

**GROUNDWATER SAMPLING  
REPORT OF FINDINGS**

**FOR**

***FC 40-3*  
MARINE CORPS BASE  
CAMP LEJEUNE, NORTH CAROLINA**

**FACILITY ID#: E-002740  
NCDENR UST INCIDENT NO. 24222  
LAND USE CLASSIFICATION: INDUSTRIAL  
RISK CLASSIFICATION: LOW**

**MAY 10, 2005**

**CONTRACT NO. N62470-01-D-3009  
DELIVERY ORDER NO. 0127  
CATLIN PROJECT NO. 204-079**



**PREPARED BY:**

**CATLIN ENGINEERS AND SCIENTISTS  
P. O. BOX 10279  
WILMINGTON, NORTH CAROLINA 28404-0279  
(910) 452-5861**

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## LIST OF ACRONYMS

2001 Guidelines	Guidelines for Assessment and Corrective Action, North Carolina Underground Storage Tank Section (Effective July 1, 2001)
2L GWQS	NCAC T15A:02L Groundwater Quality Standards
AMS	Art's Manufacturing and Supply
AST	Aboveground Storage Tank
BQL	Below Quantitation Limit
BLS	Below Land Surface
CATLIN	CATLIN Engineers and Scientists (Formerly RC&A)
CFR	Code of Federal Regulations
CSA	Comprehensive Site Assessment
DEM	Division of Environmental Management
DIPE	Diisopropyl Ether
DOD	Department of Defense
DPT	Direct Push Technology
DWQ	Division of Water Quality
DWM	Division of Waste Management
DTW	Depth to Water
EAD	Environmental Affairs Department
EMD	Environmental Management Division
EPA	Environmental Protection Agency
EPH	Extractable Petroleum Hydrocarbons
EQB	Environmental Quality Branch
FID	Flame Ionization Detector
FOD	Foreign Object Debris
FT	Feet
GCL	Gross Contaminant Level
GIS	Geographic Information System
GPS	Global Positioning System
I/C	Industrial/Commercial
ID	Identification
I&E	Installations and Environment Department
IGWQS	Interim Groundwater Quality Standards
IPE	Isopropyl Ether
LSA	Limited Site Assessment
LUST	Leaking Underground Storage Tank
MADEP	Massachusetts Department of Environmental Protection
MCALF	Marine Corps Auxiliary Landing Field
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MCOLF	Marine Corps Outlying Landing Field
mg/Kg	Milligrams per Kilogram
mg/L	Milligrams per Litre

MSCC	Maximum Soil Contaminant Concentration
MTBE	Methyl tertiary butyl ether
ug/Kg	Micrograms per Kilogram
ug/L	Micrograms per Litre
NA	Not Analyzed
N/A	Not Applicable
NAVFAC Atlantic	Naval Facilities Atlantic Division
NC	North Carolina
NCAC	North Carolina Administrative Code
NCDENR	North Carolina Department of Environment and Natural Resources
NE	None Established
NM	Not Measured
NMT	No Measurable Thickness
NS	Not Sampled
OVA	Organic Vapor Analyzer
PAH	Polynuclear Aromatic Hydrocarbons
PPB	Parts Per Billion
PPM	Parts Per Million
PID	Photo Ionization Detector
PQL	Practical Quantitation Limits
PVC	Polyvinyl chloride
RBCA	Risk-Based Corrective Action
RCRA	Resource Conservation and Recovery Act
Res	Residential
SOW	Scope of Work
STGW	Soil-to-Groundwater
SVOC	Semi Volatile Organic Compound
TDHF	Toxicologically Defined Hydrocarbons Fractions
TOC	Top of Casing
TPH	Total Petroleum Hydrocarbons
US	United States
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
VPH	Volatile Petroleum Hydrocarbons
WiRO	Wilmington Regional Office

**A. SITE IDENTIFICATION**

DATE OF REPORT: January 25, 2005  
Facility ID: E-002740 UST Incident Number (if known): 24222  
Land Use Classification: Industrial Risk Classification: Low  
Site Name: FC 40-3  
Site Location: Building FC 40, Sneads Ferry Rd. MCB, Camp Lejeune (See Figure 1)  
Nearest City/Town: Jacksonville County: Onslow

UST Owner: Commanding General – MCB Camp Lejeune  
I&E/EMD/EQB  
Address: PSC 20004 Phone: (910) 451-5068  
MCB Camp Lejeune, NC 28542

UST Operator: Same as above  
Address: Same as above Phone: Same as above

Property Owner: Same as above  
Address: Same as above Phone: Same as above

Property Occupant: Combat Engineers Battalion, 2<sup>nd</sup> Marine Division  
Address: Building 1800, Lewis Road Phone: (910) 451-9660

Consultant/Contractor: CATLIN Engineers and Scientists  
Address: 220 Old Dairy Road, Wilmington, North Carolina 28405 Phone: (910) 452-5861

**Release Information**

Date Discovered: April 16, 2002  
Longitude: W 77° 18' 55" Latitude: N 34° 39' 25"

Estimated Quantity of Release: Unknown

Cause of Release: Unknown

Source of Release (e.g. Piping/UST):  
Possible leaking UST and/or associated piping

Sizes and contents of UST system(s) from which the release occurred:  
1,000-gallon Used Oil

I, Michael E. Mason Professional Engineer Licensed Geologist (circle one) for  
CATLIN Engineers and Scientists, do certify that the information contained in this report is correct and  
accurate to the best of my knowledge.



(Please Affix Seal and Signature)

## **B. BACKGROUND AND PURPOSE**

*(Refer to Figure 2)*

On April 3, 2002 J.A. Jones Environmental Services Company (J.A. Jones) of Charlotte, North Carolina performed UST excavation operations and removed one 1,000-gallon, double wall fiberglass UST from the site (see Figure 2). The UST was reportedly utilized to store used oil generated during vehicle maintenance activities conducted at Building FC 40. Two of six soil samples obtained from the tank basin during removal were indicative of a release.

In March 2003, CATLIN conducted field work and sampling required by NCDENR for a Phase I LSA. One soil sample and one groundwater sample were collected for laboratory analysis from a temporary boring/well. The soil sample was collected from beneath the former product line location. The soil sample results did not reveal any concentrations above the laboratory PQLs except lead and chromium; however, lead and chromium concentrations were below the lowest MSCCs. The groundwater sample was collected from a temporary well in the former UST basin area. Groundwater sample analytical results revealed bis(2-ethylhexyl)phthalate and C<sub>9</sub>-C<sub>22</sub> Aromatics above the 2L GWQS. Additionally, 0.5 µg/L of 4-Isopropyltoluene was identified in the groundwater sample collected from USTFC40-03-TW01. There is no current 2L GWQS, GCL, or IGWQS for this compound. The Phase I LSA Report dated June 20, 2003 concluded the site may be considered for No Further Action.

The NCDENR determined that the site meets the criteria for Low Risk and Industrial Land Use. Based on historical soil and groundwater sample results, the site is eligible for “No Further Action” status with issuance of a Notice of Residual Petroleum or Land Use Restriction for the groundwater only.

The purpose of this investigation was to resample the groundwater in order to determine if contaminant concentrations had naturally attenuated below the 2L GWQS. If so, the site would be eligible for No Further Action Status without Land Use Restriction.

## **C. METHODS**

### **1. Field Methods**

*(Refer to Figure 2 and Appendices A, B, and C)*

All field work was conducted in general accordance with CATLIN’s Standard Procedures provided in Appendix A. CATLIN personnel gathered subsurface soil data by Direct Push Technology boring advancement using an AMS PowerProbe™ 9600D (PowerProbe) on November 3, 2004. When using the PowerProbe, the borings are advanced to depth by static force and a 90-pound hydraulic percussion hammer. Two and one-quarter inch diameter by four-foot length steel is used as casing. Soil samples are continuously collected in one and one-half inch clear liners. Liners are removed from the casing and then cut in half longitudinally to allow for visual/manual classification by the USCS and organic vapor analysis utilizing a PID. A boring log for the USTFC40-03-DPT01 boring is provided in Appendix B. The boring location is illustrated on Figure 2.

Well materials were installed in an attempt to determine accurate water table measurements and facilitate groundwater sampling. The well was constructed with 1.25-inch slotted PVC well screen.

The depth to water was gauged and a grab groundwater sample was collected. The sample was collected on November 3, 2004 utilizing a peristaltic pump and new polyethylene tubing. The groundwater sample was labeled USTFC40-03-DPT01.

New disposable nitrile gloves were worn during sampling activities. All samples were placed into the appropriately labeled glassware and packed on ice in an insulated cooler for transportation to the laboratory. Sample integrity was maintained by following proper chain of custody procedures. A copy of the chain of custody is provided following the complete laboratory report in Appendix C.

Boreholes were abandoned to the surface using three-eighth inch bentonite chips. Bentonite and water were poured into the borehole simultaneously to facilitate hydration.

## **2. Analytical Methods**

Samples were transported to Paradigm Analytical Laboratories, Inc. (NC Certification #481) in Wilmington, North Carolina. At the laboratory the groundwater sample was analyzed for the presence of 4-Isopropyltoluene per EPA Method 6210D, bis(2-ethylhexyl)phthalate and phenol per EPA Method 625, and MADEP EPH and VPH.

## **D. RESULTS**

*(Refer to Tables 1, 2, 3A, and 3B and Appendices B and C)*

Field observations noted during soil boring advancement indicate site geology comprised of gravel to approximately 2.7 feet BLS and silty very fine to fine sand to six feet BLS. No soils were recovered from six to eight feet BLS and then gravels from eight to 12 feet BLS. Fine and very fine sand was encountered from 12 feet to boring termination at 16 feet BLS. A boring log for the soil boring including organic vapor screening results is included in Appendix B.

Groundwater depth as measured in the temporary monitoring well USTFC40-03-DPT01 on November 3, 2004 was approximately six feet BLS.

The complete laboratory analytical report is included in Appendix C. Bis(2-ethylhexyl)phthalate concentrations in the USTFC40-03-DPT01 groundwater sample collected on November 3, 2004 were detected above the 3 ug/L 2L GWQS (Result = 44.3 ug/L). Phenol and 4-isopropyltoluene concentrations were not detected above their corresponding laboratory PQLs. Groundwater sample analysis per MADEP EPH and VPH revealed detectable concentrations of all EPH and VPH hydrocarbon fractions. The MADEP C<sub>9</sub>-C<sub>18</sub> Aliphatics result of 14,510 ug/L exceeds the 4,200 ug/L corresponding 2L GWQS.

The MADEP C<sub>19</sub>-C<sub>36</sub> Aliphatics result of 250,000 ug/L exceeds the 42,000 ug/L corresponding 2L GWQS. The MADEP C<sub>9</sub>-C<sub>22</sub> Aromatics result of 48,490 ug/L exceeds the 210 ug/L corresponding 2L GWQS. Groundwater sample analytical results are summarized on Tables 1, 2, 3A, and 3B.

## **E. CONCLUSIONS AND RECOMMENDATIONS**

The previously detected 4-Isopropyletoluene and Phenol concentrations above the 2L GWQS and/or PQL were not revealed during the recent (November 3, 2004) groundwater sampling. The bis(2-ethylhexyl)phthalate and MADEP EPH and VPH concentrations previously detected in groundwater around the former UST at Building FC40-3 have not naturally attenuated to below the corresponding 2L GWQS. The groundwater contaminant concentrations revealed will prevent “No Further Action” without a Land Use Restriction for groundwater. CATLIN recommends adopting a Land Use Restriction for groundwater and requesting No Further Action.

## **F. REFERENCES**

CATLIN Engineers and Scientists, *LUST Phase I Limited Site Assessment Report for FC 40-3, MCB Camp Lejeune, NC*, June 20, 2003.

J.A. Jones Environmental Services Company. *Underground Storage Tank Closure Report, UST FC40-3, MCB Camp Lejeune, NC*, June 6, 2002.

North Carolina Department of Environment and Natural Resources, *Guidelines for Assessment and Corrective Action, North Carolina Underground Storage Tank Section* (Effective July 1, 2001).

## TABLES

**TABLE 1 SUMMARY OF GROUNDWATER LABORATORY RESULTS**

Date: November 2004

Incident Number and Name:  
24222 - FC 40-3

Facility ID#: E-002740

**Analytical Method: EPA METHOD 6210D**

Well ID	Contaminant of Concern →		4-Isopropyltoluene
	Sample ID	Date Collected	
USTFC40-03-DPT01	USTFC40-03-DPT01	11/3/2004	<0.5
2L GWQS GCL			NE NE

All result in ug/L  
NE = None Established

**TABLE 2 SUMMARY OF GROUNDWATER LABORATORY RESULTS**

Date: November 2004

Incident Number and Name:  
24222 - FC 40-3

Facility ID#: E-002740

Analytical Method: EPA METHOD 625

Well ID	Contaminant of Concern →		Bis(2-ethylhexyl)phthalate	Phenol
	Sample ID	Date Collected		
USTFC40-03-DPT01	USTFC40-03-DPT01	11/3/2004	44.3	<10
2L GWQS GCL			3 3000	300 NE

All results in ug/L

Shaded concentrations exceed the 2L GWQS

NE = None Established

**TABLE 3A SUMMARY OF GROUNDWATER LABORATORY RESULTS**

Date: November 2004

Incident Number and Name:

24222 - FC 40-3

Facility ID#: E-002740

**Analytical Methods: MADEP EPH/VPH**

Well ID	Contaminant of Concern →		C9-C18 Aliphatics	C19-C36 Aliphatics	C11-C22 Aromatics	C5-C8 Aliphatics	C9-C12 Aliphatics	C9-C10 Aromatics
	Sample ID	Date Collected						
USTFC40-03-DPT01	USTFC40-03-DPT01	11/3/2004	14,000	250,000	48,000	130	510	490

All results in ug/L

**TABLE 3B SUMMARY OF GROUNDWATER LABORATORY RESULTS**

Date: November 2004

Incident Number and Name:  
24222 - FC 40-3

Facility ID#: E-002740

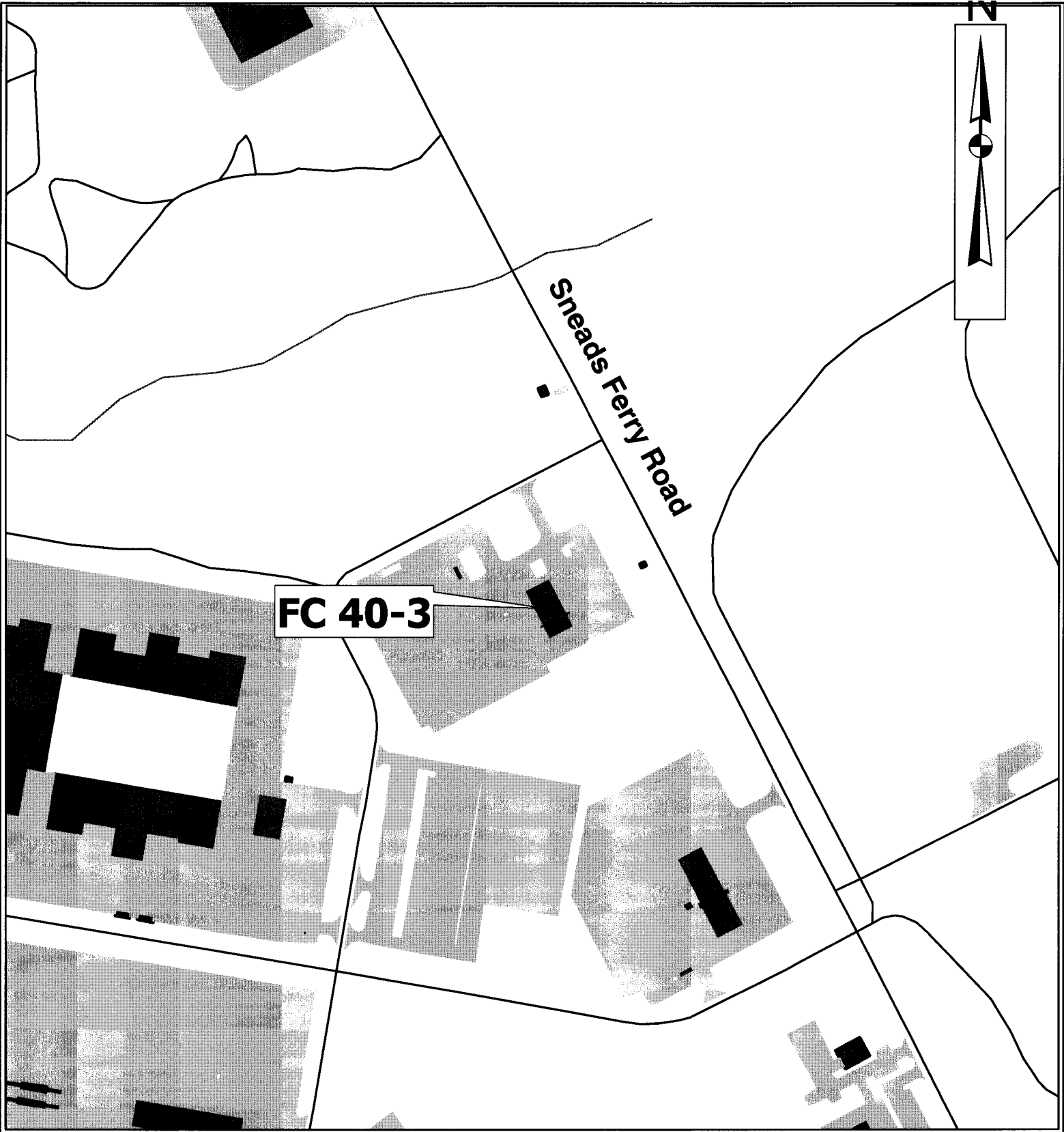
**Analytical Methods: MADEP EPH/VPH AS COMPARED TO THE 2L GWQS**

Well ID	Contaminant of Concern →		C5-C8 Aliphatics	C9-C18 Aliphatics	C19-C36 Aliphatics	C9-C22 Aromatics
	Sample ID	Date Collected				
USTFC40-03-DPT01	USTFC40-03-DPT01	11/3/2004	130	14,510	250,000	48,490
2L GWQS			420	4,200	42,000	210

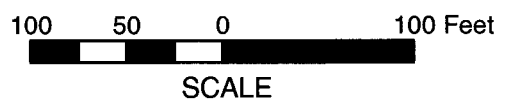
All results in ug/L

Shaded concentrations exceed the 2L GWQS

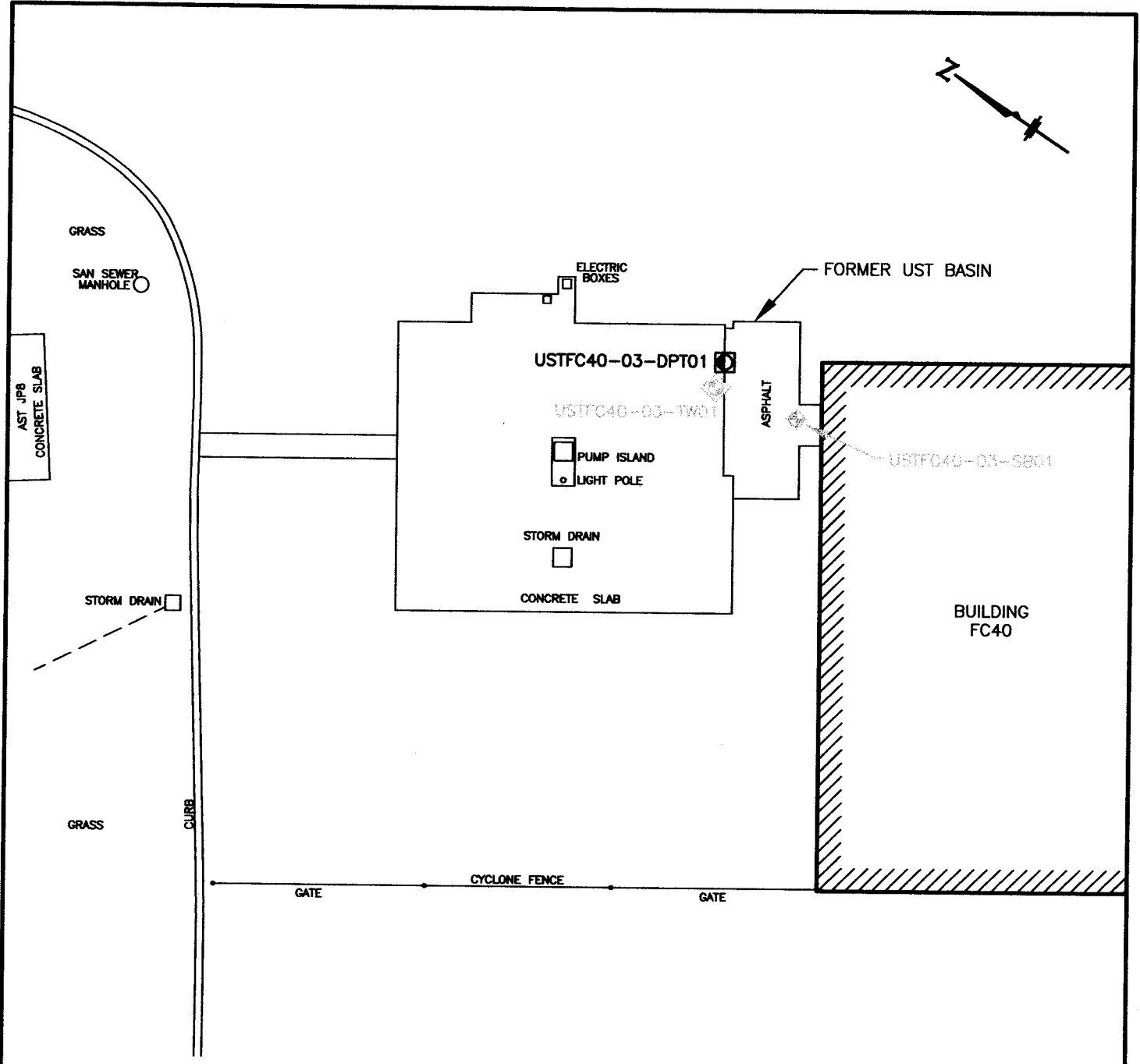
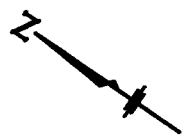
## FIGURES



NOTE: All GIS supplied by MCB Camp Lejeune Business and Logistics Support Department

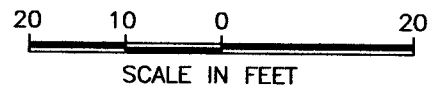


	PROJECT FC 40-3 MARINE CORPS BASE CAMP LEJEUNE, NC		TITLE SITE VICINITY MAP		FIGURE 1
	JOB NO. 204-079	DATE JAN 2005	SCALE AS SHOWN	DRAWN BY THW	



LEGEND

PREVIOUS	EXISTING	NEW	DESCRIPTION
			BUILDING
			TEMPORARY WELL
			SOIL BORING
			DPT PROBE AND GROUNDWATER SAMPLE



 <b>CALLIN</b> ENGINEERS and SCIENTISTS WILMINGTON, NORTH CAROLINA	PROJECT <b>FC40-3</b> MARINE CORPS BASE CAMP LEJEUNE, N.C.	TITLE <b>BUILDING FC40-3</b> <b>SITE PLAN</b>	FIGURE <b>2</b>
	JOB NO: 204-079 DATE: DEC 2004	SCALE: 1"=20'	DRAWN BY: WHW CHECKED BY: MEM

**APPENDIX A**  
**STANDARD PROCEDURES**

# CATLIN STANDARD METHODS OF INVESTIGATION

(REVISED APRIL 2002)

## 1.0 DATA COLLECTION

### 1.1 BACKGROUND DATA

Background data and history information relevant to the site investigation is generated through numerous sources. These sources may include, but are not limited to, the following:

- Conversations with the client and regulatory officials involved with the incident.
- Review of pertinent regulatory correspondence.
- Review of previous and existing reports and other technical data.
- Review of available historical records.

### 1.2 SURVEYS AND POTENTIAL RECEPTOR DATA

Physical survey and potential receptor data are collected in accordance with the intended level of investigation. In general, the purpose is to collect sufficient information for site assessment and corrective action planning.

Individual receptors are identified and evaluated in the context of their potential for contaminant impact. Potential receptors of contamination can include surface water bodies, groundwater supply wells, wellhead protection areas, and subsurface building structures.

#### 1.2.1 Horizontal Survey

Horizontal survey data are generated using either accepted general field surveying techniques, or existing survey maps; or by using a combination of existing data and field generated information. The survey area generally extends to a point at least 50 feet beyond suspected plume boundaries. A receptor scale survey of a larger area surrounding a site will be made if appropriate and necessary.

#### 1.2.2 Vertical Survey

A vertical survey is conducted at the site typically within an accuracy of 0.01 foot. The datum plane is generally assumed unless otherwise noted. Assumed temporary benchmarks (TBM) are selected near ground level. The vertical survey includes such points as top of all well casings, selected ground shots, important utility inverts, utility fluid levels, important surface water levels, and other items determined to be significant.

### **1.3 DRILLING AND MONITORING WELL/PIEZOMETER INSTALLATION**

Necessary permits are applied for and obtained in accordance with federal, state, and local requirements prior to drilling or well construction activities. Additionally, the well locations are scanned for underground utilities prior to conducting intrusive subsurface activities. Wells are installed under applicable licensing requirements, and are designed and constructed in accordance with accepted standards and practices. Any wells purposely installed at off-site locations are permitted through appropriate right-of-entry agreements with all necessary property owners and/or their agents.

#### **1.3.1 Drilling Methods and Subsurface Data Collection**

Drilling is accomplished utilizing one or more of the following methods:

##### ***Auger Drilling***

Auger drilling is the preferred, most often used method of subsurface investigation and is accomplished using a vehicle or trailer mounted drill rig. Continuous flight auger types used vary upon the site and situation; ranging from the 4-inch outside diameter solid stem to the 12-inch outside diameter hollow stem. Auger type is selected based upon appropriateness and/or site-specific requirements.

##### ***Hand Augering***

Hand augering is utilized when economically and scientifically feasible, or when no other method is suitable. Hand augers typically produce three-inch diameter holes and are generally limited to depths of less than 15 feet.

##### ***Direct Push***

Direct push methods of subsurface investigation are used generally for soil screening purposes or collection of groundwater samples where permanent wells are not viable.

##### ***Other Methods***

Other drilling methods, such as mud and air rotary, rock coring, cable tool, and large bucket augering are used when site conditions or project requirements dictate.

Regardless of the drilling method used, the drill rig(s) and all drilling tools are thoroughly cleaned between boreholes to prevent cross introduction of contaminants. Split spoon samples are collected and field-described at intervals of five feet or less, and cuttings are continuously monitored for organic vapors. Drill cuttings are containerized for off-site disposal or are spread on the ground surface in proximity to the well or boring in accordance with North Carolina Department of Environment and Natural Resources (NCDENR) requirements. A geologist or engineer, trained in using visual/manual techniques, is always present during drilling and is responsible for subsurface contaminant and geologic data collection. Soils are classified in general agreement with the Unified Soils Classification System (USCS).

### **1.3.2 Hydropunch Installation**

Hydropunch penetrometers (Hydropunches) are used to delineate the spatial extent of dissolved and free phase plumes. Soil borings are advanced to the appropriate depth and then the Hydropunch is advanced through the soil boring into undisturbed material. Groundwater samples are collected by pulling back on the body of the Hydropunch and allowing the groundwater to enter the screened portion of the sample chamber. Samples are retrieved using a decontaminated Teflon bailer or peristaltic pump.

### **1.3.3 Well Installation**

Wells are typically constructed of threaded PVC casing and screen. No glues or cements are used in joining PVC components. Well diameter, slot sizes, and protective covers vary depending upon site-specific conditions or situation-specific requirements.

### **1.3.4 Well Development**

Wells are developed by over-pumping or surging using appropriate pumps, blocks, or bailers. Through development, unwanted fine materials are removed from the natural formation surrounding the well. Well development will be performed no sooner than 24-hours after grouting is completed for the Type III wells. Water generated during development is containerized and properly disposed or is discharged onto the ground in proximity of the well in accordance with NCDENR requirements.

## **1.4 HYDROGEOLOGIC DATA COLLECTION**

Data used to help characterize hydrogeologic conditions at a site are obtained through various procedures including, but not necessarily limited to, those described below:

### **1.4.1 Regional Geology**

Information pertaining to the regional geologic framework is compiled from existing publications, maps, and scientific papers.

### **1.4.2 Site Geology**

Shallow site geology is generally determined from field descriptions and borehole samples. Interpretations with regard to hydrogeologically important contacts, zones, fractures, faults, cleavage, and facies changes are made when possible.

### **1.4.3 Groundwater Occurrence and Characteristics**

Groundwater data is obtained utilizing a number of methods and procedures, not limited to the general list below:

#### ***Well Water Levels***

After well development, wells are allowed to stabilize for a minimum of 24 hours prior to measuring. Water level and free product thickness (where applicable) measurements are performed using an electronic interface probe or steel tape with water/product finding pastes.

The specific gravity of any accumulated product is determined and used to calculate true hydraulic grade from measured water levels. This information is combined with vertical survey data to determine relative potentiometric surface elevations for all wells.

#### ***Aquifer Testing***

Various aquifer tests may be used to make determinations of hydraulic conductivity. Slug or pumping tests are often used to characterize site hydrogeologic conditions and to develop remedial action alternatives utilizing appropriate pumping technologies.

#### ***Other Methods***

Other methods may be deemed appropriate for determining various groundwater characteristics. These other methods may include nested well configurations and/or clustered piezometer installations; sieve or pipette analysis; fracture trace analysis; computer modeling; and geophysical logging.

## **1.5 PETROLEUM HYDROCARBON DATA COLLECTION**

### **1.5.1 Collection Methods**

Petroleum hydrocarbon data is obtained through various methods including, but not limited to, the following:

#### ***Field Analysis***

- Direct thickness measurement of phase separated components using tapes and/or probes.
- Manual vapor analysis using a photoionization detector (PID) or flame ionization detector (FIS).
- Detectable odor and visual observation.

#### ***Laboratory Analysis***

- Laboratory analysis of phase-separated products.
- Laboratory vapor, soil, and groundwater analysis using appropriate EPA Methods.

### **1.5.2 Field Sampling**

Field sampling procedures are performed in accordance with recommended protocol, accepted industry standards, and under appropriate chain-of-custody procedures. Generally, sampling procedures are as follows:

#### ***Product Samples***

Product samples are obtained using clean equipment and containers. Each is shipped to the analytical laboratory in protective containers.

#### ***Vapor Samples***

PID/FID readings are measured from soil sample headspace using containerized samples that have been brought to ambient temperature.

Carbon tubes are utilized in conjunction with a laboratory-calibrated vacuum pump to obtain vapor samples. The carbon tubes are sealed and refrigerated for shipment to the analytical laboratory (This method is known as the Carbon Adsorption Method).

### ***Soil Samples***

Soil samples are immediately packed into clean containers, and refrigerated for shipment to the analytical laboratory.

### ***Groundwater Samples***

Groundwater samples are collected in accordance with the following procedures:

- Creeks/Lakes/Etc.

Grab samples are obtained.

- Domestic Wells

Wells are pumped for a time sufficient to completely purge the well and any pressure or holding tanks prior to sampling.

- Monitoring Wells

Water level measurements are made and well volumes calculated for each well.

Three well volumes are removed from each well using a thoroughly cleaned Teflon bailer or appropriate purging pump. If it is not possible to remove three volumes, due to very low yields, a minimum of one volume is removed prior to obtaining a sample.

Where analysis for metals is required, wells are typically sampled utilizing low flow techniques, which reduce turbidity and the potential for matrix interference.

Samples are collected and containerized in a manner that minimizes agitation and contact with the air.

Sampling records are field prepared.

Samples are labeled and proper chain of custody documents are maintained.

Samples are promptly protectively packed, refrigerated, and shipped to the analytical laboratory for analysis.

## 2.0 DATA EVALUATION

Data obtained as a result of the site investigation is compiled and evaluated and a report is prepared for client review and distribution to the appropriate agencies. Generally, specific data are evaluated as follows:

- Background data are evaluated in context with the suspected or confirmed problem.
- Survey data are utilized to develop site maps and to evaluate contaminant receptors.
- Well construction records are compiled and presented as part of the report. As-built information is used in combination with other data to evaluate subsurface conditions and monitoring well screen settings as they relate to the investigation.
- Subsurface drilling logs are used to develop geologic cross-sections, fence diagrams, isopachs, structure contours, or other constructions. Regional geologic data are used to obtain an overall framework.
- Hydrogeologic data are used to develop contour maps, flow nets and other constructions. The data is also used to calculate various hydrogeologic parameters that describe aquifer characteristics.
- Hydrocarbon data are utilized to develop various plume geometry and isoconcentration maps.
- All data are compiled and utilized for making specific recommendations with regard to remedial action alternatives.

**APPENDIX B**  
**BORING LOG**

# BORING LOG

**CATLIN**  
ENGINEERS and SCIENTISTS

Wilmington, North Carolina

SHEET 1 OF 1

PROJECT NO.: 204-079	STATE: NC	COUNTY: Onslow	LOCATION: Havelock
PROJECT NAME: Eight Site Closures		LOGGED BY: Tom Stetler	BORING ID: USTFC40
		DRILLER: Bobbie Fowler	-03-DPT01
LATITUDE:	LONGITUDE:	CREW:	
SYSTEM:	BORING LOCATION: At edge of asphalt		LAND ELEV.: NM
DRILL MACHINE: Power Probe	METHOD: Direct Push	0 HOUR DTW: 6.0	BORING DEPTH: 16.0
START DATE: 11/03/04	FINISH DATE: 11/03/04	24 HOUR DTW: NM	ROCK DEPTH: --

DEPTH	BLOW COUNT 0.5 0.5 0.5 0.5	SAMP. TYPE	OVA RESULTS (ppm)				LAB.	U S C S	L O G	DEPTH	SOIL AND ROCK DESCRIPTION	ELEVATION
			0	1000	2000	3000						
0.0									0.0	LAND SURFACE		
0.0									0.0	ASPHALT		
0.3									0.3			
1.4	DP DP DP DP		▲1.4						1.4	Light brown to gray, very poorly sorted limestone GRAVEL in f. to vf. SAND matrix. Moist.		
2.0									2.7			
2.7	DP DP DP DP		▲0						2.7	Tan, silty, f. to vf. SAND. Trace road gravel. Moderate sorting. Moist. No hydrocarbon odor. 1.9' recovery on 0-4' tube.		
4.0									4.0			
4.0	DP DP DP DP		▲0						4.0	Same as above. Tan, silty f. to vf. SAND. Trace road gravel. Moist. No hydrocarbon odor.		
6.0									6.0			
6.0	DP DP DP DP								6.0	No return. Free hydraulic push without hammer between 6' and 8' BLS. .7' recovery on 4-8' tube.		
8.0									8.0			
8.0	DP DP DP DP		▲0						8.0	Light brown to gray, very poorly sorted limestone GRAVEL and silty, f. to vf. SAND. Moist. Hard surface at 10' BLS. No hydrocarbon odor. 1.2' recovery on 8-10' tube.		
10.0									10.0			
10.0	DP DP DP DP		▲3.5						10.0	Same as above. Asphalt plug at base of tube (approximately 2" in thickness). Dry. Slight hydrocarbon odor. .75' recovery on 10-12' tube.		
12.0									12.0			
12.0	DP DP DP DP		▲18						12.0	Dark gray, f. to vf. SAND. Well sorted. Saturated. Strong hydrocarbon odor.		
13.1									13.1			
13.1	DP DP DP DP		▲4.1						13.1	Light tan, vf. SAND. Well sorted. Saturated. Slight hydrocarbon odor. 4' recovery on 12-16' tube.		
14.0									14.0			
14.0	DP DP DP DP								14.0			
16.0									16.0			
16.0									16.0	Boring Terminated at Depth 16.0 ft Assumes uniform compaction. Hole caved to 6' BLS. Set temporary 1" well and abandoned with bentonite following sampling.		

CATLIN ENVIRO. LOG 204-079 8 SITES CAMP LEJUNE GEL CATLIN.GDI 01/13/05

**APPENDIX C**

**LABORATORY ANALYTICAL REPORT AND  
CHAIN OF CUSTODY DOCUMENTATION**

**PARADIGM ANALYTICAL LABORATORIES, INC.**

5500 Business Drive  
Wilmington, North Carolina 28405  
(910) 350-1903  
Fax (910) 350-1557

Mr. Ben Ashba  
Richard Catlin & Associates  
P.O. Box 10279  
Wilmington NC 28404-0279

Report Number: G128-1403

Client Project: Building FC-40-3

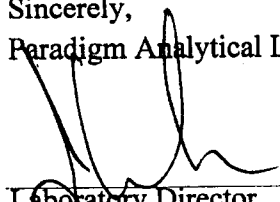
Dear Mr. Ashba:

Enclosed are the results of the analytical services performed under the referenced project. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of five years in the event they are required for future reference. Any samples submitted to our laboratory will be retained for a maximum of thirty (30) days from the date of this report unless other arrangements are requested.

If there are any questions about the report or the services performed during this project, please call Paradigm at (910) 350-1903. We will be happy to answer any questions or concerns which you may have.

Thank you for using Paradigm Analytical Labs for your analytical services. We look forward to working with you again on any additional analytical needs which you may have.

Sincerely,  
Paradigm Analytical Laboratories, Inc.

  
\_\_\_\_\_  
Laboratory Director  
J. Patrick Weaver

11/24/04  
\_\_\_\_\_  
Date

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Semivolatiles  
by GCMS 625

Client Sample ID: USTFC40-03-DPT01  
 Client Project ID: Building FC-40-3  
 Lab Sample ID: G128-1403-1H  
 Lab Project ID: G128-1403

Analyzed By: MRC  
 Date Collected: 11/03/2004 16:50  
 Date Received: 11/04/2004  
 Date Extracted: 11/10/2004  
 Matrix: Water

Compound	Result ug/L	Quantitation Limit ug/L	Dilution Factor	Date Analyzed
Bis(2-ethylhexyl)phthalate	44.3	10.0	1	11/12/2004
Phenol	BQL	10.0	1	11/12/2004

	Spike Added	Spike Result	Percent Recovered
2-Fluorobiphenyl	10	9.3	93
2-Fluorophenol	10	6.4	64
Nitrobenzene-d5	10	8.3	83
Phenol-d6	10	8.3	83
2,4,6-Tribromophenol	10	3.7	37
4-Terphenyl-d14	10	9.8	98

Comments:

Flags:

BQL = Below Quantitation Limits.

Reviewed By:

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles  
by GCMS 6210D

Client Sample ID: USTFC40-03-DPT01  
Client Project ID: Building FC-40-3  
Lab Sample ID: G128-1403-1A  
Lab Project ID: G128-1403

Analyzed By: JTF  
Date Collected: 11/03/2004 16:50  
Date Received: 11/04/2004  
Matrix: Water

Compound	Result UG/L	Quantitation Limit UG/L	Dilution Factor	Date Analyzed
4-Isopropyltoluene	BQL	0.500	1	11/17/2004
		Spike Added	Spike Result	Percent Recovered
4-Bromofluorobenzene		10	9.88	99
1,2-Dichloroethane-d4		10	9.91	99
Toluene-d8		10	9.92	99

Comments:

Flags:

BQL = Below Quantitation Limits.

Reviewed By:     *ew*

**EPH (Aliphatics/Aromatics) Results**

by MDEP-EPH

Client Name: Richard Catlin & Associates

Project Name: Building FC-40-3

Sample Information and Analytical Results	
Sample Identification	USTFC40-03-DPT01
Sample Matrix	Water
Date Collected	11/03/04
Date Received	11/04/04
Date Extracted	11/16/04
Date Analyzed	11/23/04
Dry Weight	
Dilution Factor	50:2
C <sub>9</sub> -C <sub>18</sub> Aliphatics*	14000 (µg/L)
C <sub>19</sub> -C <sub>36</sub> Aliphatics*	250000 (µg/L)
C <sub>11</sub> -C <sub>22</sub> Aromatics*	48000 (µg/L)
Aliphatic Surrogate % Recovery	NA
Aromatic Surrogate % Recovery	84
Fractionation Surrogate 1 % Recovery	110

**Comments:**

\* = Excludes any surrogates or internal standards.

NA = Not applicable, surrogate diluted out.

Lab info: G128-1403-11

Reviewed By: RW

**PARADIGM ANALYTICAL LABORATORIES, INC.**

Attachment 3

**EPH Laboratory Reporting Form**

<b>Calibration and QA/QC Information</b>
--

Initial Calibration Date: 11/18/04

**Calibration Ranges and Limits**

Range	MDL (2/2004) (µg/L)	ML (µg/L)	RL	
			(µg/L)	(mg/Kg)
C <sub>9</sub> -C <sub>18</sub> Aliphatics	3.84	12.2	100	10
C <sub>19</sub> -C <sub>36</sub> Aliphatics	0.57	1.8	100	10
C <sub>11</sub> -C <sub>22</sub> Aromatics	4.54	14.4	100	10

**Calibration Concentration Levels**

Range	Levels (µg/mL)	%RSD or CCC	Method of Quantitation
C <sub>9</sub> -C <sub>18</sub> Aliphatics	6	2.40	Calibration Factor
	30		
	60		
	120		
	240		
C <sub>19</sub> -C <sub>36</sub> Aliphatics	8	1.6	Calibration Factor
	40		
	80		
	160		
	320		
C <sub>11</sub> -C <sub>22</sub> Aromatics	17	2	Calibration Factor
	85		
	170		
	340		
	680		

Calibration Check Date: 11/22/04

**Calibration Check**

Range	Levels (µg/mL)	RPD
C <sub>9</sub> -C <sub>18</sub> Aliphatics	120	0.4
C <sub>19</sub> -C <sub>36</sub> Aliphatics	160	-7.8
C <sub>11</sub> -C <sub>22</sub> Aromatics	340	-9.2

MDL = Method Detection Limit  
 ML = Minimum Limit  
 RL = Reportable Limit

RPD = Relative Percent Difference  
 %RSD = Percent Relative Standard Deviation  
 CCC = Correlation Coefficient of Curve

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

Project Name: Building FC-40-3

Sample Information and Analytical Results	
Sample Identification	USTFC40-03-DPT01
Sample Matrix	Water
Collection Option (for Soil)*	
Date Collected	11/03/04
Date Received	11/04/04
Date Extracted	11/10/04
Date Analyzed	11/10/04
Dry Weight	
Dilution Factor	1
C <sub>5</sub> -C <sub>8</sub> Aliphatics**	130 (µg/L)
C <sub>9</sub> -C <sub>12</sub> Aliphatics**	510 (µg/L)
C <sub>9</sub> -C <sub>10</sub> Aromatics**	490 (µg/L)
Surrogate % Recovery - PID	130
Surrogate % Recovery - FID	200***

\* = Option 1 = Established fill line on vial, Option 2 = Sampling Device/Brand, or Option 3 = Field weight of soil.

\*\* = Excludes any surrogates or internal standards.

\*\*\*= High surrogate recovery due to matrix interference

Lab Info: g128-1403-1b

Reviewed By: EW

Attachment 2

VPH Laboratory Reporting Form

Calibration and QA/QC Information

FID Initial Calibration Date: 10/18/04

PID Initial Calibration Date: 10/18/04

**Calibration Ranges and Limits**

Range	MDL (07/15/2004) (µg/L)	ML (µg/L)	RL	
			(µg/L)	(mg/Kg)
C <sub>5</sub> -C <sub>8</sub> Aliphatics	4.4	14	100	10
C <sub>9</sub> -C <sub>12</sub> Aliphatics	3.4	11	100	10
C <sub>9</sub> -C <sub>10</sub> Aromatics	0.13	0.41	100	10

**Calibration Concentration Levels**

Range	Levels (µg/L)	%RSD or CCC	Method of Quantitation
C <sub>5</sub> -C <sub>8</sub> Aliphatics	40	13.5	Calibration Factor
	1000		
	2000		
	3000		
	4000		
C <sub>9</sub> -C <sub>12</sub> Aliphatics	10	14.5	Calibration Factor
	250		
	500		
	750		
	1000		
C <sub>9</sub> -C <sub>10</sub> Aromatics	10	3.7	Calibration Factor
	250		
	500		
	750		
	1000		

Calibration Check Date: 11/11/04

**Calibration Check**

Range	Levels		RPD
	(µg/L)	(mg/Kg)	
C <sub>5</sub> -C <sub>8</sub> Aliphatics	2000	200	24.3
C <sub>9</sub> -C <sub>12</sub> Aliphatics	500	50	-0.7
C <sub>9</sub> -C <sub>10</sub> Aromatics	500	50	-14.5

MDL = Method Detection Limit  
ML = Minimum Limit  
RL = Reportable Limit

RPD = Relative Percent Difference  
%RSD = Percent Relative Standard Deviation  
CCC = Correlation Coefficient of Curve

List of Reporting Abbreviations  
and Data Qualifiers

B = Compound also detected in batch blank

BQL = Below Quantitation Limit

DF = Dilution Factor

Dup = Duplicate

E = Estimated concentration, exceeds calibration range.

J = Estimated concentration, below calibration range and above MDL

LCS(D) = Laboratory Control Spike (Duplicate)

MDL = Method Detection Limit

MS(D) = Matrix Spike (Duplicate)

PQL = Practical Quantitation Limit

RL = Reporting Limit

RPD = Relative Percent Difference

mg/kg = milligram per kilogram, ppm, parts per million

ug/kg = micrograms per kilogram, ppb, parts per billion

mg/L = milligram per liter, ppm, parts per million

ug/L = micrograms per liter, ppb, parts per billion

% Rec = Percent Recovery

% solids = Percent Solids

Special Notes:

- 1) Metals and mercury samples are digested with a hot block, see the standard operating procedure document for details.
- 2) Uncertainty for all reported data is less than or equal to 30 percent.

MI34.011404.1

**PARADIGM ANALYTICAL LABORATORIES, INC.**

5500 Business Drive, Wilmington, NC 28405

Phone: (910)-350-1903 FAX: (910)-350-1557

Chain-of Custody Record & Analytical Request

COC# 39825

Page 1 of 1

Client: Catlin Project ID: Building FC-40-3 Date: 11-4-04 Report To: Ben Ashba @ Catlin  
 Address: 220 Old Dairy Rd. Contact: Ben Ashba Turnaround: Standard  
 Address: Wilmington NC 28405 Phone: 910-452-5861 Job Number: 204-079  
 Quote #: DOD 101 Fax: 910-452-7563 P.O. Number: 241029-3 Invoice To: Shail @ Catlin

Sample ID	Date	Time	Preservatives		Analyses				Received By	Date	Time	Temperature	State Certification Requested				
			Ice	HCl	EPA 625	EPA 6210D	MADP GPH	MADP VPH									
STFC 40-03-DPT01	11-3-04	4:50P	GW	✓	✓	✓	✓	✓	✓	✓	✓	1430	11/4/04	1430	on site	5.8°C	NC ✓ SC Other
Comments: Please specify any special reporting requirements G128-1403 * 625 → Report only * bis(2-ethylhexyl)phthalate 725 and phend * 6210D Report only 4 - Isopropyltoluene - LeJenne and summary EDD format Samples are HOT																	

ORIGINAL