GROUNDWATER SAMPLING
REPORT OF FINDINGS

FOR

PP-3326
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

FACILITY ID#: E-002740
NCDENR UST INCIDENT NO. 24009
LAND USE CLASSIFICATION: RESIDENTIAL
RISK CLASSIFICATION: LOW

OCTOBER 31, 2007

CONTRACT NO. N62470-05-D-6200
DELIVERY ORDER NO. 0016
CATLIN PROJECT NO. 205-077

PREPARED BY:

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A. SITE IDENTIFICATION

DATE OF REPORT: October 31, 2007
Facility ID: E-002740 UST Incident Number (if known): 24009
Land Use Classification: Residential Risk Classification: Low
Site Name: PP-3326
Site Location: 3326 Onslow Drive, Marine Corps Base (MCB), Camp Lejeune (See Figure 1)
Nearest City/Town: Jacksonville County: Onslow

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

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: Military personnel and family

Address: 3326 Onslow Drive Phone: Unknown

Consultant/Contractor: CATLIN Engineers and Scientists

Address: 220 Old Dairy Road, Wilmington, North Carolina 28405 Phone: (910) 452-5861

Release Information

Date Discovered: October 2001
Longitude: 77.3665 W **Latitude:** 34.6839 N
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:
Non-regulated, non-commercial, 285-gallon fuel oil UST used for heating the single family residence.

I, **Michael E. Mason** a (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

The project is located at Building PP-3326 aboard Marine Corps Base (MCB) Camp Lejeune, North Carolina. Building PP-3326 is located in the Paradise Point Housing Area and was heated using heating oil from a 285-gallon Underground Storage Tank (UST). The former tank was located adjacent to the single family residence and was within several feet of the foundation.

The UST was removed in October 2001 by J.A. Jones Environmental Services Company (J.A. Jones). J.A. Jones conducted confirmation soil sampling, which indicated soil contamination in the former tank basin at levels in excess of the Residential Maximum Soil Contaminant Concentrations (MSCCs).

Since subsurface impacts were confirmed, the North Carolina Department of Environment and Natural Resources (NCDENR) required MCB Camp Lejeune to conduct a Phase I Limited Site Assessment (LSA) at the site. CATLIN Engineers and Scientists (CATLIN) performed the assessment, dated November 29, 2002, and concluded that two soil compounds (C_9-C_{22} Aromatics and 2-Methylnaphthalene) were detected at concentrations above their respective Residential MSCCs. In addition, laboratory analysis of the site's groundwater revealed a Naphthalene concentration of 110 µg/L, which was above the 2L Groundwater Quality Standard (GWQS) of 21 µg/L. The C_9-C_{22} Aromatics were also detected in groundwater at a concentration of 460 µg/L, which is above the 2L GWQS of 210 µg/L. The LSA recommended additional soil assessment to further delineate the extent of soil contamination.

CATLIN performed additional soil assessment work in June 2003. The Soil Assessment Report (SAR) concluded that the extent of soil contamination was limited to the immediate vicinity of the former tank basin, and they proposed that the impacted soils be removed via soil excavation.

MCB Camp Lejeune, therefore, conducted a soil removal action at the site. Shaw Environmental and Infrastructure Inc. (Shaw) mobilized to the site and performed soil excavation activities in April and May 2004. Results of the removal action were presented in a Shaw report dated November 2004. While the remedial action was successful in removing the majority of the contaminated soil, some Massachusetts Department of Environmental Protection (MADEP) constituents persisted at concentrations above the Residential MSCCs. Two locations of the former tank basin (3326-NW-001 and 3326-WW-004) required additional excavation.

In December 2005, MCB Camp Lejeune resampled the two locations listed above to determine if further excavation was required. Osage of Virginia Inc. (Osage) personnel conducted preliminary soil sampling for MADEP constituents at PP-3326 on December 14, 2005. Results from the sampling activities showed that MADEP fraction contaminant levels attenuated to below Residential MSCCs, with the exception of one sample. C_9-C_{18} Aliphatics and C_9-C_{22} Aromatics persisted in sample PP3326-004 at levels above the Residential MSCCs.

Sovereign Consulting Inc. (Sovereign) was then tasked to re-excavate the offending location (sidewall 004) at PP-3326. The soil removal action occurred on February 10, 2006. Approximately 9.37 tons of soil was excavated. The confirmation soil sample was analyzed per EPA Method 8260, 8270, and the MADEP VPH/EPH. Only Acetone was detected at a concentration of 10.3 µg/kg, which is well below both the Soil-to-Groundwater (STGW) and Residential MSCCs of 2,800 µg/kg and 1,564,000 µg/kg, respectively. In March 2006 the NCDENR agreed with a request for No Further Action (NFA) for the soil as contaminated soil above the Residential MSCCs had been remediated at the site.

As part of the February 2006 Sovereign removal action, a temporary well was installed in the former tank basin to assess groundwater conditions at the site. Laboratory data showed contamination in the groundwater sample from PP-3326. Naphthalene was detected above its 2L GWQS (21 µg/L) at a concentration of 125 µg/L. The ten largest peaks were also identified, and two compounds were quantitated. 1-Methylnaphthalene and 2-Methylnaphthalene had results of 112 µg/L and 145 µg/L, respectively. The North Carolina GWQS for 2-Methylnaphthalene is 14 µg/L, and there is no established standard for 1-Methylnaphthalene. MADEP constituents were also detected. However, only the C_9-C_{22} Aromatic concentrations (1,350 µg/L), exceeded the 2L GWQS of 210 µg/L. Conclusions and findings of the Sovereign removal action are summarized in the report *Soil Cleanup Report With Site Closure Request, Paradise Point, NCDENR Incident Numbers: 24009, 24010, 24011, 24014, Marine Corps Base, Camp Lejeune, North Carolina,* March 1, 2006.

MCB Camp Lejeune continues to monitor groundwater at the site to assess attenuation of contaminant concentrations. The purpose of the current investigation was to resample the groundwater in order to assess current groundwater conditions.

C. METHODS

1. Field Methods

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 (DPT) boring advancement using an AMS PowerProbe™ 9600D (PowerProbe) on July 26, 2007. 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 Unified Soil Classification System (USCS) and organic vapor analysis utilizing a Photo Ionization Detector (PID). A boring log for the USTPP3326-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 one inch slotted PVC well screen.

A depth to water (DTW) measurement was recorded and a grab groundwater sample was collected. The sample was collected on July 26, 2007 utilizing a peristaltic pump and new polyethylene tubing. The groundwater sample was labeled USTPP3326-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 (COC) procedures. A copy of the COC is provided following the complete laboratory report in Appendix C.

The borehole was 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 SGS Environmental Services, Inc. (NC Certification #481) in Wilmington, North Carolina. At the laboratory, the groundwater sample was analyzed for semivolatiles and MADEP constituents per EPA Method 8270 GC/MS (EPA Method 610 compounds) and MADEP VPH/EPH, respectively.

D. RESULTS

Field observations noted during boring advancement indicate site geology is comprised of fine sand to approximately six feet Below Land Surface (BLS) with a sandy clay gradation in the two to four feet interval. Clay was observed from six to eight feet BLS. A hydrocarbon odor was recorded in the four to six feet interval, which was also noted as saturated. The boring terminated at a depth of eight 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 USTPP-3326-DPT01 on July 26, 2007 was approximately 3.8 feet BLS.

Analytical results for the groundwater sample are included in Appendix C (Please note the sample from this site was included on the COC with additional sites. As a result, only the applicable pages from the lab report are included. Page numbers are not consecutive, as multiple sites were sampled during the same event.). The analytical results are summarized as follows.

EPA Method 610 (610 compounds reported by EPA Method 8270 GC/MS)

As indicated in Table 1 and illustrated on Figure 2, six EPA Method 610 target analytes were detected in groundwater sample USTPP3326-DPT01 – Acenaphthene, Fluorene, 1-Methylnaphthalene, 2-Methylnaphthalene, Naphthalene, and Phenanthrene. Three of the six compounds, Acenaphthene, Fluorene, and Phenanthrene, were detected at concentrations below the established 2L GWQSs.

The compounds 1-Methylnaphthalene, 2-Methylnaphthalene, and Naphthalene were detected in the groundwater sample at concentrations above the groundwater quality standards, but below the Gross Contaminant Levels (GCLs), where established. Since 1-Methylnaphthalene has neither an established 2L GWQS, nor GCL, any detection is considered noncompliant. This compound was detected in the sample at a concentration of 372 µg/L. 2-Methylnaphthalene was detected at a concentration of 247 µg/L, as compared to the 2L GWQS of 14 µg/L. Finally, laboratory analysis detected Naphthalene at a concentration of 392 µg/L, which is above the 2L GWQS of 21 µg/L.

MADEP VPH/EPH

As indicated in Table 2 and illustrated on Figure 2, the C_9-C_{22} Aromatics were detected at a concentration of 3,434 µg/L, which is above the 2L GWQS of 210 µg/L. Laboratory analysis also detected C_9-C_{18} Aliphatics above the 2L GWQS of 4,200 µg/L at a concentration of 4,570 µg/L. All other MADEP fractions were detected at concentrations less than the applicable 2L GWQS.

E. CONCLUSIONS AND RECOMMENDATIONS

The Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene and C_9-C_{22} Aromatic concentrations previously detected in groundwater around the former UST at PP-3326 have not naturally attenuated to below the corresponding groundwater standards. In fact, the compounds' concentrations have increased, and the C_9-C_{18} Aliphatics concentration is noncompliant as of the current investigation. Current groundwater contaminant concentrations continue to prevent the site from qualifying for NFA without a Land Use Restriction (LUR). Since groundwater conditions have shown an increase in contaminant concentrations since the last sampling event (February 2006), CATLIN recommends resampling in one year to monitor groundwater conditions. If contaminant levels continue to increase, additional assessment and/or remediation may be necessary.

F. REFERENCES

CATLIN Engineers and Scientists, *Soil Assessment Report for PP-3326, Marine Corps Base Camp Lejeune, North Carolina,* June 10, 2003.

CATLIN Engineers and Scientists, *Leaking Underground Storage Tank (LUST) Phase I Limited Site Assessment Report for PP-3326, Marine Corps Base, Camp Lejeune, North Carolina,* November 29, 2002.

J.A. Jones Environmental Services Inc., *Underground Storage Tank Closure, UST No. CC-3326 Camp Lejeune, North Carolina,* January 22, 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).

Sovereign Consulting Inc., *Soil Cleanup Report With Site Closure Request, Paradise Point, NCDENR Incident Numbers: 24009, 24010, 24011, 24014, Marine Corps Base, Camp Lejeune, North Carolina*, March 1, 2006.

TABLES

TABLE 1
SUMMARY OF GROUNDWATER LABORATORY RESULTS
EPA METHOD 610 COMPOUNDS BY EPA METHOD 8270 GC/MS

PP-3326, MCB Camp Lejeune

Well ID	Contaminant of Concern →		Acenaphthene	Fluorene	1-Methylnaphthalene	2-Methylnaphthalene	Naphthalene	Phenanthrene	All Other EPA 610 Compounds
	Sample ID	Date Collected							
GCL (µg/L)			2,120	950	NE	12,500	15,500	410	Varies
2L GWQS (µg/L)			80	280	NE	14	21	210	Varies
USTPP3326-DPT01	USTPP3326-DPT01	7/26/2007	11.5 J	22.5 J	**372**	**247**	**392**	28.0 J	BMDL

All results in micrograms per liter (µg/L).

BMDL = Below Method Detection Limit

NE = None Established

J = Estimated concentration, below calibration range and above MDL

Bold results indicate concentrations above 2L GWQS or GCL

GCL = Gross Contaminant Level

2L GWQS = NCAC T15A:02L Groundwater Quality Standards

TABLE 2
SUMMARY OF GROUNDWATER LABORATORY RESULTS
MADEP VPH/EPH

PP-3326, MCB Camp Lejeune

Well ID	Contaminant of Concern →		C_5-C_8 Aliphatics	C_9-C_{18} Aliphatics	C_{19}-C_{36} Aliphatics	C_9-C_{22} Aromatics
	Sample ID	Date Collected				
GCL (µg/L) 2L GWQS (µg/L)			NE 420	NE 4,200	NE 42,000	NE 210
USTPP3326-DPT01	USTPP3326-DPT01	7/26/2007	109	**4,570**	280	**3,434**

All results in micrograms per liter (µg/L).

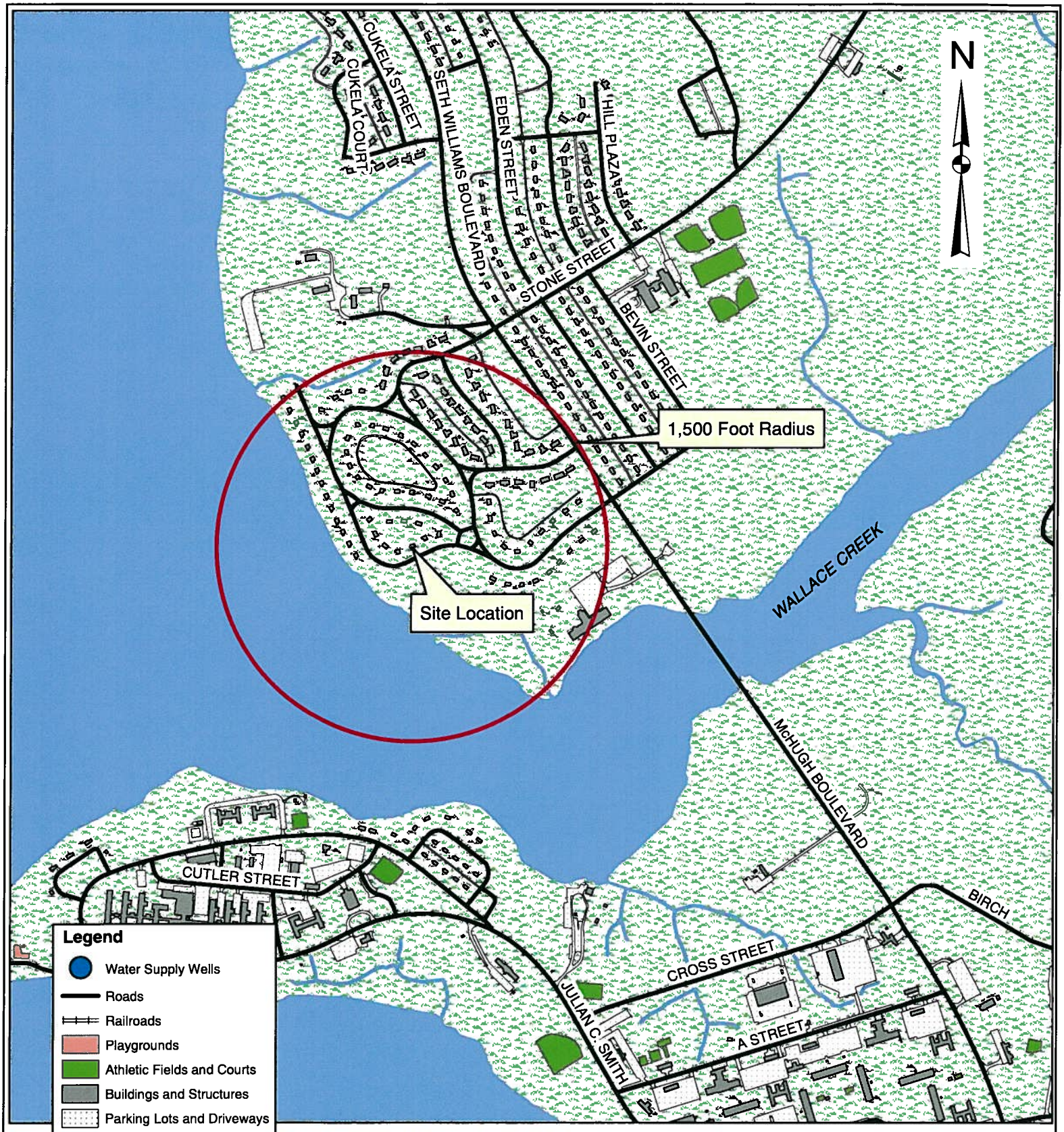
NE = None Established

Bold results indicate concentrations above 2L GWQS or GCL

GCL = Gross Contaminant Level

2L GWQS = NCAC T15A:02L Groundwater Quality Standards

FIGURES

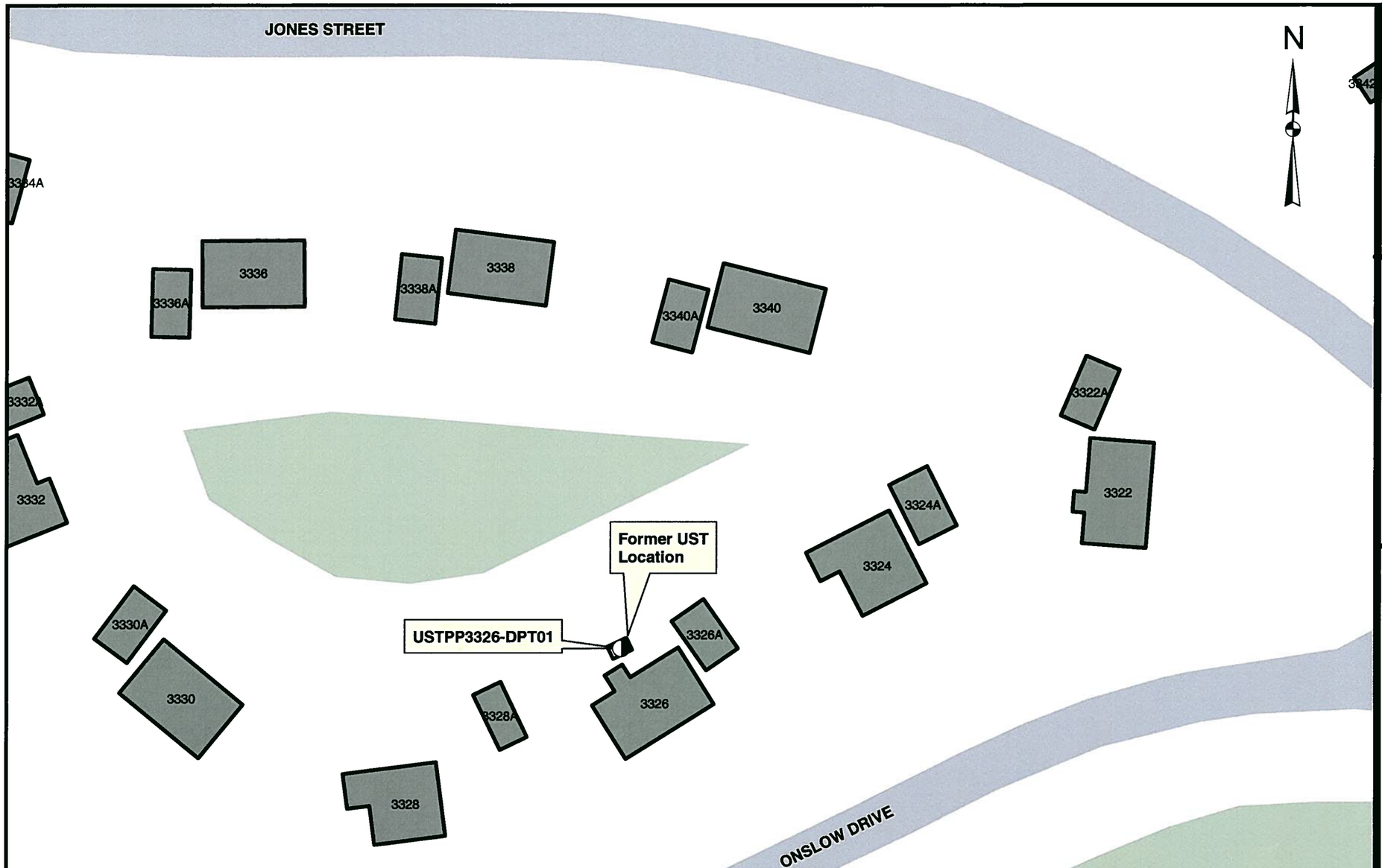


Data Sources: Data Layers provided by MCB Camp Lejeune GIS Office.

CATLIN ENGINEERS and SCIENTISTS

PROJECT	TITLE	FIGURE
GROUNDWATER SAMPLING REPORT OF FINDINGS SITE PP-3326 MARINE CORPS BASE CAMP LEJEUNE, NC	SITE LOCATION MAP	1

JOB NO.	DATE	SCALE	DRAWN BY	CHECKED BY
205-077	OCT 2007	AS SHOWN	SAC	MEM



Well ID	Method →		EPA 610 Compounds by 8270						MADEP VPH/EPH			
	Contaminant of Concern →		Acenaphthene	Fluorene	1-Methylnaphthalene	2-Methylnaphthalene	Naphthalene	Phenanthrene	C_5-C_8 Aliphatics	C_9-C_{18} Aliphatics	C_{19}-C_{36} Aliphatics	C_9-C_{22} Aromatics
	Sample ID	Date Collected										
GCL (µg/L)			2,120	950	NE	12,500	15,500	410	NE	NE	NE	NE
2L GWQS (µg/L)			80	280	NE	14	21	210	420	4,200	42,000	210
USTPP3326-DPT01	USTPP3326-DPT01	7/26/2007	11.5 J	22.5 J	**372**	**247**	**392**	28.0 J	109	**4,570**	280	**3,434**

50 25 0 50 Feet

SCALE

GROUNDWATER SAMPLING REPORT OF FINDINGS SITE PP-3326 MCB CAMP LEJEUNE, NC

NAVFAC Naval Facilities Engineering Command

LEGEND

- DPT Well
- Water Supply Wells
- Above Ground Storage Tank
- Underground Storage Tank
- Railroad Tracks

Walls and Fences

- FENCE
- GATE
- WALL

- Buildings and Structures
- Demolished Structures
- Oil/Water Separators
- Slabs
- Roads
- Driveways
- Parking Lots
- Surface Water Bodies
- Creeks and Streams

Vegetation Cover

- Forestland
- Scrubland
- Wetland

Airfield Pavement

- HELIPAD
- RAMP
- RUNWAY
- SHLDR_OVERRUN
- TAXIWAY

NOTES

GIS data layers provided by the MCB Camp Lejeune GIS Department.

All results in micrograms per liter (ug/L)

NE = None Established

J = Estimated concentration, below calibration range and above MDL

Bold results indicate concentration above 2L GWQS or GCL

GCL = Gross Contaminant Level

2L GWQS = NCAC T15A:02L Groundwater Quality Standards

CATLIN ENGINEERS and SCIENTISTS

SITE MAP WITH SUMMARY OF GROUNDWATER LABORATORY RESULTS

FIGURE 2

Job No.:	Date:	Scale:	Drawn By:	Checked By:
205-077	OCT 2007	AS SHOWN	SAC	MEM

APPENDICES

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 (FID).
- 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, isopaths, 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

WELL LOG

CATLIN ENGINEERS and SCIENTISTS
205-077
Wilmington, NC

SHEET 1 OF 1

PROJECT NO.: 205-077	STATE: NC	COUNTY: Onslow	LOCATION: Jacksonville
PROJECT NAME: Lejuene LUR Sites	LOGGED BY: J Heter		WELL ID: USTPP3326-DPT01
	DRILLER: Bobbie D. Fowler		
NORTHING: 3840542.1	EASTING: 283198.0	CREW: T Stetler	
SYSTEM: UTM NAD83 (m)	BORING LOCATION: House# 3326 backyard		T.O.C. ELEV.:
DRILL MACHINE: Power Probe	METHOD: Direct Push	0 HOUR DTW: 3.8	TOTAL DEPTH: 8.0
START DATE: 7/26/07	FINISH DATE: 7/26/07	24 HOUR DTW: NM	WELL DEPTH: 8.0

DEPTH	BLOW COUNT 6in / 6in / 6in / 6in	OVA (ppm)	LAB.	USCS	LOG	SOIL AND ROCK DESCRIPTION	WELL DETAIL
						0.0 LAND SURFACE	0.0
0.0		0.3		SP		Grass. Brown fine SAND. Uniform. Loose. Moist. 2.0	0.0
2.0		22.4		SP/ CL		Brown fine SAND grading into brown SANDY CLAY. 4.0	3.0
4.0		1512.0		SP		Brown to dark brown fine SAND. Medium dense. HCO odor. Saturated. 6.0	
6.0		318.0		CL		Dark brown CLAY. Medium plasticity. Medium stiff. Slight Odor. 8.0	8.0
						Boring Terminated at Depth 8.0 ft Dark CLAY.	8.0

1" Sch. 40 PVC

1" Slot .010 Sch. 40 PVC

Bentonite Pellets

CATLIN BORING LOG 205-077 LEJUENE LUR SITES.GPJ TEST.GDT 8/20/07

APPENDIX C

LABORATORY ANALYTICAL REPORT AND CHAIN OF CUSTODY DOCUMENTATION

Mr. Shane Chasteen
Richard Catlin & Associates
P.O. Box 10279
Wilmington NC 28404-0279

Report Number: G128-1993

Client Project: Lejuene LUR Sites

Dear Mr. Chasteen:

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 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 SGS/Paradigm at (910) 350-1903. We will be happy to answer any questions or concerns which you may have.

Thank you for using SGS/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,
SGS/Paradigm Analytical Laboratories, Inc.

8/10/2007

Laboratory Director Date
J. Patrick Weaver

List of Reporting Abbreviations and Data Qualifiers

B = Compound also detected in batch blank

BQL = Below Quantitation Limit (RL or MDL)

DF = Dilution Factor

Dup = Duplicate

D = Detected, but RPD is > 40% between results in dual column method.

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

% soilds = 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.

MI34.030606.3

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Results for Semivolatiles
610 Compounds by GCMS 8270

Client Sample ID: USTPP3326-DPT01
Client Project ID: Lejuene LUR Sites
Lab Sample ID: G128-1993-4G
Lab Project ID: G128-1993

Analyzed By: EAW
Date Collected: 7/26/2007 10:45
Date Received: 7/27/2007
Date Extracted: 7/31/2007
Matrix: Water

Compound	Result ug/L	RL ug/L	MDL ug/L	Dilution Factor	Date Analyzed	Flag
Acenaphthene	**11.5**	50.0	6.10	5	8/6/2007	J
Acenaphthylene	BQL	50.0	5.60	5	8/6/2007	
Anthracene	BQL	50.0	8.75	5	8/6/2007	
Benzo[a]anthracene	BQL	50.0	6.80	5	8/6/2007	
Benzo[a]pyrene	BQL	50.0	6.35	5	8/6/2007	
Benzo[b]fluoranthene	BQL	50.0	7.15	5	8/6/2007	
Benzo[g,h,i]perylene	BQL	50.0	22.9	5	8/6/2007	
Benzo[k]fluoranthene	BQL	50.0	5.45	5	8/6/2007	
Chrysene	BQL	50.0	5.55	5	8/6/2007	
Dibenzo[a,h]anthracene	BQL	50.0	24.4	5	8/6/2007	
Fluoranthene	BQL	50.0	7.05	5	8/6/2007	
Fluorene	**22.5**	50.0	6.10	5	8/6/2007	J
Indeno(1,2,3-c,d)pyrene	BQL	50.0	22.9	5	8/6/2007	
1-Methylnaphthalene	**372**	50.0	6.15	5	8/6/2007	
2-Methylnaphthalene	**247**	50.0	6.80	5	8/6/2007	
Naphthalene	**392**	50.0	5.40	5	8/6/2007	
Phenanthrene	**28.0**	50.0	6.90	5	8/6/2007	J
Pyrene	BQL	50.0	10.4	5	8/6/2007	

	Spike Added	Spike Result	Percent Recovered
2-Fluorobiphenyl	2	1.9	97
Nitrobenzene-d5	2	2.2	109
4-Terphenyl-d14	2	1.3	66

Comments:

Flags:
BQL = Below Quantitation Limits.
J = Detected below the quantitation limit.

Reviewed By:

EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Richard Catlin & Associates

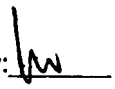
Project Name: Lejuene LUR Sites

Sample Information and Analytical Results	
Sample Identification	USTPP3326-DPT01
Sample Matrix	Water
Date Collected	07/26/07
Date Received	07/27/07
Date Extracted	07/31/07
Date Analyzed	08/03/07
Dry Weight	
Dilution Factor	1:1
C_9-C_{18} Aliphatics*	3000 (ug/L)
C_{19}-C_{36} Aliphatics*	280 (ug/L)
C_{11}-C_{22} Aromatics*	2600 (ug/L)
Aliphatic Surrogate % Recovery	45
Aromatic Surrogate % Recovery	51
Fractionation Surrogate 1 % Recovery	73

Comments:

* = Excludes any surrogates or internal standards.

Lab info: G128-1993-4E

Reviewed By: 

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

Project Name: Lejuene LUR Sites

Sample Information	
Sample Identification	USTPP3326-DPT01
Sample Matrix	Water
Collection Option (for Soil)*	NA
Date Collected	07/26/07
Date Received	07/27/07
Date Extracted	08/02/07 17:23 - 08/02/07 17:23
Date Analyzed	08/02/07 17:23 - 08/02/07 17:23
Dry Weight	NA
Dilution Factor	1 - 1

Analytical Results			
Analyte	Result µg/L	Report Limit µg/L	Flags
C_5-C_8 Aliphatics**	109	100	
C_9-C_{12} Aliphatics**	1570	100	
C_9-C_{10} Aromatics**	834	100	

	Percent Recovery	Flags	Limits Lower	Limits Upper
Surrogate % Recovery - PID	141	***	70	130
Surrogate % Recovery - FID	111		70	130

* = 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 and are unadjusted for individual analytes.

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

Lab Info: g128-1993-4b	Lab Info: g128-1993-4b
FID Info: VP080207/018F0101.D	PID Info: VP080207/018R0101.D

Reviewed By:

SGS

CHAIN OF CUSTODY RECORD
SGS Environmental Services Inc.

Locations Nationwide
- Alaska
- Hawaii
- Ohio
- Maryland
- New Jersey
- North Carolina
- West Virginia

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N.C. CERTIFICATION #481

(1) CLIENT: Catlin

CONTACT: Shane Chasteen PHONE NO:(910) 452-5801

PROJECT: Lejeune LUR sites SITE/PWSID#: 205-077

REPORTS TO: Shane Chasteen E-MAIL: FAX NO.:( )

INVOICE TO: Sheila Smith QUOTE # DOD 101 P.O. NUMBER 270726-1

SGS Reference: G128-1993

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(2)

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No CONTAINERS	SAMPLE TYPE (C=COMP G=GRAB)	Preservatives Used	HCl	—	—	HCl	HCl						REMARKS
							Analysis Required (3)	602 (add Naphthalene)	625 B/N/A + TICS	610	EPH	VPH						
	USTFC40-3-DPT01	7/27/07	1300	W	3	G		1			1	1						* Results in
	USTPP3311-DPT01	7/24/07	1430		5		3				1	1						Summary + Lejeune
	USTPP3322-DPT01	7/27/07	1015		5		3				1	1						EDD format
	USTPP3326-DPT01	7/26/07	1045		3					1	1	1						
	USTPP3330-DPT01	7/26/07	1145		3					1	1	1						
	USTPP3332-DPT01	7/26/07	1225		3					1	1	1						
	USTPP3340-DPT01	7/27/07	1100		2						1	1						
	USTPP3343-DPT01	7/24/07	1330		2						1	1						
	USTPP3350-DPT01	7/26/07	1400		3					1	1	1						
	USTPP3354-DPT01	7/26/07	1445		5		3				1	1						

(5)

Collected/Relinquished By:(1)	Date	Time	Received By:	Date	Time
Justin Peters	7/27/07	1600		7/27/07	1600
Relinquished By: (2)	Date	Time	Received By:	Date	Time
Relinquished By: (3)	Date	Time	Received By:	Date	Time
Relinquished By: (4)	Date	Time	Received By:	Date	Time

(4)

Shipping Carrier:

Shipping Ticket No:

Samples Received Cold? (Circle) YES NO

Temperature °C: on ice 5.6 5.8°C

Special Deliverable Requirements:

Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT

Special Instructions:

Requested Turnaround Time:

☐ RUSH _____ Date Needed ☑ STD

White - Retained by Lab
Yellow - Returned with Report
Pink - Retained by Sampler

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CHAIN OF CUSTODY RECORD
SGS Environmental Services Inc.

Locations Nationwide
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- Hawaii
- Ohio
- Maryland
- New Jersey
- North Carolina
- West Virginia

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N.C. CERTIFICATION #481

(1)

CLIENT: Catlin

CONTACT: Shane Chasteen PHONE NO:(910) 452.5861

PROJECT: Lejeune LU2 sites SITE/PWSID#: 205-077

REPORTS TO: Shane Chasteen E-MAIL:

FAX NO.:( )

INVOICE TO: Sheila Smith QUOTE # DOD 101

P.O. NUMBER 270726-1

SGS Reference:

PAGE 2 OF 2

(2)

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No CONTAINERS	SAMPLE TYPE C= COMP G= GRAB	Preservatives Used	HCl	—	MeOH	HCl						REMARKS
							Analysis Required (3)	602 (add naphthalene)	EPH	VPH	VPH						
	USTPP3354-DPTC2	7/24/07	1230	S	3	G			1	2							* Results in
	Duplicate	7/27/07	1100	W	5	G		3			2						Summary &
																	Lejeune EDD
																	format

(5)

Collected/Relinquished By:(1)	Date	Time	Received By:	Date	Time
Justin Hobbs	7/27/07	1600		7/27/07	1600
Relinquished By: (2)	Date	Time	Received By:	Date	Time
Relinquished By: (3)	Date	Time	Received By:	Date	Time
Relinquished By: (4)	Date	Time	Received By:	Date	Time

(4)

Shipping Carrier:

Shipping Ticket No:

Samples Received Cold? (Circle) YES NO

Temperature °C: 5.8, 5.6, 5.9 °C

Special Deliverable Requirements:

Chain of Custody Seal: (Circle)

INTACT BROKEN ABSENT

Special Instructions:

Requested Turnaround Time:

☐ RUSH _____ Date Needed ☑ STD

☐ 200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
☐ 5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557
☐ 1270 Greenbrier Street Charleston, WV 25311 Tel: (304) 346-0725 Fax: (304) 346-0761

White - Retained by Lab
Yellow - Returned with Report
Pink - Retained by Sampler