear aquifers and their associated confining unit, are present in approximately 1,500 feet of sedimentary sequence that overlies the basement rock (Cardinell et al., 1993).

Recharge of aquifers within the Coastal Plain region generally occurs within interstream areas, and has been estimated in the range of 5 to 21 inches yearly (Heath, 1989). Natural discharge of groundwater from the Coastal Plain aquifer system is generally into streams, swamps, and lakes. Evapotranspiration from the soil zone and upward leakage through confining units into streams, estuaries, swamps, and the ocean contribute to groundwater discharge. The New River estuary serves as the principal discharge area for groundwater from the Castle Hayne aquifer within the vicinity of MCB CAMLEJ (Harned et al., 1989).

4.3.2 SWMU 615 Geologic Setting

In the vicinity of SWMU 615, silty sands dominate the shallow soils to depths of approximately 19 ft. A clayey silt layer of the Belgrade Formation is present from 19 to approximately 25 ft bgs, and is underlain by silty sand of the River Bend Formation extending to approximately 50 ft bgs, where partially cemented sand is present to approximately 60 ft bgs (CH2M HILL, 2008b and **Appendix B**). Samples for grain size analysis and TOC samples were collected from the screened interval depths of the soil borings installed for monitoring wells. Results confirm that the site is underlain by fine sand with relatively low organic content (**Table 4-1**).

4.3.3 SWMU 615 Hydrogeologic Setting

Investigation of groundwater at SWMU 615 focused upon the surficial aquifer (unconfined) and the underlying UCH aquifer. These aquifers are locally separated by a discontinuous clayey silt layer of the Belgrade Formation, although in portions of nearby Site 88 the fine-grained layer is absent and the two aquifers are in direct hydraulic communication. Water level gauging (**Table 3-2**) shows that the water table is approximately 7 ft bgs, while the water level measured in the UCH was approximately 7 ft lower, indicating a significant downward potential gradient from the surficial to the UCH aquifer. The groundwater elevations recorded in October 2014 are depicted on **Figure 4-1**. Groundwater in the surficial and upper Castle Hayne aquifers in the vicinity of SWMU 615 appears to generally flow west toward the New River.

Based on aquifer testing results using wells installed within Site 88, the hydraulic conductivity in the surficial aquifer ranged from 1.2 to 9.5 ft/day with a geometric mean of 4.1 ft/day. The hydraulic conductivity in UCH wells ranged from 6.9 to 27.6 ft/day, with a geometric mean of 14.7 ft/day (CH2M HILL, 2012). Using an average hydraulic conductivity of 4.1 ft/day, a gradient of 0.01 ft/ft, and an estimated porosity of 25%, the average linear seepage velocity is approximately 5 feet per month with a range of 1 to 12 feet per month based on the range of the hydraulic conductivities (1.2 to 9.5 ft/day).

4.3.4 Regional Water Usage

Potable water available to MCB CAMLEJ and the surrounding area is provided by water supply wells that pump groundwater from the Castle Hayne aquifer. Although freshwater is present within the surficial aquifer, it is not used by MCB CAMLEJ as a water supply source (Cardinell et al., 1993). The nearest potable supply well is located more than 1.5 miles east of SWMU 615.

TABLE 4-1
SWMU 615 TOC and Grain Size
SWMU 615 RFI Report
MCB CAMLEJ

Station ID	SWMU615-MW01		SWMU615-MW02		SWMU615-MW03IW	SWMU615-MW04	
Sample ID	SWMU615-MW01-14-15-14B	SWMU615-MW01-4-4_5-14B	SWMU615-MW02-14-15-14B	SWMU615-MW02-4-4_5-14B	SWMU615-MW03IW-39-40-14B	SWMU615-MW04-14-15-14B	SWMU615-MW04-4-4_5-14B
Sample Date	04/16/14	04/17/14	04/17/14	04/17/14	04/15/14	04/17/14	04/17/14
Chemical Name							
Wet Chemistry							
Total organic carbon (TOC) (mg/kg)	1,100	1,700	2,200	2,500	5,300	2,100	2,900
Grain Size (pct)							
Coarse Sand (%)	0	NA	0	NA	0	0	NA
Fine Sand (%)	89.1	NA	92.1	NA	74.3	92.5	NA
Fines (%)	10.7	NA	5.9	NA	5.7	7.4	NA
Gravel (%)	0	NA	0	NA	0	0	NA
Medium Sand (%)	0.2	NA	2	NA	20	0.1	NA
GRAINSIZE (PCT/P)							
GS05 Sieve 2" (50 mm)	100	NA	100	NA	100	100	NA
GS06 Sieve 1.5" (37.5 mm)	100	NA	100	NA	100	100	NA
GS07 Sieve 1" (25.0 mm)	100	NA	100	NA	100	100	NA
GS08 Sieve 0.75" (19.0 mm)	100	NA	100	NA	100	100	NA
GS09 Sieve 0.5" (12.5 mm)	100	NA	100	NA	100	100	NA
GS10 Sieve 0.375" (9.5 mm)	100	NA	100	NA	100	100	NA
Hyd1 - Percent Passing (%)	10.2	NA	5.9	NA	5.3	5.6	NA
Hyd2 - Percent Passing (%)	9.8	NA	5.2	NA	5.3	5.6	NA
Hyd3 - Percent Passing (%)	9.4	NA	4.8	NA	4.9	5.2	NA
Hyd4 - Percent Passing (%)	9	NA	4.8	NA	4.6	5.2	NA
Hyd5 - Percent Passing (%)	8.6	NA	4.4	NA	4.2	4.4	NA
Hyd6 - Percent Passing (%)	7.8	NA	4.4	NA	3.8	4.7	NA
Hyd7 - Percent Passing (%)	7.5	NA	4.4	NA	3.5	3.9	NA
Sieve No. 004 (4.75 mm)	100	NA	100	NA	100	100	NA
Sieve No. 010 (2.00 mm)	100	NA	100	NA	100	100	NA
Sieve No. 020 (850 um)	100	NA	99.9	NA	98.2	100	NA
Sieve No. 040 (425 um)	99.8	NA	98	NA	80	99.9	NA
Sieve No. 060 (250 um)	99.2	NA	91.9	NA	48.6	98.3	NA
Sieve No. 140 (106 um)	17.4	NA	7.7	NA	6.3	17.7	NA
Sieve No. 200 (75 um)	10.7	NA	5.9	NA	5.7	7.4	NA
GRAINSIZE (MM)							
Hyd1 - Particle Diam. (mm)	0.0358	NA	0.0371	NA	0.037	0.0372	NA
Hyd2 - Particle Diam. (mm)	0.0227	NA	0.0236	NA	0.0234	0.0236	NA
Hyd3 - Particle Diam. (mm)	0.0131	NA	0.0136	NA	0.0135	0.0136	NA
Hyd4 - Particle Diam. (mm)	0.0093	NA	0.0095	NA	0.0096	0.0095	NA
Hyd5 - Particle Diam. (mm)	0.0066	NA	0.0067	NA	0.0068	0.0068	NA
Hyd6 - Particle Diam. (mm)	0.0033	NA	0.0033	NA	0.0034	0.0033	NA
Hyd7 - Particle Diam. (mm)	0.0014	NA	0.0014	NA	0.0014	0.0014	NA

Notes:
mg/kg - Milligrams per kilogram
pct - Percent

TABLE 4-1
SWMU 615 TOC and Grain Size
SWMU 615 RFI Report
MCB CAMLEJ

Station ID	SWMU615-MW05			SWMU615-MW06	SWMU615-MW07		SWMU615-MW08	SWMU615-SB01
Sample ID	SWMU615-MW05-14-15-14B	SWMU615-MW05-4-4_5-14B	SWMU615-MW05D-4-4_5-14B	SWMU615-SB06-2-3-14C	SWMU615-SB07-3-4-14C	SWMU615-SB07D-3-4-14C	SWMU615-SB08-2-3-14C	SWMU615-SB01-4-5-14B
Sample Date	04/16/14	04/17/14	04/17/14	07/01/14	07/01/14	07/01/14	07/01/14	04/16/14
Chemical Name								
Wet Chemistry								
Total organic carbon (TOC) (mg/kg)	3,800	4,700	NA	NA	NA	NA	NA	NA
Grain Size (pct)								
Coarse Sand (%)	0	NA	NA	NA	NA	NA	NA	NA
Fine Sand (%)	86.9	NA	NA	NA	NA	NA	NA	NA
Fines (%)	11.8	NA	NA	NA	NA	NA	NA	NA
Gravel (%)	0	NA	NA	NA	NA	NA	NA	NA
Medium Sand (%)	1.3	NA	NA	NA	NA	NA	NA	NA
GRAINSIZE (PCT/P)								
GS05 Sieve 2" (50 mm)	100	NA	NA	NA	NA	NA	NA	NA
GS06 Sieve 1.5" (37.5 mm)	100	NA	NA	NA	NA	NA	NA	NA
GS07 Sieve 1" (25.0 mm)	100	NA	NA	NA	NA	NA	NA	NA
GS08 Sieve 0.75" (19.0 mm)	100	NA	NA	NA	NA	NA	NA	NA
GS09 Sieve 0.5" (12.5 mm)	100	NA	NA	NA	NA	NA	NA	NA
GS10 Sieve 0.375" (9.5 mm)	100	NA	NA	NA	NA	NA	NA	NA
Hyd1 - Percent Passing (%)	10.7	NA	NA	NA	NA	NA	NA	NA
Hyd2 - Percent Passing (%)	10	NA	NA	NA	NA	NA	NA	NA
Hyd3 - Percent Passing (%)	9.3	NA	NA	NA	NA	NA	NA	NA
Hyd4 - Percent Passing (%)	8.6	NA	NA	NA	NA	NA	NA	NA
Hyd5 - Percent Passing (%)	7.1	NA	NA	NA	NA	NA	NA	NA
Hyd6 - Percent Passing (%)	7.1	NA	NA	NA	NA	NA	NA	NA
Hyd7 - Percent Passing (%)	5.3	NA	NA	NA	NA	NA	NA	NA
Sieve No. 004 (4.75 mm)	100	NA	NA	NA	NA	NA	NA	NA
Sieve No. 010 (2.00 mm)	100	NA	NA	NA	NA	NA	NA	NA
Sieve No. 020 (850 um)	100	NA	NA	NA	NA	NA	NA	NA
Sieve No. 040 (425 um)	98.7	NA	NA	NA	NA	NA	NA	NA
Sieve No. 060 (250 um)	93.1	NA	NA	NA	NA	NA	NA	NA
Sieve No. 140 (106 um)	13.3	NA	NA	NA	NA	NA	NA	NA
Sieve No. 200 (75 um)	11.8	NA	NA	NA	NA	NA	NA	NA
GRAINSIZE (MM)								
Hyd1 - Particle Diam. (mm)	0.0356	NA	NA	NA	NA	NA	NA	NA
Hyd2 - Particle Diam. (mm)	0.0226	NA	NA	NA	NA	NA	NA	NA
Hyd3 - Particle Diam. (mm)	0.0131	NA	NA	NA	NA	NA	NA	NA
Hyd4 - Particle Diam. (mm)	0.0093	NA	NA	NA	NA	NA	NA	NA
Hyd5 - Particle Diam. (mm)	0.0066	NA	NA	NA	NA	NA	NA	NA
Hyd6 - Particle Diam. (mm)	0.0033	NA	NA	NA	NA	NA	NA	NA
Hyd7 - Particle Diam. (mm)	0.0014	NA	NA	NA	NA	NA	NA	NA

Notes:
mg/kg - Milligrams per kilogram
pct - Percent

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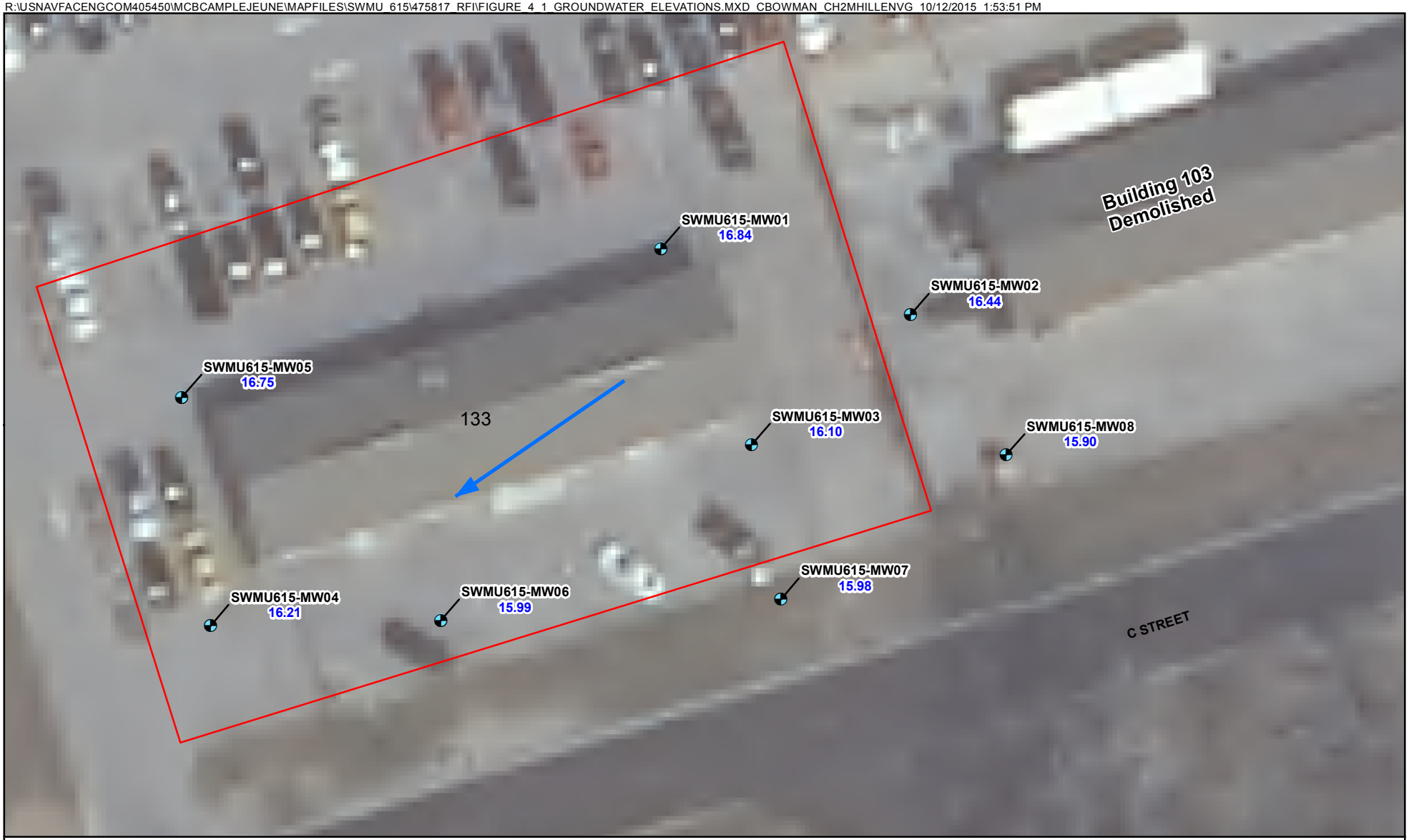

Legend

- Surficial Monitoring Well
- Approximate Groundwater Flow Direction
- SWMU 615

Notes:

- Groundwater elevations are expressed as feet above mean sea level.
- Depth to water measurements collected October 20, 2014

N

0 15 30 Feet

1 inch = 30 feet

Figure 4-1
Groundwater Elevations
SWMU 615 RFI Report
MCB CAMLEJ
North Carolina

ch2m

SECTION 5

Data Evaluation and Extent of Contamination

This section presents data evaluation, screening criteria, and the nature and extent of soil and groundwater contamination at SWMU 615.

5.1 Data Evaluation

A complete set of the analytical data is provided in **Appendix D**. Analytical data reports for the RFI were submitted to Environmental Data Quality, Inc., for third-party validation. Validation procedures established by the *National Functional Guidelines for Superfund Organic Analyses (USEPA, 2014)*, were adhered to during the validation process. These steps (third-party validation and electronic data handling) serve to reduce inherent uncertainties associated with data authenticity and usability.

Data qualifiers used during the data validation process and general interpretations for these flags are presented as follows:

- Data qualified with a "U" indicate that the analyte was analyzed for but not detected above the detection limit.
- Data qualified with a "J" indicate that the values are estimated. Data may be estimated for several reasons, including: exceedance of holding times, laboratory QA/QC sample results outside of acceptance limits, intra-sample variability, or if the reported value is below the Limit of Quantitation.
- Data qualified with a "UJ" indicate that the analyte was not detected but that the quantitation limit may be inaccurate or imprecise. Quantitation limits may be estimated for several reasons, including laboratory QA/QC sample results outside of acceptance limits, instrument calibration issues, or documented matrix interference.

For the April 2014 samples, reported VOC (detected and non-detected) values may be biased low or high. Additionally, there is uncertainty that reported non-detect values are accurate, indicating there is the potential for low level detections. The data from the April 2014 samples did not meet data quality objectives because of non-standard processing of associated internal and continuing calibration standards, as well as laboratory control samples. Since additional rounds of data were collected in October and December 2014, which did not have the above mentioned quality issues, the impact of the April 2014 data set is minimal to project decisions.

5.1.1 Laboratory and Non-site-related Contaminants

Certain organic constituents detected in samples collected from SWMU 615 may be attributed to non-site-related conditions or activities. Non-site-related results include laboratory contaminants such as acetone, carbon disulfide, and methylene chloride.

Some chemical compounds detected in field samples may have been introduced during field sampling, transporting the samples to the analytical laboratory, or as a result of laboratory procedures. A variety of blank samples containing pure water are used in the QA process to determine which of the contaminants may not be attributable to the field sample. An equipment rinsate blank is used to determine whether the equipment used to collect the samples (such as stainless steel trowels or sample containers) was adequately clean. A trip blank is used to ascertain if volatile compounds were introduced during packing or shipping. The results from the blank samples indicate that contaminants were not introduced during the sampling and transport activities.

Common laboratory contaminants can be introduced during the analytical methodology process. The laboratory includes a method blank in each batch of 20 samples analyzed to verify instrument cleanliness and function. The data presented in **Appendix D** were evaluated with regard to the blank contamination and qualified in accordance with USEPA procedures. Low levels of laboratory contaminants (acetone, carbon disulfide, and methylene chloride) were detected in soil samples below all screening criteria.

5.2 Screening Criteria

Analytical results for all media were compared against regulatory criteria. The comparison levels for surface and subsurface soil are identified as follows:

- USEPA Adjusted[2] Residential Soil Regional Screening Levels (RSLs)
- USEPA Adjusted[2] Industrial Soil RSLs
- NC SSLs[3]

The comparison levels for groundwater are identified as follows:

- USEPA Adjusted[2] Tap Water RSLs
- Maximum concentration level (MCL)
- NCGWQS

5.3 Nature and Extent of Contamination

Subsurface soil and groundwater analytical data are provided in **Tables 5-1** and **5-2,** respectively. These tables also provide a comparison to the criteria as outlined in **Section 5.2**. The laboratory analytical data is presented in **Appendix D**.

5.3.1 Subsurface Soil

Fifteen subsurface soil samples were collected for VOC analysis.

Three VOCs (acetone, carbon disulfide, and methylene chloride) were detected in the subsurface soil samples; however, none of these detections exceeded regulatory criteria.

5.3.2 Groundwater

Nineteen groundwater samples (including duplicates) were collected from the eight surficial aquifer and 1 UCH aquifer monitoring wells for VOC analysis. Four VOCs (benzene, PCE, TCE, and cis-1,2-dichloroethene [cis-1,2-DCE]) were detected in the groundwater samples collected from surficial monitoring wells. VOCs were not detected above method detection limits in the UCH groundwater sample in the most recent sample collected from SWMU615-MW03IW.

During the April 2014 sampling, the sample collected from monitoring well SWMU615-MW03 contained elevated concentrations of PCE (1,300 µg/L) and TCE (59 µg/L); and the sample collected from SWMU615-MW03IW contained PCE at 4.4 µg/L. In order to confirm these elevated concentrations, additional samples were collected in October 2014 and December 2014. During the October 2014 sampling, the PCE and TCE concentrations detected in the sample collected from monitoring well SWMU615-MW03 (1.2 J µg/L and 3.3 J µg/L, respectively) and the PCE concentration in the sample from SWMU615-MW03IW (1 U µg/L) were significantly lower than concentrations detected in the April 2014 samples. In the December 2014 sampling, the concentrations of PCE and TCE (1.4 J µg/L and 3.9 J µg/L) in the sample from SWMU615-MW03 were similar to those detected in the October 2014 sampling and again significantly lower than those from the April 2014 sampling. The lack of PCE detections in samples collected from downgradient monitoring well SWMU615-MW06 within the approximate timeframe (7 months) expected for groundwater to travel from SWMU615-MW03 to SWMU615-MW06 suggests that the elevated PCE detection was isolated in time and space to the April 2014 sample from SWMU615-MW03. Due to the anomalous nature of the April 2014 sample results from SWMU615-MW03 and MW03IW, the most recent sample results (October 2014 for SWMU615-MW03IW and December 2014 for SWMU615-MW03) were used to characterize the nature and extent of the groundwater contamination.

Figure 5-1 illustrates the distribution of sampling locations and samples that exceed regulatory criteria.

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2 The RSLs for non-carcinogens were adjusted to account for exposure to multiple constituents. The adjusted values for non-carcinogens are one-tenth of the published RSLs.

3 The NC SSLs are chemical-specific screening levels for the protection of groundwater.

Benzene was detected in one groundwater sample collected from monitoring well, SWMU615-MW06, in October 2014. The detected concentration (0.91 J µg/L) exceeded the RSL of 0.45 µg/L but was less than the NCGWQS of 1 µg/L.

PCE was detected in groundwater samples collected from three monitoring wells (SWMU615-MW03, SWMU615-MW07, and SWMU615-MW08). All three samples exceeded the NCGWQS of 0.7 µg/L with detected concentrations ranging from 1.1 J µg/L (SWUM615-MW08) to 1.8 J µg/L (SWUM615-MW07).

TCE was detected in groundwater samples collected from two monitoring wells (SWMU615-MW03 and SWMU615- SWMU615-MW08). Concentrations ranged from 1.2 J µg/L to 3.9 J µg/L. Both samples exceeded the RSL of 0.28 µg/L, and the sample from monitoring well SWMU615-MW03 also exceeded the NCGWQS (3 µg/L).

Cis-1,2-DCE was detected in groundwater samples collected from monitoring wells SWMU615-MW03 and SWMU615-MW07, at concentrations of 7.7 J µg/L and 0.57 J µg/L, respectively. The detected concentrations of cis-1,2-DCE exceeded the RSL (3.6 µg/L), but were below the NCGWQS (70 µg/L).

5.3.3 Nature and Extent Summary

VOCs were not detected in the subsurface soil samples above regulatory criteria. Concentrations of PCE and TCE detected in groundwater samples collected from the surficial aquifer, localized in the southeastern corner of the investigation area and near the sanitary sewer manhole, slightly exceeded the NCGWQS (**Figure 5-1**); however, CVOCs were not detected in samples collected from the well installed in the UCH aquifer, below the clayey layer.

5.4 Fate and Transport

The current distribution of CVOCs in the groundwater at SWMU 615 appears related to IRP Site 88 dissolved-phase groundwater contaminant plume, likely following the route of the subsurface sewer system that connects the two sites. The horizontal spread of the PCE via the sewer system may have resulted in a line of smaller source areas that originate from breaks in the sewer pipes at loose joints and manhole junctions. After release from the sewer pipes, the PCE was transported to its current position. The primary potential migration pathway at SWMU 615 is through groundwater flow in the surficial aquifer. The mechanisms of transport include advection, dispersion, and biodegradation. Groundwater flows generally to the west towards the New River; however, the water table gradient is flat and the samples collected from surficial monitoring wells located towards the west in the general downgradient direction (SWMU615-MW04 and SWMU615-MW06) did not contain detections of CVOCs. The most significant biodegradation process, as shown on **Figure 5-2**, for PCE, TCE, and cis-1,2-DCE occurs via reductive dechlorination which occurs under anaerobic conditions (USEPA, 1998). Based on the detections of TCE and cis-1,2-DCE in the sample collected from SWMU615-MW03, it appears that natural attenuation of PCE through biodegradation processes is occurring.

TABLE 5-1
SWMU 615 Soil Exceedances
SWMU 615 RFI Report
MCB CAMLEJ

Station ID	**NCSSL (February 2012)**	**Adjusted Industrial Soil RSLs (January 2015)**	**Adjusted Residential Soil RSLs (January 2015)**	SWMU615-MW01		SWMU615-MW02		SWMU615-MW03IW
Sample ID				SWMU615-MW01-14-15-14B	SWMU615-MW01-4-4_5-14B	SWMU615-MW02-14-15-14B	SWMU615-MW02-4-4_5-14B	SWMU615-MW03IW-39-40-14B
Sample Date				04/16/14	04/17/14	04/17/14	04/17/14	04/15/14
Chemical Name								
Volatile Organic Compounds (µg/kg)								
Acetone	24,000	67,000,000	6,100,000	NA	9.1 J	NA	22 U	NA
Carbon disulfide	3,800	350,000	77,000	NA	6 U	NA	8.6 U	NA
Methylene chloride	23	320,000	35,000	NA	6 U	NA	8.6 U	NA

Notes:
Bold box indicates exceedance of NC SSL
Bold text indicates exceedance of Adjusted Industrial Soil RSLs
Underline indicates exceedance of Adjusted Residential Soil RSLs
NA - Not analyzed
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
µg/kg - Micrograms per kilogram

TABLE 5-1
SWMU 615 Soil Exceedances
SWMU 615 RFI Report
MCB CAMLEJ

Station ID	**NCSSL (February 2012)**	**Adjusted Industrial Soil RSLs (January 2015)**	**Adjusted Residential Soil RSLs (January 2015)**	SWMU615-MW04		SWMU615-MW05		
Sample ID				SWMU615-MW04-14-15-14B	SWMU615-MW04-4-4_5-14B	SWMU615-MW05-14-15-14B	SWMU615-MW05-4-4_5-14B	SWMU615-MW05D-4-4_5-14B
Sample Date				04/17/14	04/17/14	04/16/14	04/17/14	04/17/14
Chemical Name								
Volatile Organic Compounds (µg/kg)								
Acetone	24,000	67,000,000	6,100,000	NA	18 J	NA	15 J	30 U
Carbon disulfide	3,800	350,000	77,000	NA	5.4 U	NA	7.1 U	12 U
Methylene chloride	23	320,000	35,000	NA	5.4 U	NA	7.1 U	12 U

Notes:
Bold box indicates exceedance of NC SSL
Bold text indicates exceedance of Adjusted Industrial Soil RSLs
Underline indicates exceedance of Adjusted Residential Soil RSLs
NA - Not analyzed
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
µg/kg - Micrograms per kilogram

TABLE 5-1
SWMU 615 Soil Exceedances
SWMU 615 RFI Report
MCB CAMLEJ

Station ID	**NCSSL (February 2012)**	**Adjusted Industrial Soil RSLs (January 2015)**	**Adjusted Residential Soil RSLs (January 2015)**	SWMU615-MW06	SWMU615-MW07		SWMU615-MW08	SWMU615-SB01
Sample ID				SWMU615-SB06-2-3-14C	SWMU615-SB07-3-4-14C	SWMU615-SB07D-3-4-14C	SWMU615-SB08-2-3-14C	SWMU615-SB01-4-5-14B
Sample Date				07/01/14	07/01/14	07/01/14	07/01/14	04/16/14
Chemical Name								
Volatile Organic Compounds (µg/kg)								
Acetone	24,000	67,000,000	6,100,000	16 J	18 J	8.5 J	180 U	15 J
Carbon disulfide	3,800	350,000	77,000	7.7 U	5.9 U	5.4 U	3.1 J	5.9 U
Methylene chloride	23	320,000	35,000	1.4 J	0.9 J	1.1 J	5.2 U	5.9 U

Notes:
Bold box indicates exceedance of NC SSL
Bold text indicates exceedance of Adjusted Industrial Soil RSLs
Underline indicates exceedance of Adjusted Residential Soil RSLs
NA - Not analyzed
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
µg/kg - Micrograms per kilogram

TABLE 5-2
SWMU 615 Groundwater Exceedances
SWMU 615 RFI Report
MCB CAMLEJ

Station ID	**NCGWQS (April 2013)**	**RSLs Tapwater Adjusted (January 2015)**	SWMU615-MW01		SWMU615-MW02	SWMU615-MW03				
Sample ID			SWMU615-GW01-14B	SWMU615-GW01-14D	SWMU615-GW02-14B	SWMU615-GW03-14B	SWMU615-GW03-14D	SWMU615-GW03D-14D	SWMU615-GW03-14D-1	SWMU615-GW03D-14D-1
Sample Date			04/22/14	10/25/14	04/21/14	04/21/14	10/25/14	10/25/14	12/17/14	12/17/14
Chemical Name										
Volatile Organic Compounds (µg/l)										
1,4-Dichlorobenzene	6	0.48	1 U	1 U	1 U	**2**	1 U	1 U	1 U	1 UJ
Benzene	1	0.45	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ
cis-1,2-Dichloroethene	70	3.6	0.53 J	1 U	1 U	**36**	**5 J**	**5.3 J**	**7.7 J**	**6.7 J**
Tetrachloroethene	0.7	4.1	1 U	1 U	1 U	**1,300**	1.1 J	1.2 J	1.4 J	1.1 J
trans-1,2-Dichloroethene	100	36	1 U	1 U	1 U	0.87 J	1 U	1 U	1 U	1 UJ
Trichloroethene	3	0.28	1 U	1 U	1 U	**59**	**3.2 J**	**3.3 J**	**3.7 J**	**3.9 J**
Vinyl chloride	0.03	0.019	1 U	1 U	1 U	**2.8**	1 U	1 U	1 U	1 UJ
Wet Chemistry										
Total organic carbon (TOC) (mg/l)	--	--	1.4	NA	5.1	4	NA	NA	NA	NA

Notes:

Bold box indicates exceedance of NCGWQS

Bold text indicates exceedance of Adjusted Tap Water RSLs

NA - Not analyzed

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

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

mg/l - Milligrams per liter

µg/l - Micrograms per liter

TABLE 5-2
SWMU 615 Groundwater Exceedances
SWMU 615 RFI Report
MCB CAMLEJ

Station ID	**NCGWQS (April 2013)**	**RSLs Tapwater Adjusted (January 2015)**	SWMU615-MW03IW		SWMU615-MW04	SWMU615-MW05		SWMU615-MW06	
Sample ID			SWMU615-GW03IW-14B	SWMU615-GW03IW-14D	SWMU615-GW04-14B	SWMU615-GW05-14B	SWMU615-GW05D-14B	SWMU615-GW06-14C	SWMU615-GW06-14D
Sample Date			04/22/14	10/25/14	04/23/14	04/22/14	04/22/14	07/08/14	10/25/14
Chemical Name									
Volatile Organic Compounds (µg/l)									
1,4-Dichlorobenzene	6	0.48	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Benzene	1	0.45	1 U	1 U	1 U	1 U	1 U	1 U	**0.91 J**
cis-1,2-Dichloroethene	70	3.6	1 U	1 U	1 U	1 U	1 U	0.65 J	1 U
Tetrachloroethene	0.7	4.1	**4.4**	1 U	1 U	1 U	1 U	1 U	1 U
trans-1,2-Dichloroethene	100	36	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Trichloroethene	3	0.28	1 U	1 U	1 U	1 U	1 U	**1 J**	1 U
Vinyl chloride	0.03	0.019	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Wet Chemistry									
Total organic carbon (TOC) (mg/l)	--	--	4.3	NA	2.5	2.8	NA	NA	NA

Notes:

Bold box indicates exceedance of NCGWQS

Bold text indicates exceedance of Adjusted Tap Water RSLs

NA - Not analyzed

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

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

mg/l - Milligrams per liter

µg/l - Micrograms per liter

TABLE 5-2
SWMU 615 Groundwater Exceedances
SWMU 615 RFI Report
MCB CAMLEJ

Station ID	**NCGWQS (April 2013)**	**RSLs Tapwater Adjusted (January 2015)**	SWMU615-MW07		SWMU615-MW08	
Sample ID			SWMU615-GW07-14C	SWMU615-GW07D-14C	SWMU615-GW08-14C	SWMU615-GW08-14D
Sample Date			07/08/14	07/08/14	07/08/14	10/25/14
Chemical Name						
Volatile Organic Compounds (µg/l)						
1,4-Dichlorobenzene	6	0.48	1 U	1 U	1 U	1 U
Benzene	1	0.45	1 U	1 U	1 U	1 U
cis-1,2-Dichloroethene	70	3.6	0.57 J	1 U	0.9 J	1 J
Tetrachloroethene	0.7	4.1	1.8 J	1.4 J	1.8 J	1.1 J
trans-1,2-Dichloroethene	100	36	1 U	1 U	1 U	1 U
Trichloroethene	3	0.28	1 U	1 U	**1.2 J**	**1.2 J**
Vinyl chloride	0.03	0.019	1 U	1 U	1 U	1 U
Wet Chemistry						
Total organic carbon (TOC) (mg/l)	--	--	NA	NA	NA	NA

Notes:

Bold box indicates exceedance of NCGWQS

Bold text indicates exceedance of Adjusted Tap Water RSLs

NA - Not analyzed

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

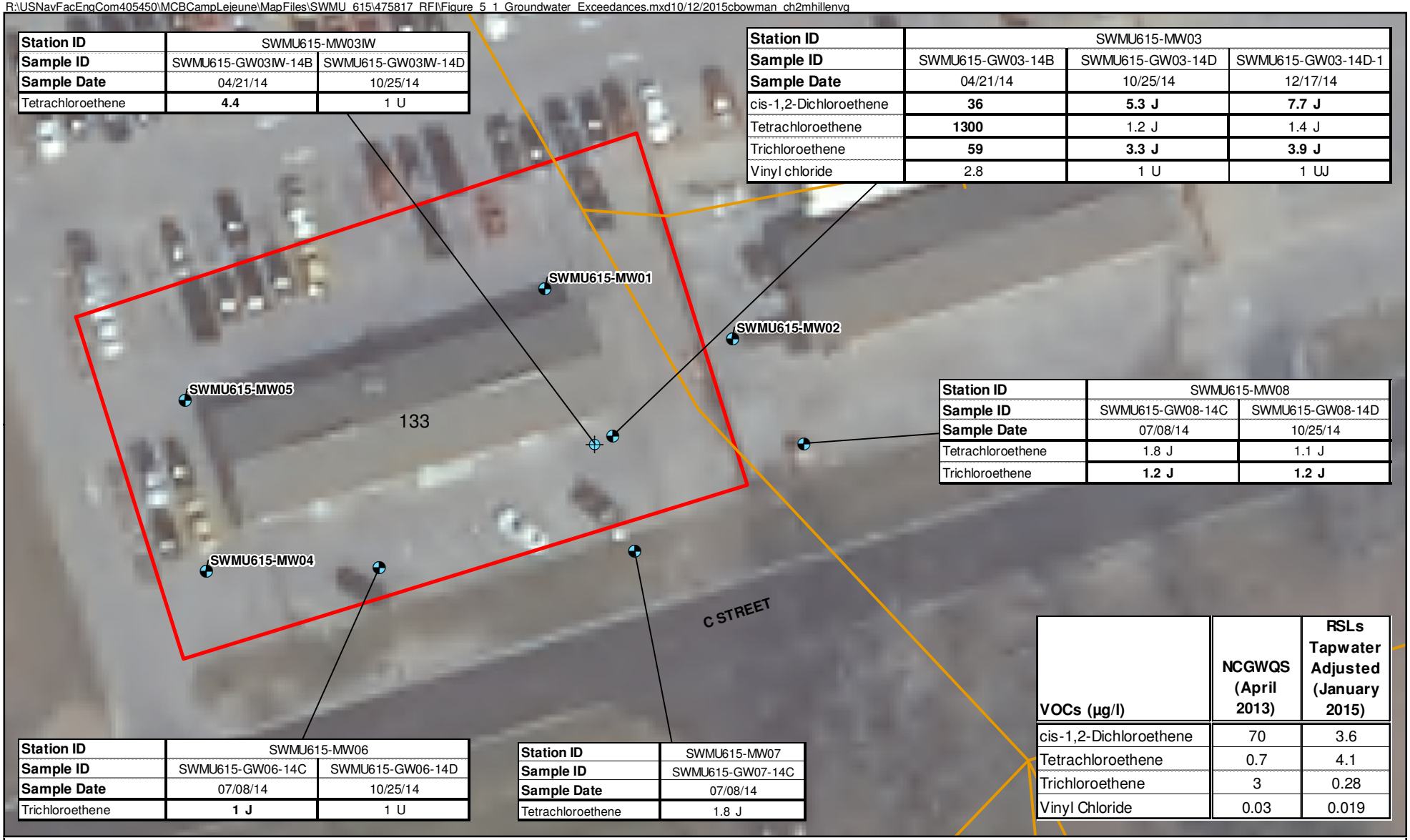
U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

mg/l - Milligrams per liter

µg/l - Micrograms per liter

R:\USNavFacEngCom405450\MCBCampLejeune\MapFiles\SWMU_615\475817_RFI\Figure_5_1_Groundwater_Exceedances.mxd10/12/2015cbowman_ch2mhillenvg



Station ID	SWMU615-MW03IW	
Sample ID	SWMU615-GW03IW-14B	SWMU615-GW03IW-14D
Sample Date	04/21/14	10/25/14
Tetrachloroethene	**4.4**	1 U

Station ID	SWMU615-MW03		
Sample ID	SWMU615-GW03-14B	SWMU615-GW03-14D	SWMU615-GW03-14D-1
Sample Date	04/21/14	10/25/14	12/17/14
cis-1,2-Dichloroethene	**36**	**5.3 J**	**7.7 J**
Tetrachloroethene	**1300**	1.2 J	1.4 J
Trichloroethene	**59**	**3.3 J**	**3.9 J**
Vinyl chloride	2.8	1 U	1 UJ

Station ID	SWMU615-MW08	
Sample ID	SWMU615-GW08-14C	SWMU615-GW08-14D
Sample Date	07/08/14	10/25/14
Tetrachloroethene	1.8 J	1.1 J
Trichloroethene	**1.2 J**	**1.2 J**

Station ID	SWMU615-MW06	
Sample ID	SWMU615-GW06-14C	SWMU615-GW06-14D
Sample Date	07/08/14	10/25/14
Trichloroethene	**1 J**	1 U

Station ID	SWMU615-MW07
Sample ID	SWMU615-GW07-14C
Sample Date	07/08/14
Tetrachloroethene	1.8 J

VOCs (µg/l)	NCGWQS (April 2013)	RSLs Tapwater Adjusted (January 2015)
cis-1,2-Dichloroethene	70	3.6
Tetrachloroethene	0.7	4.1
Trichloroethene	3	0.28
Vinyl Chloride	0.03	0.019

Legend

- Surficial Monitoring Well
- Upper Castle Hayne Monitoring Well
- Wastewater Line
- SWMU 615

Notes:

Bold box indicates exceedance of NCGWQS

Bold text indicates exceedance of Adjusted Tap Water RSLs

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

Concentrations shown in µl

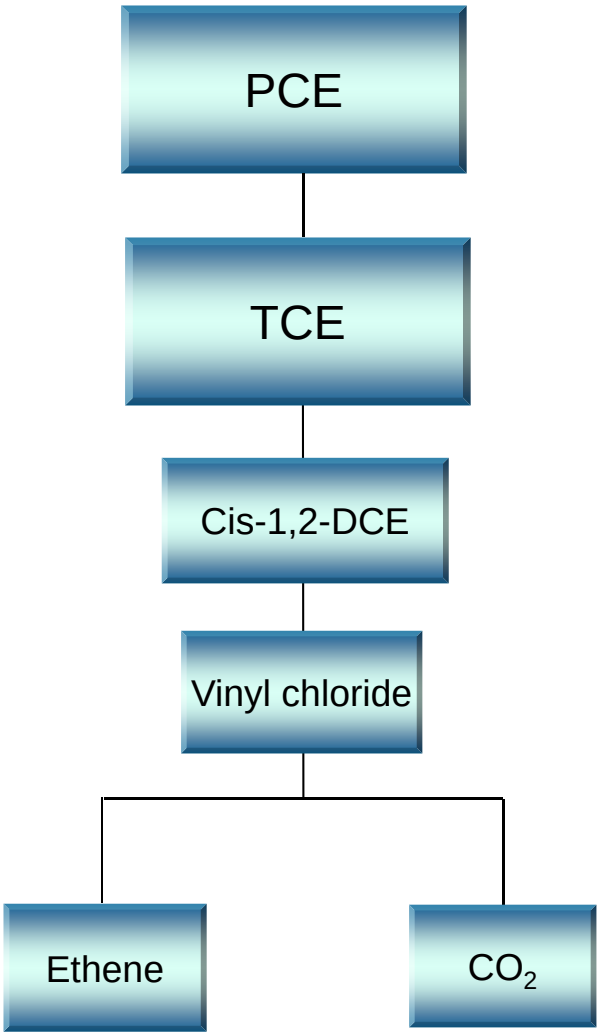
N

0 20 40 Feet

1 inch = 40 feet

Figure 5-1
Groundwater Exceedances
SWMU 615 RFI Report
MCB CAMLEJ
North Carolina

ch2m



PCE - Tetrachloroethene

TCE – Trichloroethene

DCE – Dichloroethene

CO_2 - Carbon Dioxide

Figure 5-2
Degradation Pathway of Tetrachloroethene
SWMU 615 RFI Report
MCB CAMLEJ
North Carolina

CH2MHILL

SECTION 6

Risk Screening

A human health risk screening (HHRS) was performed to evaluate potential risks associated with exposure to groundwater and soil at SWMU 615. Based on its location within a developed area and the fact that the site is a building and asphalt-paved parking lot, SWMU 615 does not support an ecological habitat and the planned future use of this site will not support ecological habitats in the future. Therefore, there are no significant exposure pathways to ecological receptors, and an ecological risk screening was not conducted. The results of the HHRS provide a preliminary indication of potential risks from exposure to chemicals detected at the site, and are used to help evaluate whether future unrestricted (i.e., residential) use of the site is acceptable, or if the site requires further evaluation (e.g., additional data collection, a baseline risk assessment).

The analytical data evaluated in the HHRS include surficial groundwater, UCH groundwater, and subsurface soil. Multiple rounds of groundwater samples have been collected from the monitoring wells at SWMU 615. However, as explained in **Section 5.3.2**, the April 2014 results for samples collected from SWMU615-MW03 and SWMU615-MW03IW were not representative of groundwater concentrations and therefore, the most recent sample results were used in the HHRS. These samples are identified in **Table 6-1**. Subsurface soil samples were collected during installation of the monitoring wells in April and July 2014. The groundwater and subsurface soil samples were analyzed for VOCs.

The data evaluated in the HHRS were all validated. Validation of the data identified the following criteria for data usability:

- Estimated values flagged with a J qualifier were treated as unqualified detected concentrations.
- For duplicate samples, the maximum concentration between the two samples was used as the sample concentration. If the analyte was only detected in one of the samples, the detected concentration was used as the sample concentration. If the analyte was not detected in either of the samples, the higher detection limit was used as the sample detection limit.

VI at Building 133 was evaluated in a Technical Memorandum (CH2M HILL, 2013b). This evaluation indicated that the VI pathway is not currently significant and is unlikely to become significant even if the indoor air concentration of Building 133 were to vary by an order of magnitude. No further VI evaluation was recommended for Building 133.

6.1 Human Health Risk Screening

The HHRS methodology and results are documented below.

6.1.1 Human Health Risk Screening Methodology

The HHRS was conducted in three steps using a risk ratio technique (U.S. Navy, 2000). Chemicals of potential concern (COPCs) identified in Step 1 were evaluated in Step 2. If COPCs were identified in Step 2, they were evaluated in Step 3. The three-step screening process is described below.

6.1.1.1. Step 1

The maximum detected concentrations for each medium were compared to the USEPA RSLs (USEPA, 2015a) and other human health risk screening levels (if appropriate). The data were not compared to the MCB CAMLEJ BTVs as BTVs are not available for VOCs. RSLs based on non-carcinogenic effects were based on a hazard quotient of 0.1 to account for exposure to multiple constituents. RSLs based on carcinogenic endpoints were based on a carcinogenic risk of 1×10^{-6}.

The shallow and deep groundwater data were compared to tap water RSLs. Groundwater data were also compared to the MCLs (USEPA, 2015b) and the (NCDENR, 2013); however, these comparisons were not used to identify COPCs to carry forward to Step 2.

The subsurface soil data were compared to residential soil RSLs. Residential soil RSLs were used for the soil screening as they are more conservative (i.e., lower) than industrial soil RSLs, and are therefore protective of all potential future receptors (e.g., military personnel, trespassers/visitors, residents, industrial workers, construction workers). The Inactive Hazardous Sites Branch Preliminary Soil Remediation Goals Protection of Groundwater (NCDENR, 2014) are also shown on the Step 1 soil screening table; however they were not used to identify COPCs but used to indicate the potential for leaching from the soil to groundwater at concentrations of potential concern to human receptors.

If the maximum detected concentration of an analyte in groundwater or soil exceeded the RSL, the screening level risk evaluation proceeded to Step 2.

In addition to comparing the detected concentrations to the screening levels, the detection limits for constituents reported as non-detected were compared to the screening levels. Analytes with detection limits exceeding the screening level were not identified as COPCs; however, the information is used to evaluate the potential for underestimating the total risks.

6.1.1.2. Step 2

For analytes identified as COPCs in Step 1, a corresponding risk level was calculated using the following equation as discussed in *Overview of Screening, Risk Ratio, and Toxicological Evaluation. Procedures for Northern Division Human Health Risk Assessments* (U.S. Navy, 2000):

$$\text{corresponding risk level} = \frac{\text{concentration x acceptable risk level}}{\text{RSL}}$$

The concentration is the maximum detected concentration (the same concentration that was used in Step 1). The acceptable risk level is 1 for noncarcinogens and 10^{-6} for carcinogens. RSLs for noncarcinogens are based on a hazard quotient of 1, instead of the hazard quotient of 0.1 used in Step 1.

The corresponding risk levels for each analyte within a medium were summed to calculate the cumulative corresponding carcinogenic risk (for carcinogens) and cumulative corresponding hazard index (HI, for noncarcinogens). If the cumulative corresponding carcinogenic risk is greater than 5×10^{-5}, or the cumulative corresponding HI for a target organ/effect is greater than 0.5, the anayltes contributing to these values are retained as COPCs and carried forward to Step 3.

6.1.1.3. Step 3

For analytes identified as COPCs in Step 2, a corresponding risk level was calculated as discussed above for Step 2; however, the 95 percent upper confidence limit (UCL) was used as the concentration instead of the maximum detected concentration. If the cumulative corresponding HI by target organ/effect is greater than 0.5, or the cumulative corresponding carcinogenic risk is greater than 5×10^{-5}, the analytes contributing to these values are considered COPCs.

ProUCL Version 5.0 (USEPA, 2013) was used to calculate the 95 percent UCL. In cases where the recommended UCL exceeded the maximum detected concentration, or ProUCL indicated there was not enough data to compute reliable statistics or estimates, the maximum detected concentration was used as the Step 3 exposure point concentration.

6.1.2 Human Health Risk Screening Results

6.1.2.1. Shallow Groundwater Risk Screening

Tables 6-2 and **6-3** present the risk-based screening for shallow groundwater. As shown on **Table 6-2**, three VOCs (benzene, cis-1,2-DCE, and TCE exceeded the tap water RSL and were identified as COPCs for evaluation in Step 2. TCE was the only analyte identified as a COPC in Step 2 (**Table 6-3**). Step 3 was not performed as ProUCL indicated there were only two detected concentrations, which was not enough data to compute reliable statistics or estimated. Therefore, TCE is a COPC for shallow groundwater. The two detected concentrations of TCE in the

eight samples (3.9 J µg/L and 1.2 J µg/L) are both less than the MCL of 5 µg/L; however, the maximum detected concentration slightly exceeds the NCGWQS of 3 µg/L.

There were some VOCs in shallow groundwater that were not detected but had detection limits above the tap water RSL, and less that had detection limits above MCL and/or NCGWQS values. There is some uncertainty associated with undetected constituents that have detection limits above the screening levels; however, based on past site use and results of those constituents detected in the site media, this is not expected to affect the results of this risk screening evaluation.

6.1.2.2. Deep Groundwater Risk Screening

There were no VOCs detected in samples collected from the monitoring well installed in the UCH. As shown in **Table 6-4**, similar to the surficial groundwater, there were some VOCs in UCH groundwater that were not detected but had detection limits above the tap water RSL, but less that had detection limits above MCL and/or NCGWQS values. There is some uncertainty associated with undetected constituents that have detection limits above the screening levels; however, based on past site use and results of those constituents detected in the surficial groundwater, this is not expected to affect the results of this risk screening evaluation.

6.1.2.3. Subsurface Soil Risk Screening

Table 6-5 present the risk-based screening evaluation for subsurface soil. As shown on **Table 6-5**, no COPCs were identified for exposure to subsurface soil. Therefore, exposure to subsurface soil would not be expected to result in unacceptable human health risks.

There were a few VOCs that were not detected in soil that had detection limits above the residential soil RSL and/or NC SSL for the protection of groundwater. However, in general, the detection limits for these analytes were only slightly above the residential soil RSL (were within one or two orders of magnitude of the RSLs). Additionally, groundwater data were collected that indicate that significant leaching from soil to groundwater has not occurred at SWMU 615 (only three VOCs were detected in shallow groundwater, and none were detected in deep groundwater). There is some uncertainty associated with undetected constituents that have detection limits above the screening levels; however, based on past site use and results of those constituents detected in the site media, this is not expected to affect the results of this risk evaluation.

6.2 Risk Screening Summary

6.2.1 Human Health Risk Screening Summary

One COPC (TCE) was identified for shallow groundwater. However, the detected concentrations are below the MCL (5 µg/L) and only the maximum detected concentration (3.9 µg/L) is slightly above the NCGWQS (3 µg/L). No VOCs were detected in the deep groundwater monitoring well, and there were no COPCs identified for the subsurface soil. Although one VOC was identified as a COPC in shallow groundwater, due to the low detected concentration, no exceedance of MCL, and only slight exceedance of the NCGWQS, it is expected there would be no adverse human health risks associated with exposure to SWMU 615 media.

6.2.2 Ecological Risk Screening Summary

SWMU 615 does not support an ecological habitat and the planned future use of this site will not support ecological habitats in the future. Therefore, there are no significant exposure pathways to ecological receptors, and an ecological risk screening was not conducted.

TABLE 6-1

Summary of Data Evaluated in Human Health Risk Screening Assessment

SWMU 615 RFI Report

MCB CAMLEJ

Medium/ Sample ID	Date of Sampling	Parameters
Shallow Groundwater		
SWMU615-GW01-14D	10/25/2014	VOCs
SWMU615-GW02-14B	4/21/2014	VOCs
SWMU615-GW03-14D-1	12/17/2014	VOCs
SWMU615-GW03D-14D-1[1]	12/17/2014	VOCs
SWMU615-GW04-14B	4/23/2014	VOCs
SWMU615-GW05-14B	4/22/2014	VOCs
SWMU615-GW05D-14B[1]	4/22/2014	VOCs
SWMU615-GW06-14D	10/25/2014	VOCs
SWMU615-GW07-14C	7/8/2014	VOCs
SWMU615-GW07D-14C[1]	7/8/2014	VOCs
SWMU615-GW08-14D	10/25/2014	VOCs
Deep Groundwater		
SWMU615-GW03IW-14D	10/25/2014	VOCs
Subsurface Soil		
SWMU615-MW01-4-4.5-14B	4/17/2014	VOCs
SWMU615-MW02-4-4.5-14B	4/17/2014	VOCs
SWMU615-MW04-4-4.5-14B	4/17/2014	VOCs
SWMU615-MW05-4-4.5-14B	4/17/2014	VOCs
SWMU615-MW05D-4-4.5-14B[1]	4/17/2014	VOCs
SWMU615-SB06-2-3-14C	7/1/2014	VOCs
SWMU615-SB07-3-4-14C	7/1/2014	VOCs
SWMU615-SB07D-3-4-14C[1]	7/1/2014	VOCs
SWMU615-SB08-2-3-14C	7/1/2014	VOCs
SWMU615-SB01-4-5-14B	4/16/2014	VOCs

Notes:
VOCs = volatile organic compounds
[1] Duplicate of previous sample.

TABLE 6-2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN FOR SHALLOW GROUNDWATER

SWMU 615 RFI Report

MCB CAMLEJ

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Shallow Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
SWMU 615 Tap Water (Shallow Groundwater)	71-55-6	1,1,1-Trichloroethane	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	8.0E+02 N	2.0E+02	MCL, NGWQS	NO	DLBSL
	79-34-5	1,1,2,2-Tetrachloroethane	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	7.6E-02 C	2.0E-01	NCGWQS	YES	DLASL
	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-11	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	5.5E+03 N	2.0E+05	NCGWQS	NO	DLBSL
	79-00-5	1,1,2-Trichloroethane	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	4.1E-02 N	5.0E+00	MCL	YES	DLASL
	75-34-3	1,1-Dichloroethane	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	2.7E+00 C	6.0E+00	NCGWQS	NO	DLBSL
	75-35-4	1,1-Dichloroethene	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	2.8E+01 N	7.0E+00	MCL, NGWQS	NO	DLBSL
	120-82-1	1,2,4-Trichlorobenzene	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	4.0E-01 N	7.0E+01	MCL, NGWQS	YES	DLASL
	96-12-8	1,2-Dibromo-3-chloropropane	ND	ND	UG/L		0/8	10 - 10	1.0E+01	N/A	3.3E-04 C	2.0E-01	MCL	YES	DLASL
												4.0E-02	NCGWQS		
	106-93-4	1,2-Dibromoethane	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	7.5E-03 C	5.0E-02	MCL	YES	DLASL
												2.0E-02	NCGWQS		
	95-50-1	1,2-Dichlorobenzene	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	3.0E+01 N	6.0E+02	MCL	NO	DLBSL
												2.0E+01	NCGWQS		
	107-06-2	1,2-Dichloroethane	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	1.7E-01 C	5.0E+00	MCL	YES	DLASL
												4.0E-01	NCGWQS		
	78-87-5	1,2-Dichloropropane	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	4.4E-01 C	5.0E+00	MCL	YES	DLASL
												6.0E-01	NCGWQS		
	541-73-1	1,3-Dichlorobenzene	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	4.8E-01 C	2.0E+02	NCGWQS	YES	DLASL
	106-46-7	1,4-Dichlorobenzene	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	4.8E-01 C	7.5E+01	MCL	YES	DLASL
												6.0E+00	NCGWQS		
	78-93-3	2-Butanone	ND	ND	UG/L		0/8	25 - 25	2.5E+01	N/A	5.6E+02 N	4.0E+03	NCGWQS	NO	DLBSL
	591-78-6	2-Hexanone	ND	ND	UG/L		0/8	5 - 5	5.0E+00	N/A	3.8E+00 N	N/A		YES	DLASL
	108-10-1	4-Methyl-2-pentanone	ND	ND	UG/L		0/8	5 - 5	5.0E+00	N/A	1.2E+02 N	N/A		NO	DLBSL
	67-64-1	Acetone	ND	ND	UG/L		0/8	25 - 25	2.5E+01	N/A	1.4E+03 N	6.0E+03	NCGWQS	NO	DLBSL
	71-43-2	**Benzene**	**9.1E-01 J**	**9.1E-01 J**	**UG/L**	**SWMU615-GW06-14D**	**1/8**	2 -2	**9.1E-01**	N/A	**4.5E-01 C**	**5.0E+00**	**MCL**	**YES**	**ASL**
												1.0E+00	**NCGWQS**		
	75-27-4	Bromodichloromethane	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	1.3E-01 C	8.0E+01	MCL	YES	DLASL
												6.0E-01	NCGWQS		
	75-25-2	Bromoform	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	9.2E+00 C	8.0E+01	MCL	NO	DLBSL
												4.0E+00	NCGWQS		
	74-83-9	Bromomethane	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	7.5E-01 N	N/A		YES	DLASL
	75-15-0	Carbon disulfide	ND	ND	UG/L		0/8	10 - 10	1.0E+01	N/A	8.1E+01 N	7.0E+02	NCGWQS	NO	DLBSL
	56-23-5	Carbon tetrachloride	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	4.5E-01 C	5.0E+00	MCL	YES	DLASL
												3.0E-01	NCGWQS		
	108-90-7	Chlorobenzene	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	7.8E+00 N	1.0E+02	MCL	NO	DLBSL
												5.0E+01	NCGWQS		
	75-00-3	Chloroethane	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	2.1E+03 N	3.0E+03	NCGWQS	NO	DLBSL
	67-66-3	Chloroform	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	2.2E-01 C	8.0E+01	MCL	YES	DLASL
												7.0E+01	NCGWQS		
	74-87-3	Chloromethane	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	1.9E+01 N	3.0E+00	NCGWQS	NO	DLBSL
	156-59-2	**cis-1,2-Dichloroethene**	**5.7E-01 J**	**7.7E+00 J**	**UG/L**	**SWMU615-GW03-14D-1**	**3/8**	**2 -2**	**7.7E+00**	N/A	**3.6E+00 N**	**7.0E+01**	**MCL, NGWQS**	**YES**	**ASL**
	10061-01-5	cis-1,3-Dichloropropene	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	4.7E-01 C	4.0E-01	NCGWQS	YES	DLASL

TABLE 6-2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN FOR SHALLOW GROUNDWATER

SWMU 615 RFI Report

MCB CAMLEJ

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Shallow Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	110-82-7	Cyclohexane	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	1.3E+03 N	N/A		NO	DLBSL
	124-48-1	Dibromochloromethane	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	1.7E-01 C	8.0E+01	MCL	YES	DLASL
												4.0E-01	NCGWQS		
	75-71-8	Dichlorodifluoromethane (Freon-12)	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	2.0E+01 N	1.0E+03	NCGWQS	NO	DLBSL
	100-41-4	Ethylbenzene	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	1.5E+00 C	7.0E+02	MCL	YES	DLASL
												6.0E+02	NCGWQS		
	98-82-8	Isopropylbenzene	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	4.5E+01 N	7.0E+01	NCGWQS	NO	DLBSL
	79-20-9	Methyl acetate	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	2.0E+03 N	N/A		NO	DLBSL
	108-87-2	Methylcyclohexane	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	3.2E+01 N	N/A		NO	DLBSL
	75-09-2	Methylene chloride	ND	ND	UG/L		0/8	10 - 10	1.0E+01	N/A	1.1E+01 N	5.0E+00	MCL, NCGWQS	NO	DLBSL
	1634-04-4	Methyl-tert-butyl ether (MTBE)	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	1.4E+01 C	2.0E+01	NCGWQS	NO	DLBSL
	100-42-5	Styrene	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	1.2E+02 N	1.0E+02	MCL	NO	DLBSL
												7.0E+01	NCGWQS		
	127-18-4	Tetrachloroethene	1.1E+00 J	1.8E+00 J	UG/L	SWMU615-GW07-14C	3/8	2 -2	1.8E+00	N/A	4.1E+00 N	5.0E+00	MCL	NO	BSL
												7.0E-01	NCGWQS		
	108-88-3	Toluene	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	1.1E+02 N	1.0E+03	MCL	NO	DLBSL
												6.0E+02	NCGWQS		
	156-60-5	trans-1,2-Dichloroethene	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	3.6E+01 N	1.0E+02	MCL, NCGWQS	NO	DLBSL
	10061-02-6	trans-1,3-Dichloropropene	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	4.7E-01 C	4.0E-01	NCGWQS	YES	DLASL
	79-01-6	**Trichloroethene**	**1.2E+00 J**	**3.9E+00 J**	**UG/L**	**SWMU615-GW03D-14D-1**	**2/8**	**2 -2**	**3.9E+00**	N/A	**2.8E-01 N**	**5.0E+00**	**MCL**	**YES**	**ASL**
												3.0E+00	**NCGWQS**		
	75-69-4	Trichlorofluoromethane (Freon-11)	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	1.1E+02 N	2.0E+03	NCGWQS	NO	DLBSL
	75-01-4	Vinyl chloride	ND	ND	UG/L		0/8	2 -2	2.0E+00	N/A	1.9E-02 C	2.0E+00	MCL	YES	DLASL
												3.0E-02	NCGWQS		
	1330-20-7	Xylene, total	ND	ND	UG/L		0/8	4 - 4	4.0E+00	N/A	1.9E+01 N	1.0E+04	MCL	NO	DLBSL
												5.0E+02	NCGWQS		

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening. If not detected, maximum detection limit presented.

[3] Background values not available.

[4] Oak Ridge National Laboratory (ORNL). January 2015. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Tap Water RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). [Online]. Available: http://epa-prgs.ornl.gov/chemicals/index.shtm
RSL for 1,4-dichlorobenzene used as surrogate for 1,3-dichlorobenzene
RSL for 1,3-dichloropropene used as a surrogate for cis-1,3-dichloropropene and trans-1,3-dichloropropene.
RSL for n-hexane used as surrogate for methylcyclohexane.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Detection Limit Above Screening Level (DLASL), not quantitatively evaluated in HHRA
Deletion Reason: Below Screening Level (BSL)
Detection Limit Below Screening Level (DLBSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
C = Carcinogenic
N = Noncarcinogenic
MCL - Drinking water Maximum Contaminant Level (MCL) (USEPA, 2015).
NCGWQS - North Carolina Classifications and Groundwater Quality Standards, April 1, 2013.
N/A = Not available, not applicable
ND = Not detected
UG/L - Microgram per liter

TABLE 6-3

Risk Ratio Screening for Shallow Groundwater, Maximum Detected Concentration

SWMU 615 RFI Report

MCB CAMLEJ

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier) (UG/L)	Sample Location of Maximum Detected Concentration	Carcinogenic Tap Water RSL (UG/L)	Acceptable Risk Level	Corresponding Cancer Risk[a]	Non-carcinogenic Tap Water RSL (UG/L)	Acceptable Hazard Level	Corresponding Hazard Index[b]	Target Organ
Benzene	1 / 8	9.1E-01 J	SWMU615-GW06-14D	4.5E-01	1E-06	2E-06	3.3E+01	1	0.03	Blood
cis-1,2-Dichloroethene	3 / 8	7.7E+00 J	SWMU615-GW03-14D-1	N/A			3.6E+01	1	0.2	Kidney
Trichloroethene	**2 / 8**	**3.9E+00 J**	**SWMU615-GW03D-14D-1**	**4.9E-01**	**1E-06**	**8E-06**	**2.8E+00**	**1**	**1**	**Adult immunological effects, Development immunotoxicity, Heart malformations**
Cumulative Corresponding Hazard Index[c]									**2**	
Cumulative Corresponding Cancer Risk[d]						**1E-05**				

Total Blood HI =	0.03
Total Kidney HI =	0.2
Total Adult immunological effects HI =	**1**
Total Development immunotoxicity HI =	**1**
Total Heart malformations HI =	**1**

Notes:

[a] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

HI = Hazard Index

UG/L = Microgram per liter

N/A = Not available/not applicable

TABLE 6-4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN FOR DEEP GROUNDWATER

SWMU 615 RFI Report

MCB CAMLEJ

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Deep Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
SWMU 615 Tap Water (Deep Groundwater)	71-55-6	1,1,1-Trichloroethane	ND	ND	UG/L		0/1	2	2.0E+00	N/A	8.0E+02 N	2.0E+02	MCL, NCGWQS	NO	DLBSL
	79-34-5	1,1,2,2-Tetrachloroethane	ND	ND	UG/L		0/1	2	2.0E+00	N/A	7.6E-02 C	2.0E-01	NCGWQS	YES	DLASL
	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-11	ND	ND	UG/L		0/1	2	2.0E+00	N/A	5.5E+03 N	2.0E+05	NCGWQS	NO	DLBSL
	79-00-5	1,1,2-Trichloroethane	ND	ND	UG/L		0/1	2	2.0E+00	N/A	4.1E-02 N	5.0E+00	MCL	YES	DLASL
	75-34-3	1,1-Dichloroethane	ND	ND	UG/L		0/1	2	2.0E+00	N/A	2.7E+00 C	6.0E+00	NCGWQS	NO	DLBSL
	75-35-4	1,1-Dichloroethene	ND	ND	UG/L		0/1	2	2.0E+00	N/A	2.8E+01 N	7.0E+00	MCL, NCGWQS	NO	DLBSL
	120-82-1	1,2,4-Trichlorobenzene	ND	ND	UG/L		0/1	2	2.0E+00	N/A	4.0E-01 N	7.0E+01	MCL, NCGWQS	YES	DLASL
	96-12-8	1,2-Dibromo-3-chloropropane	ND	ND	UG/L		0/1	10	1.0E+01	N/A	3.3E-04 C	2.0E-01	MCL	YES	DLASL
												4.0E-02	NCGWQS		
	106-93-4	1,2-Dibromoethane	ND	ND	UG/L		0/1	2	2.0E+00	N/A	7.5E-03 C	5.0E-02	MCL	YES	DLASL
												2.0E-02	NCGWQS		
	95-50-1	1,2-Dichlorobenzene	ND	ND	UG/L		0/1	2	2.0E+00	N/A	3.0E+01 N	6.0E+02	MCL	NO	DLBSL
												2.0E+01	NCGWQS		
	107-06-2	1,2-Dichloroethane	ND	ND	UG/L		0/1	2	2.0E+00	N/A	1.7E-01 C	5.0E+00	MCL	YES	DLASL
												4.0E-01	NCGWQS		
	78-87-5	1,2-Dichloropropane	ND	ND	UG/L		0/1	2	2.0E+00	N/A	4.4E-01 C	5.0E+00	MCL	YES	DLASL
												6.0E-01	NCGWQS		
	541-73-1	1,3-Dichlorobenzene	ND	ND	UG/L		0/1	2	2.0E+00	N/A	4.8E-01 C	2.0E+02	NCGWQS	YES	DLASL
	106-46-7	1,4-Dichlorobenzene	ND	ND	UG/L		0/1	2	2.0E+00	N/A	4.8E-01 C	7.5E+01	MCL	YES	DLASL
												6.0E+00	NCGWQS		
	78-93-3	2-Butanone	ND	ND	UG/L		0/1	25	2.5E+01	N/A	5.6E+02 N	4.0E+03	NCGWQS	NO	DLBSL
	591-78-6	2-Hexanone	ND	ND	UG/L		0/1	5	5.0E+00	N/A	3.8E+00 N	N/A		YES	DLASL
	108-10-1	4-Methyl-2-pentanone	ND	ND	UG/L		0/1	5	5.0E+00	N/A	1.2E+02 N	N/A		NO	DLBSL
	67-64-1	Acetone	ND	ND	UG/L		0/1	25	2.5E+01	N/A	1.4E+03 N	6.0E+03	NCGWQS	NO	DLBSL
	71-43-2	Benzene	ND	ND	UG/L		0/1	2	2.0E+00	N/A	4.5E-01 C	5.0E+00	MCL	YES	DLASL
												1.0E+00	NCGWQS		
	75-27-4	Bromodichloromethane	ND	ND	UG/L		0/1	2	2.0E+00	N/A	1.3E-01 C	8.0E+01	MCL	YES	DLASL
												6.0E-01	NCGWQS		
	75-25-2	Bromoform	ND	ND	UG/L		0/1	2	2.0E+00	N/A	9.2E+00 C	8.0E+01	MCL	NO	DLBSL
												4.0E+00	NCGWQS		
	74-83-9	Bromomethane	ND	ND	UG/L		0/1	2	2.0E+00	N/A	7.5E-01 N	N/A		YES	DLASL
	75-15-0	Carbon disulfide	ND	ND	UG/L		0/1	10	1.0E+01	N/A	8.1E+01 N	7.0E+02	NCGWQS	NO	DLBSL
	56-23-5	Carbon tetrachloride	ND	ND	UG/L		0/1	2	2.0E+00	N/A	4.5E-01 C	5.0E+00	MCL	YES	DLASL
												3.0E-01	NCGWQS		
	108-90-7	Chlorobenzene	ND	ND	UG/L		0/1	2	2.0E+00	N/A	7.8E+00 N	1.0E+02	MCL	NO	DLBSL
												5.0E+01	NCGWQS		
	75-00-3	Chloroethane	ND	ND	UG/L		0/1	2	2.0E+00	N/A	2.1E+03 N	3.0E+03	NCGWQS	NO	DLBSL
	67-66-3	Chloroform	ND	ND	UG/L		0/1	2	2.0E+00	N/A	2.2E-01 C	8.0E+01	MCL	YES	DLASL
												7.0E+01	NCGWQS		
	74-87-3	Chloromethane	ND	ND	UG/L		0/1	2	2.0E+00	N/A	1.9E+01 N	3.0E+00	NCGWQS	NO	DLBSL
	156-59-2	cis-1,2-Dichloroethene	ND	ND	UG/L		0/1	2	7.7E+00	N/A	3.6E+00 N	7.0E+01	MCL, NCGWQS	YES	DLASL
	10061-01-5	cis-1,3-Dichloropropene	ND	ND	UG/L		0/1	2	2.0E+00	N/A	4.7E-01 C	4.0E-01	NCGWQS	YES	DLASL

TABLE 6-4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN FOR DEEP GROUNDWATER

SWMU 615 RFI Report

MCB CAMLEJ

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Deep Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	110-82-7	Cyclohexane	ND	ND	UG/L		0/1	2	2.0E+00	N/A	1.3E+03 N	N/A		NO	DLBSL
	124-48-1	Dibromochloromethane	ND	ND	UG/L		0/1	2	2.0E+00	N/A	1.7E-01 C	8.0E+01	MCL	YES	DLASL
												4.0E-01	NCGWQS		
	75-71-8	Dichlorodifluoromethane (Freon-12)	ND	ND	UG/L		0/1	2	2.0E+00	N/A	2.0E+01 N	1.0E+03	NCGWQS	NO	DLBSL
	100-41-4	Ethylbenzene	ND	ND	UG/L		0/1	2	2.0E+00	N/A	1.5E+00 C	7.0E+02	MCL	YES	DLASL
												6.0E+02	NCGWQS		
	98-82-8	Isopropylbenzene	ND	ND	UG/L		0/1	2	2.0E+00	N/A	4.5E+01 N	7.0E+01	NCGWQS	NO	DLBSL
	79-20-9	Methyl acetate	ND	ND	UG/L		0/1	2	2.0E+00	N/A	2.0E+03 N	N/A		NO	DLBSL
	108-87-2	Methylcyclohexane	ND	ND	UG/L		0/1	2	2.0E+00	N/A	3.2E+01 N	N/A		NO	DLBSL
	75-09-2	Methylene chloride	ND	ND	UG/L		0/1	10	1.0E+01	N/A	1.1E+01 N	5.0E+00	MCL, NCGWQS	NO	DLBSL
	1634-04-4	Methyl-tert-butyl ether (MTBE)	ND	ND	UG/L		0/1	2	2.0E+00	N/A	1.4E+01 C	2.0E+01	NCGWQS	NO	DLBSL
	100-42-5	Styrene	ND	ND	UG/L		0/1	2	2.0E+00	N/A	1.2E+02 N	1.0E+02	MCL	NO	DLBSL
												7.0E+01	NCGWQS		
	127-18-4	Tetrachloroethene	ND	ND	UG/L		0/1	2	1.8E+00	N/A	4.1E+00 N	5.0E+00	MCL	NO	DLBSL
												7.0E-01	NCGWQS		
	108-88-3	Toluene	ND	ND	UG/L		0/1	2	2.0E+00	N/A	1.1E+02 N	1.0E+03	MCL	NO	DLBSL
												6.0E+02	NCGWQS		
	156-60-5	trans-1,2-Dichloroethene	ND	ND	UG/L		0/1	2	2.0E+00	N/A	3.6E+01 N	1.0E+02	MCL, NCGWQS	NO	DLBSL
	10061-02-6	trans-1,3-Dichloropropene	ND	ND	UG/L		0/1	2	2.0E+00	N/A	4.7E-01 C	4.0E-01	NCGWQS	YES	DLASL
	79-01-6	Trichloroethene	ND	ND	UG/L		0/1	2	3.9E+00	N/A	2.8E-01 N	5.0E+00	MCL	YES	DLASL
												3.0E+00	NCGWQS		
	75-69-4	Trichlorofluoromethane (Freon-11)	ND	ND	UG/L		0/1	2	2.0E+00	N/A	1.1E+02 N	2.0E+03	NCGWQS	NO	DLBSL
	75-01-4	Vinyl chloride	ND	ND	UG/L		0/1	2	2.0E+00	N/A	1.9E-02 C	2.0E+00	MCL	YES	DLASL
												3.0E-02	NCGWQS		
	1330-20-7	Xylene, total	ND	ND	UG/L		0/1	4	4.0E+00	N/A	1.9E+01 N	1.0E+04	MCL	NO	DLBSL
												5.0E+02	NCGWQS		

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening. If not detected, maximum detection limit presented.

[3] Background values not available.

[4] Oak Ridge National Laboratory (ORNL). January 2015. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Tap Water RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). [Online]. Available: http://epa-prgs.ornl.gov/chemicals/index.shtm
RSL for 1,4-dichlorobenzene used as surrogate for 1,3-dichlorobenzene
RSL for 1,3-dichloropropene used as a surrogate for cis-1,3-dichloropropene and trans-1,3-dichloropropene.
RSL for n-hexane used as surrogate for methylcyclohexane.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Detection Limit Above Screening Level (DLASL), not quantitatively evaluated in HHRA

Deletion Reason: Below Screening Level (BSL)
Detection Limit Below Screening Level (DLBSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
C = Carcinogenic
N = Noncarcinogenic
MCL - Drinking water Maximum Contaminant Level (MCL) (USEPA, 2015).
NCGWQS - North Carolina Classifications and Groundwater Quality Standards, April 1, 2013.
N/A = Not available, not applicable
ND = Not detected
UG/L - Microgram per liter

TABLE 6-5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN FOR SOIL

SWMU 615 RFI Report

MCB CAMLEJ

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Subsurface Soil	71-55-6	1,1,1-Trichloroethane	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	6.4E+02 SAT	1.2E+00	NCSSL	NO	DLBSL
	79-34-5	1,1,2,2-Tetrachloroethane	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	6.0E-01 C	1.2E-03	NCSSL	YES	DLASL
	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-1	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	9.1E+02 SAT	9.0E+03	NCSSL	NO	DLBSL
	79-00-5	1,1,2-Trichloroethane	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	1.5E-01 N	3.2E-03	NCSSL	YES	DLASL
	75-34-3	1,1-Dichloroethane	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	3.6E+00 C	3.0E-02	NCSSL	YES	DLASL
	75-35-4	1,1-Dichloroethene	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	2.3E+01 N	4.5E-02	NCSSL	NO	DLBSL
	120-82-1	1,2,4-Trichlorobenzene	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	5.8E+00 N	2.2E+00	NCSSL	NO	DLBSL
	96-12-8	1,2-Dibromo-3-chloropropane	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	5.3E-03 C	2.5E-04	NCSSL	YES	DLASL
	106-93-4	1,2-Dibromoethane	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	3.6E-02 C	9.7E-05	NCSSL	YES	DLASL
	95-50-1	1,2-Dichlorobenzene	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	1.8E+02 N	2.4E-01	NCSSL	NO	DLBSL
	107-06-2	1,2-Dichloroethane	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	4.6E-01 C	2.0E-03	NCSSL	YES	DLASL
	78-87-5	1,2-Dichloropropane	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	1.0E+00 C	3.2E-03	NCSSL	YES	DLASL
	541-73-1	1,3-Dichlorobenzene	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	2.6E+00 C	2.4E+00	NCSSL	YES	DLASL
	106-46-7	1,4-Dichlorobenzene	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	2.6E+00 C	7.0E-02	NCSSL	YES	DLASL
	78-93-3	2-Butanone	ND	ND	MG/KG		0/8	5.2 - 12	1.2E+01	N/A	2.7E+03 N	1.6E+01	NCSSL	NO	DLBSL
	591-78-6	2-Hexanone	ND	ND	MG/KG		0/8	5.2 - 12	1.2E+01	N/A	2.0E+01 N	1.7E-01	NCSSL	NO	DLBSL
	108-10-1	4-Methyl-2-pentanone	ND	ND	MG/KG		0/8	5.2 - 12	1.2E+01	N/A	5.3E+02 N	4.3E-01	NCSSL	NO	DLBSL
	67-64-1	Acetone	9.1E-03 J	1.8E-02 J	MG/KG	SWMU615-MW04-4-4_5-14B, SWMU615-SB07-3-4-14C	6/8	26 - 60	1.8E-02	N/A	6.1E+03 N	2.4E+01	NCSSL	NO	BSL
	71-43-2	Benzene	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	1.2E+00 C	7.3E-03	NCSSL	YES	DLASL
	75-27-4	Bromodichloromethane	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	2.9E-01 C	2.9E-03	NCSSL	YES	DLASL
	75-25-2	Bromoform	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	6.7E+01 C	1.9E-02	NCSSL	NO	DLBSL
	74-83-9	Bromomethane	ND	ND	MG/KG		0/8	10 - 24	2.4E+01	N/A	6.8E-01 N	4.8E-02	NCSSL	YES	DLASL
	75-15-0	Carbon disulfide	3.1E-03 J	3.1E-03 J	MG/KG	SWMU615-SB08-2-3-14C	1/8	10 - 24	3.1E-03	N/A	7.7E+01 N	3.8E+00	NCSSL	NO	BSL
	56-23-5	Carbon tetrachloride	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	6.5E-01 C	2.1E-03	NCSSL	YES	DLASL
	108-90-7	Chlorobenzene	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	2.8E+01 N	4.3E-01	NCSSL	NO	DLBSL
	75-00-3	Chloroethane	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	1.4E+03 N	1.6E+01	NCSSL	NO	DLBSL
	67-66-3	Chloroform	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	3.2E-01 C	3.4E-01	NCSSL	YES	DLASL
	74-87-3	Chloromethane	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	1.1E+01 N	1.5E-02	NCSSL	NO	DLBSL
	156-59-2	cis-1,2-Dichloroethene	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	1.6E+01 N	3.6E-01	NCSSL	NO	DLBSL
	10061-01-5	cis-1,3-Dichloropropene	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	1.8E+00 C	2.3E-03	NCSSL	YES	DLASL
	110-82-7	Cyclohexane	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	1.2E+02 SAT	N/A		NO	DLBSL
	124-48-1	Dibromochloromethane	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	7.3E-01 C	1.9E-03	NCSSL	YES	DLASL
	75-71-8	Dichlorodifluoromethane (Freon-12)	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	8.7E+00 N	2.9E+01	NCSSL	NO	DLBSL
	100-41-4	Ethylbenzene	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	5.8E+00 C	8.1E+00	NCSSL	NO	DLBSL
	98-82-8	Isopropylbenzene	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	1.9E+02 N	1.3E+00	NCSSL	NO	DLBSL
	79-20-9	Methyl acetate	ND	ND	MG/KG		0/8	10 - 24	2.4E+01	N/A	7.8E+03 N	N/A		NO	DLBSL

TABLE 6-5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN FOR SOIL

SWMU 615 RFI Report

MCB CAMLEJ

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	108-87-2	Methylcyclohexane	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	5.4E+01 N	N/A		NO	DLBSL
	75-09-2	Methylene chloride	1.1E-03 J	1.4E-03 J	MG/KG	SWMU615-SB06-2-3-14C	2/8	10 - 24	1.4E-03	N/A	3.5E+01 N	2.3E-02	NCSSL	NO	BSL
	1634-04-4	Methyl-tert-butyl ether (MTBE)	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	4.7E+01 C	8.5E-02	NCSSL	NO	DLBSL
	100-42-5	Styrene	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	6.0E+02 N	9.2E-01	NCSSL	NO	DLBSL
	127-18-4	Tetrachloroethene	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	8.1E+00 N	5.0E-03	NCSSL	NO	DLBSL
	108-88-3	Toluene	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	4.9E+02 N	5.5E+00	NCSSL	NO	DLBSL
	156-60-5	trans-1,2-Dichloroethene	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	1.6E+02 N	5.1E-01	NCSSL	NO	DLBSL
	10061-02-6	trans-1,3-Dichloropropene	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	1.8E+00 C	2.3E-03	NCSSL	YES	DLASL
	79-01-6	Trichloroethene	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	4.1E-01 N	1.8E-02	NCSSL	YES	DLASL
	75-69-4	Trichlorofluoromethane (Freon-11)	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	7.3E+01 N	2.4E+01	NCSSL	NO	DLBSL
	75-01-4	Vinyl chloride	ND	ND	MG/KG		0/8	2.1 - 4.8	4.8E+00	N/A	5.9E-02 C	1.9E-04	NCSSL	YES	DLASL
	1330-20-7	Xylene, total	ND	ND	MG/KG		0/8	4.2 - 9.5	9.5E+00	N/A	5.8E+01 N	5.8E+00	NCSSL	NO	DLBSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening. If not detected, maximum detection limit presented.

[3] Background values not available.

[4] Oak Ridge National Laboratory (ORNL). January 2015. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Residential Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). [Online]. Available: http://epa-prgs.ornl.gov/chemicals/index.shtm
RSL for 1,4-dichlorobenzene used as surrogate for 1,3-dichlorobenzene
RSL for 1,3-dichloropropene used as a surrogate for cis-1,3-dichloropropene and trans-1,3-dichloropropene.
RSL for n-hexane used as surrogate for methylcyclohexane.

[5] Rationale Codes

Selection Reason:	Above Screening Levels (ASL)
	Detection Limit Above Screening Level (DLASL), not quantitatively evaluated in HHRA
Deletion Reason:	Below Screening Level (BSL)
	Detection Limit Below Screening Level (DLBSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
C = Carcinogenic
N = Noncarcinogenic
N/A = Not available
ND = Not detected
NCSSL = North Carolina Preliminary Soil Remediation Goal, Protection of Groundwater, September 2014
SAT = RSL exceeds soil saturation concentration, therefore, soil saturation concentration used as screening level
MG/KG = Milligram per kilogram
RSL = Regional Screening Level

SECTION 7

Conclusions and Recommendations

This section presents the conclusions and recommendations based on the results of the SWMU 615 RFI.

7.1 Conclusions

VOCs previously identified in soil adjacent to the southeastern corner of Building 133 were removed. Although analytical data for the confirmatory soil samples indicated that soil exceeding the MSCC for PCE remained in place, adjacent to the building and potentially beneath the building, that could not be addressed due to concerns about building stability. The results of subsequent subslab soil gas and subslab soil indicated that PCE was not present at concentrations above the NC SSLs and there was not a significant VI pathway identified. The results of additional subsurface soil samples collected as part of the RFI indicate that VOCs are not present in subsurface soil at concentrations above regulatory criteria (**Figure 3-1** and **Table 5-1**).

Two CVOCs, PCE and TCE, are present in surficial aquifer groundwater, localized to the southeastern corner of SWMU 615, at concentrations that slightly exceeded the NCGWQS (**Figure 5-1**). CVOCs were not detected in samples collected from the deeper monitoring well installed in the UCH aquifer, below the clayey layer. The current distribution of CVOCs in groundwater at SWMU 615 appears related to IRP Site 88 dissolved-phase groundwater contaminant plume, likely following the route of the subsurface sewer system that connects the two sites. Although TCE was identified during the HHRS as a COPC in surficial aquifer groundwater, it is expected there would be no adverse human health risks due to the low detected groundwater concentrations, no exceedance of MCL, and only slight exceedance of the NCGWQS.

7.2 Recommendations

Because the CVOCs identified in the surficial aquifer groundwater at SMWU 615 are located in the vicinity of the CVOC groundwater plumes at IRP Site 88, it is recommended that the NCGWQS exceedances of PCE and TCE be addressed as part of the Feasibility Study for Site 88 that is currently being conducted.

SECTION 8

References

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Appendix A
Building 133 Additional Vapor Intrusion Investigation Technical Memorandum

Building 133 Additional Vapor Intrusion Investigation, Marine Corps Installations East – Marine Corps Base Camp Lejeune, North Carolina

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PREPARED BY: CH2M HILL

DATE: July 24, 2013

This technical memorandum documents the findings of the additional vapor intrusion (VI) investigation completed following the soil excavation and soil and groundwater sampling at Building 133. Building 133 is located in the Mainside Area of Marine Corps Installations East-Marine Corps Base Camp Lejeune (MCIEAST – MCB CAMLEJ), North Carolina (**Figure 1**).

Background

Building 133 is a one-story brick and mortar building with a concrete slab. It is approximately 110 feet long by 32 feet wide and 8 feet high. The building is divided into several office spaces and a break room. During building foundation repair activities, petroleum-impacted soil was discovered adjacent to the building. Portions of the impacted soils were removed in January 2013. However, impacted soil remains in place directly adjacent to the building and may extend beneath the building slab. These soils could not be excavated due to concerns about building stability. In addition, tetrachloroethene (PCE) was detected during confirmation sampling at a maximum concentration of 20 micrograms per kilogram (µg/kg) in the sample collected from the northern sidewall of the excavation.

A groundwater sample was collected from a temporary monitoring well in February 2013. Vinyl chloride was the only detected chlorinated solvent in this sample. Vinyl chloride was detected at 6.2 micrograms per liter [µg/L], which is above the North Carolina Groundwater Quality Standard (NCGWQS) (0.03 µg/L), and the generic cancer groundwater vapor intrusion (VI) screening level (2.6 µg/L). Due to the presence of soil and groundwater contamination adjacent to and potentially extending beneath the building, MCIEAST-MCB CAMLEJ requested that a VI evaluation be completed to evaluate the potential for VI within Building 133.

Vapor Intrusion Field Activities

Soil gas, HAPSITE, and indoor air samples were collected to evaluate the VI pathway at Building 133. The activities and findings are discussed in the following subsections.

Soil Gas

During the week of March 25, 2013 four subslab soil gas probes (SG01, SG02, SG03, and SG04) were installed in Building 133 (**Figure 2**). The locations were chosen due to their proximity to the impacted soil located along the building exterior. Third-party utility location was completed prior to installation of the probes. After installation, each of the probes was leak-tested using a water leak check and the purged air was field-screened for volatile organic compounds (VOCs), methane, lower explosive limit (LEL), and carbon monoxide. Subslab soil gas samples were collected from each location in 1.4-L SUMMA canisters equipped with 200-milliliter-per-minute (mL/min) flow controllers. The samples were analyzed for VOCs and Tentatively Identified Compounds (TICs) by USEPA Method TO-15 (**Table 1**).

The results were screened against the generic Industrial Shallow Soil Gas Screening Level (SGSLs) and Base-specific SGSLs (**Table 1**). The generic SGSLs are based on a $1x10^{-6}$ cancer risk and a non-cancer Hazard Quotient (HQ) of 1. However, noncancer SGSLs were divided by 10 (resulting in a HQ of 0.1) prior to applying the generic attenuation factor (AF) to account for potential cumulative noncancer effects. Cancer-based SGSLs were not divided by 10 for potential cumulative effects since they are based on a target risk of $1x10^{-6}$ and the U.S. Environmental Protection Agency (USEPA) (1991) cumulative target cancer risk range is from $1x10^{-6}$ to $1x10^{-4}$.

With the exception of PCE, all constituents were either detected at concentrations below the reporting limit (non-detect) or at least one order of magnitude below the corresponding SGSL. The PCE concentration (55.6 parts per billion by volume [ppbv]) exceeded the adjusted generic SGSL of 26 ppbv in the duplicate sample collected from SG01, but did not exceed the Base-specific SGSL. However, since only one VOC was detected above the screening level based on an HQ of 0.1, it is not necessary to account for cumulative noncancer risks. Thus, it is appropriate to compare the PCE detections to the cancer SGSL based on the 1×10^{-6} target risk level (70 ppbv). None of the samples contained PCE concentrations above the cancer-based SGSL. These results indicated that there was a low potential for VI in the area sampled. However, the highest PCE concentration was detected at SG01, the northernmost location, indicating that the subslab PCE concentrations were not fully delineated. Therefore, further sampling was recommended to delineate the PCE impacts beneath the building slab.

HAPSITE

During the week of April 8, 2013, a HAPSITE portable gas chromatograph/mass spectrophotometer (GC/MS) was used to complete an expanded subslab soil gas survey (**Attachment A**). Three additional subslab soil gas probes (SG05, SG06, and SG07) were installed to delineate PCE soil gas concentrations (**Figure 2**). After installation, the probes were allowed to equilibrate for 30 minutes and were leak-tested using a water leak check. A small sample volume was then collected from each probe using a syringe for analysis by the HAPSITE. The results from the HAPSITE screening (**Table 2**) were then compared to the analytical results from the four initial subslab samples. A sample was then collected for analysis by an off-site laboratory from the location with the highest PCE concentration (SG06) exceeded.

Two additional step-out subslab soil gas probes (SG08 and SG09) were installed to further delineate PCE in subslab soil gas (**Figure 2**). Subslab soil gas samples were collected from each location for HAPSITE analysis. The PCE concentration in each of these samples was lower than in the sample collected from SG06, indicating that the subslab impacts were delineated and that the highest concentrations were located near SG06.

An indoor air sample was collected with the HAPSITE to measure the PCE concentration in the indoor air near SG06. The PCE concentration in this sample did not exceed the generic Industrial Indoor Air Screening Level (IASL).

Indoor Air

To confirm the results of the HAPSITE, an indoor air sample was collected for analysis by an offsite laboratory. Indoor air sample IR88-BLDG133-IA01 was collected in a 6-L SUMMA canister equipped with a flow controller for a total sample collection duration of approximately 24 hours and was analyzed for VOCs + TICs by USEPA Method TO-15 Scan Low-Level; results are presented in **Table 3**. Complete analytical results are presented in **Attachment B**.

PCE was detected in IA01 at a concentration of 0.07J ppbv, roughly 37 time below the IASL of 2.6 ppbv (HQ=0.1) and 370 times lower than the IASL based on an HQ of 1. As with the soil gas results discussed above, an HQ of 1 is appropriate because cumulative noncancer risks were not in issue.

Conclusions and Recommendations

Although chloroform was detected in indoor air slightly above the IASL, the chloroform concentrations are generally a result of the addition of chlorine to the public water supply. Additionally, chloroform was not detected in the subslab soil gas samples above the SGSL, indicating that the indoor air detection is not likely the result of VI. These results indicate that the VI pathway is not currently significant and is unlikely to become significant even if

the indoor air concentration were to vary by an order of magnitude. Therefore, no further VI evaluation is recommended for Building 133.

Tables

Figures

Attachments

Tables

TABLE 1
Summary of Subslab Soil Gas Analytical Results
Building 133
MCIEAST-MCB CAMLEJ, North Carolina

Sample ID	Industrial Shallow Soil Gas VISL Noncancer (HQ=0.1)	Base-Specific Industrial Shallow Soil Gas VISL Noncancer (HQ=0.1)	Industrial Shallow Soil Gas VISL Cancer (TCR=10^{-6})	Base-Specific Industrial Shallow Soil Gas VISL Cancer (TCR=10^{-6})	IR88-BLDG133-SG01-13A	IR88-BLDG133-SG01D-13A	IR88-BLDG133-SG02-13A	IR88-BLDG133-SG03-13A	IR88-BLDG133-SG04-13A	BLDG133-SG06-13B	BLDG133-SG06D-13B
Sample Date					3/26/13	3/26/13	3/26/13	3/26/13	3/26/13	4/9/13	4/9/13
Chemical Name											
Volatile Organic Compounds (PPBV)											
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	17,146	1,714,600	--	--	0.05 U	0.05 J	0.06 J	0.06 J	0.05 J	0.06 J	0.06 J
1,1,2-Trichloroethane	0.16	16	1.4	140	0.1 U	0.1 UJ	0.1 UJ	0.1 U	0.1 U	0.14 J	0.25 U
1,2,4-Trimethylbenzene	6.2	620	--	--	0.26	0.36 J	0.32 J	0.26	0.52 J	0.77	0.77
1,3,5-Trimethylbenzene	6.2	620	--	--	0.1 U	0.1 UJ	0.1 UJ	0.1 U	0.12 J	0.36 J	0.32 J
2-Butanone	7426	742,600	--	--	3.6	1.9 J	1 J	1.1	0.88	2.4	2
2-Propanol	12616	1,261,600	--	--	4.2	2.5	2.2	5.1	0.1 U	25.7	17
4-Ethyltoluene	--	--	--	--	0.1 U	0.1 UJ	0.1 UJ	0.1 U	0.1 UJ	0.25 U	0.18 J
4-Methyl-2-pentanone	7400	740,000	--	--	0.05 U	0.05 UJ	0.05 UJ	0.05 U	0.05 U	0.22 J	0.28 J
Acetone	57,159	5,715,900	--	--	11.7	18.2	8.3	28.2	12.3	79.4	55.2
Benzene	41	4,100	4.9	490	0.24	0.27 J	0.42 J	0.58	0.32	0.55	0.78
Carbon tetrachloride	70	7,000	3.2	320	0.08	0.1 J	0.11 J	0.06	0.06	0.15 J	0.11 J
Chloroform	88	8,800	1.1	110	0.07 J	0.17	0.05 U	0.09 J	0.14	0.19 J	0.14 J
Chloromethane	--	--	--	--	0.29	0.1 U	0.1 U	0.1 U	0.1 U	0.25 U	0.19 J
Cyclohexane	7635	763,500	--	--	0.1 U	0.1 U	0.36	0.1 U	0.1 U	0.25 U	0.25 U
Dichlorodifluoromethane (Freon-12)	89	8,900	--	--	0.23	0.18	0.2	0.2	0.21	0.11 J	0.15 J
Ethyl acetate	--	--	--	--	0.64	0.79	1.1	0.74	1.1	1.6	2
Ethylbenzene	1000	100,000	11	1100	0.12	0.12 J	0.1 UJ	0.1 U	0.1 UJ	0.13 J	0.51
Heptane	--	--	--	--	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.14 J	0.26 J
m- and p-Xylene	101	10,100	--	--	0.41	0.49 J	0.32 J	0.21	0.2 UJ	0.32 J	1.2
Methylene chloride	757	75,700	3531	353100	0.53	0.66	0.52	0.93	0.85	0.94	1.1
Naphthalene	2.5	250	0.69	69	0.05 U	0.05 UJ	0.05 UJ	0.05 U	0.05 UJ	0.17 J	0.21 J
o-Xylene	101	10,100	--	--	0.18	0.23 J	0.17 J	0.1	0.1 UJ	0.15 J	0.44 J
Styrene	1028	102,800	--	--	0.3	0.38 J	0.18 J	0.11	0.13 J	0.23 J	1.3
Tetrachloroethene	26	2,600	70	7000	14.4 J	**55.6 J**	18.8	22.7	10.3	**68**	**45.6**
Tetrahydrofuran	--	--	--	--	2.8	0.93	0.58	0.32	0.21	2.1	1.7
Toluene	5811	581,100	--	--	1.6	1.1 J	1.4 J	0.7	0.43	0.91	2.7
Trichloroethene	1.6	160	5.6	560	0.02 U	0.02 UJ	0.02 UJ	0.02 U	0.07	0.29 J	0.21 J
Trichlorofluoromethane (Freon-11)	546	54,600	--	--	0.19	0.21	0.19	0.2	0.2	0.22 J	0.22 J

Notes:

HQ - Hazard quotient

J - Analyte present, estimated value

PPBV - Parts per billion volume

TCR - Total Cancer Risk

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

VISL - Vapor intrusion screening level

Bold text indicates the concentration exceeds the generic industrial shallow soil gas non-cancer screening level

TABLE 2
HAPSITE Portable GC/MS Investigation Data
Building 133
MCIEAST-MCB CAMLEJ, North Carolina

	Sample ID	**BLDG133_HPIA1**		Sample ID	**BLDG133_HPSG05**		Sample ID	**BLDG133_HPSG06**		Sample ID	**BLDG133_HPSG07**		Sample ID	**BLDG133-HPSG08**		Sample ID	**BLDG133-HPSG09**	
	Date	4/8/2013			4/8/2013			4/8/2013			4/8/2013			4/10/2013			4/10/2013	
	DF	1		DF	5		DF	20		DF	20		DF	20		DF	20	
Compound	RL	Result (ppbv)	Q	RL	Result (ppbv)	Q	RL	Result (ppbv)	Q	RL	Result (ppbv)		RL	Result (ppbv)	Q	RL	Result (ppbv)	Q
Chloroform	0.10	0.10	U	0.50	**3.0**		2.0	**2.8**		2.0	2.0		2.0	2.0	U	2.0	2.0	U
Trichloroethylene	0.10	0.10	U	0.50	0.50	U	2.0	2.0	U	2.0	2.0		2.0	2.0	U	2.0	2.0	U
Tetrachloroethylene	0.10	0.10	U	0.50	**73.3**		2.0	**204**		2.0	**50.1**		2.0	**88.2**		2.0	**36.6**	

Notes:
DF - Dilution factor
E - Exceeds upper limit of calibration
PPBV - Parts per billion volume
RL - Reporting limit
U - Not detected above RL
BOLD indicates detection

TABLE 3
Summary of Indoor Air Analytical Results
Building 133
MCIEAST-MCB CAMLEJ, North Carolina

Sample ID	Industrial Indoor Air Noncancer (HQ=0.1)	Industrial Indoor Air VISL Cancer (TCR=10^{-6})	BLDG133-IA01-13B
Sample Date			**4/11/13**
Chemical Name			
Volatile Organic Compounds (PPBV)			
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	1715	--	0.06 J
1,1,2-Trichloroethane	0.02	0.14	0.25 U
1,2,4-Trimethylbenzene	0.62	--	0.25 UJ
1,3,5-Trimethylbenzene	0.62	--	0.25 UJ
2-Butanone	743	--	2.7
2-Propanol	1262	--	2.6
4-Ethyltoluene	--	--	0.25 UJ
4-Methyl-2-pentanone	740	--	0.25 U
Acetone	5,716	--	6.5
Benzene	4.1	0.49	0.11 J
Carbon tetrachloride	7	0.32	0.06 J
Chloroform	8.8	0.11	0.14 J
Chloromethane	--	--	0.38 J
Cyclohexane	764	--	0.25 U
Dichlorodifluoromethane (Freon-12)	8.9	--	0.27 J
Ethyl acetate	--	--	1.6
Ethylbenzene	100	1.1	0.14 J
Heptane	--	--	0.25 U
m- and p-Xylene	10	--	0.64 J
Methylene chloride	76	353	1.2
Naphthalene	0.25	0.069	0.25 UJ
o-Xylene	10	--	0.24 J
Styrene	103	--	0.25 UJ
Tetrachloroethene	2.6	7	0.07 J
Tetrahydrofuran	--	--	2.4
Toluene	581	--	4.6
Trichloroethene	0.16	0.56	0.25 U
Trichlorofluoromethane (Freon-11)	55	--	0.22 J

Notes:

HQ - Hazard quotient

J - Analyte present, estimated value

PPBV - Parts per billion volume

TCR - Total Cancer Risk

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

VISL - Vapor intrusion screening level

Bold box indicates concentration exceeds the generic industrial indoor air cancer screening level

Figures

R:\USNavFacEngCom405450\MCBCampLejeune\MapFiles\Building_133\437451_TM\Figure_1_Bldg_133_Site_Map.mxd6/28/2013martese

Legend

- Building 133 sidewalk
- Building 133
- Installation Boundary

N

0 37.5 75

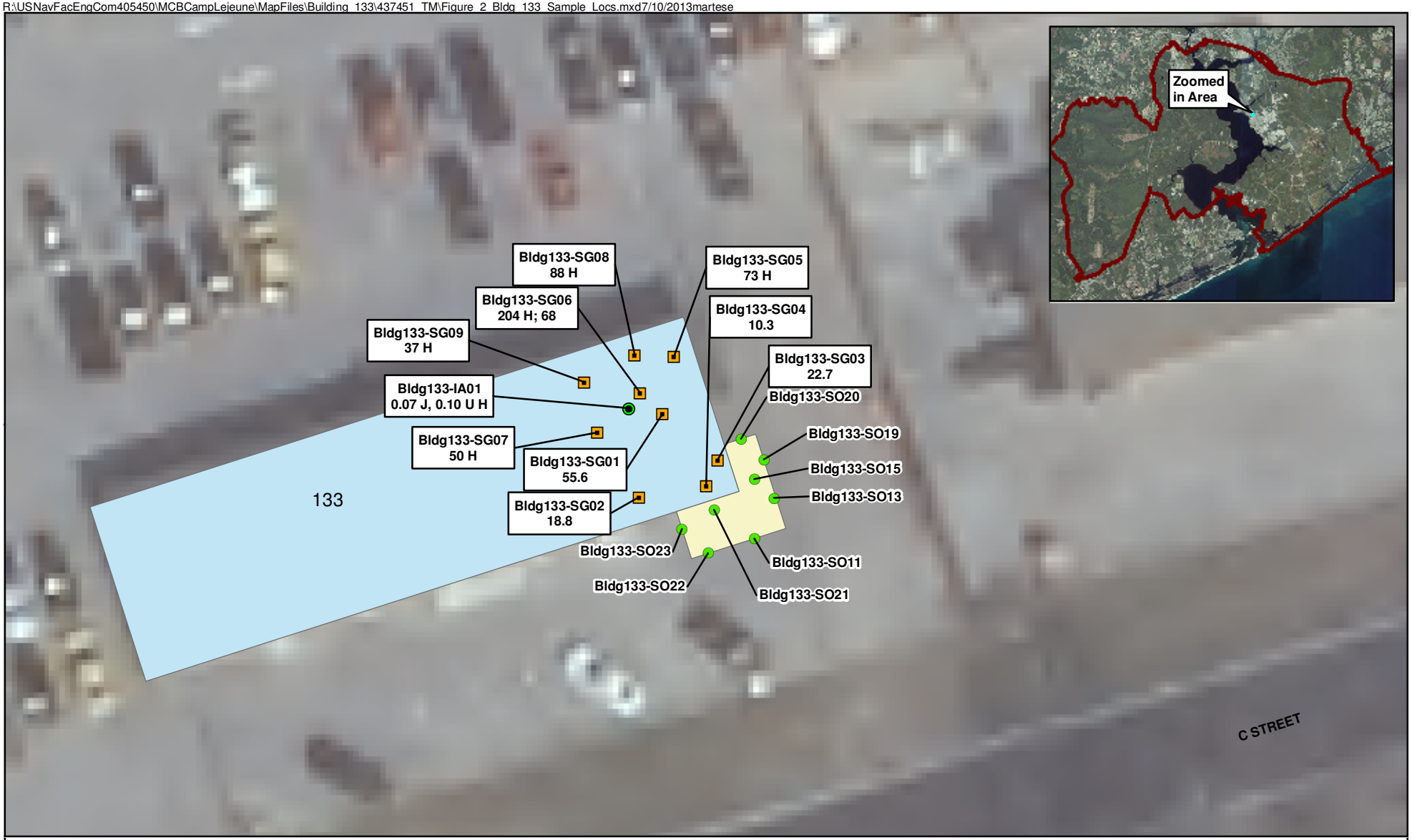
Feet

1 inch = 75 feet

Figure 1
Building 133 Site Map
Building 133 Tech Memo
MCIEAST-MCB CAMLEJ
North Carolina

CH2MHILL

R:\USNavFacEngCom405450\MCBCampLejeune\MapFiles\Building_133\437451_TM\Figure_2_Bldg_133_Sample_Locs.mxd7/10/2013martese



Legend

- Indoor Air Sample Locations
- Soil Sample Locations
- Soil Gas Sample Locations
- Building 133 sidewalk
- Building 133
- Installation Boundary

Note:
H indicates concentration detected by HAPSITE.
Highest concentration between the parent and the duplicate sample are displayed.
All concentrations are reported in ppbv.

N

0 12.5 25 Feet

1 inch = 25 feet

Figure 2
Building 133 Sample Locations
Building 133 Tech Memo
MCIEAST-MCB CAMLEJ
North Carolina

CH2MHILL

Attachment A – HAPSITE Report

FULL SCAN Calibration Response Table
HAPSITE method: /Haps/Method/CH2Mhill 5m Carbon Conc 1.mth
Method Description:
General purpose Air analysis for VOCs

Tune File: default.tun
Target Library: CH2MhillCampLJ
Last Modified: 4/8/2013 11:25:15 AM

W = RT +- (0:30.00 / 2 + RT * 0.050)
Min Fit = 0.050; Min Pur = 0.010; Min Area = 5
Width = 7 - 70 scans; Res = 5 scans; NLM = 2.000

Average Response Factor

Internal Standards

I.S. #1 -- BPFB HAPSITE IS #2
Concentration = 4.81 3 Calibration Points

pt.	File	Area	Resp.Factor
1	_20130408_005	7944128	1651586
2	_20130408_004	7235864	1504338
3	_20130408_003	7027750	1461071

Average RF = 1.38E+06 RSD of RF = 6.49%

Analyte. #11 -- chloroform
3 Calibration Points
Average Response Factor
Concentration = (0.0000e+000)(AREA**2)+(9.6908e-001)(AREA)+0.0000e+000

pt.	File	Conc.	Cratio	Area	Aratio	Resp. Factor
1	_20130408_005	5	1.04E+00	7087199	8.92E-01	8.58E-01
2	_20130408_004	1	2.08E-01	1571776	2.17E-01	1.04E+00
3	_20130408_003	0.1	2.08E-02	174258	2.48E-02	1.19E+00

Average RF = 1.03E+00 RSD of Ave 16.24%
RSD of Curve Fit = 33.78%

Analyte. #12 -- TRIS HAPSITE IS #1
3 Calibration Points
Average Response Factor
Concentration = (0.0000e+000)(AREA**2)+(3.2801e-001)(AREA)+0.0000e+000

pt.	File	Conc.	Cratio	Area	Aratio	Resp. Factor
1	_20130408_005	5	1.04E+00	1270279	1.60E-01	1.54E-01
2	_20130408_004	1	2.08E-01	1246933	1.72E-01	8.29E-01
3	_20130408_003	0.1	2.08E-02	1192716	1.70E-01	8.16E+00

Average RF = 3.05E+00 RSD of Ave 145.71%
RSD of Curve Fit = 1287.40%

Analyte. #18 -- Trichloroethylene
3 Calibration Points
Average Response Factor
Concentration = (0.0000e+000)(AREA**2)+(1.8956e+000)(AREA)+0.0000e+000

pt.	File	Conc.	Cratio	Area	Aratio	Resp. Factor
1	_20130408_005	5	1.04E+00	4200903	5.29E-01	5.09E-01
2	_20130408_004	1	2.08E-01	815919	1.13E-01	5.42E-01
3	_20130408_003	0.1	2.08E-02	77655	1.11E-02	5.31E-01

Average RF = 5.28E-01 RSD of Ave 3.26%
RSD of Curve Fit = 6.44%

Analyte. #22 -- Tetrachloroethylene
3 Calibration Points
Average Response Factor
Concentration = (0.0000e+000)(AREA**2)+(1.5253e+000)(AREA)+0.0000e+000

pt.	File	Conc.	Cratio	Area	Aratio	Resp. Factor
1	_20130408_005	5	1.04E+00	5491046	6.91E-01	6.65E-01
2	_20130408_004	1	2.08E-01	1026606	1.42E-01	6.82E-01
3	_20130408_003	0.1	2.08E-02	90500	1.29E-02	6.19E-01

Average RF = 6.56E-01 RSD of Ave 4.96%
RSD of Curve Fit = 2.82%

Camp Lejuene
Hapsite GC/MS Sample Locations

04/08/13 MBOS Hapsite = SmartPlus

File ID	Location ID[1]	Matrix[2]	Description
001	XB1-0408	QC	N2 Blank
002	XB2-0408	QC	N2 Blank
003	Level_1	QC	ICAL 0.1 ppbv
004	Level_2	QC	ICAL 1.0 ppbv
005	Level_3	QC	ICAL 5.0 ppbv
001	ICV10408	QC	Calibration Verification
002	ICV20408	QC	Calibration Verification
003	BLDG133-HPIA1	IA	Breakroom
004	BLDG133-SG05	SG	No location noted
005	BLDG133-SG06	SG	No location noted
006	BLDG133-SG07	SG	No location noted
007	XB3-0408	QC	N2 Blank
008	CV1_0408	QC	Calibration Verification

04/10/13 MBOS Hapsite = Smart

File ID	Location ID[1]	Matrix[2]	Description
001	XB1-0410	QC	N2 Blank
002	XB2-0410	QC	N2 Blank
003	CV1-0410	QC	Calibration Verification
004	BLDG133-HPSG08	SG	Room 112, Head
005	BLDG133-HPSG09	SG	Room 109, Instructor

1 = Hapsite (HS) Sampling Point
2 = Quality Control (QC); Indoor Air (IA)

Unknown Identification Report
Date: 04/09/13 Time: 08:13:53
Calibration Method:
/Haps/Method/CH2Mhill 5m Carbon Conc 1.mth
Tune File:
default.tun
Method Description:
General purpose Air analysis for VOCs

Data File: /Data/CH2MHILL/CH2Mhill CampLJ_040813/_20130408_003.hps on 10.210.0.8
GPS Info:
Latitude: N 34 Deg 40.27794 Min Longitude: W 77 Deg 21.12122 Min GMT: 04/08/13 07:01:17 PM

Acquisition Date and Time: 4/8/2013 4:00:41 PM
Acquisition Method: /Haps/Method/CH2MHILL/CH2Mhill CampLJ_040813.mth
Target Library: CH2MhillCampLJ
Last Calibrated: 4/9/2013 6:02:06 AM

Peak Search Parameters:
Search Window: 0:30.00
Window Expand Factor: 0.050
Peak Resolution: 5
Noise Level Multiplier: 2.000
Minimum Area: 5
Minimum Width: 7
Maximum Width: 70
Minimum Fit: 0.050
Minimum Purity: 0.010

Q-Ion	Pred.RT	Int.Std.Name	Act.RT	fit	purity	area	ppb	RFC	Flag
117	08:00.5	BPFB HAPSITE IS #2	07:55.0	0.989	0.684	9479575	4.81	42.97	

Q-Ion	Pred.RT	Analyte Name	Act.RT	fit	purity	area	ppb	Flag
62	01:28.5	Vinyl chloride	N/A	0	0	0		Not found with current search parameters
84	01:52.7	Methylene Chloride	01:52.7	0.842	0.647	209804	0.125	
101	01:54.2	1,1,2-trichloro-1,2,2-trifluoroethane	01:52.7	0.993	0.072	23646	0.064	
61	01:54.5	Ethene, 1,1-dichloro-	01:56.0	0.527	0.086	16084	0.022	
76	01:58.3	Carbon Disulfide	01:57.6	0.99	0.309	138590	0.020	
61	02:05.5	trans-1,2-dichlorethene	02:08.5	0.84	0.013	5584	0.004	
73	02:08.3	MtBE	02:10.1	0.624	0.143	37150	0.035	
63	02:09.5	1,1-dichloroethane	02:26.8	0.783	0.056	4421	0.003	
57	02:20.4	Hexane	02:19.3	0.908	0.233	56815	0.038	
61	02:21.5	cis-1,2-dichloroethene	02:18.4	0.382	0.114	54665	0.035	
83	02:25.5	chloroform	02:21.7	0.996	0.406	128062	0.063	
213	02:36.2	TRIS HAPSITE IS #1	02:31.8	0.991	0.784	1499231	0.918	
62	02:41.3	Ethane, 1,2-dichloro-	02:36.9	0.837	0.526	87687	0.045	
97	02:47.3	Ethane, 1,1,1-trichloro-	02:42.7	0.502	0.08	10021	0.008	
78	02:59.1	Benzene	02:54.3	0.957	0.734	267931	0.081	
56	03:02.0	Cyclohexane	03:05.9	0.324	0.016	39577	0.023	
117	03:02.5	Carbon Tetrachloride	02:57.6	0.99	0.518	77308	0.085	
130	03:30.1	Trichloroethylene	03:26.0	0.586	0.224	6460	0.006	
71	03:40.0	Heptane	03:46.8	0.61	0.132	7967	0.005	
97	04:43.1	Ethane, 1,1,2-trichloro-	04:16.8	0.395	0.085	2934	0.002	
91	05:01.7	Toluene	04:52.6	0.991	0.925	1035816	0.108	
166	06:32.5	Tetrachloroethylene	06:30.0	0.133	0.029	6385	0.005	
91	08:16.2	Ethylbenzene	08:23.3	0.977	0.527	872300	0.044	
91	08:30.8	m,p-Xylene	08:23.3	0.99	0.534	872300	0.037	
104	08:57.0	Styrene	08:50.1	0.972	0.78	150914	0.023	
91	09:03.7	o-Xylene	08:57.6	0.898	0.379	411813	0.039	
105	10:18.3	1,3,5-trimethylbenzene	10:19.3	0.871	0.304	368930	0.059	
105	10:27.2	1,2,4-trimethybenzene	10:35.1	0.918	0.218	140330	0.016	
128	13:21.6	Naphthalene	13:15.5	0.4	0.124	6626	0.004	

Target Library: CH2MhillCampLJ_040813
Last Calibrated: 4/8/2013 11:28:27 AM

Peak Search Parameters:
Search Window: 0:30.00
Window Expand Factor: 0.050
Peak Resolution: 5
Noise Level Multiplier: 2.000
Minimum Area: 5
Minimum Width: 7
Maximum Width: 70

Minimum Fit: 0.050
Minimum Purity: 0.010

Q-Ion	Pred.RT	Int.Std.Name	Act.RT	fit	purity	area	ppb	RFC	Flag
117	08:00.5	BPFB HAPSITE IS #2	07:55.0	0.989	0.684	9479575	4.81	42.97	

Q-Ion	Pred.RT	Analyte Name	Act.RT	fit	purity	area	ppb	Flag
62	01:28.5	Vinyl chloride	N/A	0	0	0		Not found with current search parameters
84	01:52.7	Methylene Chloride	01:52.7	0.842	0.647	209804	0.1247	
101	01:54.2	1,1,2-trichloro-1,2,2-trifluoroethane	01:52.7	0.993	0.072	23646	0.06447	
61	01:54.5	Ethene, 1,1-dichloro-	01:56.0	0.527	0.086	16084	0.02248	
76	01:58.3	Carbon Disulfide	01:57.6	0.99	0.309	138590	0.01953	
61	02:05.5	trans-1,2-dichlorethene	02:08.5	0.84	0.013	5584	0.0042	
73	02:08.3	MtBE	02:10.1	0.624	0.143	37150	0.03505	
63	02:09.5	1,1-dichloroethane	02:26.8	0.783	0.056	4421	0.00291	
57	02:20.4	Hexane	02:19.3	0.908	0.233	56815	0.03812	
61	02:21.5	cis-1,2-dichloroethene	02:18.4	0.382	0.114	54665	0.0345	
83	02:25.5	chloroform	02:21.7	0.996	0.406	128062	0.06297	
213	02:36.2	TRIS HAPSITE IS #1	02:31.8	0.991	0.784	1499231	0.9178	
62	02:41.3	Ethane, 1,2-dichloro-	02:36.9	0.837	0.526	87687	0.04451	
97	02:47.3	Ethane, 1,1,1-trichloro-	02:42.7	0.502	0.08	10021	0.00791	
78	02:59.1	Benzene	02:54.3	0.957	0.734	267931	0.08073	
56	03:02.0	Cyclohexane	03:05.9	0.324	0.016	39577	0.02329	
117	03:02.5	Carbon Tetrachloride	02:57.6	0.99	0.518	77308	0.08485	
130	03:30.1	Trichloroethylene	03:26.0	0.586	0.224	6460	0.00621	
71	03:40.0	Heptane	03:46.8	0.61	0.132	7967	0.00537	
97	04:43.1	Ethane, 1,1,2-trichloro-	04:16.8	0.395	0.085	2934	0.00191	
91	05:01.7	Toluene	04:52.6	0.991	0.925	1035816	0.1076	
166	06:32.5	Tetrachloroethylene	06:30.0	0.133	0.029	6385	0.00494	
91	08:16.2	Ethylbenzene	08:23.3	0.977	0.527	872300	0.04377	
91	08:30.8	m,p-Xylene	08:23.3	0.99	0.534	872300	0.03656	
104	08:57.0	Styrene	08:50.1	0.972	0.78	150914	0.02287	
91	09:03.7	o-Xylene	08:57.6	0.898	0.379	411813	0.03875	
105	10:18.3	1,3,5-trimethylbenzene	10:19.3	0.871	0.304	368930	0.05938	
105	10:27.2	1,2,4-trimethybenzene	10:35.1	0.918	0.218	140330	0.01555	
128	13:21.6	Naphthalene	13:15.5	0.4	0.124	6626	0.00397	

Unknown Identification Report
Date: 04/09/13 Time: 08:28:40
Calibration Method:
/Haps/Method/CH2Mhill 5m Carbon Conc 1.mth
Tune File:
default.tun
Method Description:
General purpose Air analysis for VOCs

Data File: /Data/CH2MHILL/CH2Mhill CampLJ_040813/_20130408_004.hps on 10.210.0.8
GPS Info:
Latitude: N 34 Deg 40.27908 Min Longitude: W 77 Deg 21.12076 Min GMT: 04/08/13 07:27:23 PM

Acquisition Date and Time: 4/8/2013 4:26:48 PM
Acquisition Method: /Haps/Method/CH2MHILL/CH2Mhill CampLJ_040813.mth
Target Library: CH2MhillCampLJ
Last Calibrated: 4/9/2013 6:02:06 AM

Peak Search Parameters:
Search Window: 0:30.00
Window Expand Factor: 0.050
Peak Resolution: 5
Noise Level Multiplier: 2.000
Minimum Area: 5
Minimum Width: 7
Maximum Width: 70
Minimum Fit: 0.050
Minimum Purity: 0.010

Q-Ion	Pred.RT	Int.Std.Name	Act.RT	fit	purity	area	ppb	RFC	Flag
117	08:00.5	BPFB HAPSITE IS #2	07:53.4	0.996	0.675	6093594	4.81	-8.1	

Q-Ion	Pred.RT	Analyte Name	Act.RT	fit	purity	area	ppb	DF
62	01:28.5	Vinyl chloride	01:23.3	0.503	0.043	5302	0.02	0.11
84	01:52.7	Methylene Chloride	01:49.9	0.822	0.349	100480	0.09	0.46
101	01:54.2	1,1,2-trichloro-1,2,2-trifluoroethane	01:51.6	0.795	0.076	2409	0.01	0.05
61	01:54.5	Ethene, 1,1-dichloro-	01:48.2	0.191	0.075	14405	0.03	0.16
76	01:58.3	Carbon Disulfide	01:54.9	0.997	0.66	295247	0.06	0.32
61	02:05.5	trans-1,2-dichlorethene	01:48.2	0.337	0.069	14405	0.02	0.08
73	02:08.3	MtBE	02:07.5	0.707	0.061	13752	0.02	0.10
63	02:09.5	1,1-dichloroethane	01:59.9	0.532	0.014	10611	0.01	0.05
57	02:20.4	Hexane	02:17.5	0.66	0.438	38584	0.04	0.20
61	02:21.5	cis-1,2-dichloroethene	02:39.1	0.901	0.083	3921	0.00	0.02
83	02:25.5	chloroform	02:20.0	0.998	0.848	776770	0.59	2.97
213	02:36.2	TRIS HAPSITE IS #1	02:30.0	0.993	0.862	1053652	1.00	5.02
62	02:41.3	Ethane, 1,2-dichloro-	02:29.1	0.354	0.014	28887	0.02	0.11
97	02:47.3	Ethane, 1,1,1-trichloro-	N/A	0	0	0		
78	02:59.1	Benzene	02:50.8	0.948	0.729	220241	0.10	0.52
56	03:02.0	Cyclohexane	03:09.1	0.854	0.19	54565	0.05	0.25
117	03:02.5	Carbon Tetrachloride	02:55.9	0.856	0.123	7177	0.01	0.06
130	03:30.1	Trichloroethylene	N/A	0	0	0		
71	03:40.0	Heptane	03:39.2	0.415	0.116	4170	0.00	0.02
97	04:43.1	Ethane, 1,1,2-trichloro-	04:54.9	0.385	0.304	62218	0.06	0.31
91	05:01.7	Toluene	05:04.9	0.273	0.057	2952	0.00	0.00
166	06:32.5	Tetrachloroethylene	06:19.3	0.993	0.959	12166490	14.65	73.25
91	08:16.2	Ethylbenzene	08:21.7	0.948	0.678	242776	0.02	0.09
91	08:30.8	m,p-Xylene	08:40.0	0.576	0.064	4058	0.00	0.00
104	08:57.0	Styrene	08:58.3	0.324	0.049	4706	0.00	0.01
91	09:03.7	o-Xylene	08:56.6	0.918	0.475	89133	0.01	0.07
105	10:18.3	1,3,5-trimethylbenzene	10:17.6	0.98	0.437	103487	0.03	0.13
105	10:27.2	1,2,4-trimethybenzene	10:24.2	0.994	0.043	69624	0.01	0.06
128	13:21.6	Naphthalene	13:17.8	0.55	0.149	101574	0.09	0.47

Target Library: CH2MhillCampLJ_040813
Last Calibrated: 4/8/2013 11:28:27 AM

Peak Search Parameters:
Search Window: 0:30.00
Window Expand Factor: 0.050
Peak Resolution: 5
Noise Level Multiplier: 2.000
Minimum Area: 5
Minimum Width: 7
Maximum Width: 70

Minimum Fit: 0.050
Minimum Purity: 0.010

Q-Ion	Pred.RT	Int.Std.Name	Act.RT	fit	purity	area	ppb	RFC	Flag
117	08:00.5	BPFB HAPSITE IS #2	07:53.4	0.996	0.675	6093594	4.81	-8.1	

Q-Ion	Pred.RT	Analyte Name	Act.RT	fit	purity	area	ppb	Flag
62	01:28.5	Vinyl chloride	01:23.3	0.503	0.043	5302	0.02161	
84	01:52.7	Methylene Chloride	01:49.9	0.822	0.349	100480	0.09288	
101	01:54.2	1,1,2-trichloro-1,2,2-trifluoroethane	01:51.6	0.795	0.076	2409	0.01022	
61	01:54.5	Ethene, 1,1-dichloro-	01:48.2	0.191	0.075	14405	0.03132	
76	01:58.3	Carbon Disulfide	01:54.9	0.997	0.66	295247	0.06474	
61	02:05.5	trans-1,2-dichlorethene	01:48.2	0.337	0.069	14405	0.01688	
73	02:08.3	MtBE	02:07.5	0.707	0.061	13752	0.02018	
63	02:09.5	1,1-dichloroethane	01:59.9	0.532	0.014	10611	0.01085	
57	02:20.4	Hexane	02:17.5	0.66	0.438	38584	0.04028	
61	02:21.5	cis-1,2-dichloroethene	02:39.1	0.901	0.083	3921	0.00385	
83	02:25.5	chloroform	02:20.0	0.998	0.848	776770	0.5942	
213	02:36.2	TRIS HAPSITE IS #1	02:30.0	0.993	0.862	1053652	1.003	
62	02:41.3	Ethane, 1,2-dichloro-	02:29.1	0.354	0.014	28887	0.02281	
97	02:47.3	Ethane, 1,1,1-trichloro-	N/A	0	0	0		Not found with current search parameters
78	02:59.1	Benzene	02:50.8	0.948	0.729	220241	0.1032	
56	03:02.0	Cyclohexane	03:09.1	0.854	0.19	54565	0.04996	
117	03:02.5	Carbon Tetrachloride	02:55.9	0.856	0.123	7177	0.01225	
130	03:30.1	Trichloroethylene	N/A	0	0	0		Not found with current search parameters
71	03:40.0	Heptane	03:39.2	0.415	0.116	4170	0.00437	
97	04:43.1	Ethane, 1,1,2-trichloro-	04:54.9	0.385	0.304	62218	0.06296	
91	05:01.7	Toluene	05:04.9	0.273	0.057	2952	0.00048	
166	06:32.5	Tetrachloroethylene	06:19.3	0.993	0.959	12166490	14.65	
91	08:16.2	Ethylbenzene	08:21.7	0.948	0.678	242776	0.01895	
91	08:30.8	m,p-Xylene	08:40.0	0.576	0.064	4058	0.00026	
104	08:57.0	Styrene	08:58.3	0.324	0.049	4706	0.00111	
91	09:03.7	o-Xylene	08:56.6	0.918	0.475	89133	0.01305	
105	10:18.3	1,3,5-trimethylbenzene	10:17.6	0.98	0.437	103487	0.02591	
105	10:27.2	1,2,4-trimethybenzene	10:24.2	0.994	0.043	69624	0.012	
128	13:21.6	Naphthalene	13:17.8	0.55	0.149	101574	0.09475	

Unknown Identification Report
Date: 04/09/13 Time: 08:35:25
Calibration Method:
/Haps/Method/CH2Mhill 5m Carbon Conc 1.mth
Tune File:
default.tun
Method Description:
General purpose Air analysis for VOCs

Data File: /Data/CH2MHILL/CH2Mhill CampLJ_040813/_20130408_005.hps on 10.210.0.8
GPS Info:
Latitude: N 34 Deg 40.27977 Min Longitude: W 77 Deg 21.12442 Min GMT: 04/08/13 07:53:53 PM

Acquisition Date and Time: 4/8/2013 4:53:17 PM
Acquisition Method: /Haps/Method/CH2MHILL/CH2Mhill CampLJ_040813.mth
Target Library: CH2MhillCampLJ
Last Calibrated: 4/9/2013 6:02:06 AM

Peak Search Parameters:
Search Window: 0:30.00
Window Expand Factor: 0.050
Peak Resolution: 5
Noise Level Multiplier: 2.000
Minimum Area: 5
Minimum Width: 7
Maximum Width: 70
Minimum Fit: 0.050
Minimum Purity: 0.010

Q-Ion	Pred.RT	Int.Std.Name	Act.RT	fit	purity	area	ppb	RFC	Flag
117	08:00.5	BPFB HAPSITE IS #2	07:52.5	0.998	0.72	5252700	4.81	-20.78	

Q-Ion	Pred.RT	Analyte Name	Act.RT	fit	purity	area	ppb	DF
62	01:28.5	Vinyl chloride	01:35.8	0.616	0.063	4741	0.02242	0.45
84	01:52.7	Methylene Chloride	01:49.8	0.87	0.209	29970	0.03214	0.64
101	01:54.2	1,1,2-trichloro-1,2,2-trifluoroethane	01:50.7	0.779	0.01	1152	0.00567	0.11
61	01:54.5	Ethene, 1,1-dichloro-	01:48.2	0.07	0.021	3826	0.00965	0.19
76	01:58.3	Carbon Disulfide	01:54.8	0.999	0.141	17500	0.00445	0.09
61	02:05.5	trans-1,2-dichlorethene	01:48.2	0.224	0.018	3826	0.0052	0.10
73	02:08.3	MtBE	01:58.1	0.984	0.049	6996	0.01191	0.24
63	02:09.5	1,1-dichloroethane	02:04.8	0.849	0.034	5275	0.00626	0.13
57	02:20.4	Hexane	02:29.8	0.74	0.015	35909	0.04349	0.87
61	02:21.5	cis-1,2-dichloroethene	02:29.0	0.497	0.007	19335		
83	02:25.5	chloroform	02:20.6	0.996	0.757	159101	0.1412	2.82
213	02:36.2	TRIS HAPSITE IS #1	02:29.8	0.995	0.863	943479	1.042	20.84
62	02:41.3	Ethane, 1,2-dichloro-	02:38.2	0.539	0.045	3445	0.00316	0.06
97	02:47.3	Ethane, 1,1,1-trichloro-	02:39.8	0.247	0.019	2412	0.00343	0.07
78	02:59.1	Benzene	02:51.5	0.832	0.718	374641	0.2037	4.07
56	03:02.0	Cyclohexane	02:47.3	0.466	0.392	29732488	31.58	631.60
117	03:02.5	Carbon Tetrachloride	N/A	0	0	0		
130	03:30.1	Trichloroethylene	03:13.2	0.481	0.155	1619	0.00281	0.06
71	03:40.0	Heptane	03:32.3	0.536	0.126	7226	0.00879	0.18
97	04:43.1	Ethane, 1,1,2-trichloro-	04:33.9	0.54	0.153	1268	0.00149	0.03
91	05:01.7	Toluene	04:48.8	0.884	0.636	67625	0.01268	0.25
166	06:32.5	Tetrachloroethylene	06:18.3	0.994	0.962	7309576	10.21	204.20
91	08:16.2	Ethylbenzene	08:20.9	0.85	0.326	17249	0.00156	0.03
91	08:30.8	m,p-Xylene	08:24.2	0.381	0.089	14935	0.00113	0.02
104	08:57.0	Styrene	N/A	0	0	0		
91	09:03.7	o-Xylene	08:56.7	0.735	0.231	8262	0.0014	0.03
105	10:18.3	1,3,5-trimethylbenzene	10:16.8	0.965	0.181	23547	0.00684	0.14
105	10:27.2	1,2,4-trimethybenzene	10:23.4	0.887	0.062	12244	0.00245	0.05
128	13:21.6	Naphthalene	13:18.4	0.522	0.138	13302	0.0144	0.29

Target Library: CH2MhillCampLJ_040813
Last Calibrated: 4/8/2013 11:28:27 AM

Peak Search Parameters:
Search Window: 0:30.00
Window Expand Factor: 0.050
Peak Resolution: 5
Noise Level Multiplier: 2.000
Minimum Area: 5
Minimum Width: 7
Maximum Width: 70

Minimum Fit: 0.050
Minimum Purity: 0.010

Q-Ion	Pred.RT	Int.Std.Name	Act.RT	fit	purity	area	ppb	RFC	Flag
117	08:00.5	BPFB HAPSITE IS #2	07:52.5	0.998	0.72	5252700	4.81	-20.78	

Q-Ion	Pred.RT	Analyte Name	Act.RT	fit	purity	area	ppb	Flag
62	01:28.5	Vinyl chloride	01:35.8	0.616	0.063	4741	0.02242	
84	01:52.7	Methylene Chloride	01:49.8	0.87	0.209	29970	0.03214	
101	01:54.2	1,1,2-trichloro-1,2,2-trifluoroethane	01:50.7	0.779	0.01	1152	0.00567	
61	01:54.5	Ethene, 1,1-dichloro-	01:48.2	0.07	0.021	3826	0.00965	
76	01:58.3	Carbon Disulfide	01:54.8	0.999	0.141	17500	0.00445	
61	02:05.5	trans-1,2-dichlorethene	01:48.2	0.224	0.018	3826	0.0052	
73	02:08.3	MtBE	01:58.1	0.984	0.049	6996	0.01191	
63	02:09.5	1,1-dichloroethane	02:04.8	0.849	0.034	5275	0.00626	
57	02:20.4	Hexane	02:29.8	0.74	0.015	35909	0.04349	
61	02:21.5	cis-1,2-dichloroethene	02:29.0	0.497	0.007	19335		Purity too low
83	02:25.5	chloroform	02:20.6	0.996	0.757	159101	0.1412	
213	02:36.2	TRIS HAPSITE IS #1	02:29.8	0.995	0.863	943479	1.042	
62	02:41.3	Ethane, 1,2-dichloro-	02:38.2	0.539	0.045	3445	0.00316	
97	02:47.3	Ethane, 1,1,1-trichloro-	02:39.8	0.247	0.019	2412	0.00343	
78	02:59.1	Benzene	02:51.5	0.832	0.718	374641	0.2037	
56	03:02.0	Cyclohexane	02:47.3	0.466	0.392	29732488	31.58	
117	03:02.5	Carbon Tetrachloride	N/A	0	0	0		Not found with current search parameters
130	03:30.1	Trichloroethylene	03:13.2	0.481	0.155	1619	0.00281	
71	03:40.0	Heptane	03:32.3	0.536	0.126	7226	0.00879	
97	04:43.1	Ethane, 1,1,2-trichloro-	04:33.9	0.54	0.153	1268	0.00149	
91	05:01.7	Toluene	04:48.8	0.884	0.636	67625	0.01268	
166	06:32.5	Tetrachloroethylene	06:18.3	0.994	0.962	7309576	10.21	
91	08:16.2	Ethylbenzene	08:20.9	0.85	0.326	17249	0.00156	
91	08:30.8	m,p-Xylene	08:24.2	0.381	0.089	14935	0.00113	
104	08:57.0	Styrene	N/A	0	0	0		Not found with current search parameters
91	09:03.7	o-Xylene	08:56.7	0.735	0.231	8262	0.0014	
105	10:18.3	1,3,5-trimethylbenzene	10:16.8	0.965	0.181	23547	0.00684	
105	10:27.2	1,2,4-trimethybenzene	10:23.4	0.887	0.062	12244	0.00245	
128	13:21.6	Naphthalene	13:18.4	0.522	0.138	13302	0.0144	

Unknown Identification Report
Date: 04/09/13 Time: 08:38:19
Calibration Method:
/Haps/Method/CH2Mhill 5m Carbon Conc 1.mth
Tune File:
default.tun
Method Description:
General purpose Air analysis for VOCs

Data File: /Data/CH2MHILL/CH2Mhill CampLJ_040813/_20130408_006.hps on 10.210.0.8
GPS Info:
Latitude: N 34 Deg 40.27863 Min Longitude: W 77 Deg 21.12671 Min GMT: 04/08/13 08:13:59 PM

Acquisition Date and Time: 4/8/2013 5:13:23 PM
Acquisition Method: /Haps/Method/CH2MHILL/CH2Mhill CampLJ_040813.mth
Target Library: CH2MhillCampLJ
Last Calibrated: 4/9/2013 6:02:06 AM

Peak Search Parameters:
Search Window: 0:30.00
Window Expand Factor: 0.050
Peak Resolution: 5
Noise Level Multiplier: 2.000
Minimum Area: 5
Minimum Width: 7
Maximum Width: 70
Minimum Fit: 0.050
Minimum Purity: 0.010

Q-Ion	Pred.RT	Int.Std.Name	Act.RT	fit	purity	area	ppb	RFC	Flag
117	08:00.5	BPFB HAPSITE IS #2	07:51.5	0.998	0.729	4793814	4.81	-27.7	

Q-Ion	Pred.RT	Analyte Name	Act.RT	fit	purity	area	ppb	DF
62	01:28.5	Vinyl chloride	01:25.9	0.573	0.036	7991	0.04141	0.83
84	01:52.7	Methylene Chloride	01:48.5	0.673	0.107	60647	0.07126	1.43
101	01:54.2	1,1,2-trichloro-1,2,2-trifluoroethane	01:45.2	0.733	0.005	4761		
61	01:54.5	Ethene, 1,1-dichloro-	01:42.7	0.586	0.086	16777	0.04637	0.93
76	01:58.3	Carbon Disulfide	02:01.9	0.412	0.01	7991		
61	02:05.5	trans-1,2-dichlorethene	N/A	0	0	0		
73	02:08.3	MtBE	02:03.6	0.991	0.031	4488	0.00837	0.17
63	02:09.5	1,1-dichloroethane	02:06.9	0.838	0.04	4039	0.00525	0.11
57	02:20.4	Hexane	02:27.8	0.795	0.014	24481	0.03249	0.65
61	02:21.5	cis-1,2-dichloroethene	02:27.8	0.624	0.009	11396		
83	02:25.5	chloroform	02:19.5	0.862	0.295	32537	0.03164	0.63
213	02:36.2	TRIS HAPSITE IS #1	02:29.5	0.983	0.859	874131	1.058	21.16
62	02:41.3	Ethane, 1,2-dichloro-	02:52.8	0.652	0.128	2323	0.00233	0.05
97	02:47.3	Ethane, 1,1,1-trichloro-	02:28.7	0.71	0.036	7563	0.0118	0.24
78	02:59.1	Benzene	02:50.2	0.957	0.583	79442	0.04733	0.95
56	03:02.0	Cyclohexane	02:46.9	0.573	0.417	318804	0.371	7.42
117	03:02.5	Carbon Tetrachloride	N/A	0	0	0		
130	03:30.1	Trichloroethylene	N/A	0	0	0		
71	03:40.0	Heptane	N/A	0	0	0		
97	04:43.1	Ethane, 1,1,2-trichloro-	N/A	0	0	0		
91	05:01.7	Toluene	04:52.9	0.429	0.085	10623	0.00218	0.04
166	06:32.5	Tetrachloroethylene	06:17.2	0.555	0.148	1636279	2.504	50.08
91	08:16.2	Ethylbenzene	08:19.0	0.831	0.312	8719	0.00087	0.02
91	08:30.8	m,p-Xylene	08:21.5	0.479	0.1	12422	0.00103	0.02
104	08:57.0	Styrene	N/A	0	0	0		
91	09:03.7	o-Xylene	08:55.7	0.763	0.231	8829	0.00164	0.03
105	10:18.3	1,3,5-trimethylbenzene	10:17.3	0.947	0.106	9120	0.0029	0.06
105	10:27.2	1,2,4-trimethybenzene	10:34.0	0.942	0.021	2051	0.00045	0.01
128	13:21.6	Naphthalene	13:10.6	0.604	0.104	16970	0.02012	0.40

Target Library: CH2MhillCampLJ_040813
Last Calibrated: 4/8/2013 11:28:27 AM

Peak Search Parameters:
Search Window: 0:30.00
Window Expand Factor: 0.050
Peak Resolution: 5
Noise Level Multiplier: 2.000
Minimum Area: 5
Minimum Width: 7
Maximum Width: 70

Minimum Fit: 0.050
Minimum Purity: 0.010

Q-Ion	Pred.RT	Int.Std.Name	Act.RT	fit	purity	area	ppb	RFC	Flag
117	08:00.5	BPFB HAPSITE IS #2	07:51.5	0.998	0.729	4793814	4.81	-27.7	

Q-Ion	Pred.RT	Analyte Name	Act.RT	fit	purity	area	ppb	Flag
62	01:28.5	Vinyl chloride	01:25.9	0.573	0.036	7991	0.04141	
84	01:52.7	Methylene Chloride	01:48.5	0.673	0.107	60647	0.07126	
101	01:54.2	1,1,2-trichloro-1,2,2-trifluoroethane	01:45.2	0.733	0.005	4761		Purity too low
61	01:54.5	Ethene, 1,1-dichloro-	01:42.7	0.586	0.086	16777	0.04637	
76	01:58.3	Carbon Disulfide	02:01.9	0.412	0.01	7991		Purity too low
61	02:05.5	trans-1,2-dichlorethene	N/A	0	0	0		Not found with current search parameters
73	02:08.3	MtBE	02:03.6	0.991	0.031	4488	0.00837	
63	02:09.5	1,1-dichloroethane	02:06.9	0.838	0.04	4039	0.00525	
57	02:20.4	Hexane	02:27.8	0.795	0.014	24481	0.03249	
61	02:21.5	cis-1,2-dichloroethene	02:27.8	0.624	0.009	11396		Purity too low
83	02:25.5	chloroform	02:19.5	0.862	0.295	32537	0.03164	
213	02:36.2	TRIS HAPSITE IS #1	02:29.5	0.983	0.859	874131	1.058	
62	02:41.3	Ethane, 1,2-dichloro-	02:52.8	0.652	0.128	2323	0.00233	
97	02:47.3	Ethane, 1,1,1-trichloro-	02:28.7	0.71	0.036	7563	0.0118	
78	02:59.1	Benzene	02:50.2	0.957	0.583	79442	0.04733	
56	03:02.0	Cyclohexane	02:46.9	0.573	0.417	318804	0.371	
117	03:02.5	Carbon Tetrachloride	N/A	0	0	0		Not found with current search parameters
130	03:30.1	Trichloroethylene	N/A	0	0	0		Not found with current search parameters
71	03:40.0	Heptane	N/A	0	0	0		Not found with current search parameters
97	04:43.1	Ethane, 1,1,2-trichloro-	N/A	0	0	0		Not found with current search parameters
91	05:01.7	Toluene	04:52.9	0.429	0.085	10623	0.00218	
166	06:32.5	Tetrachloroethylene	06:38.2	0.555	0.148	10109	0.01547	
91	08:16.2	Ethylbenzene	08:19.0	0.831	0.312	8719	0.00087	
91	08:30.8	m,p-Xylene	08:21.5	0.479	0.1	12422	0.00103	
104	08:57.0	Styrene	N/A	0	0	0		Not found with current search parameters
91	09:03.7	o-Xylene	08:55.7	0.763	0.231	8829	0.00164	
105	10:18.3	1,3,5-trimethylbenzene	10:17.3	0.947	0.106	9120	0.0029	
105	10:27.2	1,2,4-trimethybenzene	10:34.0	0.942	0.021	2051	0.00045	
128	13:21.6	Naphthalene	13:10.6	0.604	0.104	16970	0.02012	

Unknown Identification Report
Date: 04/10/13 Time: 10:26:56
Calibration Method:
/Haps/Method/CH2M/CH2Mhill CampLJ_1.mth
Tune File:
default.tun
Method Description:
General purpose Air analysis for VOCs

Data File:
/Haps/Data/CH2M/CH2Mhill CampLJ_1/_20130410_004.hps
Data Info:

Valid GPS Information Not Available

Target Library: CH2MhillCampLJ
Last Calibrated: 5/10/2012 5:02:08 PM

Peak Search Parameters:
Search Window: 0:30.00
Window Expand Factor: 0.050
Peak Resolution: 5
Noise Level Multiplier: 2.000
Minimum Area: 5
Minimum Width: 7
Maximum Width: 70
Minimum Fit: 0.050
Minimum Purity: 0.010

Q-Ion	Pred.RT	Int.Std.Name	Act.RT	fit	purity	area	ppb	RFC	Flag
117	08:00.5	BPFB HAPSITE IS #2	07:53.3	0.983	0.689	12379947	4.81	14.98	

Q-Ion	Pred.RT	Analyte Name	Act.RT	fit	purity	area	ppb	DF
62	01:28.5	Vinyl chloride	01:29.1	0.7	0.014	10986		
84	01:52.7	Methylene Chloride	01:56.5	0.61	0.061	106346		
101	01:54.2	1,1,2-trichloro-1,2,2-trifluoroethane	01:47.4	0.791	0.013	10845	0.03623	0.72
61	01:54.5	Ethene, 1,1-dichloro-	01:55.7	0.813	0.181	106718	0.1357	2.714
76	01:58.3	Carbon Disulfide	01:49.9	0.977	0.199	462858		
61	02:05.5	trans-1,2-dichlorethene	01:55.7	0.875	0.139	106718	0.07911	1.58
73	02:08.3	MtBE	02:10.8	0.883	0.063	22769	0.01392	0.28
63	02:09.5	1,1-dichloroethane	01:58.1	0.792	0.076	11532	0.00661	0.13
57	02:20.4	Hexane	02:25.8	0.822	0.013	70919	0.02968	0.59
61	02:21.5	cis-1,2-dichloroethene	02:16.7	0.661	0.032	16522	0.01032	0.21
83	02:25.5	chloroform	02:16.7	0.93	0.226	32394	0.01766	0.35
213	02:36.2	TRIS HAPSITE IS #1	02:26.7	0.994	0.861	1636988	1.034	20.68
62	02:41.3	Ethane, 1,2-dichloro-	02:30.0	0.495	0.08	20034	0.00895	0.18
97	02:47.3	Ethane, 1,1,1-trichloro-	N/A	0	0	0		
78	02:59.1	Benzene	02:47.5	0.939	0.298	116672	0.03017	0.60
56	03:02.0	Cyclohexane	02:44.2	0.488	0.344	1101560	0.475	9.50
117	03:02.5	Carbon Tetrachloride	03:01.6	0.721	0.029	4883	0.00362	0.07
130	03:30.1	Trichloroethylene	03:18.2	0.625	0.245	10962	0.00479	0.10
71	03:40.0	Heptane	03:26.5	0.806	0.478	66874	0.01192	0.24
97	04:43.1	Ethane, 1,1,2-trichloro-	04:52.8	0.35	0.182	44219	0.03717	0.74
91	05:01.7	Toluene	04:46.1	0.993	0.935	1724917	0.4189	8.38
166	06:32.5	Tetrachloroethylene	06:16.6	0.984	0.952	10994347	4.409	88.18
91	08:16.2	Ethylbenzene	08:23.3	0.915	0.054	156715	0.02017	0.40
91	08:30.8	m,p-Xylene	08:30.7	0.548	0.093	36631	0.00286	0.06
104	08:57.0	Styrene	08:59.8	0.597	0.104	9920	0.00134	0.03
91	09:03.7	o-Xylene	08:59.0	0.872	0.423	98016	0.01732	0.35
105	10:18.3	1,3,5-trimethylbenzene	10:24.5	0.983	0.368	189449	0.02085	0.42
105	10:27.2	1,2,4-trimethybenzene	10:24.5	0.925	0.305	189449	0.01302	0.26
128	13:21.6	Naphthalene	13:21.2	0.823	0.353	149538		

Unknown Identification Report
Date: 04/10/13 Time: 13:19:49
Calibration Method:
/Haps/Method/CH2Mhill 5m Carbon Conc 1.mth
Tune File:
default.tun
Method Description:
General purpose Air analysis for VOCs

Data File: /Data/CH2M/CH2Mhill CampLJ_1/_20130410_005.hps on 10.210.5.19
GPS Info:
Valid GPS Information Not Available

Acquisition Date and Time: 4/10/2013 10:47:00 AM
Acquisition Method: /Haps/Method/CH2M/CH2Mhill CampLJ_1.mth
Target Library: CH2MhillCampLJ
Last Calibrated: 5/10/2012 5:02:08 PM

Peak Search Parameters:
Search Window: 0:30.00
Window Expand Factor: 0.050
Peak Resolution: 5
Noise Level Multiplier: 2.000
Minimum Area: 5
Minimum Width: 7
Maximum Width: 70
Minimum Fit: 0.050
Minimum Purity: 0.010

Q-Ion	Pred.RT	Int.Std.Name	Act.RT	fit	purity	area	ppb	RFC	Flag
117	08:00.5	BPFB HAPSITE IS #2	07:51.4	0.983	0.682	11038675	4.81	2.53	

Q-Ion	Pred.RT	Analyte Name	Act.RT	fit	purity	area	ppb	DF
62	01:28.5	Vinyl chloride	01:14.3	0.832	0.034	6426		
84	01:52.7	Methylene Chloride	N/A	0	0	0		
101	01:54.2	1,1,2-trichloro-1,2,2-trifluoroethane	01:46.7	0.959	0.043	19505	0.07308	1.46
61	01:54.5	Ethene, 1,1-dichloro-	01:55.8	0.793	0.127	44152	0.06298	1.26
76	01:58.3	Carbon Disulfide	01:50.0	0.983	0.087	169814		
61	02:05.5	trans-1,2-dichlorethene	02:02.4	0.207	0.04	7560	0.00629	0.13
73	02:08.3	MtBE	02:12.4	1	0.039	11738	0.00805	0.16
63	02:09.5	1,1-dichloroethane	02:14.9	0.408	0.126	9358	0.00602	0.12
57	02:20.4	Hexane	02:24.9	0.777	0.014	44304	0.02079	0.42
61	02:21.5	cis-1,2-dichloroethene	02:11.6	0.539	0.031	12201	0.00855	0.17
83	02:25.5	chloroform	02:16.6	0.913	0.312	44307	0.02708	0.54
213	02:36.2	TRIS HAPSITE IS #1	02:25.8	0.991	0.874	1420985	1.006	20.12
62	02:41.3	Ethane, 1,2-dichloro-	02:45.9	0.367	0.027	30464	0.01526	0.31
97	02:47.3	Ethane, 1,1,1-trichloro-	02:24.9	0.749	0.04	31326	0.04468	0.89
78	02:59.1	Benzene	02:47.5	0.964	0.391	3321706	0.9633	19.27
56	03:02.0	Cyclohexane	03:18.6	0.94	0.106	68181	0.03297	0.66
117	03:02.5	Carbon Tetrachloride	N/A	0	0	0		
130	03:30.1	Trichloroethylene	03:17.8	0.977	0.779	149508	0.07323	1.46
71	03:40.0	Heptane	03:33.6	0.427	0.049	10199	0.00204	0.04
97	04:43.1	Ethane, 1,1,2-trichloro-	04:54.4	0.705	0.328	6998	0.0066	0.13
91	05:01.7	Toluene	05:18.0	0.496	0.124	10418		
166	06:32.5	Tetrachloroethylene	06:14.8	0.563	0.138	4071082	1.831	36.62
91	08:16.2	Ethylbenzene	08:20.8	0.866	0.522	155883	0.0225	0.45
91	08:30.8	m,p-Xylene	08:30.0	0.673	0.113	21037	0.00184	0.04
104	08:57.0	Styrene	08:49.1	0.89	0.26	25193	0.00383	0.08
91	09:03.7	o-Xylene	08:57.4	0.753	0.187	53272	0.01056	0.21
105	10:18.3	1,3,5-trimethylbenzene	10:23.0	0.964	0.192	62387	0.0077	0.15
105	10:27.2	1,2,4-trimethybenzene	10:29.6	0.971	0.067	45600	0.00351	0.07
128	13:21.6	Naphthalene	13:20.7	0.943	0.446	231615		

Attachment B – Laboratory Analytical Report

TO-WE55
MCB_Camp Lejeune
Validated Soil Gas Detects Analytical Results
March-April 2013

Sample ID	BLDG133-IA01-13B	BLDG133-SG06-13B	BLDG133-SG06D-13B	IR88-BLDG133-SG01-13A	IR88-BLDG133-SG01D-13A	IR88-BLDG133-SG02-13A	IR88-BLDG133-SG03-13A	IR88-BLDG133-SG04-13A
Sample Date	4/11/13	4/9/13	4/9/13	3/26/13	3/26/13	3/26/13	3/26/13	3/26/13
Chemical Name								
Volatile Organic Compounds (PPBV)								
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	0.06 J	0.06 J	0.06 J	0.05 U	0.05 J	0.06 J	0.06 J	0.05 J
1,1,2-Trichloroethane	0.25 U	0.14 J	0.25 U	0.1 U	0.1 UJ	0.1 UJ	0.1 U	0.1 U
1,2,4-Trimethylbenzene	0.25 UJ	0.77	0.77	0.26	0.36 J	0.32 J	0.26	0.52 J
1,3,5-Trimethylbenzene	0.25 UJ	0.36 J	0.32 J	0.1 U	0.1 UJ	0.1 UJ	0.1 U	0.12 J
2-Butanone	2.7	2.4	2	3.6	1.9 J	1 J	1.1	0.88
2-Propanol	2.6	25.7	17	4.2	2.5	2.2	5.1	0.1 U
4-Ethyltoluene	0.25 UJ	0.25 U	0.18 J	0.1 U	0.1 UJ	0.1 UJ	0.1 U	0.1 UJ
4-Methyl-2-pentanone	0.25 U	0.22 J	0.28 J	0.05 U	0.05 UJ	0.05 UJ	0.05 U	0.05 U
Acetone	6.5	79.4	55.2	11.7	18.2	8.3	28.2	12.3
Benzene	0.11 J	0.55	0.78	0.24	0.27 J	0.42 J	0.58	0.32
Carbon tetrachloride	0.06 J	0.15 J	0.11 J	0.08	0.1 J	0.11 J	0.06	0.06
Chloroform	0.14 J	0.19 J	0.14 J	0.07 J	0.17	0.05 U	0.09 J	0.14
Chloromethane	0.38 J	0.25 U	0.19 J	0.29	0.1 U	0.1 U	0.1 U	0.1 U
Cyclohexane	0.25 U	0.25 U	0.25 U	0.1 U	0.1 U	0.36	0.1 U	0.1 U
Dichlorodifluoromethane (Freon-12)	0.27 J	0.11 J	0.15 J	0.23	0.18	0.2	0.2	0.21
Ethyl acetate	1.6	1.6	2	0.64	0.79	1.1	0.74	1.1
Ethylbenzene	0.14 J	0.13 J	0.51	0.12	0.12 J	0.1 UJ	0.1 U	0.1 UJ
Heptane	0.25 U	0.14 J	0.26 J	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
m- and p-Xylene	0.64 J	0.32 J	1.2	0.41	0.49 J	0.32 J	0.21	0.2 UJ
Methylene chloride	1.2	0.94	1.1	0.53	0.66	0.52	0.93	0.85
Naphthalene	0.25 UJ	0.17 J	0.21 J	0.05 U	0.05 UJ	0.05 UJ	0.05 U	0.05 UJ
o-Xylene	0.24 J	0.15 J	0.44 J	0.18	0.23 J	0.17 J	0.1	0.1 UJ
Styrene	0.25 UJ	0.23 J	1.3	0.3	0.38 J	0.18 J	0.11	0.13 J
Tetrachloroethene	0.07 J	68	45.6	14.4 J	55.6 J	18.8	22.7	10.3
Tetrahydrofuran	2.4	2.1	1.7	2.8	0.93	0.58	0.32	0.21
Toluene	4.6	0.91	2.7	1.6	1.1 J	1.4 J	0.7	0.43
Trichloroethene	0.25 U	0.29 J	0.21 J	0.02 U	0.02 UJ	0.02 UJ	0.02 U	0.07
Trichlorofluoromethane (Freon-11)	0.22 J	0.22 J	0.22 J	0.19	0.21	0.19	0.2	0.2

#REF!

Notes:

J - Analyte present, estimated value

PPBV - Parts per billion volume

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

Shading indicates detection

Appendix B
Boring Logs and Well Construction Diagrams

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
475817.SI.SI	SWMU615-MW01 SHEET 1 OF 1

Soil Boring Log

CLIENT: NAVFAC PROJECT : SWMU 615 LOCATION : MCB CAMLEJ, NC

ELEVATION : 23.29 ft amsl DRILLING CONTRACTOR : SAEDACCO, inc.

EAST, NORTH (UTM Z18 NAD83, meters) : 3839116.66, 284495.3 DRILLING METHOD AND EQUIPMENT : Direct push with Hollow Stem Auger

WATER LEVEL: 6.26 ft BTOC (4/22/2014) START: 4/16/2014 END: 4/16/2014 LOGGER : F.Ferguson/CLT

DEPTH BELOW GROUND SURFACE (ft)	SAMPLE TYPE	INTERVAL (ft)	RECOVERY (inches)	PID SCREENING (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION	WELL DIAGRAM
		0.0				-asphalt.		
	HA-1		60	0.0		**SAND (SP)** dark brown, dry, loose, medium grained.		
				0.0		**SILTY SAND (SM)** dark brown, dry, loose, fine grained.		
5		5.0						
		5.0		0.0				
	DPT-1		60	0.0		**SAND (SP)** medium tan, moist, loose, fine grained. -color change to dark brown.		
				0.0		**SILTY SAND (SM)** tan with orange mottling, moist, loose, very fine to fine grained.		
10		10.0						
		10.0		0.0		**SAND (SP)** gray, moist, loose to medium dense, medium grained, contain some silt.		
	DPT-2		60	0.0		**SILTY SAND (SM)** gray, wet, loose, fine to medium grained. -color change to yellow tan.		
15		15.0		0.0				
		15.0				No Recovery.		
				0.0		**SAND (SP)** gray, wet, medium dense, fine to medium grained, with some silt.		
	DPT-3		48	0.0				
20		20.0						
				0.0		End of Boring Log at 20' bgs Abbreviations: ft - feet BTOC - below top of casing amsl - above mean sea level PID - photo ionization detector ppm - parts per million HA - hand auger DPT - direct push technology run HSA - hollow stem auger run	Boring drilled to 20.0 ft below ground surface to set well.	
25								
30								

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
475817.SI.SI	SWMU615-MW02 SHEET 1 OF 1

Soil Boring Log

CLIENT: NAVFAC PROJECT : SWMU 615 LOCATION : MCB CAMLEJ, NC

ELEVATION : 22.34 ft amsl DRILLING CONTRACTOR : SAEDACCO, inc.

EAST, NORTH (UTM Z18 NAD83, meters) : 3839112.25, 284511.92 DRILLING METHOD AND EQUIPMENT : Direct push with Hollow Stem Auger

WATER LEVEL: 5.57 ft BTOC (4/21/2014) START: 4/17/2014 END: 4/17/2014 LOGGER : F.Ferguson/CLT

DEPTH BELOW GROUND SURFACE (ft)	SAMPLE TYPE	INTERVAL (ft)	RECOVERY (inches)	PID SCREENING (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION	WELL DIAGRAM
		0.0				-asphalt.		
				0.0		**GRAVEL (GW)** .		
	HA-1		60			**SAND (SP)** light tan, dry, medium dense, fine grained.		
				0.0				
5		5.0						
		5.0		0.0		No Recovery.		
				0.0				
	DPT-1		36			**SAND (SP)** gray, wet, loose, fine grained, with some silt.		
				0.0		**SILTY SAND (SM)** dark brown, wet, dense, very fine to fine grained.		
10		10.0						
		10.0		0.0		**SAND (SP)** light tan to white, loose to medium dense, very fine grained, with some silt.		
	DPT-2		60	0.0		**SILTY SAND (SM)** tan to yellow with orange mottling, wet, medium dense, very fine grained.		
						grading to tan.		
				0.0		**SAND (SP)** light tan to white, moist, loose, very fine grained.		
15		15.0						
		15.0		0.0		**SILTY SAND (SM)** tan to yellow with orange mottling, wet, medium dense, very fine grained.		
	DPT-3		60			**SAND (SP)** gray, saturated, medium dense to loose, fine to medium grained.		
				0.0				
20		20.0						
				0.0		End of Boring Log at 20' bgs Abbreviations: ft - feet BTOC - below top of casing amsl - above mean sea level PID - photo ionization detector ppm - parts per million HA - hand auger DPT - direct push technology run HSA - hollow stem auger run	Boring drilled to 20.0 ft below ground surface to set well.	
25								
30								

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
475817.SI.SI	SWMU615-MW03 SHEET 1 OF 1

Soil Boring Log

CLIENT: NAVFAC PROJECT : SWMU 615 LOCATION : MCB CAMLEJ, NC

ELEVATION : 23.13 ft amsl DRILLING CONTRACTOR : SAEDACCO, inc.

EAST, NORTH (UTM Z18 NAD83, meters) : 3839103.59, 284501.33 DRILLING METHOD AND EQUIPMENT : Direct push with Hollow Stem Auger

WATER LEVEL: 7.16 ft BTOC (4/22/2014) START: 4/15/2014 END: 4/15/2014 LOGGER : F.Ferguson/CLT

DEPTH BELOW GROUND SURFACE (ft)	SAMPLE TYPE	INTERVAL (ft)	RECOVERY (inches)	PID SCREENING (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION	WELL DIAGRAM
		0.0				-asphalt.		
						GRAVEL (GW) .		
	HA-1		60			**SAND (SP)** light tan, dry, medium dense, fine grained.	*Lithology taken from SWMU615-MW03IW*	
5		5.0						
		5.0				No Recovery.		
	HSA-1		60					
10		10.0						
		10.0				**SAND (SP)** light gray to tan, wet, loose to medium dense, fine to medium grained.		
	HSA-2		60			No Recovery.		
15		15.0						
		15.0				**SAND (SP)** light gray to tan, wet, loose to medium dense, very fine to fine grained.		
	HSA-3		60			-color change to medium gray, medium dense, with some silt.		
20		20.0						
		20.0				**SANDY CLAY (SC)** moist, high plasticity, cohesive, soft to medium, clay content decreases with depth.		
	HSA-4		36			**SAND (SP)** medium gray to tan, wet, medium dense, very fine to fine grained, contain some clay and silt, with slight odor.	Boring drilled to 23.0 ft below ground surface to set well.	
		23.0				End of Boring Log at 23' bgs		
25						Abbreviations: ft - feet BTOC - below top of casing amsl - above mean sea level PID - photo ionization detector ppm - parts per million HA - hand auger DPT - direct push technology run HSA - hollow stem auger run		
30								

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
475817.SI.SI	SWMU615-MW03IW SHEET 1 OF 2

Soil Boring Log

CLIENT: NAVFAC PROJECT : SWMU 615 LOCATION : MCB CAMLEJ, NC

ELEVATION : 23.13 ft amsl DRILLING CONTRACTOR : SAEDACCO, inc.

EAST, NORTH (UTM Z18 NAD83, meters) : 3839102.88, 284499.75 DRILLING METHOD AND EQUIPMENT : Direct push with Hollow Stem Auger

WATER LEVEL: 13.62 ft BTOC (4/22/2014) START: 4/15/2014 END: 4/15/2014 LOGGER : F.Ferguson/CLT

DEPTH BELOW GROUND SURFACE (ft)	SAMPLE TYPE	INTERVAL (ft)	RECOVERY (inches)	PID SCREENING (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION	WELL DIAGRAM
		0.0				-asphalt.		
				0.0		**GRAVEL (GW)** .		
	HA-1		60	0.0		**SAND (SP)** light tan, dry, medium dense, fine grained.		
5		5.0						
		5.0		0.0		No Recovery.		
	DPT-1		12					
10		10.0						
		10.0		0.0		**SAND (SP)** light gray to tan, wet, loose to medium dense, fine to medium grained.		
	DPT-2		36	0.0		No Recovery.		
				0.0				
15		15.0						
		15.0		0.0		**SAND (SP)** light gray to tan, wet, loose to medium dense, very fine to fine grained.		
	DPT-3		60	0.0		-color change to medium gray, medium dense, with some silt.		
				0.0				
20		20.0						
		20.0		0.0		**SANDY CLAY (SC)** moist, high plasticity, cohesive, soft to medium, clay content decreases with depth.		
	DPT-4		48	0.0		**SAND (SP)** medium gray to tan, wet, medium dense, very fine to fine grained, contain some clay and silt, with slight odor.		
				0.0				
25		25.0				No Recovery.		
		25.0		0.0		**SAND (SP)** light greenish gray, wet, medium dense to dense, fine to medium grained, contain clay/silt.		
	DPT-5		48	0.0				
				0.0				
30		30.0				-color chang to light tan with orange and green mottling.		
				0.0				

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
475817.SI.SI	SWMU615-MW03IW SHEET 2 OF 2

Soil Boring Log

CLIENT: NAVFAC PROJECT : SWMU 615 LOCATION : MCB CAMLEJ, NC

ELEVATION : 23.13 ft amsl DRILLING CONTRACTOR : SAEDACCO, inc.

EAST, NORTH (UTM Z18 NAD83, meters) : 3839102.88, 284499.75 DRILLING METHOD AND EQUIPMENT : Direct push with Hollow Stem Auger

WATER LEVEL: 13.62 ft BTOC (4/22/2014) START: 4/15/2014 END: 4/15/2014 LOGGER : F.Ferguson/CLT

DEPTH BELOW GROUND SURFACE (ft)	SAMPLE TYPE	INTERVAL (ft)	RECOVERY (inches)	PID SCREENING (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION	WELL DIAGRAM
	DPT-6	30.0 35.0	60	0.0		**SANDY CLAY (SC)** olive green, moist, stiff, high plasticity, frequent wood chunks. -color change to light gray. **SAND (SP)** light gray, loose, very fine grained, contain some clay.		
35	DPT-7	35.0 40.0	42	0.0		**CLAYEY SAND (SC)** light gray, soft, loose, low plasticity, very fine grained. No Recovery. **SAND (SW)** light tan to gray, loose o medium dense, fine to coarse grained. -olive green. -medium gray to green.		
40	DPT-8	40.0 45.0	36	0.0		No Recovery. **SAND (SW)** light tan to gray, loose o medium dense, fine to coarse grained. -olive green, loose. **CLAYEY SAND (SC)** dark gray to green, soft, loose, low plasticity, very fine to coarse, trace shells (broken).		
45	DPT-9	45.0 50.0	60			light gray/tan, very dense, many broken shells/fragments.		
50				0.0		End of Boring Log at 50' bgs Abbreviations: ft - feet BTOC - below top of casing amsl - above mean sea level PID - photo ionization detector ppm - parts per million HA - hand auger DPT - direct push technology run HSA - hollow stem auger run	Boring drilled to 50.0 ft below ground surface to set well.	
55								
60								

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
475817.SI.SI	SWMU615-MW04 SHEET 1 OF 1

Soil Boring Log

CLIENT: NAVFAC PROJECT : SWMU 615 LOCATION : MCB CAMLEJ, NC

ELEVATION : 23.72 ft amsl DRILLING CONTRACTOR : SAEDACCO, inc.

EAST, NORTH (UTM Z18 NAD83, meters) : 3839091.52, 284465.3 DRILLING METHOD AND EQUIPMENT : Direct push with Hollow Stem Auger

WATER LEVEL: 6.87 ft BTOC (4/23/2014) START: 4/17/2014 END: 4/17/2014 LOGGER : F.Ferguson/CLT

DEPTH BELOW GROUND SURFACE (ft)	SAMPLE TYPE	INTERVAL (ft)	RECOVERY (inches)	PID SCREENING (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION	WELL DIAGRAM
		0.0				-asphalt.		
				0.0		.		
	HA-1		60			**SAND (SP)** light tan, dry, medium dense, fine grained.		
5		5.0		0.0				
		5.0				No Recovery.		
	DPT-1		48	0.0		**SILTY SAND (SM)** dark brown, moist, loose, very fine grained.		
				0.0		**SAND (SP)** light tan, moist, medium dense, very fine, contain some silt.		
10		10.0						
		10.0				**SILTY SAND (SM)** light tan to gray, wet, medium dense, very fine to fine grained.		
				0.0		**SAND (SP)** tan, wet, dense, fine grained, some silt content.		
	DPT-2		48			No Recovery.		
				0.0		**SAND (SP)** tan to olive green, wet, dense, fine grained, contain some silt.		
15		15.0						
		15.0		0.0		**SILTY SAND (SM)** tan with yellowish orange mottling, wet, loose, very fine to fine grained.		
				0.0		**SAND (SP)** gray to olive green, saturated, dense, very fine to fine grained.		
	DPT-3		60			**SILTY SAND (SM)** gray to olive green, wet, loose to medium dense, very fine to fine grained, increasing fine with depth.		
20		20.0						
				0.0		**CLAYEY SAND (SC)** dark gray to olive green, wet, slightly cohesive, smears, medium plasticity, very fine grained.	Boring drilled to 20.0 ft below ground surface to set well.	
						SANDY CLAY (SC) dark gray to olive, moist, soft, high plasticity, cohesive, very fine grained.		
						End of Boring Log at 20' bgs		
25						Abbreviations: ft - feet BTOC - below top of casing amsl - above mean sea level PID - photo ionization detector ppm - parts per million HA - hand auger DPT - direct push technology run HSA - hollow stem auger run		
30								

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
475817.SI.SI	SWMU615-MW05 SHEET 1 OF 1

Soil Boring Log

CLIENT: NAVFAC PROJECT : SWMU 615 LOCATION : MCB CAMLEJ, NC

ELEVATION : 23.82 ft amsl DRILLING CONTRACTOR : SAEDACCO, inc.

EAST, NORTH (UTM Z18 NAD83, meters) : 3839106.76, 284463.4 DRILLING METHOD AND EQUIPMENT : Direct push with Hollow Stem Auger

WATER LEVEL: 6.59 ft BTOC (4/22/2014) START: 4/16/2014 END: 4/16/2014 LOGGER : F.Ferguson/CLT

DEPTH BELOW GROUND SURFACE (ft)	SAMPLE TYPE	INTERVAL (ft)	RECOVERY (inches)	PID SCREENING (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION	WELL DIAGRAM
		0.0				-asphalt.		
				0.0		.		
	HA-1		60			**SAND (SP)** light tan, dry to moist, medium dense, fine grained.		
				0.0				
5		5.0						
		5.0				-dark tan.		
	DPT-1		60	0.0		.		
						SILTY SAND (SM) tan, wet, loose, very fine to fine grained, increasing fine with depth. -orange mottling present, slightly plastic.		
10		10.0		0.0				
		10.0				No Recovery.		
	DPT-2		24	0.0				
						SAND (SP) dark gray to olive, wet, medium dense, medium grained.		
15		15.0						
		15.0		0.0		-saturated, medium dense to dense.		
	DPT-3		60	0.0				
20		20.0						
				0.0		End of Boring Log at 20' bgs	Boring drilled to 20.0 ft below ground surface to set well.	
						Abbreviations: ft - feet BTOC - below top of casing amsl - above mean sea level PID - photo ionization detector ppm - parts per million HA - hand auger DPT - direct push technology run HSA - hollow stem auger run		
25								
30								

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
475817.SI.SI	SWMU615-MW06 SHEET 1 OF 1

Soil Boring Log

CLIENT: NAVFAC PROJECT : SWMU 615 LOCATION : MCB CAMLEJ, NC

ELEVATION : 23.21 ft amsl DRILLING CONTRACTOR : SAEDACCO, inc.

EAST, NORTH (UTM Z18 NAD83, meters) : 3839091.89, 284480.64 DRILLING METHOD AND EQUIPMENT : Direct push with Hollow Stem Auger

WATER LEVEL: 8.06 ft BTOC (7/8/2014) START: 7/1/2014 END: 7/1/2014 LOGGER : T.Stewart/VBO

DEPTH BELOW GROUND SURFACE (ft)	SAMPLE TYPE	INTERVAL (ft)	RECOVERY (inches)	PID SCREENING (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION	WELL DIAGRAM
		0.0				-asphalt.		
	HA-1		60	3.8 4.9		**SILTY SAND (SM)** black, dry, loose to medium dense, non-plastic, very fine to coarse grained, some limestone gravel. -color change to brown, loose, fine to medium grained.		
5		5.0		3.0		**SAND (SW)** dark brown, dry, loose, non-plastic, trace gravel, medium to coarse grained, some silty sand.		
		5.0		1.3 1.8 2.9		**SILTY SAND (SM)** dark brown and pale brown laminated, dry to moist, fine to medium grained. -color change to light gray, wet. -trace yellow lamination, loose to medium dense, non-plastic.		
	DPT-1		31.2	4.6 NM		No Recovery.		
10		10.0						
		10.0		NM 2.8 2.7		**SAND (SP)** light gray grading to gray, loose to very loose, non-plastic, coarse to medium grained, some silt present.		
	DPT-2		60	4.7 1.3				
15		15.0						
		15.0		6.2 3.5 7.3		.		
	DPT-3		60	7.7 4.9		**CLAY (CL)** gray, moist to wet, stiff, medium plasticity, contain sand, trace of wood fragments.		
20		20.0						
				7.0		**SILTY SAND (SM)** gray, wet, loose, non-plastic, medium grained.	Boring drilled to 20.0 ft below ground surface to set well.	
						End of Boring Log at 20' bgs Abbreviations: ft - feet BTOC - below top of casing amsl - above mean sea level PID - photo ionization detector ppm - parts per million HA - hand auger DPT - direct push technology run HSA - hollow stem auger run		
25								
30								

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
475817.SI.SI	SWMU615-MW07 SHEET 1 OF 1

Soil Boring Log

CLIENT: NAVFAC PROJECT : SWMU 615 LOCATION : MCB CAMLEJ, NC

ELEVATION : 23.07 ft amsl DRILLING CONTRACTOR : SAEDACCO, inc.

EAST, NORTH (UTM Z18 NAD83, meters) : 3839093.3, 284503.27 DRILLING METHOD AND EQUIPMENT : Direct push with Hollow Stem Auger

WATER LEVEL: 7.43 ft BTOC (7/8/2014) START: 7/1/2014 END: 7/1/2014 LOGGER : T.Stewart/VBO

DEPTH BELOW GROUND SURFACE (ft)	SAMPLE TYPE	INTERVAL (ft)	RECOVERY (inches)	PID SCREENING (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION	WELL DIAGRAM
		0.0				**SILTY SAND (SM)** brown to dark brown, dry, loose, non-plastic, fine to medium grained.		
				0.1				
	HA-1		60	0.0		-color change to dark gray.		
				2.2				
5		5.0		2.4				
		5.0		1.8		**SAND (SP)**		
				2.8		pale brown, loose, non-plastic, medium grained, some silt content.		
	DPT-1		48	2.1		-wet.		
				1.7		-yellow staining present to 15 ft bgs.		
10		10.0		5.2				
		10.0		NM				
				4.6				
	DPT-2		60	6.3		-color change to light gray.		
				2.3				
15		15.0		4.2				
		15.0		1.3		-color change to gray.		
				3.1				
	DPT-3		60	2.9		-color change to dark gray.		
				3.0				
						-clay lenses, <1" thick.		
20		20.0		2.0		**CLAY (CL)** very dark gray, moist, stiff, low to medium plastic.		
				1.3		End of Boring Log at 20' bgs	Boring drilled to 20.0 ft below ground surface to set well.	
						Abbreviations: ft - feet BTOC - below top of casing amsl - above mean sea level PID - photo ionization detector ppm - parts per million HA - hand auger DPT - direct push technology run HSA - hollow stem auger run		
25								
30								

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
475817.SI.SI	SWMU615-MW08 SHEET 1 OF 1

Soil Boring Log

CLIENT: NAVFAC PROJECT : SWMU 615 LOCATION : MCB CAMLEJ, NC

ELEVATION : 22.06 ft amsl DRILLING CONTRACTOR : SAEDACCO, inc.

EAST, NORTH (UTM Z18 NAD83, meters) : 3839102.91, 284518.28 DRILLING METHOD AND EQUIPMENT : Direct push with Hollow Stem Auger

WATER LEVEL: 6.67 ft BTOC (7/8/2014) START: 7/1/2014 END: 7/1/2014 LOGGER : T.Stewart/VBO

DEPTH BELOW GROUND SURFACE (ft)	SAMPLE TYPE	INTERVAL (ft)	RECOVERY (inches)	PID SCREENING (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION	WELL DIAGRAM
		0.0				-asphalt.		
	HA-1		60	0.0 0.1 0.3		**SILTY SAND (SM)** light gray, dry, medium dense to loose, non-plastic, fine grained, well graded gravel present. -color change to black, moist, loose, non-plastic, with trace gravel and wood.		
5		5.0						
	DPT-1	5.0	19.2	0.5 0.0 0.0 NM NM		**CLAY (CL)** white to pale yellow, moist, medium plasticity, fine to medium grained sand. **SAND (SP)** pinkish gray to pale brown, wet, loose, non-plastic, fine to medium grained. No Recovery.		
10		10.0						
	DPT-2	10.0	48	NM 0.1 0.4 0.1 0.1		**SAND (SP-SM)** light gray, wet, loose, non-plastic, medium grained, with silty sand.		
15		15.0						
	DPT-3	15.0	60	NM 0.1 0.2 0.2 0.2		-color change to gray.		
20		20.0						
	DPT-4	20.0	60	0.3 0.2 0.3 0.4 0.4		**CLAYEY SAND (SC)** dark gray, trace black laminations, wet, soft, low plasticity, micas. **SAND (SP)** gray, wet, loose, non-plastic, medium grained, with silty sand.		
25		25.0						
				0.1		End of Boring Log at 25' bgs Abbreviations: ft - feet BTOC - below top of casing amsl - above mean sea level PID - photo ionization detector ppm - parts per million HA - hand auger DPT - direct push technology run HSA - hollow stem auger run	Boring drilled to 25.0 ft below ground surface to set well.	
30								

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
475817.SI.SI	SWMU615-SB01 SHEET 1 OF 1

Soil Boring Log

CLIENT: NAVFAC PROJECT : SWMU 615 LOCATION : MCB CAMLEJ, NC

ELEVATION : 23.43 ft amsl DRILLING CONTRACTOR : SAEDACCO, inc.

EAST, NORTH (UTM Z18 NAD83, meters) : 3839109.83, 284503.68 DRILLING METHOD AND EQUIPMENT : Hand Auger

WATER LEVEL: -- START: 4/16/2014 END: 4/16/2014 LOGGER : F.Ferguson/CLT

DEPTH BELOW GROUND SURFACE (ft)	SAMPLE TYPE	INTERVAL (ft)	RECOVERY (inches)	PID SCREENING (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		0.0				-asphalt.	
	HA-1		60	0 0		**SILTY SAND (SM)** dark brown, dry, loose.	Collect SWMU615-SB01-4-5-14B for VOC and SPLP from 4-5 ft bgs
5		5.0		0		End of Boring Log at 5' bgs Abbreviations: ft - feet BTOC - below top of casing amsl - above mean sea level PID - photo ionization detector ppm - parts per million HA - hand auger DPT - direct push technology run HSA - hollow stem auger run	
10							
15							
20							
25							
30							

Appendix C
Waste Manifests

009965305JJK

#22849 (10) 14396

Please print or type. (Form designed for use on elite (12-pitch) typewriter.) Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST	1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Manifest Tracking Number
	NC6170022580	1	800-255-3924-MIS0007951	009965305 JJK

GENERATOR

5. Generator's Name and Mailing Address

Marine Corps Base Camp Lejeune
PSC Box 20004:Attn I&E/EMD/ECB/RCRS
Camp Lejuene, NC 28542 USA

Generator's Site Address (if different than mailing address)

S-960 Michael Road
Camp Lejuene, NC 28542

Generator's Phone: 910-451-5007

6. Transporter 1 Company Name — U.S. EPA ID Number

A&D Environmental Services, Inc. — NCD986232221

7. Transporter 2 Company Name — U.S. EPA ID Number

EQ Atlanta EQ INDUSTRIAL SERVICES — MIDA982638876 WAD000672493

8. Designated Facility Name and Site Address — U.S. EPA ID Number

Michigan Disposal Waste Treatment Plant
49350 North I-94 Service Road
Belleville, MI 48111 USA

MID000724831

Facility's Phone: 800-592-5489

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
X	1. NA3077, Hazardous waste, solid, n.o.s.,(tetrachloroethylene), 9, PG III, ERG# 171	10	DM	41000	P	D039
	2.					
	3.					
	4.					

14. Special Handling Instructions and Additional Information

9a. 1) App# F141063MDI ; 10 x 55gal. (CTOWE4A-SWMU615-S01)

A&D Job No: 72045 P.O. #: 23196

15. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: EUGENE JONES — Signature: Eugene Jones — Month 06 Day 27 Year 14

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: Richard Joyce — Signature: Richard Joyce — Month 06 Day 27 Year 14

Transporter 2 Printed/Typed Name: Mark Eldr — Signature: Mark Eldr — Month 7 Day 1 Year 14

DESIGNATED FACILITY

18. Discrepancy

18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

18b. Alternate Facility (or Generator) — U.S. EPA ID Number

Facility's Phone:

18c. Signature of Alternate Facility (or Generator) — Month Day Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1.	2.	3.	4.
H070			

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a

Printed/Typed Name: Dan Shelton — Signature: Dan Shelton — Month 7 Day 15 Year 14

EPA Form 8700-22 (Rev. 3-05) Previous editions are obsolete.

DESIGNATED FACILITY TO DESTINATION STATE (IF REQUIRED)

Clearfield MMG
Post Office Box 1444
Chesapeake, VA 23327
(757) 549-8448
FAX: (757) 549-6668

NON-HAZARDOUS SHIPPING MANIFEST

MANIFEST NO. 1437

GENERATOR

NAME	**Marine Corps Base Camp Lejeune**	TELEPHONE	**910-451-9385**
ADDRESS	**PSC Box 20004**	CITY / STATE	**Camp Lejeune** / **NC**
SHIPMENT ORIGIN	**MCIEAST-MCB CAMLEJ, SWMU 615**	CITY / STATE	**Camp Lejeune** / **NC**
AUTHORIZED AGENT	**Charity Rychak Delaney**	FIRM	**MCB Camp Lejeune**
ADDRESS		OTHER	**CTO-WE4A** **CH2M HILL Project # 475817**

MATERIAL CHARACTERIZATION

ACTIVITY GENERATING THIS MATERIAL: UST/AST REMOVAL _____ OTHER **RCRA Facility Investigation**

PETROLEUM TYPE (S): **None** VIRGIN PRODUCT _____ NON-VIRGIN PRODUCT _____

PHYSICAL STATE: STOCKPILED _____ EXCAVATING _____ DRUMS **10** OTHER _____

HANDLING INSTRUCTIONS: **Transport To Facility Designated Below**

FIRE OR SPILL INSTRCUTIONS: **Non-Flammable / Non-Hazardous**

DESTINATION: **Chesapeake Facility, 416 Dominion Blvd. North**

(Groundwater)
4000 P

I hereby certify, to the best of my knowledge, the material characterized above is non-hazardous as defined by the Virginia Hazardous Waste Management Regulations, Federal Regulations under Subtitle C – RCRA, U.S. Department of Transportation, or local / state of origin regulations.

Signature of Generator / Agent

Printed Name / Date 6/19/14

TRANSPORTER

TRANSPORTER NAME **Clearfield MMG, Inc.** TELEPHONE **757-549-8448** TRUCK NO. **14**

I certify that the materials described above were received by me for shipment and delivered to the designated facility.

6-19-14
Transporter Signature / Date

FACILTIY

I certify that the materials described above were delivered to the facility and received by me.

ACCEPTED BY _____ DATE 6-19-14

REASONS FOR REJECTION _____

Gross Weight
Tare Weight
Net Weight
Tons

FACILITY

Clearfield MMG

Post Office Box 1444
Chesapeake, VA 23327
(757) 549-8448
FAX: (757) 549-6668

NON-HAZARDOUS SHIPPING MANIFEST

MANIFEST NO. 14473

GENERATOR

NAME	Marine Corps Base Camp Lejeune	TELEPHONE	910-451-9385
ADDRESS	MCIEAST, PSC Box 20005, Attn: AC/S G-F	CITY / STATE	Camp Lejeune / NC 28542-0005
SHIPMENT ORIGIN	MCIEAST-MCB CAMLEJ, SWMU 615	CITY / STATE	Camp Lejeune / NC 28542-0005
AUTHORIZED AGENT	Charity Rychak Delaney	FIRM	MCB Camp Lejeune
ADDRESS		OTHER	CTO-WE4A CH2M HILL Project # 475817

MATERIAL CHARACTERIZATION

ACTIVITY GENERATING THIS MATERIAL: UST/AST REMOVAL _____ OTHER RCRA Facility Investigation

PETROLEUM TYPE (S): None VIRGIN PRODUCT _____ NON-VIRGIN PRODUCT _____

PHYSICAL STATE: STOCKPILED _____ EXCAVATING _____ DRUMS 4 (soil cuttings) OTHER _____

1,500 lbs

HANDLING INSTRUCTIONS: **Transport To Facility Designated Below**

FIRE OR SPILL INSTRCUTIONS: **Non-Flammable / Non-Hazardous**

DESTINATION: Chesapeake Facility, 416 Dominion Blvd. North

I hereby certify, to the best of my knowledge, the material characterized above is non-hazardous as defined by the Virginia Hazardous Waste Management Regulations, Federal Regulations under Subtitle C – RCRA, U.S. Department of Transportation, or local / state of origin regulations.

Signature of Generator / Agent

E Lewis Sons 8/8/14

Printed Name / Date

TRANSPORTER

TRANSPORTER NAME Clearfield MMG, Inc. TELEPHONE 757-549-8448 TRUCK NO. 14

I certify that the materials described above were received by me for shipment and delivered to the designated facility.

8-8-14

Transporter Signature / Date

FACILTIY

I certify that the materials described above were delivered to the facility and received by me.

ACCEPTED BY L. Ostman DATE 8/13/14

REASONS FOR REJECTION _____

Gross Weight	
Tare Weight	
Net Weight	
Tons	

GENERATOR

Clearfield MMG
Post Office Box 1444
Chesapeake, VA 23327
(757) 549-8448
FAX: (757) 549-6668

NON-HAZARDOUS SHIPPING MANIFEST

MANIFEST NO. 1447

GENERATOR

NAME: Marine Corps Base Camp Lejeune
TELEPHONE: 910-451-9385
ADDRESS: MCIEAST, PSC Box 20005, Attn: AC/S G-F
CITY: Camp Lejeune STATE: NC 28542-0005
SHIPMENT ORIGIN: MCIEAST-MCB CAMLEJ, SWMU 615
CITY: Camp Lejeune STATE: NC 28542-0005
AUTHORIZED AGENT: Charity Rychak Delaney
FIRM: MCB Camp Lejeune
ADDRESS:
OTHER: CTO-WE4A
CH2M HILL Project # 475817

MATERIAL CHARACTERIZATION

ACTIVITY GENERATING THIS MATERIAL: UST/AST REMOVAL _____ OTHER RCRA Facility Investigation
PETROLEUM TYPE (S): None VIRGIN PRODUCT _____ NON-VIRGIN PRODUCT _____
PHYSICAL STATE: STOCKPILED _____ EXCAVATING _____ DRUMS 7 (groundwater) OTHER _____
HANDLING INSTRUCTIONS: **Transport To Facility Designated Below** 2,000 lbs
FIRE OR SPILL INSTRCUTIONS: **Non-Flammable / Non-Hazardous**
DESTINATION: Chesapeake Facility, 416 Dominion Blvd. North

I hereby certify, to the best of my knowledge, the material characterized above is non-hazardous as defined by the Virginia Hazardous Waste Management Regulations, Federal Regulations under Subtitle C – RCRA, U.S. Department of Transportation, or local / state of origin regulations.

Signature of Generator / Agent

Printed Name / Date

TRANSPORTER

TRANSPORTER NAME: Clearfield MMG, Inc. TELEPHONE: 757-549-8448 TRUCK NO. 14

I certify that the materials described above were received by me for shipment and delivered to the designated facility.

8-8-14

Transporter Signature / Date

FACILTIY

I certify that the materials described above were delivered to the facility and received by me.

ACCEPTED BY L. Ostrucen DATE 8/13/14

REASONS FOR REJECTION _____

Gross Weight	
Tare Weight	
Net Weight	
Tons	

GENERATOR

Appendix D
Analytical Data

SWMU 615
GROUNDWATER ANALYTICAL RESULTS
VALIDATED RAW ANALYTICAL DATA

Station ID	SWMU615-MW01		SWMU615-MW02	SWMU615-MW03					SWMU615-MW03IW	
Sample ID	SWMU615-GW01-14B	SWMU615-GW01-14D	SWMU615-GW02-14B	SWMU615-GW03-14B	SWMU615-GW03-14D	SWMU615-GW03D-14D	SWMU615-GW03-14D-1	SWMU615-GW03D-14D-1	SWMU615-GW03IW-14B	SWMU615-GW03IW-14D
Sample Date	04/22/14	10/25/14	04/21/14	04/21/14	10/25/14	10/25/14	12/17/14	12/17/14	04/22/14	10/25/14
Chemical Name										
Volatile Organic Compounds (µg/l)										
1,1,1-Trichloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
1,1,2,2-Tetrachloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
1,1,2-Trichloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
1,1-Dichloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
1,1-Dichloroethene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
1,2,4-Trichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
1,2-Dibromo-3-chloropropane	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 UJ	5 U	5 U
1,2-Dibromoethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
1,2-Dichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
1,2-Dichloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
1,2-Dichloropropane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
1,3-Dichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
1,4-Dichlorobenzene	1 U	1 U	1 U	2	1 U	1 U	1 U	1 UJ	1 U	1 U
2-Butanone	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 UJ	12 U	12 U
2-Hexanone	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 UJ	2.5 U	2.5 U
4-Methyl-2-pentanone	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 UJ	2.5 U	2.5 U
Acetone	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 UJ	12 U	12 U
Benzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
Bromodichloromethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
Bromoform	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
Bromomethane	1 U	1 UJ	1 U	1 U	1 UJ	1 UJ	1 U	1 UJ	1 U	1 UJ
Carbon disulfide	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 UJ	5 U	5 U
Carbon tetrachloride	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
Chlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
Chloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
Chloroform	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
Chloromethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
cis-1,2-Dichloroethene	0.53 J	1 U	1 U	36	5 J	5.3 J	7.7 J	6.7 J	1 U	1 U
cis-1,3-Dichloropropene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
Cyclohexane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
Dibromochloromethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
Dichlorodifluoromethane (Freon-12)	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
Ethylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
Isopropylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
Methyl acetate	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
Methylcyclohexane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
Methylene chloride	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 UJ	5 U	5 U
Methyl-tert-butyl ether (MTBE)	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
Styrene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
Tetrachloroethene	1 U	1 U	1 U	1,300	1.1 J	1.2 J	1.4 J	1.1 J	4.4	1 U
Toluene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
trans-1,2-Dichloroethene	1 U	1 U	1 U	0.87 J	1 U	1 U	1 U	1 UJ	1 U	1 U
trans-1,3-Dichloropropene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
Trichloroethene	1 U	1 U	1 U	59	3.2 J	3.3 J	3.7 J	3.9 J	1 U	1 U
Trichlorofluoromethane (Freon-11)	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
Vinyl chloride	1 U	1 U	1 U	2.8	1 U	1 U	1 U	1 UJ	1 U	1 U
Xylene, total	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 UJ	2 U	2 U
Wet Chemistry										
Total organic carbon (TOC) (mg/l)	1.4	NA	5.1	4	NA	NA	NA	NA	4.3	NA

Notes:
Shading indicates detections
NA - Not analyzed
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
mg/l - Milligrams per liter
µg/l - Micrograms per liter
Reported VOCs (detected and non-detected) values may be biased low or high for samples collected in April 2014 based on continuing calibration verification (CCV)and laboratory control sample (LCS) daily recoveries. Additionally, there is uncertainty that reported non-detect values are accurate, indicating there is the potential for low level detections

SWMU 615
GROUNDWATER ANALYTICAL RESULTS
VALIDATED RAW ANALYTICAL DATA

Station ID	SWMU615-MW04	SWMU615-MW05		SWMU615-MW06		SWMU615-MW07		SWMU615-MW08	
Sample ID	SWMU615-GW04-14B	SWMU615-GW05-14B	SWMU615-GW05D-14B	SWMU615-GW06-14C	SWMU615-GW06-14D	SWMU615-GW07-14C	SWMU615-GW07D-14C	SWMU615-GW08-14C	SWMU615-GW08-14D
Sample Date	04/23/14	04/22/14	04/22/14	07/08/14	10/25/14	07/08/14	07/08/14	07/08/14	10/25/14
Chemical Name									
Volatile Organic Compounds (µg/l)									
1,1,1-Trichloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2,4-Trichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dibromo-3-chloropropane	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dibromoethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloropropane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
2-Butanone	12 U	12 U	12 U	12 UJ	12 U	12 UJ	12 UJ	12 UJ	12 U
2-Hexanone	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
4-Methyl-2-pentanone	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Acetone	12 U	12 U	12 U	12 U	12 U	16 U	18 U	12 U	12 U
Benzene	1 U	1 U	1 U	1 U	0.91 J	1 U	1 U	1 U	1 U
Bromodichloromethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromoform	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromomethane	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U	1 U	1 UJ
Carbon disulfide	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon tetrachloride	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroform	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloromethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
cis-1,2-Dichloroethene	1 U	1 U	1 U	0.65 J	1 U	0.57 J	1 U	0.9 J	1 J
cis-1,3-Dichloropropene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cyclohexane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dibromochloromethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dichlorodifluoromethane (Freon-12)	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Isopropylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methyl acetate	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methylcyclohexane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methylene chloride	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Methyl-tert-butyl ether (MTBE)	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Styrene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Tetrachloroethene	1 U	1 U	1 U	1 U	1 U	1.8 J	1.4 J	1.8 J	1.1 J
Toluene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
trans-1,2-Dichloroethene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
trans-1,3-Dichloropropene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Trichloroethene	1 U	1 U	1 U	1 J	1 U	1 U	1 U	1.2 J	1.2 J
Trichlorofluoromethane (Freon-11)	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Vinyl chloride	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Xylene, total	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Wet Chemistry									
Total organic carbon (TOC) (mg/l)	2.5	2.8	NA	NA	NA	NA	NA	NA	NA

Notes:

Shading indicates detections

NA - Not analyzed

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

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

mg/l - Milligrams per liter

µg/l - Micrograms per liter

Reported VOCs (detected and non-detected) values may be biased low or high for samples collected in April 2014 based on continuing calibration verification (CCV)and laboratory control sample (LCS) daily recoveries. Additionally, there is uncertainty that reported non-detect values are accurate, indicating there is the potential for low level detections

SWMU 615
SOIL ANALYTICAL RESULTS
VALIDATED RAW ANALYTICAL DATA

Station ID	SWMU615-MW01		SWMU615-MW02		SWMU615-MW03IW	SWMU615-MW04		SWMU615-MW05		
Sample ID	SWMU615-MW01-14-15-14B	SWMU615-MW01-4-4_5-14B	SWMU615-MW02-14-15-14B	SWMU615-MW02-4-4_5-14B	SWMU615-MW03IW-39-40-14B	SWMU615-MW04-14-15-14B	SWMU615-MW04-4-4_5-14B	SWMU615-MW05-14-15-14B	SWMU615-MW05-4-4_5-14B	SWMU615-MW05D-4-4_5-14B
Sample Date	04/16/14	04/17/14	04/17/14	04/17/14	04/15/14	04/17/14	04/17/14	04/16/14	04/17/14	04/17/14
Chemical Name										
Volatile Organic Compounds (µg/kg)										
1,1,1-Trichloroethane	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
1,1,2,2-Tetrachloroethane	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
1,1,2-Trichloroethane	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
1,1-Dichloroethane	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
1,1-Dichloroethene	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
1,2,4-Trichlorobenzene	NA	1.2 U	NA	1.7 UJ	NA	NA	1.1 U	NA	1.4 U	2.4 U
1,2-Dibromo-3-chloropropane	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
1,2-Dibromoethane	NA	1.2 U	NA	1.7 UJ	NA	NA	1.1 U	NA	1.4 U	2.4 U
1,2-Dichlorobenzene	NA	1.2 U	NA	1.7 UJ	NA	NA	1.1 U	NA	1.4 U	2.4 U
1,2-Dichloroethane	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
1,2-Dichloropropane	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
1,3-Dichlorobenzene	NA	1.2 U	NA	1.7 UJ	NA	NA	1.1 U	NA	1.4 U	2.4 U
1,4-Dichlorobenzene	NA	1.2 U	NA	1.7 UJ	NA	NA	1.1 U	NA	1.4 U	2.4 U
2-Butanone	NA	3 U	NA	4.3 U	NA	NA	2.7 U	NA	3.5 U	6 U
2-Hexanone	NA	3 U	NA	4.3 U	NA	NA	2.7 U	NA	3.5 U	6 U
4-Methyl-2-pentanone	NA	3 U	NA	4.3 U	NA	NA	2.7 U	NA	3.5 U	6 U
Acetone	NA	9.1 J	NA	22 U	NA	NA	18 J	NA	15 J	30 U
Benzene	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
Bromodichloromethane	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
Bromoform	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
Bromomethane	NA	6 U	NA	8.6 U	NA	NA	5.4 U	NA	7.1 U	12 U
Carbon disulfide	NA	6 U	NA	8.6 U	NA	NA	5.4 U	NA	7.1 U	12 U
Carbon tetrachloride	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
Chlorobenzene	NA	1.2 U	NA	1.7 UJ	NA	NA	1.1 U	NA	1.4 U	2.4 U
Chloroethane	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
Chloroform	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
Chloromethane	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
cis-1,2-Dichloroethene	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
cis-1,3-Dichloropropene	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
Cyclohexane	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
Dibromochloromethane	NA	1.2 U	NA	1.7 UJ	NA	NA	1.1 U	NA	1.4 U	2.4 U
Dichlorodifluoromethane (Freon-12)	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
Ethylbenzene	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
Isopropylbenzene	NA	1.2 U	NA	1.7 UJ	NA	NA	1.1 U	NA	1.4 U	2.4 U
Methyl acetate	NA	6 U	NA	8.6 U	NA	NA	5.4 U	NA	7.1 U	12 U
Methylcyclohexane	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
Methylene chloride	NA	6 U	NA	8.6 U	NA	NA	5.4 U	NA	7.1 U	12 U
Methyl-tert-butyl ether (MTBE)	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
Styrene	NA	1.2 U	NA	1.7 UJ	NA	NA	1.1 U	NA	1.4 U	2.4 U
Tetrachloroethene	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
Toluene	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
trans-1,2-Dichloroethene	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
trans-1,3-Dichloropropene	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
Trichloroethene	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
Trichlorofluoromethane (Freon-11)	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
Vinyl chloride	NA	1.2 U	NA	1.7 U	NA	NA	1.1 U	NA	1.4 U	2.4 U
Xylene, total	NA	2.4 U	NA	3.5 UJ	NA	NA	2.2 U	NA	2.8 U	4.8 U
Wet Chemistry										
Total organic carbon (TOC) (mg/kg)	1,100	1,700	2,200	2,500	5,300	2,100	2,900	3,800	4,700	NA
Grain Size (pct)										
Coarse Sand (%)	0	NA	0	NA	0	0	NA	0	NA	NA
Fine Sand (%)	89.1	NA	92.1	NA	74.3	92.5	NA	86.9	NA	NA
Fines (%)	10.7	NA	5.9	NA	5.7	7.4	NA	11.8	NA	NA
Gravel (%)	0	NA	0	NA	0	0	NA	0	NA	NA
Medium Sand (%)	0.2	NA	2	NA	20	0.1	NA	1.3	NA	NA
GRAINSIZE (PCT/P)										
GS05 Sieve 2" (50 mm)	100	NA	100	NA	100	100	NA	100	NA	NA
GS06 Sieve 1.5" (37.5 mm)	100	NA	100	NA	100	100	NA	100	NA	NA
GS07 Sieve 1" (25.0 mm)	100	NA	100	NA	100	100	NA	100	NA	NA
GS08 Sieve 0.75" (19.0 mm)	100	NA	100	NA	100	100	NA	100	NA	NA
GS09 Sieve 0.5" (12.5 mm)	100	NA	100	NA	100	100	NA	100	NA	NA
GS10 Sieve 0.375" (9.5 mm)	100	NA	100	NA	100	100	NA	100	NA	NA
Hyd1 - Percent Passing (%)	10.2	NA	5.9	NA	5.3	5.6	NA	10.7	NA	NA
Hyd2 - Percent Passing (%)	9.8	NA	5.2	NA	5.3	5.6	NA	10	NA	NA
Hyd3 - Percent Passing (%)	9.4	NA	4.8	NA	4.9	5.2	NA	9.3	NA	NA
Hyd4 - Percent Passing (%)	9	NA	4.8	NA	4.6	5.2	NA	8.6	NA	NA
Hyd5 - Percent Passing (%)	8.6	NA	4.4	NA	4.2	4.4	NA	7.1	NA	NA
Hyd6 - Percent Passing (%)	7.8	NA	4.4	NA	3.8	4.7	NA	7.1	NA	NA
Hyd7 - Percent Passing (%)	7.5	NA	4.4	NA	3.5	3.9	NA	5.3	NA	NA
Sieve No. 004 (4.75 mm)	100	NA	100	NA	100	100	NA	100	NA	NA
Sieve No. 010 (2.00 mm)	100	NA	100	NA	100	100	NA	100	NA	NA
Sieve No. 020 (850 um)	100	NA	99.9	NA	98.2	100	NA	100	NA	NA
Sieve No. 040 (425 um)	99.8	NA	98	NA	80	99.9	NA	98.7	NA	NA
Sieve No. 060 (250 um)	99.2	NA	91.9	NA	48.6	98.3	NA	93.1	NA	NA
Sieve No. 140 (106 um)	17.4	NA	7.7	NA	6.3	17.7	NA	13.3	NA	NA
Sieve No. 200 (75 um)	10.7	NA	5.9	NA	5.7	7.4	NA	11.8	NA	NA
GRAINSIZE (MM)										
Hyd1 - Particle Diam. (mm)	0.0358	NA	0.0371	NA	0.037	0.0372	NA	0.0356	NA	NA
Hyd2 - Particle Diam. (mm)	0.0227	NA	0.0236	NA	0.0234	0.0236	NA	0.0226	NA	NA
Hyd3 - Particle Diam. (mm)	0.0131	NA	0.0136	NA	0.0135	0.0136	NA	0.0131	NA	NA
Hyd4 - Particle Diam. (mm)	0.0093	NA	0.0095	NA	0.0096	0.0095	NA	0.0093	NA	NA
Hyd5 - Particle Diam. (mm)	0.0066	NA	0.0067	NA	0.0068	0.0068	NA	0.0066	NA	NA
Hyd6 - Particle Diam. (mm)	0.0033	NA	0.0033	NA	0.0034	0.0033	NA	0.0033	NA	NA
Hyd7 - Particle Diam. (mm)	0.0014	NA	0.0014	NA	0.0014	0.0014	NA	0.0014	NA	NA

Notes:

Shading indicates detections

NA - Not analyzed

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

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

mg/kg - Milligrams per kilogram

pct - Percent

µg/kg - Micrograms per kilogram

Reported VOCs (detected and non-detected) values may be biased low or high for samples collected in April 2014 based on continuing calibration verification (CCV)and laboratory control sample (LCS) daily recoveries. Additionally, there is uncertainty that reported non-detect values are accurate, indicating there is the potential for low level detections.

SWMU 615
SOIL ANALYTICAL RESULTS
VALIDATED RAW ANALYTICAL DATA

Station ID	SWMU615-MW06	SWMU615-MW07		SWMU615-MW08	SWMU615-SB01
Sample ID	SWMU615-SB06-2-3-14C	SWMU615-SB07-3-4-14C	SWMU615-SB07D-3-4-14C	SWMU615-SB08-2-3-14C	SWMU615-SB01-4-5-14B
Sample Date	07/01/14	07/01/14	07/01/14	07/01/14	04/16/14
Chemical Name					
Volatile Organic Compounds (µg/kg)					
1,1,1-Trichloroethane	1.5 U	1.2 U	1.1 U	1 U	1.2 U
1,1,2,2-Tetrachloroethane	1.5 U	1.2 U	1.1 U	1 U	1.2 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	1.5 U	1.2 U	1.1 U	1 U	1.2 U
1,1,2-Trichloroethane	1.5 U	1.2 U	1.1 U	1 U	1.2 U
1,1-Dichloroethane	1.5 U	1.2 U	1.1 U	1 U	1.2 U
1,1-Dichloroethene	1.5 U	1.2 U	1.1 U	1 U	1.2 U
1,2,4-Trichlorobenzene	1.5 UJ	1.2 UJ	1.1 UJ	1 UJ	1.2 U
1,2-Dibromo-3-chloropropane	1.5 UJ	1.2 UJ	1.1 UJ	1 UJ	1.2 U
1,2-Dibromoethane	1.5 U	1.2 U	1.1 U	1 U	1.2 U
1,2-Dichlorobenzene	1.5 U	1.2 U	1.1 U	1 UJ	1.2 U
1,2-Dichloroethane	1.5 U	1.2 U	1.1 U	1 U	1.2 U
1,2-Dichloropropane	1.5 U	1.2 U	1.1 U	1 U	1.2 U
1,3-Dichlorobenzene	1.5 U	1.2 U	1.1 U	1 UJ	1.2 U
1,4-Dichlorobenzene	1.5 U	1.2 U	1.1 U	1 UJ	1.2 U
2-Butanone	3.8 UJ	2.9 UJ	2.7 UJ	2.6 UJ	2.9 U
2-Hexanone	3.8 U	2.9 U	2.7 U	2.6 U	2.9 U
4-Methyl-2-pentanone	3.8 U	2.9 U	2.7 U	2.6 U	2.9 U
Acetone	16 J	18 J	8.5 J	180 U	15 J
Benzene	1.5 U	1.2 U	1.1 U	1 U	1.2 U
Bromodichloromethane	1.5 U	1.2 U	1.1 U	1 U	1.2 U
Bromoform	1.5 U	1.2 U	1.1 U	1 UJ	1.2 U
Bromomethane	7.7 UJ	5.9 UJ	5.4 UJ	5.2 UJ	5.9 U
Carbon disulfide	7.7 U	5.9 U	5.4 U	3.1 J	5.9 U
Carbon tetrachloride	1.5 U	1.2 U	1.1 U	1 U	1.2 U
Chlorobenzene	1.5 U	1.2 U	1.1 U	1 UJ	1.2 U
Chloroethane	1.5 UJ	1.2 UJ	1.1 UJ	1 UJ	1.2 U
Chloroform	1.5 U	1.2 U	1.1 U	1 U	1.2 U
Chloromethane	1.5 U	1.2 U	1.1 U	1 U	1.2 U
cis-1,2-Dichloroethene	1.5 U	1.2 U	1.1 U	1 U	1.2 U
cis-1,3-Dichloropropene	1.5 U	1.2 U	1.1 U	1 UJ	1.2 U
Cyclohexane	1.5 U	1.2 U	1.1 U	1 UJ	1.2 U
Dibromochloromethane	1.5 U	1.2 U	1.1 U	1 U	1.2 U
Dichlorodifluoromethane (Freon-12)	1.5 U	1.2 U	1.1 U	1 U	1.2 U
Ethylbenzene	1.5 U	1.2 U	1.1 U	7 UJ	1.2 U
Isopropylbenzene	1.5 U	1.2 U	1.1 U	1 UJ	1.2 U
Methyl acetate	7.7 U	5.9 U	5.4 U	5.2 U	5.9 U
Methylcyclohexane	1.5 U	1.2 U	1.1 U	1 UJ	1.2 U
Methylene chloride	1.4 J	0.9 J	1.1 J	5.2 U	5.9 U
Methyl-tert-butyl ether (MTBE)	1.5 U	1.2 U	1.1 U	1 U	1.2 U
Styrene	1.5 U	1.2 U	1.1 U	1 UJ	1.2 U
Tetrachloroethene	1.5 U	1.2 U	1.1 U	1 U	1.2 U
Toluene	1.5 U	1.2 U	1.1 U	13 UJ	1.2 U
trans-1,2-Dichloroethene	1.5 U	1.2 U	1.1 U	1 U	1.2 U
trans-1,3-Dichloropropene	1.5 U	1.2 U	1.1 U	1 U	1.2 U
Trichloroethene	1.5 U	1.2 U	1.1 U	1 U	1.2 U
Trichlorofluoromethane (Freon-11)	1.5 U	1.2 U	1.1 U	1 U	1.2 U
Vinyl chloride	1.5 U	1.2 U	1.1 U	1 U	1.2 U
Xylene, total	3.1 U	2.4 U	2.2 U	5.7 UJ	2.3 U
Wet Chemistry					
Total organic carbon (TOC) (mg/kg)	NA	NA	NA	NA	NA
Grain Size (pct)					
Coarse Sand (%)	NA	NA	NA	NA	NA
Fine Sand (%)	NA	NA	NA	NA	NA
Fines (%)	NA	NA	NA	NA	NA
Gravel (%)	NA	NA	NA	NA	NA
Medium Sand (%)	NA	NA	NA	NA	NA
GRAINSIZE (PCT/P)					
GS05 Sieve 2" (50 mm)	NA	NA	NA	NA	NA
GS06 Sieve 1.5" (37.5 mm)	NA	NA	NA	NA	NA
GS07 Sieve 1" (25.0 mm)	NA	NA	NA	NA	NA
GS08 Sieve 0.75" (19.0 mm)	NA	NA	NA	NA	NA
GS09 Sieve 0.5" (12.5 mm)	NA	NA	NA	NA	NA
GS10 Sieve 0.375" (9.5 mm)	NA	NA	NA	NA	NA
Hyd1 - Percent Passing (%)	NA	NA	NA	NA	NA
Hyd2 - Percent Passing (%)	NA	NA	NA	NA	NA
Hyd3 - Percent Passing (%)	NA	NA	NA	NA	NA
Hyd4 - Percent Passing (%)	NA	NA	NA	NA	NA
Hyd5 - Percent Passing (%)	NA	NA	NA	NA	NA
Hyd6 - Percent Passing (%)	NA	NA	NA	NA	NA
Hyd7 - Percent Passing (%)	NA	NA	NA	NA	NA
Sieve No. 004 (4.75 mm)	NA	NA	NA	NA	NA
Sieve No. 010 (2.00 mm)	NA	NA	NA	NA	NA
Sieve No. 020 (850 um)	NA	NA	NA	NA	NA
Sieve No. 040 (425 um)	NA	NA	NA	NA	NA
Sieve No. 060 (250 um)	NA	NA	NA	NA	NA
Sieve No. 140 (106 um)	NA	NA	NA	NA	NA
Sieve No. 200 (75 um)	NA	NA	NA	NA	NA
GRAINSIZE (MM)					
Hyd1 - Particle Diam. (mm)	NA	NA	NA	NA	NA
Hyd2 - Particle Diam. (mm)	NA	NA	NA	NA	NA
Hyd3 - Particle Diam. (mm)	NA	NA	NA	NA	NA
Hyd4 - Particle Diam. (mm)	NA	NA	NA	NA	NA
Hyd5 - Particle Diam. (mm)	NA	NA	NA	NA	NA
Hyd6 - Particle Diam. (mm)	NA	NA	NA	NA	NA
Hyd7 - Particle Diam. (mm)	NA	NA	NA	NA	NA

Notes:

Shading indicates detections

NA - Not analyzed

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