

SOIL ASSESSMENT REPORT ADDENDUM

FOR

**TT-3548
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA**

**NC DENR UST INCIDENT NO.: 23694
RICK CLASSIFICATION: Low
LAND USE CLASSIFICATION: Residential**

May 23, 2006

**CONTRACT NO.: N62470-05-D-6200
DELIVERY ORDER NO.: 0025
CATLIN PROJECT NO.: 206-026**

PREPARED BY:

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LIST OF ACRONYMS

2000 Guidelines	Groundwater Section Guidelines for Investigation and Remediation of Soil and Groundwater
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
ARO	Asheville Regional Office
AS	Air Sparge
AST	Aboveground Storage Tank
BDL	Below Detection Limit
BN	Base/Neutral (extractables)
BNA	Base/Neutral/Acid (extractables)
BQL	Below Quantitation Limit
BLS	Below Land Surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CAP	Corrective Action Plan
CATLIN	CATLIN Engineers and Scientists (Formerly RC&A)
CFR	Code of Federal Regulations
Cr	Chromium
CSA	Comprehensive Site Assessment
CNP	Carbon Nitrogen Phosphorous
CPT	Cone Penetrometer Test
DEM	Division of Environmental Management
DIPE	Diisopropyl Ether
DO	Dissolved Oxygen
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
EDB	Ethylene di-bromide
EMD	Environmental Management Division
EPA	Environmental Protection Agency
EPH	Extractable Petroleum Hydrocarbons
EQB	Environmental Quality Branch
Fe	Iron
FID	Flame Ionization Detector
FOD	Foreign Object Debris
FRO	Fayetteville Regional Office
FT	Feet
GCL	Gross Contaminant Level
GIS	Geographic Information System
GPS	Global Positioning System

Guidelines Vol. I	Groundwater Section Guidelines for Investigation and Remediation of Soil and Groundwater, Volume I, Sources Other Than Petroleum Underground Storage Tanks (May 1998)
Guidelines Vol. II	Groundwater Section Guidelines for Investigation and Remediation of Soil and Groundwater, Volume II, Petroleum Underground Storage Tanks (January 2, 1998)
HDPE	High Density Polyethylene
I/C	Industrial/Commercial
ID	Identification
I&E	Installations and Environment Department
IGWQS	Interim Groundwater Quality Standards
IPE	Isopropyl Ether
LANTDIV	Atlantic Division
LSA	Limited Site Assessment
LUST	Leaking Underground Storage Tank
m-	meta
m	meter
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
MDL	Method Detection Limit
mg/Kg	Milligrams per Kilogram
mg/L	Milligrams per Litre
MRO	Mooresville Regional Office
MSCC	Maximum Soil Contaminant Concentration
MSL	Mean Sea Level
MTBE	Methyl tertiary butyl ether
µg/Kg	Micrograms per Kilogram
µg/L	Micrograms per Litre
NA	Not Analyzed
N/A	Not Applicable
NC	North Carolina
NCAC	North Carolina Administrative Code
NCDENR	North Carolina Department of Environment and Natural Resources
NCDOC	North Carolina Department of Corrections
NCDOT	North Carolina Department of Transportation
NCSP	North Carolina State Plane
NCSPA	North Carolina State Ports Authority
NE	None Established
NM	Not Measured
NMT	No Measurable Thickness
NS	Not Sampled
o-	ortho
OVA	Organic Vapor Analyzer
p-	para
PAH	Polynuclear Aromatic Hydrocarbons
Pb	Lead
PPB	Parts Per Billion
PPM	Parts Per Million
PID	Photo Ionization Detector

PQL	Practical Quantitation Limit
PVC	Polyvinyl chloride
RBCA	Risk-Based Corrective Action
RCRA	Resource Conservation and Recovery Act
Res	Residential
ROI	Radius of Influence
RRO	Raleigh Regional Office
SOW	Scope of Work
STGW	Soil-to-Groundwater
SVE	Soil Vapor Extraction
SVOC	Semi Volatile Organic Compound
TDHF	Toxicologically Defined Hydrocarbons Fractions
TCLP	Toxicity Characteristic Leaching Procedure
TIC	Tentatively Identified Compound
TKN	Total Kjeldahl Nitrogen
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
WaRO	Washington Regional Office
WiRO	Wilmington Regional Office
WSRO	Winston-Salem Regional Office

SOIL ASSESSMENT REPORT ADDENDUM (SARA)

A. TITLE PAGE

DATE OF REPORT: May 23, 2006
Facility ID: N/A **UST Incident Number (if known):** 23694
Site Name: TT-3548
Site Location: Marine Corps Base, Camp Lejeune
Nearest City/Town: Jacksonville **County:** Onslow
Risk Classification: Low **Land Use Classification:** Residential

UST Owner: Commanding Officer – MCB Camp Lejeune
Address: I&E/EMD/EQB
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: Currently Abandoned
Address: 3548 Chosin Circle, MCB Camp
Lejeune, NC 28542 **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: August 7, 2001
Longitude: 77° 23' 01" W **Latitude:** 34° 44' 09" N
Estimated Quantity of Release: Unknown
Cause of Release: Unknown

Source of Release (e.g. Piping/UST):

Possible leaking UST and/or associated product pipeline.

Sizes and contents of UST system(s) from which the release occurred:

Non-regulated, non-commercial, 550-gallon fuel oil UST used for heating a 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. EXECUTIVE SUMMARY

The subject site is a duplex unit (TT 3546/3548) for two, single-family residences in the Tarawa Terrace II housing area aboard MCB Camp Lejeune. The area of environmental concern is subsurface soils at the location of the former 550-gallon, non-regulated, non-commercial fuel oil UST and product line associated with the heating system for the duplex unit.

In September 2001, the UST system was removed and laboratory results obtained as part of the closure reporting requirements indicated that the UST system had released hydrocarbons into the subsurface. Subsequently, a Phase I Limited Site Assessment (LSA) and Soil Assessment Report (SAR) were prepared. Findings from these investigations indicated the following:

- The subject site meets the NCDENR criteria for a Low risk classification and a Residential land use classification. Therefore, for regulatory compliance, soil quality is subject to Residential Maximum Soil Contaminant Concentrations (MSCCs) and groundwater quality is subject to the Gross Contaminant Levels (GCLs).
- Site subsurface soils are impacted with excessive MADEP hydrocarbon fraction C9-C22 concentrations at four locations: USTT 3548-SB01; USTT 3548-SB02; USTT 3548-SB03; and USTT 3548-SB05.

The purpose of this Soil Assessment Report Addendum (SARA) investigation is to provide updated site conditions by obtaining soil samples from these locations as well as surrounding locations of interest for MADEP VPH/EPH analysis. The updated site findings can be summarized as follows:

- Updated site soil analysis revealed MADEP C9-C22 hydrocarbon fraction concentrations in excess of the applicable Residential MSCC in soil samples USTTT3548-SB09 (former location of SB01), USTTT3548-SB10 (former location of SB02), USTTT3548-SB11 (former location of SB03) and USTTT3548-SB13 (former location of SB05). However, compared to the previous MADEP analyses data, the updated soil data indicates progressive soil quality improvement at sample locations USTTT3548-SB01/09, USTTT3548-SB02/10, USTTT3548-SB03/11, and USTTT3548-SB05/13 and below MADEP VPH/EPH MDL at USTTT3548-SB04/12.

In order to achieve "No Further Action" status, site soils will need to be remediated to the applicable C9-C22 hydrocarbon fraction Residential MSCC (469 mg/Kg). The proposed site soil remediation plan has essentially remained the same as those proposed in the December, 29, 2004 SAR and can be summarized as follows:

- Excavate remnant, impacted soils from the former tank basin from six feet BLS to the water table and then properly dispose of the excavated soils at an off-site permitted disposal facility following demolition of building TT3548/3546.

- Once the laboratory results have confirmed that site contaminated soils have been removed, the excavation will then be backfilled with clean fill material.
- Just prior to the excavation, it is recommended that the on-site monitoring well be sampled. If results are below the 2L GWQS before the excavation, no further assessment or remediation of groundwater should be necessary.
- Should the groundwater laboratory results exceed the 2L GWQS, the site groundwater should be considered for remediation by natural attenuation/degradation and sampled for MADEP VPH/EPH on a bi-yearly basis until the contaminants are below the 2L GWQS.
- Once the field and laboratory work have been completed, plans are to submit the updated site data in a Soil Cleanup Report with Site Closure Request (No Further Action with Land Use Restrictions, if applicable) in accordance with the *2001 Guidelines*.

A copy of this report should be forwarded to the regional NCDENR office.

C. SITE HISTORY

(Refer to Tables 1 and 2)

The subject site is a duplex unit (TT 3546/3548) for two, single-family residences in the Tarawa Terrace II housing area aboard MCB. The area of environmental concern is subsurface soils at the location of the former 550-gallon, non-regulated, non-commercial fuel oil UST and product line associated with the heating system for the duplex unit. The duplex unit is currently abandoned and is part of the Tarawa Terrace II housing area scheduled for demolition. Former UST system history and owner information are included on Tables 1 and 2. Investigations concerning the site area of environmental concern can be summarized as follows:

<i>Underground Storage Tank Closure Report, TT3546/3548, Camp Lejeune, Onslow County, NC, dated January 16, 2002</i>	J.A. Jones
<i>Leaking Underground Storage Tank (LUST) Phase I Limited Site Assessment Report for UST TT3546/3548 Site Tarawa Terrace II Housing Area, Marine Corps Base, Camp Lejeune, North Carolina, dated May 7, 2003</i>	Mid-Atlantic Associates, P.A. (Mid-Atlantic)
<i>Soil Assessment Report, TT-3548, Marine Corp Base, Camp Lejeune, North Carolina, dated December 29, 2004</i>	CATLIN Engineers and Scientists (CATLIN)

The findings of these investigations can be summarized as follows:

UST Closure Report

- One 550-gallon No. 2 fuel oil UST and associated product was removed in August 2001. This UST system appeared to be in good condition.
- One soil sample was collected and analyzed per EPA 5030 and 3550 and five soil samples were collected and analyzed per MADEP VPH and EPH, and EPA Methods 8260 and 8270. These soil samples were collected on various dates.
- Sand backfill for the UST excavation was reportedly obtained from a borrow pit on the base.
- Laboratory analysis of soil samples collected from the former UST basin exhibited TPH concentrations above State action levels and eight risk-based soil contaminant concentrations above the lowest applicable MSCC (Soil to Groundwater MSCC).
- Laboratory analysis of a soil sample collected at the former UST basin base (8.5 feet BLS) exhibited the aromatic hydrocarbon fraction C9-C22 concentration (2,090 mg/Kg) in excess of the current Residential and Soil to Groundwater MSCCs.
- Site conditions warranted completion of a LUST Phase I LSA.

LUST Phase I LSA

- A Risk Classification and Land Use Questionnaire was completed to provide information for NCDENR to assign the subject site a risk classification and a land use. The subject site meets the NCDENR criteria for a Low risk classification and a Residential land use. Therefore, for regulatory compliance, soil quality is subject to Residential MSCCs and groundwater quality has been compared to GCLs.
- Soil samples were obtained from the area adjacent to the suspected location of the former fuel delivery line, from the UST basin, and during temporary monitoring well boring advancement. In accordance with Table 5 of the *2001 Guidelines*, soil samples collected during the Phase I LSA activities were analyzed per EPA Methods 8260+IPE+MTBE, 8270, and MADEP VPH/EPH.
- Laboratory analysis of site soil samples revealed soil sample USTT 3546/3548-SB02, 8-9' exhibited concentrations of MADEP hydrocarbon fraction C9-C22 Aromatics in excess of the applicable Residential MSCC.
- One temporary groundwater monitoring well was installed within the former UST basin. In accordance with Table 10 of the *2001 Guidelines*, groundwater samples collected during the Phase I LSA activities were analyzed per EPA Methods 602+IPE+MTBE, 625+TICs, and MADEP VPH/EPH.
- Laboratory analysis of site groundwater samples revealed all samples exhibited parameter concentrations either BQL or compliant with applicable NCDENR 2L GWQS and GCLs.
- Recommendations were to complete a Soil Assessment Report to delineate around the area of concern or the USTT 3546/3548-SB02, 8-9' soil sample location.

Soil Assessment Report

- Subsurface soil samples were obtained at eight locations for laboratory analysis per EPA Methods 8260+IPE+MTBE, 8270, and MADEP VPH/EPH.
- Laboratory analysis revealed MADEP hydrocarbon fraction C9-C22 concentrations in excess of the applicable Residential MSCC at four locations: USTT 3548-SB01 (12-14' BLS); USTT 3548-SB02 (9-11' BLS); USTT 3548-SB03 (9-11' and 11-13' BLS); and USTT 3548-SB05 (9-11' BLS).
- Initial field data indicated the potential for free-phase product; therefore, a permanent groundwater monitoring well was installed. Although no free-product was detected, surficial groundwater samples were obtained for laboratory analysis per EPA Methods 602+IPE+MTBE, 625+TICs, and MADEP VPH/EPH.
- Laboratory analysis revealed MADEP hydrocarbon fraction C9-C22 Aromatics, C9-C18 Aliphatics and C19-C36 Aliphatics concentrations in excess of the then utilized IGWQS.
- Recommendations were to resample groundwater on a yearly basis until building demolition and soil excavation occurred.

D. SOIL INVESTIGATION

As stated previously, the site area of concern is subsurface soils with excessive MADEP hydrocarbon fraction C9-C22 concentrations at four locations: USTT 3548-SB01 (12-14); USTT 3548-SB02 (9-11); USTT 3548-SB03 (9-11 and 11-13); and USTT 3548-SB05 (9-11). The purpose of this soil investigation was to provide updated site conditions by obtaining soil samples from these as well as surrounding locations of interest for MADEP VPH/EPH analysis.

Updated Soil Sampling – Soil Assessment Report Addendum

CATLIN personnel conducted a soil sampling event at the subject site on April 7, 2006 as proposed in the Workplan, dated April 3, 2006. The local weather consisted of clear skies with temperatures ranging from 70 to 80 degrees Fahrenheit. Seven soil borings (USTTT3548-SB09 through USTTT3548-SB015) were advanced utilizing DPT (AMS Power Probe 9600DC) at the locations indicated on Figure 2. Borehole soil samples were obtained on a continuous basis. Soil sample intervals to be submitted for laboratory analysis had been predetermined from the previous site Phase I LSA and SAR data. The latest (4/7/2006) borehole locations and sample intervals correspond to previously encountered areas of concern as follows:

Previous Borehole ID	USTTT3548-SB01	USTTT3548-SB2	USTTT3548-SB3	USTTT3548-SB4	USTTT3548-SB5	USTTT3548-SB6	USTTT3548-SB7
4/7/2006 Borehole ID	USTTT3548-SB09	USTTT3548-SB10	USTTT3548-SB11	USTTT3548-SB12	USTTT3548-SB13	USTTT3548-SB14	USTTT3548-SB15
Sample Interval	12-14' BLS	9-11' BLS	9-11' BLS	11-13' BLS	9-11' BLS	9-11' BLS	9-11' BLS

Once sample collection was completed, all resulting boreholes were abandoned with cuttings, drilling sand and bentonite.

All sampling was conducted in accordance with CATLIN's Standard Procedures, a copy of which has been provided in Appendix A. Each borehole sample interval intended for laboratory analysis was placed in laboratory provided glassware, labeled with site location, borehole ID/interval, date/time, and sampler and placed on ice in a cooler. Soil samples were transported under proper chain of custody protocol to SGS Environmental Services, Inc. (SGS) in Wilmington, North Carolina for analysis per MADEP VPH/EPH. A copy of the SGS analytical report and chain of custody documentation have been provided in Appendix B. The latest site soil sample results can be summarized as follows:

MADEP VPH/EPH

For regulatory compliance, MADEP VPH/EPH results are applicable to the Residential MSCCs listed in the *2001 Guidelines*. The updated (April 7, 2006) data as well as historical MADEP VPH/EPH data has been listed in Tables 3A and 3B. The location of the updated MADEP VPH/EPH data in relation to the site map has been illustrated on Figure 3.

A review of the SGS analytical report indicates MADEP C9-C22 hydrocarbon fraction concentrations in excess of the applicable Residential MSCC (469 mg/Kg) were detected in soil samples USTTT3548-SB09 (2,180 mg/Kg), USTTT3548-SB10 (640 mg/Kg), USTTT3548-SB11 (1,425 mg/Kg) and USTTT3548-SB13 (1,131 mg/Kg). However, compared to the previous MADEP analyses data, the latest soil analysis data indicates progressive soil quality improvement at sample locations USTTT3548-SB01/09 (12-14 feet BLS), USTTT3548-SB02/10 (9-11 feet BLS), USTTT3548-SB03/11 (9-11 feet BLS), and USTTT3548-SB05/13 (9-11 feet BLS) and below MADEP VPH/EPH MDL at USTTT3548-SB04/12 (11-13 feet BLS). Analysis of site soil samples USTTT3548-SB06/14 (9-11 feet BLS) and USTTT3548-SB07/15 (9-11 feet BLS) indicated soil quality at these locations remains below MDL for all MADEP VPH/EPH hydrocarbon fractions.

Other than removal of the UST system and a majority of the UST basin soils, no additional active remediation measures have been initiated. The improvement in site soil quality is due to natural attenuation. However, plans to demolish TT-3548 makes it favorable to pursue active remediation measures.

E. PROPOSED SITE SOIL REMEDIATION

In order to achieve "No Further Action" status, site soils will need to be remediated to the C9-C22 hydrocarbon fraction Residential MSCC (469 mg/Kg). The proposed site soil remediation plan has essentially remained the same as those proposed in the December, 29, 2004 SAR. Based on the limited horizontal extent of soil contamination at this site, excavation of remnant, impacted soils is recommended from the former tank basin from six feet BLS to the water table and proper disposal of the excavated soils at an off-site, permitted disposal facility. MCB plans include

demolition of several duplex units within the Tarawa Terrace II housing area within the next year. Therefore, soil excavation efforts will be scheduled following the demolition of building TT3548/3546.

During the soil excavation process, soil samples will be obtained for headspace screening with a FID or PID to establish relative excavation boundaries. This will aid in segregating the clean overburden soils to be used for backfill from the deeper contaminated soils. Once removal of the site contaminated soils appears to have been achieved, confirmatory soil samples will be collected from the resulting sidewalls. All site samples will be analyzed at an independent laboratory per MADEP VPH/EPH.

The resulting excavation boundary will be properly barricaded until the laboratory results confirm that site contaminated soils have been removed. The excavation will then be backfilled with the clean overburden soils from the original excavation and clean, make-up fill material from an off-site source.

Once the field and laboratory work have been completed, plans are to submit the updated site data in a Soil Cleanup Report with Site Closure Request (No Further Action with Land Use Restrictions, if applicable) in accordance with the *2001 Guidelines*.

F. CONCLUSIONS

The latest site field and laboratory data can be summarized as follows:

- The subject site is an abandoned, family residence, duplex unit (TT 3546/3548) in the Tarawa Terrace II housing area aboard MCB that has been scheduled for demolition. The subject site meets the NCDENR criteria for a Low risk classification and a Residential land use. Therefore, for regulatory compliance, soil quality is subject to Residential MSCCs and groundwater quality is compared to GCLs.
- The area of environmental concern is site subsurface soils with excessive MADEP hydrocarbon fraction C9-C22 concentrations at four locations around the former fuel oil UST and product line associated with the heating system for TT 3546/3548.
- Updated site soil analysis revealed MADEP C9-C22 hydrocarbon fraction concentrations in excess of the applicable Residential MSCC (469 mg/Kg) in soil samples USTTT3548-SB01/09 (2,180 mg/Kg), USTTT3548-SB02/10 (640 mg/Kg), USTTT3548-SB03/11(1,425 mg/Kg) and USTTT3548-SB05/13 (1,131 mg/Kg).

G. RECOMMENDATIONS

In order to achieve “No Further Action” status, site soils will need to be remediated to the applicable C9-C22 hydrocarbon fraction Residential MSCC (469 mg/Kg). The proposed site soil remediation plan has essentially remained the same as those proposed in the December, 29, 2004 SAR and can be summarized as follows:

- Excavate remnant, impacted soils from the former tank basin from six feet BLS to the water table and then properly dispose of the excavated soils at an off-site permitted disposal facility following the demolition of building TT3548/3546.
- During the soil excavation process, soil samples will be obtained for headspace analysis per FID to establish relative excavation boundaries. Confirmatory soil samples will be collected from the resulting excavation sidewalls. All site samples will be analyzed at an independent laboratory per MADEP VPH/EPH.
- Once the laboratory results have confirmed that site contaminated soils have been removed, the excavation will then be backfilled with the clean overburden soils from the original excavation and clean, make-up fill material from an off-site source.
- Analytical results from a groundwater sample obtained as part of the SAR indicated levels of MADEP aliphatic and aromatic hydrocarbon fractions in excess of applicable 2L GWQS. Just prior to excavation, it is recommended that the on-site monitoring well be sampled. If results are below the 2L GWQS before excavation, no further assessment or remediation of groundwater should be necessary.
- Should the groundwater laboratory results exceed the 2L GWQS, the site groundwater should be considered for remediation by natural attenuation/degradation and sampled for MADEP VPH/EPH on a bi-yearly basis until the contaminants are below the 2L GWQS.
- Following excavation and backfill, plans are to submit the updated site data in a Soil Cleanup Report with Site Closure Request (No Further Action with Land Use Restrictions, if applicable) in accordance with the *2001 Guidelines*.

A copy of this report should be forwarded to the regional NCDENR office at the following address:

North Carolina Department of Environment and Natural Resources
Division of Waste Management
UST Section
Attention: Mr. Bruce Reed
127 Cardinal Drive Extension
Wilmington, North Carolina 28405

H. LIMITATIONS

The soil samples analyzed as part of this investigation only provide isolated data points and may not represent conditions at every location in the project area. Analyses and conclusions of this report, being based on interpolation between data points at the project area, may not be completely representative of all site conditions. Conclusions and recommendations of this investigation and report are based on the best available data in an effort to comply with current regulatory requirements.

I. REFERENCES

CATLIN Engineers and Scientists, *Soil Assessment Report TT-3548, Marine Corps Base, Camp Lejeune, North Carolina*, December 29, 2004.

CATLIN Engineers and Scientists, *Workplan – Soil Assessment Addendum Report TT-3548, Marine Corps Base, Camp Lejeune, North Carolina*, April 3, 2006.

J.A. Jones Environmental Services Company. *Underground Storage Tank Closure Report TT3546/3548, Camp Lejeune, Onslow County, NC*, January 16, 2002.

Mid-Atlantic Associates, P.A., *Leaking Underground Storage Tank (LUST) Phase I Limited Site Assessment Report for UST TT3546/3548 Site Tarawa Terrace II Housing Area, Marine Corps Base, Camp Lejeune, North Carolina*, May 7, 2003.

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
SITE HISTORY
UST SYSTEM INFORMATION

TT-3548

UST ID Number	Product (gasoline, diesel, jet fuel, etc.)	Capacity (gallons)	Date Installed (m/dd/yy)	Date Permanently Closed (P), or Still in Use* (C) (m/dd/yy)	Was Release Associated With UST System? (Yes / No)
TT3546/3548	Fuel Oil ⁺	550	1976	8/07/01 (P)	Yes

⁺ UST was used strictly for residential heating purposes

* Still in use means not permanently closed.

TABLE 2
SITE HISTORY
UST OWNER/OPERATOR INFORMATION

TT-3548

UST ID Number	Name of Owner or Operator	Dates of Ownership/Operation	Owner or Operator?
TT3546/3548	Commanding Officer Marine Corps Base Camp Lejeune, NC	1976 to August 7, 2001	Owner and Operator
Address		Telephone Number	
I&E/EMD/EQB PSC 20004 Marine Corps Base, Camp Lejeune, NC 28542		910-451-5068	

TABLE 3A SUMMARY OF SOIL LABORATORY RESULTS

Date: April 2006

Incident Number and Name: 23694 - UST TT3546/3548

Facility ID#: N/A

Analytical Method: MADEP VPH/EPH

Borehole ID	Contaminant of Concern →			VPH			EPH		
	Sample ID	Date Collected	Sample Depth (ft. BLS)	C5-C8 Aliphatics	C9-C12 Aliphatics	C9-C10 Aromatics	C9-C18 Aliphatics	C19-C36 Aliphatics	C11-C22 Aromatics
USTTT3548-SB01	USTTT3548-SB01(12-14)	4/14/2004	12-14	12	280	36	3,700	690	2,700
	USTTT3548-SB09	4/7/2006	12-14	<10	150	180	4,600	690	2,000
USTTT3548-SB02	USTTT3548-SB02(9-11)	4/14/2004	9-11	13	270	35	3,700	720	2,900
	USTTT3548-SB10	4/7/2006	9-11	<10	83	100	1,400	280	540
USTTT3548-SB03	USTTT3548-SB03(9-11)	4/14/2004	9-11	29	330	55	5,300	1,100	3,200
	USTTT3548-SB11	4/7/2006	9-11	<10	31	25	4,200	730	1,400
USTTT3548-SB04	USTTT3548-SB04(11-13)	4/14/2004	11-13	15	370	58	3,900	730	2,500
	USTTT3548-SB12	4/7/2006	11-13	<10	<10	<10	<10	<10	<10
USTTT3548-SB05	USTTT3548-SB05(9-11)	4/14/2004	9-11	<10	170	22	3,500	640	2,200
	USTTT3548-SB13	4/7/2006	9-11	<10	38	31	3,900	<500	1,100
USTTT3548-SB06	USTTT3548-SB06 (9-11)	8/10/2004	9-11	<10	<10	<10	<10	<10	<10
	USTTT3548-SB14	4/7/2006	9-11	<10	<10	<10	<10	<10	<10
USTTT3548-SB07	USTTT3548-SB07(9-11)	8/10/2004	9-11	<10	<10	<10	<10	<10	<10
	USTTT3548-SB15	4/7/2006	9-11	<10	<10	<10	<10	<10	<10

All results in milligrams per Kilogram - mg/Kg.

ft. BLS = feet below land surface

TABLE 3B SUMMARY OF SOIL LABORATORY RESULTS

Date: September 2004

Incident Number and Name: 23694 - UST TT3546/3548

Facility ID#: N/A

Analytical Method: MADEP VPH/EPH AS COMPARED TO NCDENR MSCCs

Borehole ID	Contaminant of Concern →			C5-C8 Aliphatics	C9-C18 Aliphatics	C19-C36 Aliphatics	C9-C22 Aromatics
	Sample ID	Date Collected	Sample Depth (ft. BLS)				
Residential MSCC (mg/kg)				939	9,386	93,860	469
Industrial/Commercial MSCC (mg/kg)				24,528	245,280	#	12,264
Soil to Groundwater MSCC (mg/kg)				72	3300	##	34
USTTT3548-SB01	USTTT3548-SB01(12-14)	4/14/2004	12-14	12	3,980	690	2,736
	USTTT3548-SB09	4/7/2006	12-14	<10	4,750	690	2,180
USTTT3548-SB02	USTTT3548-SB02(9-11)	4/14/2004	9-11	13	3,970	720	2,935
	USTTT3548-SB10	4/7/2006	9-11	<10	1,483	280	640
USTTT3548-SB03	USTTT3548-SB03(9-11)	4/14/2004	9-11	29	5,630	1100	3,255
	USTTT3548-SB11	4/7/2006	9-11	<10	4,231	730	1,425
USTTT3548-SB04	USTTT3548-SB04(11-13)	4/14/2004	11-13	15	4,270	730	2,558
	USTTT3548-SB12	4/7/2006	11-13	<10	<20	<10	<20
USTTT3548-SB05	USTTT3548-SB05(9-11)	4/14/2004	9-11	<10	3,670	640	2,222
	USTTT3548-SB13	4/7/2006	9-11	<10	3,938	<500	1,131
USTTT3548-SB06	USTTT3548-SB06 (9-11)	8/10/2004	9-11	<10	<20	<10	<20
	USTTT3548-SB14	4/7/2006	9-11	<10	<20	<10	<20
USTTT3548-SB07	USTTT3548-SB07 (9-11)	8/10/2004	9-11	<10	<20	<10	<20
	USTTT3548-SB15	4/7/2006	9-11	<10	<20	<10	<20

All results in milligram per Kilogram - mg/Kg.

ft. BLS = feet below land surface

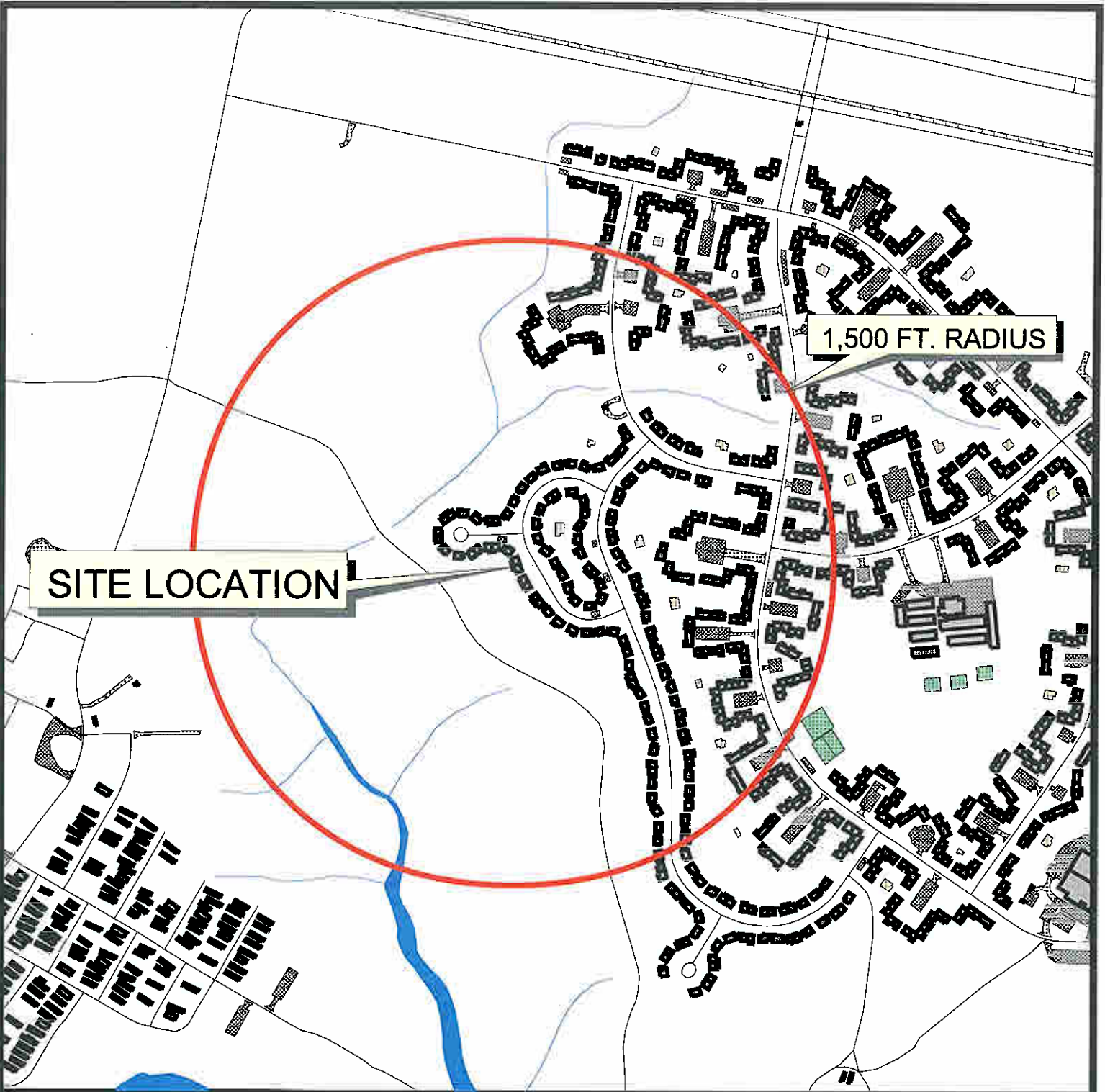
Health based level > 100%

Considered immobile

Shaded concentrations exceed the Residential MSCCs

* Result is the sum of the reported quantitation limit of one fraction and the detected concentration of the other fraction.

FIGURES



SITE LOCATION

1,500 FT. RADIUS

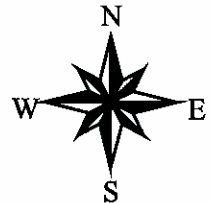
LEGEND

-  Roads
-  Railroads
-  Recreational Horse Trail
-  Buildings and Structures
-  Parking Lots
-  Playgrounds
-  Driveways
-  Athletic Fields
-  Athletic Courts
-  Surface Water
-  Creeks
-  Surface Water

500 0 500 Feet



SCALE



SITE VICINITY MAP

FIGURE

DRAWN BY: CHECK BY: APPROVED BY:

KAWS SAT MEM

SOIL ASSESSMENT REPORT ADDENDUM
TT-3548




1

CATLIN PROJECT No.: 206-026


TT-3546 ENTRANCE


SIDEWALK


LEGEND

- EXISTING  BUILDING
-  TYPE II MONITORING WELL
-  SOIL BORING
- F — FORMER FUEL DELIVERY LINE
- SS — SANITARY SEWER LINE
- W — WATER SUPPLY LINE
- () SAMPLE DEPTH


HOUSE TT-3548/3546


USTTT3548-SB15 (9-11) 


USTTT3548-SB09 (12-14) 


USTTT3548-SB12 (11-13) 


EXCAVATION

USTTT3548-SB13 (9-11) 

USTTT3548-MW01 

USTTT3548-SB10 (9-11) 

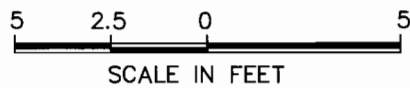
USTTT3548-SB14 (9-11) 

USTTT3548-SB11 (9-11) 

TT-3548 ENTRANCE

SIDEWALK

APPROXIMATELY 60' TO CHOSIN CIRCLE



PROJECT
SOIL ASSESSMENT REPORT
ADDENDUM
TT-3548
MARINE CORPS BASE
CAMP LEJEUNE, N.C.

JOB NO: 206-026 DATE: APR 2006

TITLE
SITE PLAN WITH
DPT LOCATIONS

SCALE: 1"=5' DRAWN BY: KAWS CHECKED BY: MEM

FIGURE
2

TT-3546 ENTRANCE

SIDEWALK

HOUSE TT-3548/3546

USTTT3548-SB15

USTTT3548-SB12

USTTT3548-SB09*

EXCAVATION

USTTT3548-SB13*

USTTT3548-MW01

USTTT3548-SB10*

USTTT3548-SB14

USTTT3548-SB11*

TT-3548 ENTRANCE

SIDEWALK

APPROXIMATELY 60' TO CHOSIN CIRCLE







*LABORATORY ANALYSIS OF 4/7/2006 SOIL SAMPLE DETECTED C9-C22 AROMATIC CONCENTRATION IN EXCESS OF APPLICATION RESIDENTIAL MSCC.

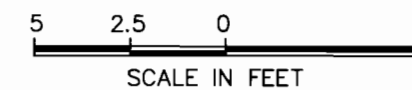
Analytical Method: MADEP VPH/EPH AS COMPARED TO NCDENR MSCCs


Borehole ID	Contaminant of Concern →			C5-C8 Aliphatics	C9-C18 Aliphatics	C19-C36 Aliphatics	C9-C22 Aromatics
	Sample ID	Date Collected	Sample Depth (ft. BLS)				
Residential MSCC (mg/kg)				939	9,386	93,860	469
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USTTT3548-SB02	USTTT3548-SB02(9-11) USTTT3548-SB10	4/14/2004 4/7/2006	9-11 9-11	13 <10	3,970 1,483	720 280	2,935 640
USTTT3548-SB03	USTTT3548-SB03(9-11) USTTT3548-SB11	4/14/2004 4/7/2006	9-11 9-11	29 <10	5,630 4,231	1100 730	3,255 1,425
USTTT3548-SB04	USTTT3548-SB04(11-13) USTTT3548-SB12	4/14/2004 4/7/2006	11-13 11-13	15 <10	4,270 <20	730 <10	2,558 <20
USTTT3548-SB05	USTTT3548-SB05(9-11) USTTT3548-SB13	4/14/2004 4/7/2006	9-11 9-11	<10 <10	3,670 3,938	640 <500	2,222 1,131
USTTT3548-SB06	USTTT3548-SB06 (9-11) USTTT3548-SB14	8/10/2004 4/7/2006	9-11 9-11	<10 <10	<20 <20	<10 <10	<20 <20
USTTT3548-SB07	USTTT3548-SB07 (9-11) USTTT3548-SB15	8/10/2004 4/7/2006	9-11 9-11	<10 <10	<20 <20	<10 <10	<20 <20

B. BLS = feet below land surface
 # Health based level > 100 %
 ## Considered immobile
 Shaded concentrations exceeded the Residential MSCCs
 * Result is the sum of the reported quantitation limit of one fraction and the detected concentration of the other fraction.

LEGEND

- EXISTING NEW DESCRIPTION
-  BUILDING
-  TYPE II MONITORING WELL
-  SOIL BORING
-  FORMER FUEL DELIVERY LINE
-  SANITARY SEWER LINE
-  WATER SUPPLY LINE



 WILMINGTON, NORTH CAROLINA	PROJECT SOIL ASSESSMENT REPORT ADDENDUM TT-3548 MARINE CORPS BASE CAMP LEJEUNE, N.C.	TITLE SITE PLAN WITH SOIL LABORATORY RESULTS - MADEP VPH/EPH AS COMPARED TO NCDEHR MSCCs	FIGURE 3
	JOB NO: 206-026 DATE: APR 2006	SCALE: 1"=5'	DRAWN BY: KAWS CHECKED BY: MEM

APPENDICES

APPENDIX A

**CATLIN STANDARD METHODS OF
INVESTIGATION**

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, 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

**LABORATORY REPORTS
AND
CHAIN-OF-CUSTODY DOCUMENTATION**



Mr. Mike E. Mason
Richard Catlin & Associates
P.O. Box 10279
Wilmington NC 28404-0279

Report Number: G128-1751

Client Project: TT-3548

Dear Mr. Mason:

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 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.


Laboratory Director

J. Patrick Weaver

4/27/2016
Date



VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

Project Name: TT-3548

Sample Information and Analytical Results	
Sample Identification	USTTT3548-SB09 (13')
Sample Matrix	Soil
Collection Option (for Soil)*	2
Date Collected	04/07/06
Date Received	04/07/06
Date Extracted	04/07/06
Date Analyzed	04/17/06
Dry Weight	95
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 10 (mg/Kg)
C ₉ -C ₁₂ Aliphatics**	150 (mg/Kg)
C ₉ -C ₁₀ Aromatics**	180 (mg/Kg)
Surrogate % Recovery - PID	390***
Surrogate % Recovery - FID	340***

* = 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: g128-1751-1a

Reviewed By: RD



VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

Project Name: TT-3548

Sample Information and Analytical Results	
Sample Identification	USTTT3548-SB10 (10')
Sample Matrix	Soil
Collection Option (for Soil)*	2
Date Collected	04/07/06
Date Received	04/07/06
Date Extracted	04/07/06
Date Analyzed	04/17/06
Dry Weight	93
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 10 (mg/Kg)
C ₉ -C ₁₂ Aliphatics**	83 (mg/Kg)
C ₉ -C ₁₀ Aromatics**	100 (mg/Kg)
Surrogate % Recovery - PID	180***
Surrogate % Recovery - FID	260***

* = 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: g128-1751-2a

Reviewed By: End



VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

Project Name: TT-3548

Sample Information and Analytical Results	
Sample Identification	USTTT354B-SB11 (10')
Sample Matrix	Soil
Collection Option (for Soil)*	2
Date Collected	04/07/06
Date Received	04/07/06
Date Extracted	04/07/06
Date Analyzed	04/17/06
Dry Weight	92
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 10 (mg/Kg)
C ₉ -C ₁₂ Aliphatics**	31 (mg/Kg)
C ₉ -C ₁₀ Aromatics**	25 (mg/Kg)
Surrogate % Recovery - PID	110
Surrogate % Recovery - FID	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.

Lab Info: g128-1751-3a

Reviewed By: RL



VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

Project Name: TT-3548

Sample Information and Analytical Results	
Sample Identification	USTTT354B-SB12 (12')
Sample Matrix	Soil
Collection Option (for Soil)*	2
Date Collected	04/07/06
Date Received	04/07/06
Date Extracted	04/07/06
Date Analyzed	04/17/06
Dry Weight	95
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 10 (mg/Kg)
C ₉ -C ₁₂ Aliphatics**	< 10 (mg/Kg)
C ₉ -C ₁₀ Aromatics**	< 10 (mg/Kg)
Surrogate % Recovery - PID	100
Surrogate % Recovery - FID	120

* = 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.

Lab Info: g128-1751-4a

Reviewed By: hl



VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

Project Name: TT-3548

Sample Information and Analytical Results	
Sample Identification	USTTT354B-SB13 (10')
Sample Matrix	Soil
Collection Option (for Soil)*	2
Date Collected	04/07/06
Date Received	04/07/06
Date Extracted	04/07/06
Date Analyzed	04/17/06
Dry Weight	89
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 10 (mg/Kg)
C ₉ -C ₁₂ Aliphatics**	38 (mg/Kg)
C ₈ -C ₁₀ Aromatics**	31 (mg/Kg)
Surrogate % Recovery - PID	120
Surrogate % Recovery - FID	180***

* = 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: g128-1751-5a

Reviewed By:



VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

Project Name: TT-3548

Sample Information and Analytical Results	
Sample Identification	USTTT354B-SB14 (10')
Sample Matrix	Soil
Collection Option (for Soil)*	2
Date Collected	04/07/06
Date Received	04/07/06
Date Extracted	04/07/06
Date Analyzed	04/17/06
Dry Weight	91
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 10 (mg/Kg)
C ₉ -C ₁₂ Aliphatics**	< 10 (mg/Kg)
C ₉ -C ₁₀ Aromatics**	< 10 (mg/Kg)
Surrogate % Recovery - PID	99
Surrogate % Recovery - FID	110

* = 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.

Lab Info: g128-1751-6a

Reviewed By: zml



VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

Project Name: TT-3548

Sample Information and Analytical Results	
Sample Identification	USTTT354B-SB15 (10')
Sample Matrix	Soil
Collection Option (for Soil)*	2
Date Collected	04/07/06
Date Received	04/07/06
Date Extracted	04/07/06
Date Analyzed	04/17/06
Dry Weight	96
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 10 (mg/Kg)
C ₉ -C ₁₂ Aliphatics**	< 10 (mg/Kg)
C ₉ -C ₁₀ Aromatics**	< 10 (mg/Kg)
Surrogate % Recovery - PID	100
Surrogate % Recovery - FID	110

* = 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.

Lab Info: g128-1751-7a

Reviewed By:



Attachment 2
VPH Laboratory Reporting Form

Calibration and QA/QC Information

FID Initial Calibration Date: 02/11/06 PID Initial Calibration Date: 02/11/06

Calibration Ranges and Limits

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

Calibration Concentration Levels

Range	Levels (µg/L)	%RSD or CCC	Method of Quantitation
C ₅ -C ₈ Aliphatics	40	10.8	Calibration Factor
	1000		
	2000		
	3000		
	4000		
C ₉ -C ₁₂ Aliphatics	10	0.99	Linear Regression
	250		
	500		
	750		
	1000		
C ₉ -C ₁₀ Aromatics	10	19.30	Calibration Factor
	250		
	500		
	750		
	1000		

Calibration Check Date: 04/17/06

Calibration Check

Range	Levels (µg/L) (mg/Kg)		RPD
	C ₅ -C ₈ Aliphatics	2000	
C ₉ -C ₁₂ Aliphatics	500	50	-5.1
C ₉ -C ₁₀ Aromatics	500	50	7.2

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

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



EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Richard Catlin & Associates

Project Name: TT-3548

Sample Information and Analytical Results	
Sample Identification	USTTT3548-SB09 (13')
Sample Matrix	Soil
Date Collected	04/07/06
Date Received	04/07/06
Date Extracted	04/19/06
Date Analyzed	04/26/06
Dry Weight	95.4
Dilution Factor	50:10
C ₉ -C ₁₈ Aliphatics*	4600 (mg/Kg)
C ₁₉ -C ₃₆ Aliphatics*	690 (mg/Kg)
C ₁₁ -C ₂₂ Aromatics*	2000 (mg/Kg)
Aliphatic Surrogate % Recovery	NA
Aromatic Surrogate % Recovery	NA
Fractionation Surrogate 1 % Recovery	NA

Comments:

* = Excludes any surrogates or internal standards.

NA = Non-applicable, surrogate diluted out.

Lab info: G128-1751-1D

Reviewed By: 



EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Richard Catlin & Associates

Project Name: TT-3548

Sample Information and Analytical Results	
Sample Identification	USTTT3548-SB10 (10')
Sample Matrix	Soil
Date Collected	04/07/06
Date Received	04/07/06
Date Extracted	04/19/06
Date Analyzed	04/26/06
Dry Weight	93.3
Dilution Factor	20:5
C ₉ -C ₁₈ Aliphatics*	1400 (mg/Kg)
C ₁₉ -C ₃₆ Aliphatics*	280 (mg/Kg)
C ₁₁ -C ₂₂ Aromatics*	540 (mg/Kg)
Aliphatic Surrogate % Recovery	NA
Aromatic Surrogate % Recovery	150
Fractionation Surrogate 1 % Recovery	89

Comments:

* = Excludes any surrogates or internal standards.

NA = Non-applicable, surrogate diluted out.

Lab info: G128-1751-2D

Reviewed By:



EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Richard Catlin & Associates

Project Name: TT-3548

Sample Information and Analytical Results	
Sample Identification	USTTT354B-SB11 (10')
Sample Matrix	Soil
Date Collected	04/07/06
Date Received	04/07/06
Date Extracted	04/19/06
Date Analyzed	04/26/06
Dry Weight	91.8
Dilution Factor	50:10
C ₉ -C ₁₈ Aliphatics*	4200 (mg/Kg)
C ₁₉ -C ₃₈ Aliphatics*	730 (mg/Kg)
C ₁₁ -C ₂₂ Aromatics*	1400 (mg/Kg)
Aliphatic Surrogate % Recovery	NA
Aromatic Surrogate % Recovery	NA
Fractionation Surrogate 1 % Recovery	NA

Comments:

* = Excludes any surrogates or internal standards.

NA = Non-applicable, surrogate diluted out.

Lab info: G128-1751-3D

Reviewed By:



EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Richard Catlin & Associates

Project Name: TT-3548

Sample Information and Analytical Results	
Sample Identification	USTTT3548-SB12 (12')
Sample Matrix	Soil
Date Collected	04/07/06
Date Received	04/07/06
Date Extracted	04/19/06
Date Analyzed	04/26/06
Dry Weight	94.8
Dilution Factor	1:1
C ₉ -C ₁₈ Aliphatics*	< 10 (mg/Kg)
C ₁₉ -C ₃₆ Aliphatics*	< 10 (mg/Kg)
C ₁₁ -C ₂₂ Aromatics*	< 10 (mg/Kg)
Aliphatic Surrogate % Recovery	110
Aromatic Surrogate % Recovery	72
Fractionation Surrogate 1 % Recovery	61

Comments:

* = Excludes any surrogates or internal standards.

Lab info: G128-1751-4D

Reviewed By: lv



EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Richard Catlin & Associates

Project Name: TT-3548

Sample Information and Analytical Results	
Sample Identification	USTTT354B-SB13 (10')
Sample Matrix	Soil
Date Collected	04/07/06
Date Received	04/07/06
Date Extracted	04/19/06
Date Analyzed	04/26/06
Dry Weight	89.2
Dilution Factor	50:10
C ₉ -C ₁₈ Aliphatics*	3900 (mg/Kg)
C ₁₉ -C ₃₆ Aliphatics*	< 500 (mg/Kg)
C ₁₁ -C ₂₂ Aromatics*	1100 (mg/Kg)
Aliphatic Surrogate % Recovery	NA
Aromatic Surrogate % Recovery	NA
Fractionation Surrogate 1 % Recovery	NA

Comments:

* = Excludes any surrogates or internal standards.

NA = Non-applicable, surrogate diluted out.

Lab info: G128-1751-5D

Reviewed By: ene



EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Richard Catlin & Associates

Project Name: TT-3548

Sample Information and Analytical Results	
Sample Identification	USTTT354B-SB14 (10')
Sample Matrix	Soil
Date Collected	04/07/06
Date Received	04/07/06
Date Extracted	04/19/06
Date Analyzed	04/20/06
Dry Weight	91.2
Dilution Factor	1
C ₉ -C ₁₈ Aliphatics*	< 10 (mg/Kg)
C ₁₉ -C ₃₆ Aliphatics*	< 10 (mg/Kg)
C ₁₁ -C ₂₂ Aromatics*	< 10 (mg/Kg)
Aliphatic Surrogate % Recovery	130
Aromatic Surrogate % Recovery	97

Comments:

* = Excludes any surrogates or internal standards.
 Sample did not require fractionation.

Lab info: G128-1751-6D

Reviewed By: PLP



EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Richard Catlin & Associates

Project Name: TT-3548

Sample Information and Analytical Results	
Sample Identification	USTTT354B-SB15 (10')
Sample Matrix	Soil
Date Collected	04/07/06
Date Received	04/07/06
Date Extracted	04/19/06
Date Analyzed	04/20/06
Dry Weight	96
Dilution Factor	1
C ₉ -C ₁₈ Aliphatics*	< 10 (mg/Kg)
C ₁₉ -C ₃₈ Aliphatics*	< 10 (mg/Kg)
C ₁₁ -C ₂₂ Aromatics*	< 10 (mg/Kg)
Aliphatic Surrogate % Recovery	130
Aromatic Surrogate % Recovery	100

Comments:

- * = Excludes any surrogates or internal standards.
 Sample did not require fractionation.

Lab info: G128-1751-7D

Reviewed By: *ml*



Attachment 3

EPH Laboratory Reporting Form

Calibration and QA/QC Information

Initial Calibration Date: 04/19/06

Calibration Ranges and Limits

Range	MDL (2/2004) ($\mu\text{g/L}$)	ML ($\mu\text{g/L}$)	RL	
			($\mu\text{g/L}$)	(mg/Kg)
C ₉ -C ₁₈ Aliphatics	3.84	12.2	100	10
C ₁₉ -C ₃₆ Aliphatics	0.57	1.8	100	10
C ₁₁ -C ₂₂ Aromatics	4.54	14.4	100	10

Calibration Concentration Levels

Range	Levels ($\mu\text{g/mL}$)	%RSD or CCC	Method of Quantitation
C ₉ -C ₁₈ Aliphatics	6	13.30	Calibration Factor
	30		
	60		
	120		
	240		
C ₁₉ -C ₃₆ Aliphatics	8	10.1	Calibration Factor
	40		
	80		
	160		
	320		
C ₁₁ -C ₂₂ Aromatics	17	4.5	Calibration Factor
	85		
	170		
	340		
	680		

Calibration Check Date: 04/20/06

Calibration Check

Range	Levels ($\mu\text{g/mL}$)	RPD
C ₉ -C ₁₈ Aliphatics	120	7.6
C ₁₉ -C ₃₆ Aliphatics	160	-7.9
C ₁₁ -C ₂₂ Aromatics	340	0.3

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

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



EPH Laboratory Reporting Form

Calibration and QA/QC Information

Initial Calibration Date: 04/19/06

Calibration Ranges and Limits

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

Calibration Concentration Levels

Range	Levels (µg/mL)	%RSD or CCC	Method of Quantitation
C ₉ -C ₁₈ Aliphatics	6	13.30	Calibration Factor
	30		
	60		
	120		
	240		
C ₁₉ -C ₃₆ Aliphatics	8	10.1	Calibration Factor
	40		
	80		
	160		
	320		
C ₁₁ -C ₂₂ Aromatics	17	4.5	Calibration Factor
	85		
	170		
	340		
	680		

Calibration Check Date: 04/26/06

Calibration Check

Range	Levels (µg/mL)	RPD
C ₉ -C ₁₈ Aliphatics	120	9.4
C ₁₉ -C ₃₆ Aliphatics	160	7.6
C ₁₁ -C ₂₂ Aromatics	340	-4.3

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 (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

% 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.



CHAIN OF CUSTODY RECORD

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1 CLIENT: **CATLIN**

CONTACT: **MIKE E. MARSH** PHONE NO: (910) 462 5864

PROJECT: **TT-354B** SITE/PWSID#:

REPORTS TO: **MIKE E. MARSH** FAX NO: (910) 462-7563

INVOICE TO: **Shunda e CATLIN** QUOTE # **DOD 101**

P.O. NUMBER **260467 -3**

SGS Reference: **G128-1751** PAGE **1** OF **1**

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No CONTAINERS	SAMPLE TYPE C= COMP G= GRAB	Preservatives Used	Analysis Required	REMARKS
	WSTTT 354B - SB09 (13')	4/7/06	1130	S	3	G			
	WSTTT 354B - SB10 (10')		1015	S	3	G			
	WSTTT 354B - SB11 (10')		1005	S	3	G			
	WSTTT 3640 - SB12 (12')		915	S	3	G			
	WSTTT 354B - SB13 (10')		940	S	3	G			
	WSTTT 354B - SB14 (10')		1036	S	3	G			
	WSTTT 354B - SB15 (10')		1700	S	3	G			

2

Shipping Carrier:	Shipping Ticket No:	Special Deliverable Requirements:	Requested Turnaround Time and Special Instructions:

3

4

5

Collected/Relinquished By: (1) *John Deena*

Relinquished By: (2) *John Deena*

Relinquished By: (3)

Relinquished By: (4)

Received By: *John Deena*

Received By:

Received By:

Received By:

Time: 1330

Date: 4/7/06

Date:

Date:

Date:

Samples Received Cold? (Circle) YES NO

Temperature (C): **11.1** **28**

Chain of Custody Seal: (Circle) INTACT BROKEN

INTACT BROKEN

ABSENT

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

1256 Greenbrier Street Charleston, WV 25311 Tel: (304) 346-0725 Fax: (304) 346-0761

200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301

5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1803 Fax: (910) 350-1557