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June 20, 2003

Commander
Naval Facilities Engineering Command
Atlantic Division
1510 Gilbert Street
Norfolk, Virginia 23511-6287

Attention: EV32JC, Mr. John D. Conway, P.G.

Re: **FINAL** Phase I Limited Site Assessment
UST 1323-3
Marine Corps Base
Camp Lejeune, North Carolina

Navy Contract No. N62470-01-D-3009
Delivery Order No. 0060
CATLIN Project No. 203-002

Dear Mr. Conway:

CATLIN Engineers and Scientists (CATLIN) and Mid-Atlantic Associates, P.A. (Mid-Atlantic) are pleased to submit the Phase I Limited Site Assessment for the above referenced site. We have reviewed comments made to the DRAFT document, and where applicable, changes have been incorporated into the FINAL report. A summary of the comments and responses is attached.

CATLIN and Mid-Atlantic appreciate the opportunity to continue to provide services to LANTDIV and MCAS Cherry Point on your environmental projects.

Sincerely,

Michael E. Mason, P.E.
CATLIN Program Manager

Attachments: Phase I Limited Site Assessment

cc: Mr. Roger R. Marce, Jr. - Code AQ 135 Contracts (correspondence only)
Commanding General, Attn: Director I&E/EMD/EQB (w/ two attachments)
Dan Nielsen, Mid-Atlantic (correspondence only)

203002_Final ltr

Response to Comments
Draft Phase I LSA Report, UST 1323-3
Date of Draft Phase I LSA Report: May 1, 2003

Written By: BYA Date: 6/18/03
Reviewed By: DMR Date: 6/18/03

Editorial Note: Reviewer comments are noted in courier font and were copied from e-mail responses received from Ms. Kimberly Hakola and Ms. Nikki Hall of MCB Camp Lejeune. Mr. John Conway of LANTDIV did not have further comments on the Draft UST 1323-3 Phase I LSA report. Mid-Atlantic received reviewer correspondence from the MCB and LANTDIV on June 4, 2003.

Response to Mr. Conway's Comments:

Mr. Conway did not have comments regarding the Draft Phase I LSA report in addition to those provided by the MCB.

Responses to Comments by Ms. Hakola and Ms. Hall:

Comment No. 1 (Title Page):

1) "Date Release Discovered: March 26, 2002"
UST was removed March 20, 2002.

Response:

The report has been revised as requested.

Comments 2 and 3 (Page 1, Section 1.0):

2) Address: Marine Corps Base, PSC Box 20004, Camp Lejeune, NC 28542
3) Date Discovered: March 20, 2002

Response

We have modified the text in the report, as requested.

Comments 4 through 7 (Page 2, Section 2.0):

4) 2nd paragraph, 2nd sentence
Insert commas to read "...was noted in the tank pit, however, unidentified organic..."

5) 4th paragraph, 4th sentence

May want to note that while C9-C22 aromatics exceeded the residential standard, it does not exceed the industrial/commercial MSCC.

6) 4th paragraph, last sentence

Are all the results from the JA Jones report included in Appendix A?

7) 6th paragraph, last sentence

Delete "rebar" since "reinforced concrete" is a sufficient description.

Response:

Comments 4, 5 and 7: We have modified the text, as requested.

Comment 6: All of the results presented by J.A. Jones in their UST closure report are included on the tables within Appendix A.

Comments 8 and 9 (Section 3, Question 2 and Section 4.7, respectively):

8) Part II, Property Surrounding Source Area of Release, Question 2 Table 3.2 was omitted from this report.

9) Table 3.2 was omitted from this report.

Response:

We have included Table 3.2 in the final Phase I LSA report. We regret the omission.

Comments 10 and 11 (Page 11, Section 5.0):

10) 2nd paragraph, 5th sentence

Do you mean UST 1323-SB01 (not TMW01) was later converted? Be consistent with well labels. For instance, I found TMW01, TMW1, TW1, and TW01.

11) 2nd paragraph, 6th sentence

I would include USCS classifications for consistency.

Response:

Comment 10: The reference to UST1323-TMW01 is correct. Two borings were advanced during the Phase I LSA, a hand auger boring (UST1323-SB01) and a monitoring well boring (UST1323-TMW01). In hindsight, designating the latter boring UST1323-SB02 would have been less confusing.

Thank you for pointing out the lack of consistency with the well labels. We have changed the text to reference "UST1323-TW01" for the monitoring well boring and the soil/groundwater samples collected from this boring/well. The only items in the report that do not reflect the "UST1323-TW01" designation are well label notations on the monitoring well construction record and well abandonment record. Both documents are originals that were signed by the certified well driller.

Comment 11: We have included the USCS soil types in this sentence, after the soil descriptions.

Comments 12 and 13 (Pages 13 and 15, Section 6.1):

12) MADEP VPH/EPH last sentence (3rd paragraph)
This sentence seems out of place. Should it be moved to the 1st paragraph?

13) Chromium and Lead
Lead concentration of 6.16 should be 6.18.

Response:

We have omitted the last sentence of the third paragraph. It is not needed based on the text in this section. We have revised the text to include a concentration of 6.18 mg/Kg.

Comment No. 14 (Page 15, Section 6.2):

14) 1st paragraph, 2nd sentence
Include method 6010B/3030 Metals.

Response:

We added the text "...and chromium and lead by EPA preparation/testing methods 6010B/3030C." to the end of the second sentence.

Comments 15 through 17 (Page 17, Section 7.0):

15) 2nd bullet, 3rd sentence

While you mention that the concentration of C₁₁-C₂₂ aromatics is above STGW MSCC, note that is below the Residential MSCC.

16) New bullet

Note that all other constituents are below the lowest MSCC.

17) 4th bullet, 2nd sentence

Do you mean C₉-C₁₂ instead of C₅-C₈?

Response:

We modified the text as requested in Comment No. 15. A third bullet was added to Section 7.0 that states: "VOCs, semi-VOCs, total chromium and total lead were detected at concentrations below the lowest applicable MSCCs." The second sentence of the fourth bullet should read "C9-C12" instead of C5 to C8.

Comments 18 and 19 (Tables 6.1 and 6.2, respectively):

18) Table 6.1

Numbers in bold exceed STGW (not residential) standards.

19) Table 6.2

Duplicate sample should be labeled UST1323-3-TW01 (not 1323-2)

Response:

Tables 6.1 and 6.2 have been modified, as requested.

Comment No. 20 (Table 6.3):

20) What do the * and ** reference?

Response:

The * and ** are typically used on similar tables to reference the minimum thickness of free product which can be measured by the oil/water interface probe (*) and that a top-of-casing elevation is based on an arbitrary benchmark of 100 feet (**), respectively. Both conditions were not applicable to this site, and therefore are not needed. We have omitted the asterisks from Table 6.3.

Comments 21 through 23 (Drawings):

21) Drawing 2.1

May want to use a different line type or color to distinguish area shown in Drawings 4.1 and 6.1 to 6.6.

22) Drawing 3.1

Buildings are the same color as athletic fields.

23) Drawing 6.2

Do you want to include TICS?

Response:

We revised Drawing 2.1 to include a different line type for the box designating the area shown on drawings 4.1 and 6.1 to 6.6. The color of the athletic fields was changed on Drawing 3.1. Drawing 6.2 was revised to include TICs in the data boxes.

Comment No. 24 (Appendix C):

24) Last sheet of Appendix C
Remove Page 4 of Delco Truck Stop Site CAP Monitoring Report.

Response:

We removed the extraneous page from Appendix C, as requested.

**LEAKING UNDERGROUND STORAGE TANK (LUST)
PHASE I LIMITED SITE ASSESSMENT REPORT
UST 1323-3
VEHICLE MAINTENANCE FACILITY
HEADQUARTERS BATTERY, 10TH MARINES
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA**

NCDENR UST INCIDENT NO.: 24232

JUNE 18, 2003

CONTRACT NO.: N62470-01-D-3009
DELIVERY ORDER NO.: 0060
MID-ATLANTIC PROJECT NO.: 000R1243.60

Prepared By:

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**LEAKING UNDERGROUND STORAGE TANK (LUST)
PHASE I LIMITED SITE ASSESSMENT REPORT
UST 1323-3
VEHICLE MAINTENANCE FACILITY
HEADQUARTERS BATTERY, 10TH MARINES
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA**

NCDENR UST Incident No.: 24232
Source of the Release: One 600-Gallon Used Oil UST System
Facility ID No.: 5-002740
Date Release Discovered: March 20, 2002
Risk Classification: Undetermined
Land Use Classification: Undetermined
Latitude: 34° 39' 55.0" (34.6653°N)
Longitude: 77° 19' 47.8" (77.3299°W)

Mid-Atlantic Job No. 000R1243.60

June 18, 2003

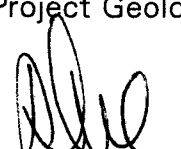
Prepared For:

Commanding General
Naval Facilities Engineering Command
Atlantic Headquarters, Env. Division
Technical Services Branch
1510 Gilbert Street
Norfolk, Virginia 23511-6287

Prepared By:

MID-ATLANTIC ASSOCIATES, INC.


Eric B. Aufderhaar, P.G.
Project Geologist


Daniel H. Nielsen, P.E.
Principal Engineer

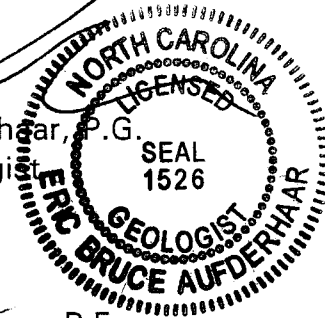


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LIST OF ACRONYMS

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
DENR	Department of Environment and Natural Resources
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

LIST OF ACRONYMS (CON'T.)

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
Mid-Atlantic	Mid-Atlantic Associates, Inc.
MDL	Method Detection Limit
mg/Kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
MRO	Mooresville Regional Office
MSCC	Maximum Soil Contamination Concentration
MSL	Mean Sea Level
MTBE	Methyl tertiary butyl ether
µg/Kg	Micrograms per Kilogram
µg/L	Micrograms per Liter
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
NCGWQS	North Carolina Groundwater Quality Standards

LIST OF ACRONYMS (CON'T.)

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
PLS	Professional Locating Service, Jacksonville, North Carolina
PPB	Parts Per Billion
PPM	Parts Per Million
PID	Photo Ionization Detector
PQL	Practical Quantitation Limit
PVC	Polyvinyl chloride
BCA	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

PURPOSE OF INVESTIGATION

The purpose of this investigative document is to provide data to fulfill the initial site assessment and risk characterization requirements in accordance with 15A NCAC 2L.0115(c)(4). This Phase I LSA document has been formatted utilizing the *Guidelines for Assessment and Corrective Action* effective July 1, 2001, (2001 *Guidelines*) for ease of DENR review. The purpose of the field activities was to collect the necessary information allowing DENR to classify the level of risk resulting from the release.

In order to establish this information and to confirm or deny the presence of petroleum contamination at this site, a receptor survey was performed, one temporary groundwater-monitoring well was installed and groundwater sampled in the former UST basin, and soil samples were collected in the UST basin and adjacent to associated piping. Mid-Atlantic, in accordance with the 2001 *Guidelines*, performed collection of soil samples for testing by analytical methods consistent with the required analysis for used oil-contaminated soil and groundwater.

Previous work at the UST 1323-3 site has been performed by J.A. Jones Environmental Services (J.A. Jones), Charlotte, North Carolina. Law Engineering and Environmental Services, Inc. (LAW) also completed environmental assessment work near UST 1323-3, in the vicinity of two hydraulic oil USTs and lifts formerly operated in vehicle servicing bays approximately 25 and 65 feet to the southeast of UST 1323-3, respectively. Petroleum contaminated soils were encountered when the hydraulic oil lifts were closed in March 2000 (DWM Incident No. 21796). The results of the work by J.A. Jones and LAW are presented in the following reports:

- Underground Storage Tank Closure Report, UST 1323-3, Marine Corps Base, Camp Lejeune, NC, J.A. Jones Environmental Services, June 6, 2002.
- Soil Assessment Report and Recommendation for "No Further Action", Former Hydraulic Oil UST's, Building 1323...[abbreviated title], Law Engineering and Environmental Services, Inc., August 24, 2001.

J.A. Jones performed environmental monitoring activities during removal of the 600-gallon used oil UST on March 20, 2002, and completed subsequent soil sampling at the site on April 2, 2002. Laboratory analysis of three soil samples collected after the tank and limited soils were removed indicated that petroleum contaminants remained in the soils at concentrations exceeding State cleanup levels. These three soil samples were collected from the base-of-excavation, the east sidewall and the south sidewall. The previous soil sample locations and laboratory results are included as Appendix A.

PURPOSE OF INVESTIGATION (CONTINUED)

The UST Section, DWM, DENR issued a letter to the MCB on December 18, 2002, requesting that a LSA be performed within 120 days of letter receipt. On March 21, 2003, the MCB requested an extension of the LSA submittal deadline until June 30, 2003. The DENR granted this extension on April 3, 2003.

Mid-Atlantic was retained by CATLIN, the prime contractor under Navy Contract N62470-01-D-3009, to perform the LSA. Delivery Order No. 60 was issued by LANTDIV to CATLIN on February 7, 2003, for completion of this work. Mid-Atlantic is submitting this report in order to fulfill the DENR request.

PHASE I LIMITED SITE ASSESSMENT REPORT

1.0 SITE IDENTIFICATION

DATE OF REPORT: June 18, 2003
Facility ID: 5-002740 UST Incident Number (if known): 24232
Site Name: UST 1323-3
Site Location: Building 1323, Marine Corps Base, Camp Lejeune, NC (Drawing 1.1)
Nearest City/Town: Jacksonville County: Onslow

UST Owner: Commanding General - MCB Camp Lejeune I&E/EMD/EQB
Address: Marine Corps Base, PSC Box 20004, 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: Vehicle Maintenance Facility, Headquarters Battalion, Tenth Marines
Address: 1323 "O" St., MCB Camp Lejeune, NC Phone: Same as above

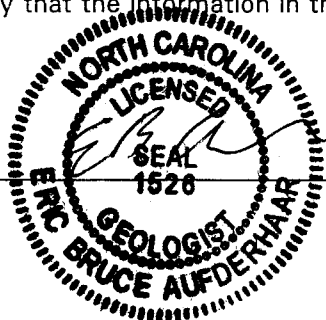
Consultant/Contractor: Mid-Atlantic Associates, Inc.
Address: 409 Rogers View Court, Raleigh, NC 27610 Phone: (919) 250-9918

RELEASE INFORMATION

Date Discovered: March 20, 2002
Longitude: 77.3299' W (77° 19 '47.8" W) Latitude: 34.6653' N (34° 39' 55.0" N)
Estimated Quantity of Release: Unknown
Cause of Release: Unknown
Source of Release (e.g. Piping/UST) USTs and associated piping are suspected
Sizes and contents of UST system(s) from which the release occurred:
600-gallon Used Oil UST

I Eric B. Aufderhaar a Professional Engineer Licensed Geologist (circle one) for Mid-Atlantic Associates, P.A., do certify that the information in this report is correct and accurate to the best of my knowledge.

(Please Affix Seal and Signature)



2.0 SITE HISTORY

The site previously contained one 600-gallon used oil UST. An unknown diameter used oil supply line extended from a remote fill location within Building 1323 to UST 1323-3 (Drawing 2.1). The 600-gallon used oil UST was installed in June 1990 and was last used on March 19, 2002. The tank was considered a regulated tank under 15A NCAC 2N and was operated under DENR Facility ID No. 5-002740. It was constructed of double walled fiberglass and measured 5.75 feet in length and 4.33 feet in diameter. UST history and owner information are included on Tables 2.1 and 2.2.

The UST was removed by J.A. Jones on March 20, 2002, and a closure report was prepared by J.A. Jones as referenced previously. According to the UST closure report, no apparent soil discoloration was noted in the tank pit, however, un-identified organic odors were noted in soil/gravel located on the east sidewall of the tank pit. UST Form 61, "24-Hour Release and UST Leak Reporting Form", was issued to DENR by the MCB on April 1, 2002. J.A. Jones excavated additional soils on April 2, 2002 until the final dimensions of the excavation were 13 feet (length) by 9 feet (width) by 7.5 feet (depth). Approximately 1.5 cubic yards of contaminated soil/gravel were excavated during the tank removal and transported to a J.A. Jones staging area at the MCB for eventual off-site disposal.

J.A. Jones collected nine soil samples from the base of excavation and sidewalls subsequent to tank removal. These soil samples were collected on March 20 and April 2, 2002 and consisted of a mixture of soil and gravel. Native soils adjacent to the UST were reported to consist of brown to light brown clayey silt based on field observations by on-site J.A. Jones personnel. The soil/gravel samples were shipped to Prism Laboratories in Charlotte, North Carolina for various laboratory tests. Five soil/gravel samples were collected on March 20, 2002 during the UST closure. These samples included four sidewall samples and one base-of-excavation sample collected from depths ranging from 6 to 7.3 feet BLS (Appendix A). The five soil/gravel samples were tested for TPH by EPA preparation methods 5030 and 3550 with testing method 8015M and total metals (chromium and lead) using EPA Method 6010B. The laboratory reported semi-volatile TPH in four of the five samples at concentrations ranging from 11 mg/Kg to 460 mg/Kg. These four samples were collected from the west, east and south UST pit sidewalls and from the base-of-excavation (Appendix A).

Four additional soil/gravel samples were collected on April 2, 2002 from adjacent to the previous UST closure assessment samples where semi-volatile TPH results exceeded the DENR action level of 10 mg/Kg. The four samples, collected from soil/gravel zones approximately one-half foot deeper than the previous samples, were tested for VPH and EPH by the MADEP methods, VOCs by EPA Method 8260, SVOCs by EPA Method 8270 and Chromium and Lead by EPA Method 6010B. The laboratory reported VPH and EPH compounds present among three of the four hydrocarbon fraction ranges, at concentrations below the industrial/commercial MSCCs. The MADEP VPH + EPH result for C9-C22 aromatics (730 mg/Kg) for a sample collected from 6.5 feet BLS in the east sidewall exceeded the residential MSCC of 469 mg/Kg but was below the industrial/commercial MSCC. The results of the laboratory analyses and sample locations, as reported by J.A. Jones, are included in Appendix A.

The UST closure report stated that the product line associated with the used oil UST was disconnected from the former remote fill. A portion of the product line was removed during the tank closure, however approximately eleven feet of product line remains at the site between the former remote fill and the former south UST excavation sidewall.

The tank was emptied by others prior to the UST closure. J.A. Jones reported that there was no residual material within the tank prior to removing the UST on March 20, 2002. According to the closure report, past releases from the tank were not reported. J.A. Jones personnel did observe unidentified organic odors in the gravel fill on the east sidewall of the tank excavation. Sand backfill for the UST excavation was reportedly obtained from a borrow pit on the base and was placed in the excavation to return the excavation to grade. The concrete pavement was then patched with approximately 0.3 feet of reinforced concrete.

3.0 RISK CHARACTERIZATION

Limited Site Assessment Risk Classification and Land Use Form

Part I – Groundwater/Surface Water/Vapor Impacts

High Risk

1. *Has the release contaminated any water-supply well including any used for non-drinking purposes?* YES NO

Water supply wells are not located within a 1,500-foot radius of the project site (Table 3.1).

2. *Is a water-supply well used for drinking water located within 1,000-feet of the source area of the discharge or release?* YES NO

There are no water-supply wells located within 1,000 feet of the source area.

3. *Is a water-supply well not used for drinking water (e.g., irrigation, washing cars, industrial cooling water, filling swimming pools) located within 250 feet of the source area of the release?* YES NO

There are no water-supply wells located within 250 feet of the source area of the release.

4. *Does groundwater within 500 feet of the source area of the release have the potential for future use (there is no other source of water-supply other than the groundwater)?* YES NO

No. There are an adequate number of locations for additional water-supply wells to be installed on other portions of the base.

5. *Do vapors from the release pose a threat of explosion because of accumulation of the vapors in a confined space or pose any other serious threat to public health, public safety or the environment? If yes, describe.* YES NO

No. No evidence of vapor accumulations were reported in the UST Closure document or during this investigation.

6. *Are there any other factors that would cause the discharge or release to pose an imminent danger to public health, public safety, or the environment? If yes, describe.* YES NO

No. Review of available previous environmental reports and data collected during this investigation does not provide evidence to suggest other factors that would cause the discharge or release to pose an imminent danger to public health, public safety, or the environment.

Intermediate Risk

7. *Is a surface water body located within 500 feet of the source area of the discharge or release?* **YES** NO

Yes. A perennial stream is located approximately 430 feet northeast of the former tank basin (source area). This stream is shown by the USGS on the Camp Lejeune, NC 7.5 Minute Topographic Map (Drawing 1.1) as a perennial stream crossing undeveloped land now occupied by the Building 1323 facility. This stream is no longer visible on the developed land occupied by the Building 1323 facility. Apparently, this segment of the stream was filled in or diverted into underground piping during construction of the Building 1323 facility. The perennial stream is an unnamed tributary of Cogdels Creek.

Cogdels Creek is listed in the DENR stream classification rules (15A NCAC 2B .0301) as "SC NSW" ("Tidal Salt Water: Aquatic life propagation and survival, fishing, wildlife and secondary recreation") from its source to the New River. According to (i)(1) of Section .0301, the unnamed perennial stream must be considered as a class "C" stream because it receives freshwater and is a tributary to a tidal saltwater stream.

During our receptor survey, we verified the location and nature of the unnamed perennial stream shown nearby on the USGS topographic map. The "stream" is a deep drainage ditch, approximately 5 to 6 feet deep near the Building 1323 facility. We traced the ditch upstream to a stormwater culvert outlet near the northeast side of the Building 1323 vehicle parking lots. Standing water was observed within the drainage ditch, both adjacent to the culvert and in the stream channel to the south of Building 1118 (Drawing 3.1).

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

No. The contaminant concentrations detected in groundwater for chromium and lead are below the water quality standards for class "C". The target PAH compounds specified in section .0208¹ of the water quality standards were

¹ Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

not reported in the groundwater sample at concentrations above the PQLs. The reported concentrations of bis (2-ethylhexyl) phthalate and C5-C8 Aliphatics are less than ten times the values recommended by the DENR and EPA in the EPA National and NC Criteria Table and the National Recommended Water Quality Criteria: 2002 (EPA, 2002). The values recommended in these two sources are 1,200 µg/L (DENR, 2002) and 1.2 µg/L (EPA, 2002).

8. *Is the source area of the discharge or release located within an approved or planned wellhead protection area as defined in 42 USC 300h-7(e)? If YES, describe.* YES NO

No. Wellhead protection areas defined by 42 USC 300h-7(e) have not, as of this time, been designated by the State for the MCB. However, MCB Camp Lejeune has identified proposed wellhead protection areas on the base. The site is not located in a proposed wellhead protection area.

9. *Is the release located in the Coastal Plain physiographic region as designated on a map entitled "Geology of North Carolina" published by the Department in 1985?* YES NO

As identified in the Geologic Map of North Carolina (North Carolina Geological Survey, 1985), the subject site lies within the Coastal Plain Physiographic Province. Potential impacts to deeper aquifers are unknown.

If YES, is the source area of the release located in an area in which there is recharge to an unconfined or semi-confined deeper aquifer that is being used or may be used as a source of drinking water? YES NO

Aquifers below the surficial aquifer in the area of UST 1323-3 typically include the Castle Hayne Aquifer, the Beaufort Aquifer, and the Peedee Aquifer, in order of increasing depth. Both the Beaufort and Peedee Aquifers contain saltwater in portions of the MCB and are not generally used for water-supply. The Castle Hayne Aquifer contains freshwater and is the principal aquifer used in the area for water-supply.

While there is likely recharge to the unconfined surficial aquifer at the Base, this aquifer is not used for water supply. Deeper aquifers may obtain a portion of recharge from the surficial aquifer at the Base; however, the amount of recharge provided by the surficial aquifer is expected to be substantially limited due to the presence of confining units.

10. *Do the levels of groundwater contamination for any contaminant exceed the gross contamination levels established by the Department?* YES NO

Groundwater sample results were below established GCLs.

Part II – Land Use

Property Containing Source Area of Release

The questions below pertain to the property containing the source area of the release.

1. *Does the property contain one or more primary or secondary residences (permanent or temporary)? Describe.* YES NO

No. The property contains a motor vehicle maintenance and servicing facility. Vehicles are serviced within two garage areas located to the southeast and southwest of the former UST.

2. *Does the property contain a school, daycare center, hospital, playground, park, recreation area, church, nursing home, or other place of public assembly? Describe.* YES NO

No. The property contains a motor vehicle maintenance and service facility as previously described.

3. *Does the property contain a commercial (e.g., retail, warehouse, office/business space, etc.) or industrial (e.g., manufacturing, utilities, industrial research and development, chemical/petroleum bulk storage, etc.) enterprise, an inactive commercial or industrial enterprise, or is the land undeveloped? Describe.* YES NO

The property is an industrial enterprise as previously mentioned.

4. *Do children visit the property? Explain.*

YES NO

No. The immediate site is located in a secured area used for the staging and servicing of U.S. Marine Corps combat and troop vehicles. Children would not typically be permitted in this area.

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

YES NO

The site is located within a restricted area of the base and fencing surrounds the site. When facility personnel are not present at the site, the facility is secured. Military Police also patrol the area.

5. *Do pavement, buildings, or other structures cap the contaminated soil? Describe.*

YES NO

Yes. Reinforced concrete pavement overlies the former UST location and known area of petroleum-contaminated soils.

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

The MCB Camp Lejeune is not subject to local or county zoning requirements. The Building 1323 site is developed and used as a motor vehicle servicing facility.

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

YES NO

No. The designated use of the facility on the Base is not likely to change in the foreseeable future.

Property Surrounding Source Area of Release

The questions below pertain to the area within 1,500 feet of the source area of the release (excludes property containing source area of the release):

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

The closest housing barracks for military personnel is Building 1340 located approximately 1,000 feet northwest of the release (Drawing 3.1). This would be considered a semi-permanent residence facility.

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

Athletic courts are located approximately 1,040 feet to the northwest of the release area, adjacent to Building 1340. Table 3.2 lists the MCB buildings and occupants in close proximity to the Building 1323 site.

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

As previously stated, MCB Camp Lejeune is not subject to local or county zoning requirements. The surrounding property has been developed for military support purposes.

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

The surrounding buildings to the southwest, northwest and northeast are developed and generally used for warehouses, distribution of supplies/equipment and for MCB combat/troop vehicle servicing operations. Undeveloped land used for troop training exercises is located to the southeast. Several tank trails cross the undeveloped land (Drawing 3.1).

4.0 RECEPTOR INFORMATION

4.1 Water-Supply Wells

There are no public drinking water-supply wells located within 1,500 feet of the source area of the release (Table 3.1).

4.2 Public Water Supplies

Public water is provided to buildings within 1,500 feet of the subject site by water mains which carry treated, potable water. Potable water is supplied to the site and surrounding areas by the MCB water-supply system. The closest water line to

the site, as noted on MCB revised as-built drawing 4174172², is situated approximately 10 feet to the northwest of former UST 1323-3. Potable water for the Industrial Area of the MCB is provided by the Holcomb Boulevard Water Treatment Facility. Groundwater obtained from the Castle Hayne Aquifer beneath the MCB is the raw water source for the treatment facilities.

4.3 Surface Water

The closest surface water body is a perennial stream located approximately 430 feet northeast of the former tank basin (Drawing 1.1). A small pond and an additional perennial stream are located approximately 1,200 feet and 1,480 feet to the southwest, respectively (Drawing 3.1). The perennial streams are tributaries to Cogdels Creek. Cogdels Creek flows westward and enters the New River approximately 1.4 miles to the southeast of the UST 1323-3 site.

4.4 Wellhead Protection Areas

Wellhead protection areas have not, as of this time, been designated by the State for the MCB. However, MCB Camp Lejeune has identified proposed wellhead protection areas on the base. The site is not located in a proposed wellhead protection area.

4.5 Deep Aquifers in the Coastal Plain Physiographic Region

As identified in the Geologic Map of North Carolina (North Carolina of Natural Resources and Community Development, 1985), the subject site lies within the Coastal Plain Physiographic Province. Potential impacts to deeper aquifers are unknown.

To some degree, seven of the ten aquifers identified to date in the North Carolina Coastal Plain are typically present beneath portions of the MCB. In order of increasing depth, these aquifers include the surficial, Castle Hayne, Beaufort, Peedee, Black Creek, and upper and lower Cape Fear aquifers.

² Water and Sewer Plan (Revised As-Built), MT/ENG Building, Combat Vehicle Maintenance Shop, Hadnot Point, MCB Camp Lejeune, Gantt Huberman Architects, Charlotte, NC, February 7, 1991.

Aquifers below the surficial aquifer in the area of UST 1323-3 typically include the Castle Hayne Aquifer, the Beaufort Aquifer, and the Peedee Aquifer, in order of increasing depth. Both the Beaufort and Peedee Aquifers contain saltwater in portions of the MCB and are not generally used to water supply. The Castle Hayne Aquifer contains freshwater and is the principal aquifer used in the area for water supply.

4.6 Subsurface Structures

A sewer line is located adjacent to the former UST excavation on the northwest side. Power and fiber optic communication lines are located near the excavation on the east and southwest sides, respectively (Drawing 4.1). Other underground utilities may be present near the former UST but were not encountered during this investigation or are shown on MCB drawing 4174172.

4.7 Property Owners and Occupants

The site and adjacent buildings are located on the MCB property, therefore the U.S. Government owns land in the vicinity of Building 1323. Table 3.2 lists occupants and/or usage of buildings adjacent to Building 1323.

5.0 **SITE GEOLOGY AND HYDROGEOLOGY**

According to the Geologic Map of North Carolina (North Carolina Geological Survey, 1985), the site lies within the Coastal Plain Physiographic Province.

Mid-Atlantic classified the soil texture of samples collected during advancement of borings adjacent to the inactive, used oil delivery line and within the backfilled UST excavation. Concrete was first core-drilled at the soil boring locations. The concrete thickness at each location included 0.9 feet at boring UST1323-SB01 and 0.3 feet at boring UST1323-TW01. Surficial soils collected from UST1323-SB01 were comprised primarily of fine gravel with little fine sand and clay (USCS soil type GW) between 0.9 and 2 feet BLS, brown fine sand and little clay (USCS Type SP) between 2 and 4 feet BLS and tan-brown slightly clayey fine sand (SP) between 4 and 5 feet, the termination depth of the product line boring. Soil boring UST1323-TW01, advanced in the backfilled UST pit, was later converted into temporary monitoring well, also designated UST1323-TW01. The backfill consisted of tan-brown fine sand (SP) from 0.3 to approximately 8 feet BLS, gray fine sand with

some clay (SC) between 8 and 9 feet BLS, white-brown slightly clayey fine sand (SP) between 9 and 12 feet BLS, white-brown fine sand (SP) between 12 and 14 feet BLS and white-brown fine to medium sand (SP) between 18 and 20 feet BLS. Soils from 14 to 18 feet BLS were not sampled. A record of the soil boring results are presented in Appendix B. During drilling, we noted wet soils in the 12 to 14 and 18 to 20 foot depth split-spoon soil samples.

Depth to groundwater was measured in well UST1323-TW01 at a depth of approximately 13.5 feet BLS, approximately 19 hours after installation. Other groundwater table depth measurements obtained from nearby permanent shallow wells include 14 feet BLS at well UST1323-MW02 on March 19, 2003 (measured by Mid-Atlantic); 13.1 feet BLS at well UST1323-MW01 on November 14, 2000 (LAW) and 12.9 feet BLS at UST1323-MW02 on November 14, 2000 (LAW). Monitoring wells MW01 and MW02 are located approximately 75 and 35 feet to the southeast of former UST 1323-3, respectively. Based on the location of Building 1323 with respect to nearby streams, the groundwater flow direction from the site would most likely be to the east or south-southwest.

6.0 SAMPLING RESULTS

6.1 Soil Sampling

As detailed in the Site History section and summarized in Appendix A, soil samples were obtained following removal of the tank. Laboratory analyses of these samples were above State action levels for TPH diesel range organics and C9-C22 aromatic petroleum hydrocarbons. A Phase I LSA was then requested by the DWM.

Mid-Atlantic personnel completed soil-sampling activities on March 19, 2003 and March 24, 2003. The product line soil boring (UST1323-SB01) was advanced to a depth of 5 feet BLS on March 19, 2003. This boring was advanced adjacent to the southeast side of the former excavation, near an 11-foot section of the remaining used oil delivery line. The boring was advanced with a hand auger and PowerProbe™. Drilling with a hand auger was discontinued at a depth of 2.3 feet BLS due to the repeated cave-in of pea-sized gravel from the borehole walls. The PowerProbe™ was then used to advance the boring to a depth of 5 feet BLS. Soil samples were collected in approximately one-foot intervals from 0.9 to 5 feet BLS. We did not observe apparent petroleum odors emanating from soil samples collected from the product line boring. Soil boring UST1323-TW01 was advanced in the center of the

former UST pit on March 24, 2003. Split spoon soil samples were collected from the UST1323-TW01 boring at depths of 8 to 10, 10 to 12, 12 to 14 and 18 to 20 feet BLS. Each soil sample was classified by the USCS for soil texture and screened with an OVA. The soil sample with the highest OVA reading from the product line soil boring (sample UST1323-SB01, 1 - 2 Ft.; OVA reading of 3.7 ppm) was submitted to the laboratory for environmental testing. The soil sample collected from 8 to 9 feet BLS at boring UST1323-TW01 (designated UST1323-3-TW01, 8 - 9 Ft. in the laboratory report) was submitted to the laboratory for testing. We observed blue-black, suspect petroleum-contaminated soils between 8 and 8.5 feet BLS in addition to petroleum odor emanating from these soils. A duplicate sample was also collected for laboratory analysis from this 8 to 9 foot depth soil zone (soil sample UST 1323-TW01, 8-9' DUPL). An OVA reading of 15.8 ppm was measured in the soil sample collected from this zone for field screening. All sampling was conducted in accordance with Mid-Atlantic's Standard Procedures included in Appendix C.

The soil samples were placed in laboratory glassware, labeled, placed immediately on ice in a cooler, and transported under proper chain-of-custody protocol to Paradigm Analytical Laboratories, Inc. (Paradigm) of Wilmington, North Carolina. Analytical results for the soil samples are included in Appendices D and E and are as follows:

EPA Method 8260B (includes DIPE and MTBE)

As indicated in Table 6.1 and illustrated in Drawing 6.1, no VOC compounds were detected in soil sample UST1323-SB01, 1-2' (hereafter SB01, 1-2') at concentrations above the laboratory PQLs.

Seven compounds (n-butylbenzene, sec-butylbenzene, 4-isopropyltoluene, naphthalene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene and total xylenes) were detected above laboratory PQLs in sample UST1323-TW01, 8-9' (hereafter TW01, 8-9'). The concentrations reported by the laboratory are below the applicable STGW, Residential, and Industrial/Commercial MSCCs.

EPA Method 8270

As indicated in Table 6.1 and illustrated in Drawing 6.2, no SVOC compounds were detected in soil sample SB01, 1-2'. One unknown TIC was reported by the laboratory in this soil sample, at an estimated concentration of 0.14 mg/Kg.

The laboratory did not detect EPA Method 8270-listed SVOC compounds in soil sample TW01, 8-9' at concentrations above the laboratory PQLs. Ten unknown TICs were reported as a result of the library search for EPA Method 8270 compounds in sample TW01, 8-9'. The total estimated concentration for the TICs was 3.81 mg/Kg.

MADEP VPH/EPH

As indicated in Table 6.1 and illustrated in Drawing 6.3, no MADEP VPH or EPH compounds were detected in soil sample SB01, 1-2' at concentrations greater than laboratory PQLs. However, VPH and EPH compounds were reported over three VPH/EPH hydrocarbon fraction ranges in sample TW01, 8 - 9' and the duplicate soil sample, UST1323-TW01, 8-9' DUPL (hereafter TW01, 8-9' DUPL). The reported concentrations for sample TW01, 8 - 9' are below the STGW, Residential and Industrial/Commercial MSCCs. But within duplicate soil sample TW01, 8-9' DUPL, the laboratory reported greater EPH results. A concentration of 250 mg/Kg was reported for C9-C22 aromatics in sample TW01, 8-9', greater than the STGW MSCC (34 mg/Kg) but less than the Residential and Industrial/Commercial MSCCs (469 mg/Kg and 12,264 mg/Kg, respectively). The laboratory reported C9-C22 aromatics at a concentration of 25 mg/Kg in the non-duplicate soil sample (TW-1, 8-9') collected from UST1323-TW01.

Due to the differing EPH results between the two samples, the laboratory re-extracted and retested both sample TW01, 8-9' and duplicate soil sample TW-1, 8-9' DUPL for EPH by the MADEP methods. The subsequent laboratory tests completed on the re-extracted samples confirmed the greater C9-C22 aromatics result obtained from the first test on sample TW-1 8-9' DUPL. The laboratory concluded that the soil samples were comprised of a non-homogenous matrix because the four laboratory data sets yielded different results. The measured concentrations of EPH were different in each of the four extractions and analyses. Paradigm provided a case narrative about the initial tests and retests within the laboratory report, contained in Appendix E. We have also included the chromatograms from the four EPH laboratory tests with the case narrative in Appendix E.

The concentrations reported for samples TW01, 8-9' and TW01, 8-9' DUPL were below established Residential and Industrial/Commercial MSCCs.

Chromium and Lead

As indicated in Table 6.1 and illustrated in Drawing 6.4, chromium was detected in soil sample SB01, 1-2', at 9.09 mg/Kg. In sample TW01, 8-9', chromium and lead were detected at 12.3 and 6.18 mg/Kg, respectively. These reported concentrations are below the STGW, Residential and Industrial/ Commercial MSCCs.

6.2 Groundwater Sampling

On March 25, 2003, Mid-Atlantic personnel collected a groundwater sample from monitoring well UST1323-TW01 (sample UST1323-3-TW01). Laboratory analysis completed on the groundwater sample included VOCs by EPA Method 602 (including total xylenes, IPE and MTBE), SVOCs by EPA Method 625 (including TICs), MADEP VPH and MADEP EPH and chromium and lead by EPA preparation/testing methods 6010B/3030C. A duplicate sample, UST1323-3-TW01 DUPL was collected for laboratory analysis per EPA Method 602.

Groundwater samples were collected in accordance with Mid-Atlantic's Standard Methods and Procedures specified in Appendix C. The groundwater samples were placed in laboratory glassware, labeled, placed immediately on ice in a cooler, and transported under proper chain-of-custody protocol to Paradigm. Analytical results for the groundwater samples collected are included in Appendix E and are as follows:

EPA Method 602 + IPE + MTBE

As indicated in Table 6.2 and illustrated on Drawing 6.5, groundwater sample UST1323-3-TW01 (TW01) and duplicate groundwater sample UST1323-3-TW01 DUPL (TW01 DUPL) were not detected with VOCs at concentrations above the laboratory PQLs.

EPA Method 625 + TICs

As shown on Table 6.2 and illustrated on Drawing 6.6, bis (2-ethylhexyl) phthalate (BEHP) was detected in groundwater sample TW01 at an estimated concentration of 6.4 µg/L. This value is greater than the laboratory method detection limit (MDL) but less than the PQL (reported by Paradigm at 10 µg/L). The PQL refers to "the level of analyte that can be routinely detected and quantified in a real matrix³" while the

³ Environmental Analytical Chemistry for People who don't really care by Those who do, Fifth Edition, Environmental Conservation Laboratories, Inc., April 1999, Page 4.

MDL is "the minimum level of analyte that can be detected with 99% confidence that the analytical response is greater than 0."⁴ EPA typically considers the PQL as 12 times the standard deviation obtained from the methods used to calculate the MDL (ENCO, 1999). The 6.4 µg/L value should be considered an estimated concentration and is flagged in the laboratory report with a "J".

BEHP is a common field and laboratory contaminant. The most common sources of BEHP include plasticizers for PVC and other polymers including rubber, cellulose and styrene (EPA, 2002b). It may also be associated with organic vacuum pump fluid, insect repellent formulations, cosmetics, detergents, industrial and lubricating oils and several other sources.

Paradigm did not report the presence of TICs in groundwater sample TW01.

MADEP VPH/EPH

As shown on Table 6.2 and illustrated on Drawing 6.7, one toxicologically defined hydrocarbon fraction was detected above the laboratory PQL. A concentration of 160 µg/L was reported in groundwater sample TW01 for C9-C12 aliphatic VPH compounds. This concentration is below the applicable State Groundwater Standard of 4,200 µg/L for C9-C18 aliphatic compounds, which includes the C9-C12 aliphatic VPH fraction.

Chromium and Lead

As shown on Table 6.2 and illustrated on Drawing 6.8, chromium and lead were detected in groundwater sample TW01 at concentrations of 24 and 13.9 ug/L, respectively. These concentrations are below the NCGWQS of 50 and 15 ug/L (respectively) and the applicable GCLs.

6.3 Temporary Monitoring Well Construction and Abandonment Information

On March 24, 2003, Mid-Atlantic personnel installed temporary monitoring well UST1323-TW01 for groundwater sampling.

Monitoring well UST1323-TW01 was constructed to a depth of 20 feet BLS using 10 feet of 2-inch diameter, 0.010 inch slotted schedule 40 PVC well screen and 10 feet of 2-inch diameter schedule 40 PVC riser. The annular space between the wells and

⁴ IBID

boring walls were filled with medium sand to 1.5 feet above the well screen. Two feet of bentonite was placed on top of the sand pack and hydrated. Refer to Appendix B for boring logs and North Carolina well construction records. Well construction information is summarized in Table 6.3.

CATLIN abandoned the temporary monitoring well on March 25, 2003. The two-inch diameter PVC piping was first removed from the hole. Then, granular bentonite was poured down the well annular space and hydrated with potable water. Well construction information is summarized in Table 6.3. Refer to Appendix B for the monitoring well abandonment record.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of this Phase I LSA, Mid-Atlantic provides the following conclusions.

- The UST 1323-3 site meets the criteria for classification as Low Risk. The land usage appropriate for the site should be Industrial/Commercial, due to the use of the site as a motor vehicle maintenance facility and surrounding commercial-type land usage (land usage in the immediate vicinity would be considered "commercial" if the site were not located on a military reservation). The closest residence, a military barracks facility (Building 1340), is located approximately 1,000 feet to the northwest.
- Two soil samples, collected from an 8 to 9 foot depth in boring UST1323-TW01, were submitted for laboratory testing of MADEP VPH and EPH compounds. These samples included TW01, 8-9' and duplicate soil sample TW01, 8-9' DUPL. The laboratory detected C11-C22 aromatic EPH compounds in sample TW01 8-9' DUPL at a concentration of 250 mg/Kg, in excess of the STGW MSCC of 34 mg/Kg but below the residential MSCC of 469 mg/Kg. Similar MADEP contaminants were reported for sample TW01, 8-9', however they were detected at lower concentrations. The laboratory re-extracted and retested both soil samples to further evaluate the discrepancy. Based upon the results of the retests and a review of the earlier test results, the laboratory concluded that the soil samples were comprised of a non-homogenous matrix, because the four laboratory data sets yielded different results. The chromatograms from the four EPH laboratory tests are included within the case narrative in Appendix E.

- VOCs, semi-VOCs, total chromium and total lead were detected at concentrations below the lowest applicable MSCCs.
- The C11-C22 aromatic EPH compounds were not identified in the underlying groundwater, suggesting that migration of the identified EPH contaminants has been limited. Instead, the laboratory reported C9-C12 aliphatic VPH compounds in groundwater sample UST1323-3-TW01 at a concentration of 160 µg/L, above the PQL but below the NCGWQS. BEHP was the only other contaminant detected in the groundwater sample as a result of the VOC and SVOC analysis. BEHP was reported at an estimated concentration of 6.4 µg/L, above the MDL but below the laboratory PQL of 10 µg/L (the laboratory flagged the result with a "J"). The NCGWQS for BEHP is 3 µg/L. This compound is a common field and laboratory contaminant. Therefore, the detected concentration may be due to inadvertent cross-contamination of the groundwater sample in the field or laboratory.
- A perennial stream is located approximately 430 feet northeast of former UST 1323-3. However, the detected groundwater contaminant concentrations for chromium, lead, bis(2-ethylhexyl)phthalate (BEHP), and C9-C12 aliphatics were less than ten times the surface water quality standards and criteria found or referenced in 15A NCAS 2B. 0200.
- Since groundwater contaminants were reported at concentrations less than 10 times the applicable groundwater standards for BEHP and C9 to C22 aromatic petroleum hydrocarbons, a Phase II LSA was not required.

Based on our knowledge of the requirements in the *Guidelines for Assessment and Corrective Action* (DENR, 2001) and our experience, Mid-Atlantic recommends the following:

- The MCB should submit this report to the DWM, DENR in accordance with their written requests of December 18, 2002 and April 3, 2003.
- If the DENR assigns a "low risk" classification to the site, we recommend that the MCB submit a request for No Further Action (NFA) at this site.

8.0 FREE PRODUCT INVESTIGATION/RECOVERY

Free product accumulations have not been documented or observed during tank removal activities or this investigation.

9.0 REFERENCES

- Cardinell, A.P. and Others, 1993, *Hydrogeologic Framework of U.S. Marine Corps Base at Camp Lejeune, North Carolina; U.S. Geological Survey Water-Resources Investigation Report 93-4049*: U.S. Geological Survey, Raleigh, North Carolina.
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- North Carolina Geological Survey, 1985, *Geologic Map of North Carolina (Scale 1:500,000)*.
- Winner, M.D., Jr., and Coble, R.W., 1989, *Hydrogeologic Framework of the North Carolina Coastal Plain Aquifer System: U.S. Geological Survey Open-File Report 87-690*, 155 p.

TABLES

**TABLE 2.1
SITE HISTORY
UST SYSTEM INFORMATION**

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)
1323-3	Used Oil	600	June 1990 (day not reported)	3/20/02 (P)	Yes

* Still in use means not permanently closed.

**TABLE 2.2
SITE HISTORY
UST OWNER/OPERATOR INFORMATION**

Dates of Ownership/Operation (m/dd/yy) to (m/dd/yy)	UST ID Number	Name of Owner or Operator (indicate which)	Site Use
June 1990 to 3/19/02	UST-1323-3	Marine Corps Base – Owner	Temporary Used Oil Storage from Vehicle Servicing Activities
Address		Telephone Number	
Commanding General (Attn: I&E/EMD/EOB) Marine Corps Base PSC Box 20004 Camp Lejeune, NC 28542-0004		(910) 451-5068	

TABLE 3.1 WATER SUPPLY WELL INFORMATION Date: <u>April 2003</u> Incident Number/Name: <u>24232 / UST 1323-3</u> Facility ID #: <u>5-002740</u>									
Well ID #	Well Owner/User (indicate which)	Address	Phone Number	Well Use	Well Depth (ft. BGS)	Type of Well	Well Casing Depth (ft. BGS)	Well Screen Interval (x to x ft. BGS)	Distance from source area of release (ft.)
No Water Supply Wells are Located within a 1,500 Foot Radius									

TABLE 3.1 WATER SUPPLY WELL INFORMATION Date: <u>April 2003</u> Incident Number/Name: <u>24232 / UST 1323-3</u> Facility ID #: <u>5-002740</u>									
Well ID #	Well Owner/User (indicate which)	Address	Phone Number	Well Use	Well Depth (ft. BGS)	Type of Well	Well Casing Depth (ft. BGS)	Well Screen Interval (x to x ft. BGS)	Distance from source area of release (ft.)
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TABLE 3.1 WATER SUPPLY WELL INFORMATION Date: <u>April 2003</u> Incident Number/Name: <u>24232 / UST 1323-3</u> Facility ID #: <u>5-002740</u>									
Well ID #	Well Owner/User (indicate which)	Address	Phone Number	Well Use	Well Depth (ft. BGS)	Type of Well	Well Casing Depth (ft. BGS)	Well Screen Interval (x to x ft. BGS)	Distance from source area of release (ft.)
No Water Supply Wells are Located within a 1,500 Foot Radius									

TABLE 3.1 WATER SUPPLY WELL INFORMATION Date: <u>April 2003</u> Incident Number/Name: <u>24232 / UST 1323-3</u> Facility ID #: <u>5-002740</u>									
Well ID #	Well Owner/User (indicate which)	Address	Phone Number	Well Use	Well Depth (ft. BGS)	Type of Well	Well Casing Depth (ft. BGS)	Well Screen Interval (x to x ft. BGS)	Distance from source area of release (ft.)
No Water Supply Wells are Located within a 1,500 Foot Radius									

TABLE 3.2

**PROPERTY OWNERS/BUILDING OCCUPANTS
NEAR PROJECT SITE**

Date: April 2003 Incident No./Name: 24232 / IS 1323-3 Facility ID #: 5-002740

PART A: PROPERTY OWNERSHIP INFORMATION

Tax Parcel Number/Map ID	Owner Name (Last, First, MI)	Address
The entire surrounding area is used for military support facilities	Commanding General Marine Corps Base Camp Lejeune, NC	I&E/EMD/EQB PSC Box 20004 Marine Corps Base Camp Lejeune, NC 28542

PART B: BUILDING OCCUPANT INFORMATION

Building ID (Reference Drawing 3.1)	Building Occupants	Usage of Building¹
1323 [subject site]	Motor Pool & Engineers Shop	Vehicle Maintenance Facility Headquarters Battery 10 th Marine Division
1450	Marine Troops	Vehicle Maintenance Facility 10 th Marine Division
1317	Contingency and Training Equipment Pool	Warehouse and Distribution 2 nd Supply Battallion, 2 nd FSSG
1212	Property Control Operations & Systems	Warehouse and Distribution Supplies & Services Branch, BLSD Supply Division
1117	Armory (East Side) Defense Reutilization & Marketing Office (West Side)	Armory (East Side) Warehouse and Office Area (West Side)
1118	Material Distribution Center	Warehouse and Distribution Int. Supply Support Activity, 2 nd FSSG
1332	Appeared Unoccupied	Warehouse

FSSG = Facilities Support Services Group

Table 6.1: Summary of Chemical Constituents Detected in Soil (mg/Kg)

Date: April 2003

Incident Number and Name: 24232, UST 1323-3

Facility ID#: 5-002740

Analytical Method (e.g., VOC by EPA 8260) →			VOC EPA 8260	VOC EPA 8260	VOC EPA 8260	VOC EPA 8260	VOC EPA 8260	VOC EPA 8260	VOC EPA 8260	Semi- VOC EPA 8270	Semi- VOC EPA 8270	Metals EPA 6010B	Metals EPA 6010B	MADEP VPH	MADEP VPH	MADEP EPH	MADEP EPH	MADEP VPH	MADEP EPH
Sample ID	Contaminant of Concern →		n-Butylbenzene	Sec-Butylbenzene	4-Isopropyltoluene	Naphthalene (EPA 8260 test)	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	Total Xylenes	Naphthalene	Total TICs (estimated concentration)	Chromium	Lead	C5-C8 Aliphatics	C9-C12 Aliphatics	C9-C18 Aliphatics	C19-C36 Aliphatics	C9-C10 Aromatics	C11-C22 Aromatics
	Date Collected (m/dd/yy)	Sample Depth (Ft. BLS)																	
TW-1 8-9'	3/24/03	8 - 9'	.140	.073	.063	.260	.410	.120	.232	<.38	10 [3.81]	12.3	6.18	<10	31	<10	30	<10	25
TW-1 8-9' Duplicate	3/24/03	8 - 9'	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<10	25	17	140	<10	250
SB-1 1-2'	3/19/03	1 - 2'	<.006	<.006	<.006	<.006	<.006	<.006	<.006	<.34	1 [.14]	9.09	<.95	<10	<10	<10	<10	<10	<10
Soil-to-Groundwater MSCC (mg/kg)			4	3	Not Est.	.58	8	7	5	.58	NA	27	270	72	3,255		Immobile	34	
Residential MSCC (mg/kg)			156	156	Not Est.	63	782	782	32,000	63	NA	47	400	939	9,386		93,860	469	
Industrial/Commercial MSCC (mg/kg)			4,088	4,088	Not Est.	1,635	20,440	20,440	200,000	1,635	NA	1,226	400	24,528	245,280		HBL >100%	12,264	

Notes:

Numbers in Bold = Concentrations exceed Soil-to-Groundwater MSCCs.
 <.35 = Contaminant Concentration not detected at or above the laboratory practical quantitation limit.
 Ft. BLS = Feet below land surface
 mg/Kg = milligrams per kilogram
 HBL = Health-Based Level
 MSCC = Maximum Soil Contaminant Concentration
 NT = Sample not tested for this parameter
 TIC = Tentatively Identified Compound

Table 6.2: Summary of Chemical Constituents Detected in Groundwater (µg/L)

Date: April 2003 Incident Number and Name: 24232, UST 1323-3 Facility ID#: 5-002740

Analytical Method (e.g., VOC by EPA 601) →			VOC EPA 602	Semi-VOC EPA 625	Semi-VOC EPA 625	Metals 6010B/3030C	Metals 6010B/3030C	MADEP VPH	MADEP VPH	MADEP EPH	MADEP EPH	MADEP VPH	MADEP EPH
Contaminant of Concern →			Ethylbenzene	Bis(2-ethylhexyl) phthalate	Total TICs (Estimated concentration)	Chromium	Lead	C5-C8 Aliphatics	C9-C12 Aliphatics	C9-C18 Aliphatics	C19-C36 Aliphatics	C9-C10 Aromatics	C11-C22 Aromatics
Well ID	Sample ID	Date Collected (m/dd/yy)											
UST1323-3-TW01 Temp. Well at former UST location	UST1323-3-TW01	3/25/03	Not I.D.'d	6.4 J	Not I.D.'d	24	13.9	<100	160	<100	<100	<100	<100
UST1323-3-TW01 (note: duplicate sample)	UST1323-3-TW01 Duplicate	3/25/03	Not I.D.'d	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2L Standard (ug/l)			NA	3	NA	50	15	420	4,200		42,000	210	
GCL (ug/l)			NA	3,000	NA	50,000	15,000	Not Est.	Not Est.		Not Est.	Not Est.	

Notes:

Bold = Concentration is equal to or exceeds State Groundwater Standard
GCL = Gross Contaminant Level
J = Contaminant concentration detected below PQL but above method detection limit. Concentration shown is estimated.
NA = Not Applicable
Not Est. = GCL not established
Not I.D.'d = Compounds or TICs not identified as a result of the EPA Method 602 test or EPA Method 625 Library Search.
NT = Sample not tested for this parameter.
PQL = Practical Quantitation Limit
ug/L = micrograms per liter

TABLE 6.3

WELL CONSTRUCTION INFORMATION

Date: April 2003 Incident Number/Name: 24232 / UST 1323-3 Facility ID #: 5-002740

Well ID	Date Installed (m/dd/yy)	Date Water Level Measured (m/dd/yy)	Well Casing Depth (ft. BLS)	Screened Interval (x to y ft. BLS)	Bottom of Well (ft. BLS)	Top of Casing Elevation (ft.)	Depth of Water From Top of Casing (ft.)	Free Product Thickness (ft.)	Ground Water Elevation (ft.)	Comments
TW-1	3/24/03	3/25/03	10	10 to 20	20	0	13.5	NMT	N/A	Temporary Well Abandoned by CATLIN on March 25, 2002

No other wells installed during Phase I Limited Site Assessment

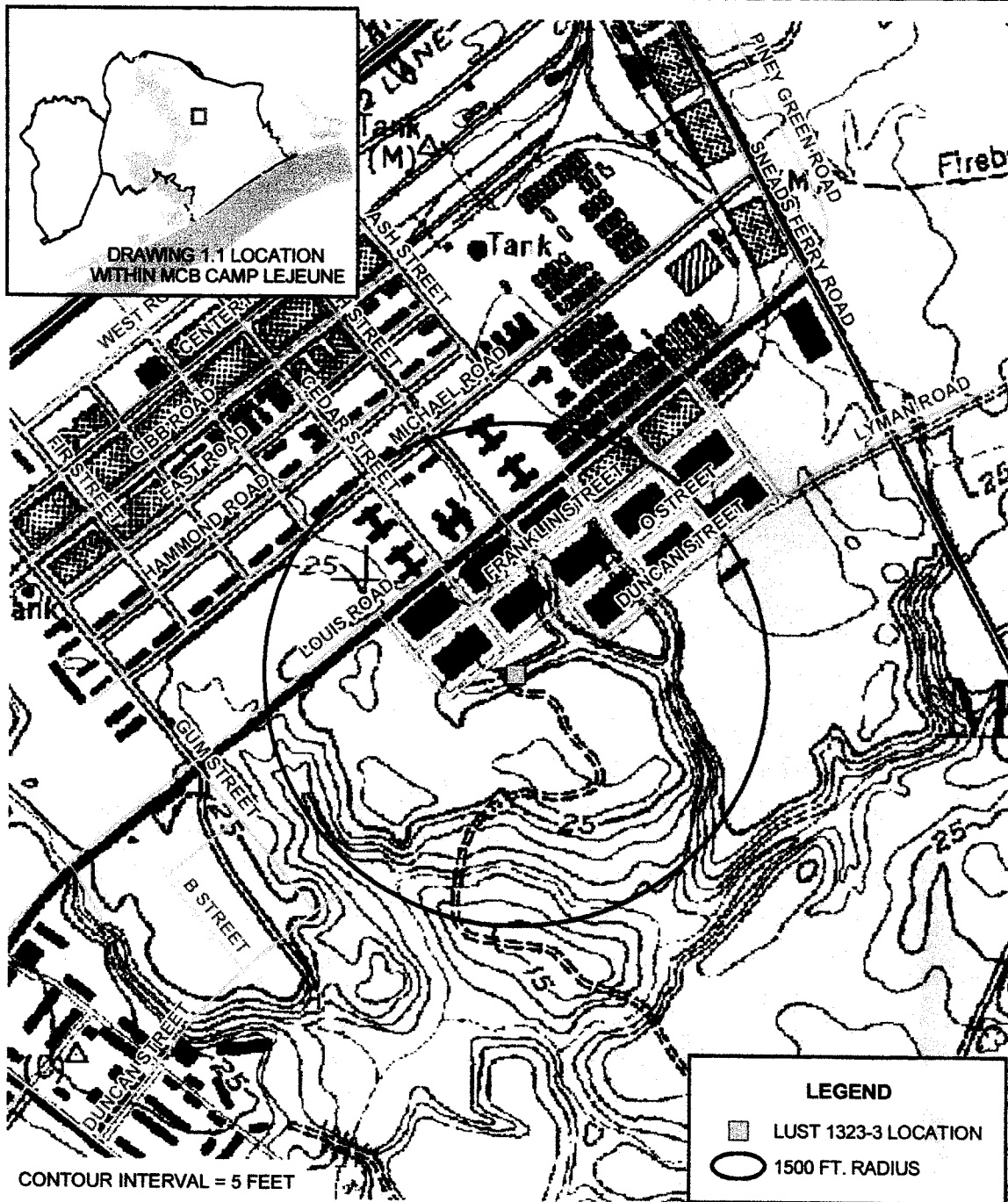
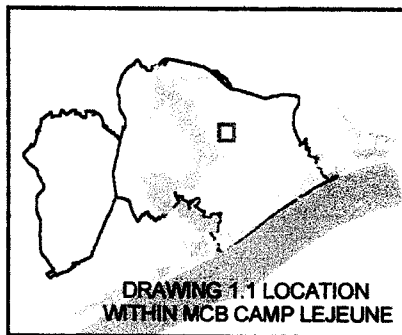
ft BLS = Feet below land surface

TW-1 = Abbreviated Well Identification. The MCB Well ID is USTTT1323-3-TW01

N/A = Not Applicable

NMT = No Measurable Thickness. Free product paste did not change color on tape measure inserted into well.

DRAWINGS



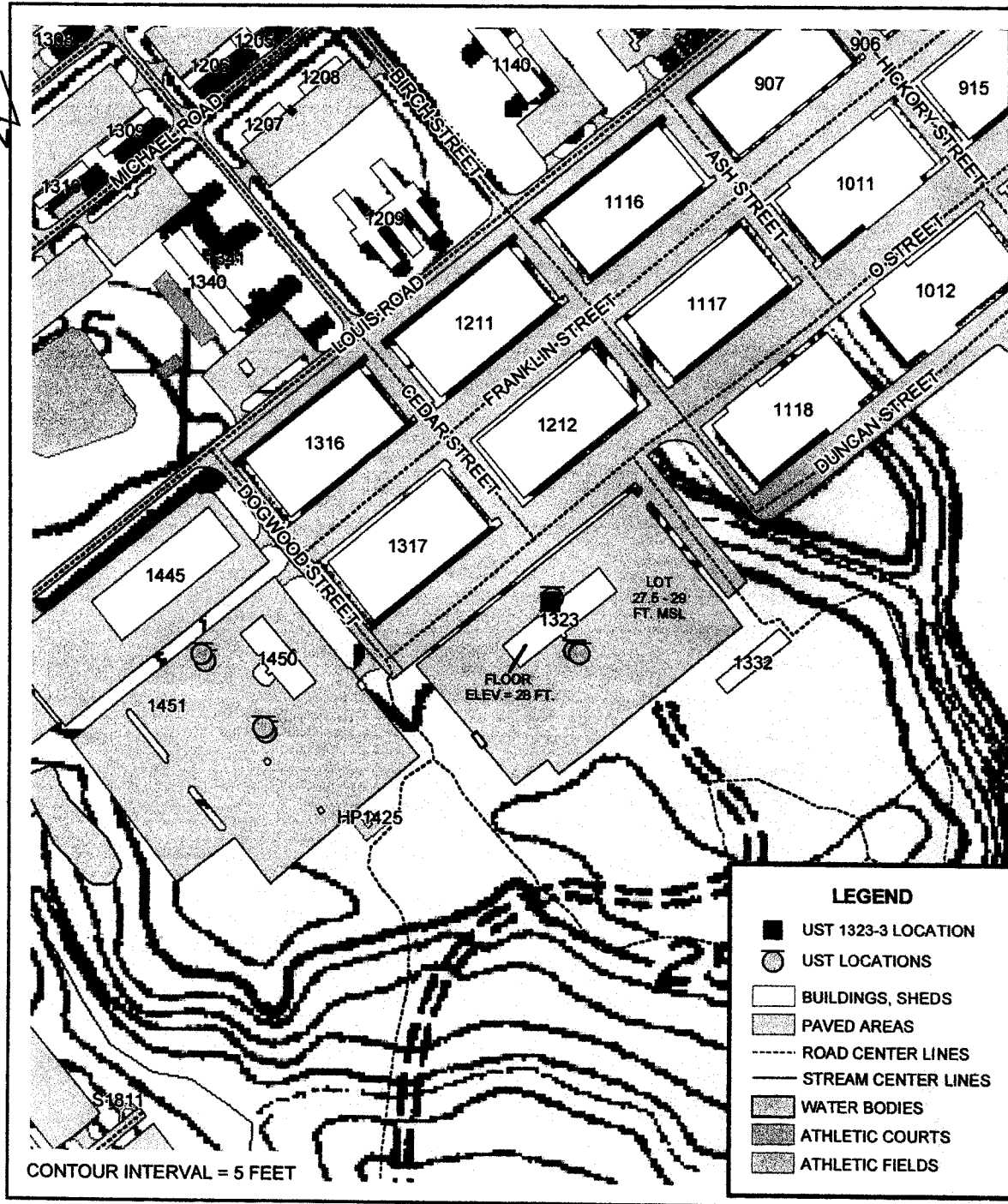
REFERENCE:

CAMP LEJEUNE, NC DIGITAL RASTER GRAPHIC,
USGS (1997). SCANNED FROM 1:24,000
SCALE CAMP LEJEUNE TOPOGRAPHIC MAP,
PUBLISHED 1952, PHOTOREVISED 1971, USGS.

MID-ATLANTIC
ASSOCIATES, P.A.
Engineering & Environmental Solutions

TOPOGRAPHIC SITE LOCATION MAP
WITH 1500 FT. RADIUS
LUST 1323-3
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

DRAWN BY: <i>EJA</i>	DATE: APRIL 2003
DRAFT CHECK: <i>EJA</i>	JOB NO: 000R1243.60
ENG. CHECK: <i>PHW</i>	GIS NO: 01G-1243.60-1
APPROVAL: <i>EJA</i>	DWG NO: 1.1



REFERENCES:

1. TOPOGRAPHIC BASE MAP. DEE DRAWING 1.1, REFERENCE 1.
2. DIGITAL GIS DATA LAYERS FROM MCB GIS OFFICE. MOST DATA SHOWN LAST UPDATED 2001.
3. TOPOGRAPHIC ELEVATIONS SHOWN FROM MCB DRAWING 4174167 (2/7/1991).

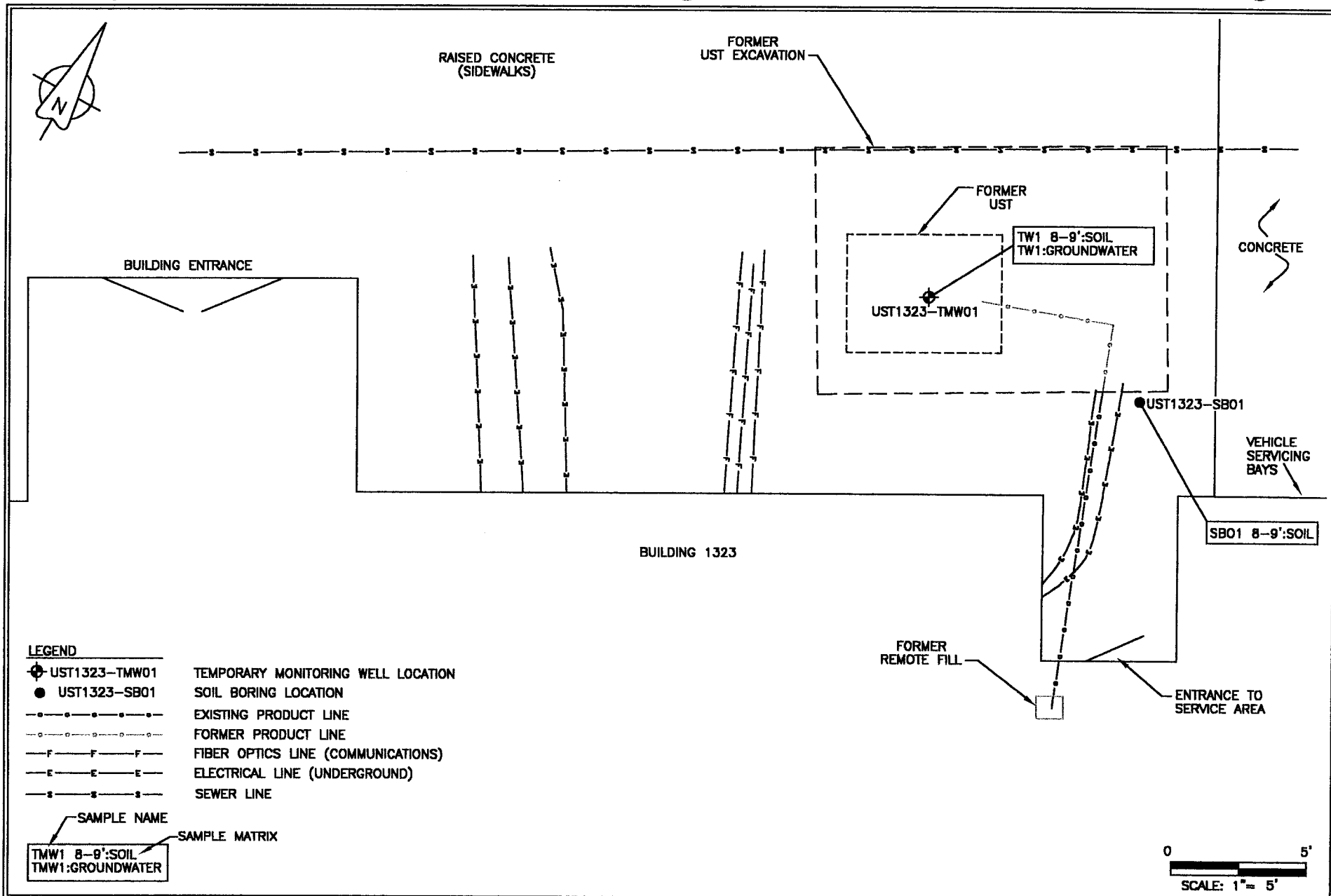
SCALE: 1:4,800



MID-ATLANTIC
ASSOCIATES, INC.
Environmental & Engineering Solutions

SITE LOCATION AND NEARBY
BUILDINGS/FEATURES
LUST 1323-3
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

DRAWN BY: EBA	DATE: JUNE 2003
DRAFT CHECK: [Signature]	JOB NO: 000R1243.60
ENG. CHECK: [Signature]	GIS NO: 01G-1243.60-2
APPROVAL: [Signature]	DWG NO: 3.1

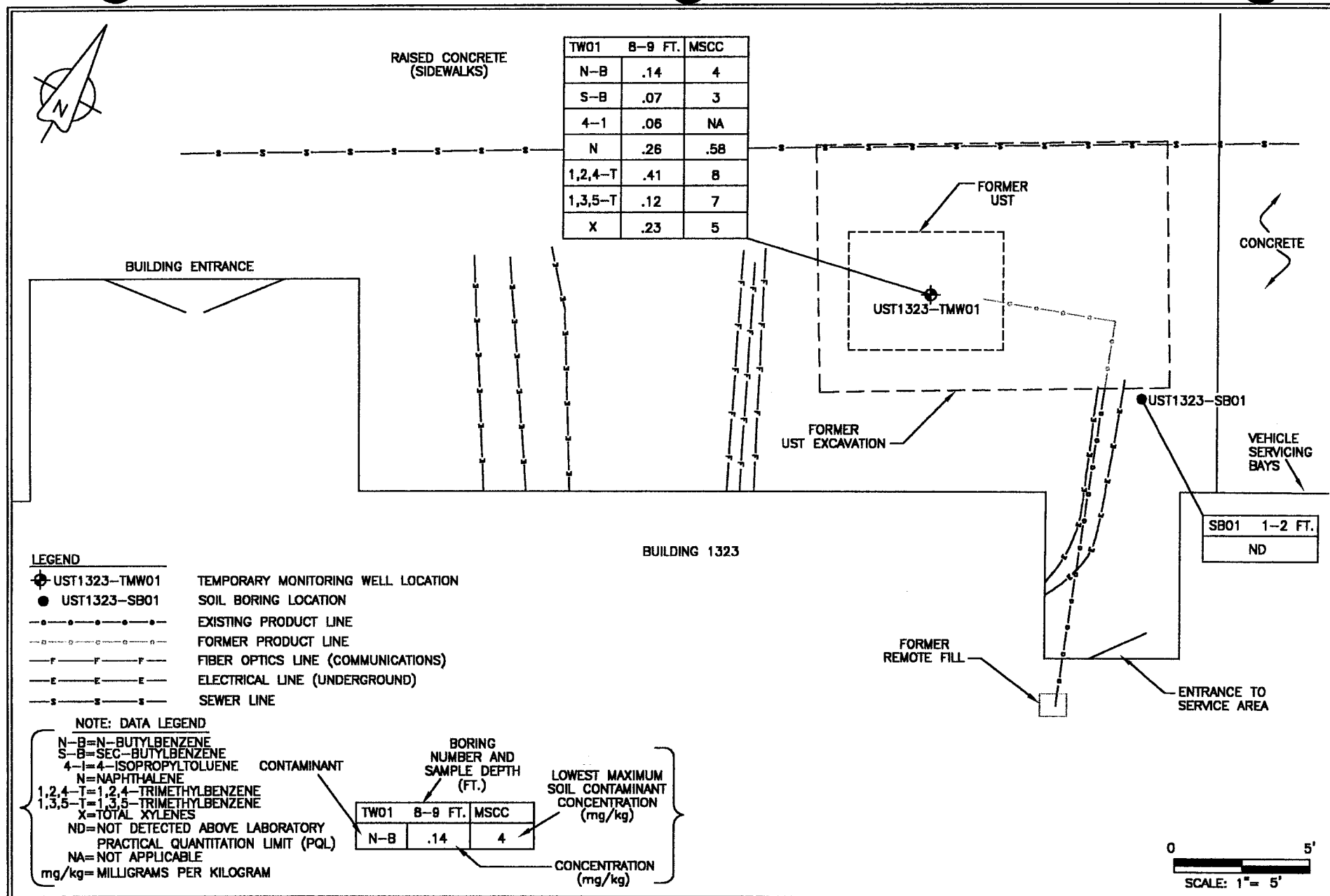


MID-ATLANTIC
ASSOCIATES, INC.
Engineering & Environmental Solutions

SITE MAP WITH UTILITIES AND
 SAMPLE LOCATIONS
 LUST 1323-3
 MARINE CORPS BASE
 CAMP LEJEUNE, NORTH CAROLINA

REFERENCE: J.A. JONES ENVIRONMENTAL SERVICES SITE MAP, DATED 3/20/02.

DRAWN BY: <i>EH</i>	DATE: APRIL 2003
DRAFT CHECK: <i>EH</i>	JOB NO: 000R1243.60
ENG CHECK: <i>DEW</i>	CAD NO: 01-124301-60
APPROVAL: <i>EB4</i>	DWG NO: 4.1



MID-ATLANTIC ASSOCIATES, INC.
Engineering & Environmental Solutions

SOIL SAMPLE LABORATORY RESULTS
VOCS-EPA METHOD 8260B
LUST 1323-3
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

DRAWN BY: *[Signature]*

DATE: APRIL 2003

DRAFT CHECK: *[Signature]*

JOB NO: 000R1243.60

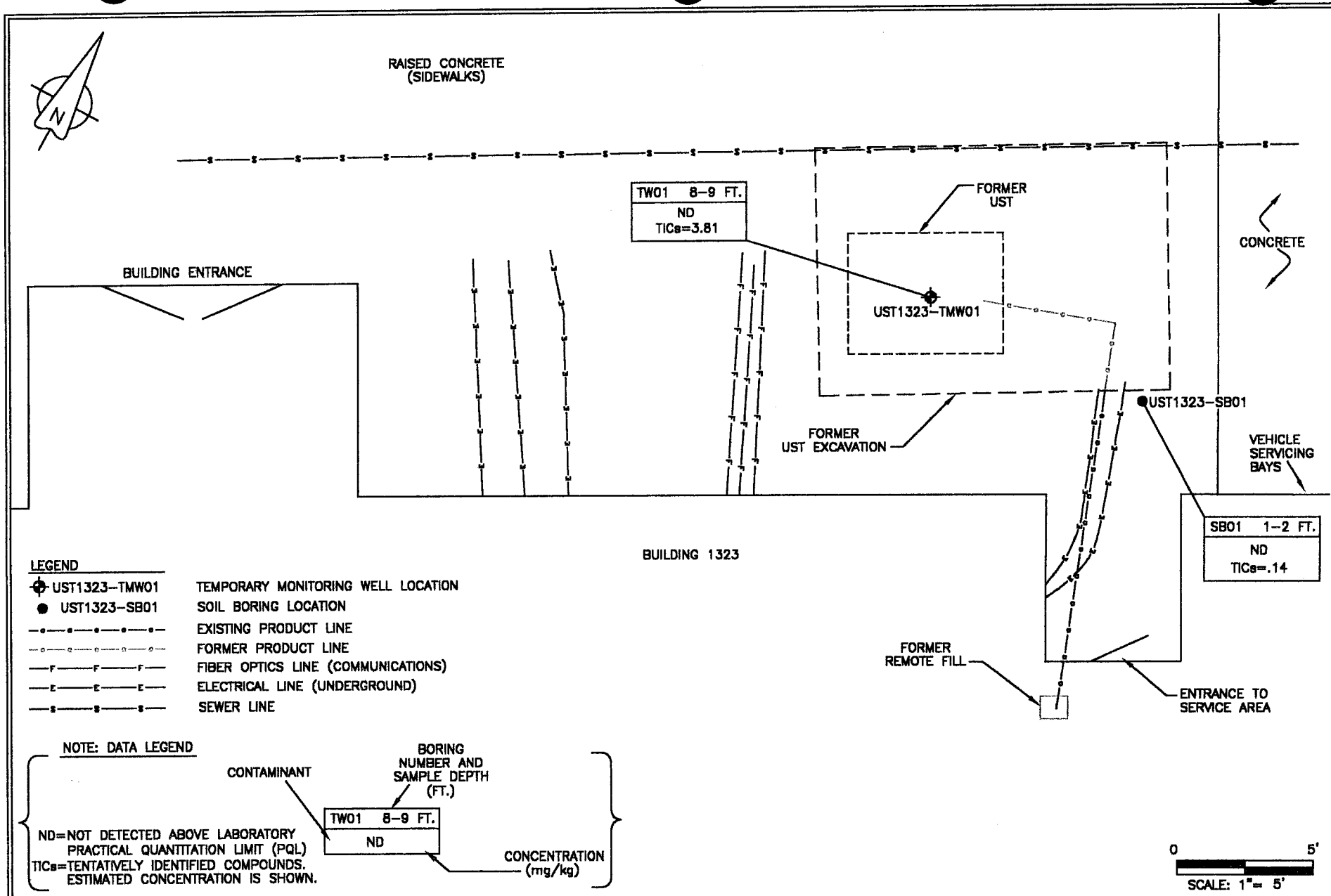
ENG CHECK: *[Signature]*

CAD NO: 01-124303-60

APPROVAL: *[Signature]*

DWG NO: 6.1

REFERENCE: J.A. JONES ENVIRONMENTAL SERVICES SITE MAP, DATED 3/20/02.

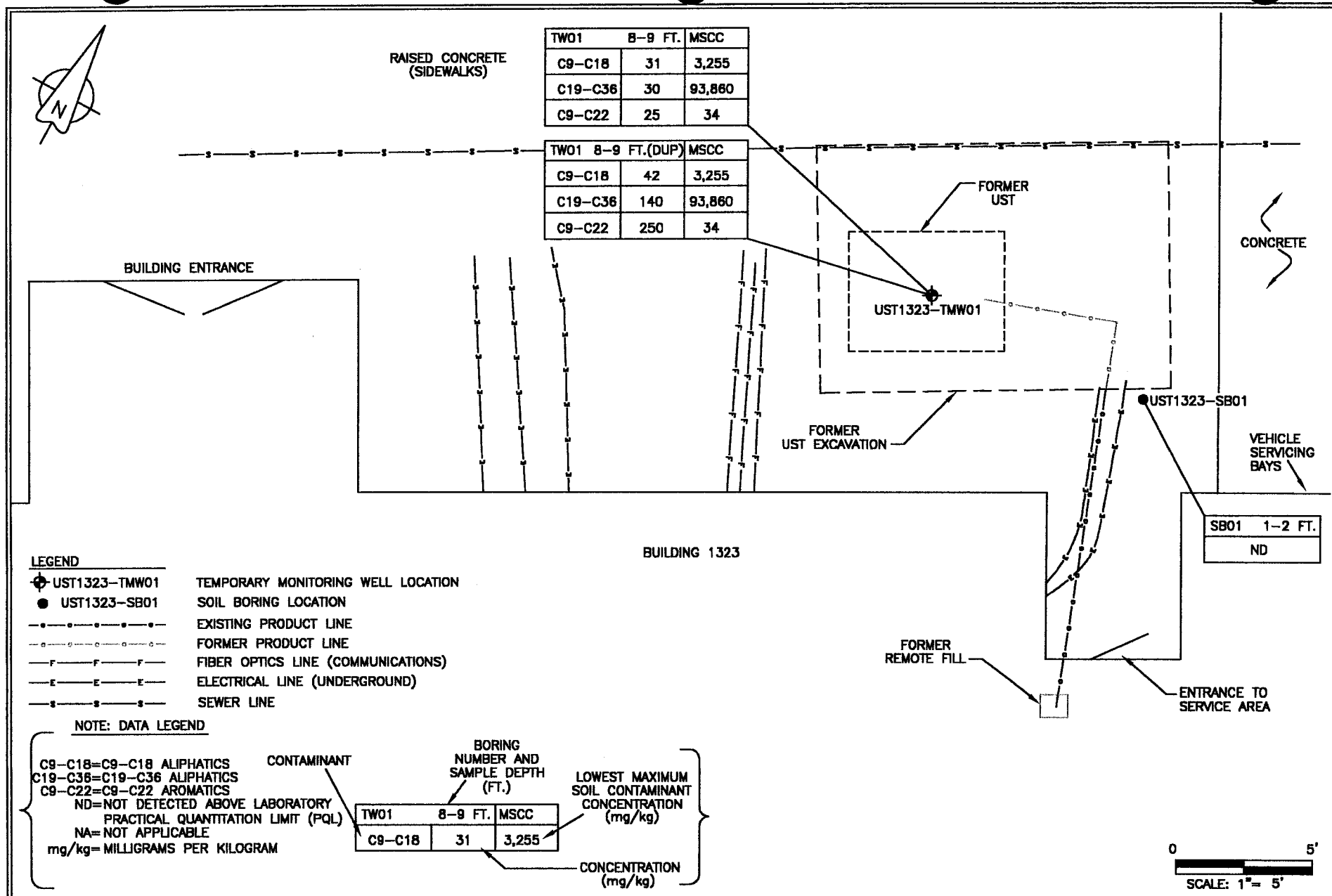


MID-ATLANTIC ASSOCIATES, INC.
 Engineering & Environmental Solutions

SOIL SAMPLE LABORATORY RESULTS
 SVOCs-EPA METHOD 8270
 LUST 1323-3
 MARINE CORPS BASE
 CAMP LEJEUNE, NORTH CAROLINA

DRAWN BY: <i>[Signature]</i>	DATE: JUNE 2003
DRAFT CHECK:	JOB NO: 000R1243.60
ENG CHECK: <i>[Signature]</i>	CAD NO: 01-124304-60
APPROVAL: <i>EAA</i>	DWG NO: 6.2

REFERENCE: J.A. JONES ENVIRONMENTAL SERVICES SITE MAP, DATED 3/20/02.

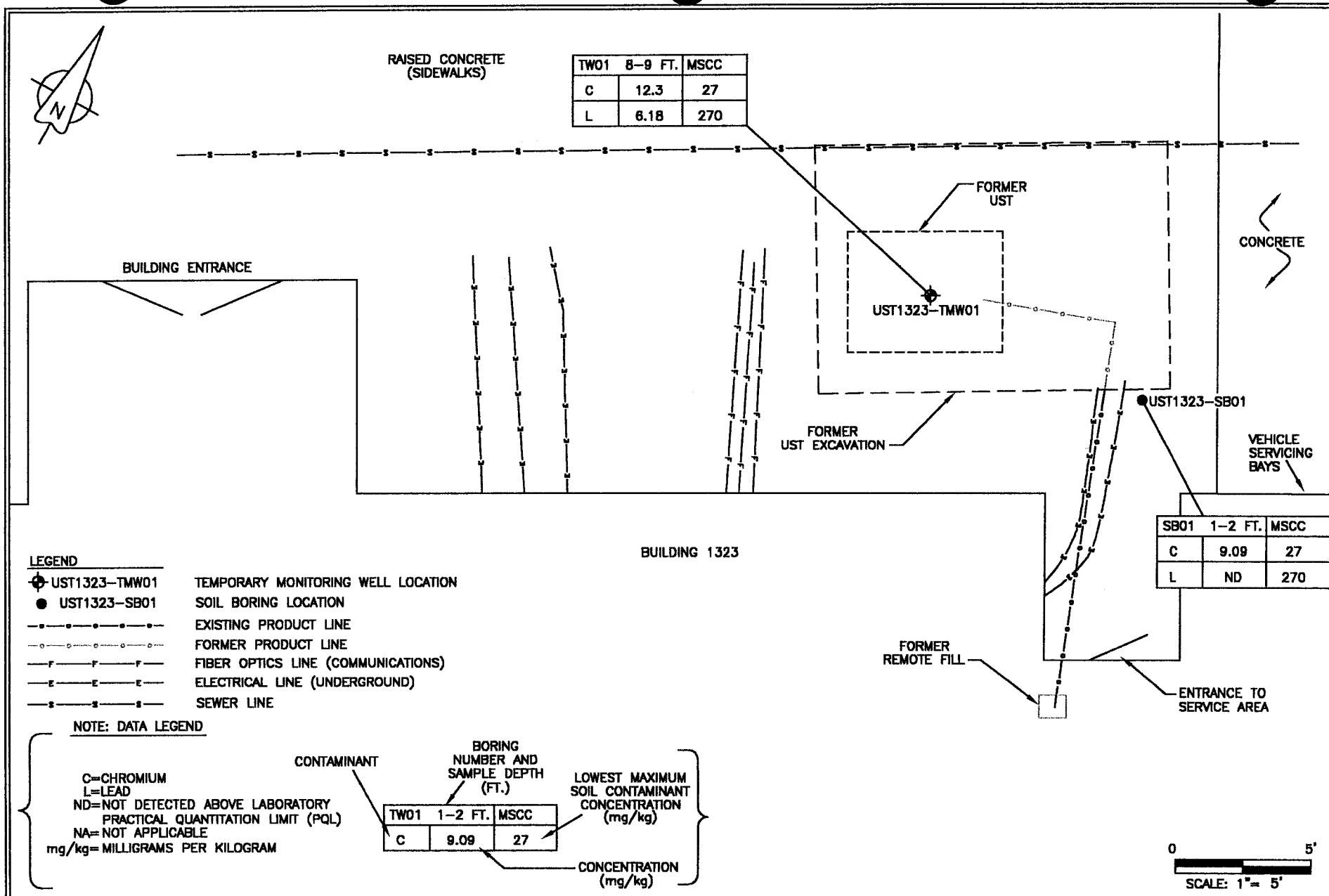


MID-ATLANTIC ASSOCIATES, INC.
 Engineering & Environmental Solutions

SOIL SAMPLE LABORATORY RESULTS
 MADEP VPH/EPH
 LUST 1323-3
 MARINE CORPS BASE
 CAMP LEJEUNE, NORTH CAROLINA

DRAWN BY: <i>[Signature]</i>	DATE: APRIL 2003
DRAFT CHECK: <i>[Signature]</i>	JOB NO: 000R1243.60
ENG CHECK: <i>[Signature]</i>	CAD NO: 01-124305-60
APPROVAL: <i>[Signature]</i>	DWG NO: 6.3

REFERENCE: J.A. JONES ENVIRONMENTAL SERVICES SITE MAP, DATED 3/20/02.

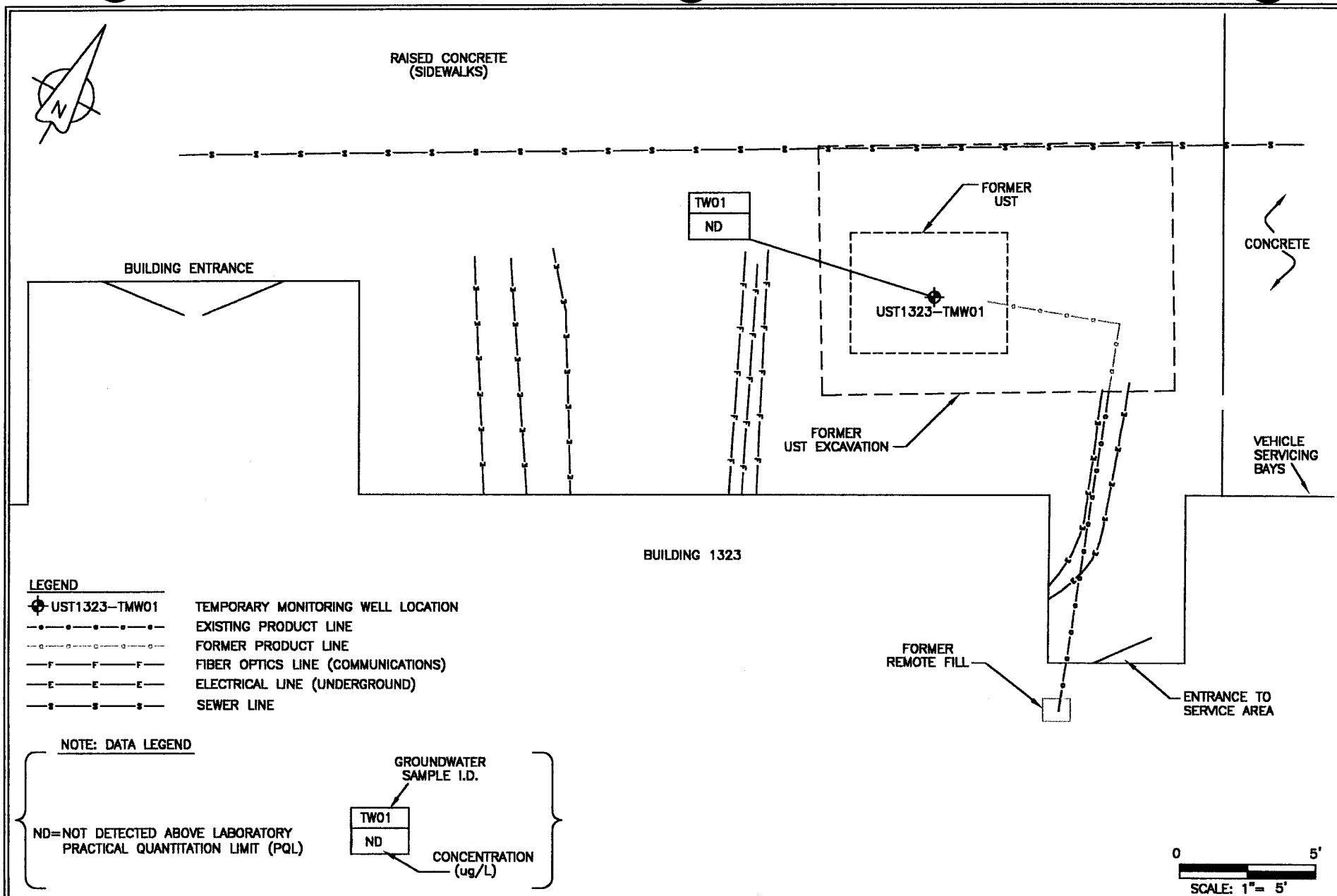


MID-ATLANTIC
ASSOCIATES, INC.
Engineering & Environmental Solutions

SOIL SAMPLE LABORATORY RESULTS
TOTAL CHROMIUM AND LEAD, EPA METHOD 6010B
LUST 1323-3
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

DRAWN BY: <i>[Signature]</i>	DATE: APRIL 2003
DRAFT CHECK:	JOB NO: 000R1243.60
ENG CHECK: <i>[Signature]</i>	CAD NO: 01-124306-60
APPROVAL: <i>ERA</i>	DWG NO: 6.4

REFERENCE: J.A. JONES ENVIRONMENTAL SERVICES SITE MAP, DATED 3/20/02.



MID-ATLANTIC
ASSOCIATES, INC.
Engineering & Environmental Solutions

GROUNDWATER SAMPLE LABORATORY RESULTS
 VOCs—EPA METHOD 602
 LUST 1323-3
 MARINE CORPS BASE
 CAMP LEJEUNE, NORTH CAROLINA

DRAWN BY: *[Signature]*

DRAFT CHECK: *EMA*

ENG CHECK: *[Signature]*

APPROVAL: *EMA*

DATE: APRIL 2003

JOB NO: 000R1243.60

CAD NO: 01-124307-60

DWG NO: 6.5

REFERENCE: J.A. JONES ENVIRONMENTAL SERVICES SITE MAP, DATED 3/20/02.



RAISED CONCRETE
(SIDEWALKS)

BUILDING ENTRANCE

TW01	NCAC 2L
BP	6.4J 3

FORMER
UST

UST1323-TMW01

FORMER
UST EXCAVATION

CONCRETE

VEHICLE
SERVICING
BAYS

BUILDING 1323

LEGEND

- ⊕ UST1323-TMW01 TEMPORARY MONITORING WELL LOCATION
- EXISTING PRODUCT LINE
- - - - - FORMER PRODUCT LINE
- F - F - F FIBER OPTICS LINE (COMMUNICATIONS)
- E - E - E ELECTRICAL LINE (UNDERGROUND)
- S - S - S SEWER LINE

NOTE: DATA LEGEND

BP=BIS (2-ETHYLHEXYL) PHTHALATE
J=COMPOUND NOT DETECTED
ABOVE LABORATORY PRACTICAL
PRACTICAL QUANTITATION LIMIT (PQL)
NA=NOT APPLICABLE
ug/L=MICROGRAMS PER LITER (PPB)

CONTAMINANT

GROUNDWATER
SAMPLE I.D.

STATE
GROUNDWATER
STANDARD (ug/L)

TW01	NCAC 2L
BP	6.4J 3

CONCENTRATION
(ug/L)

FORMER
REMOTE FILL

ENTRANCE TO
SERVICE AREA

0 5'
SCALE: 1"= 5'

MID-ATLANTIC
ASSOCIATES, INC.
Engineering & Environmental Solutions

GROUNDWATER SAMPLE LABORATORY RESULTS
SVOCs-EPA METHOD 625
LUST 1323-3
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

DRAWN
BY:

DRAFT
CHECK:

ENG
CHECK:

APPROVAL:

DATE: APRIL 2003

JOB NO: 000R1243.60

CAD NO: 01-124308-60

DWG NO: 6.6

REFERENCE: J.A. JONES ENVIRONMENTAL SERVICES SITE MAP, DATED 3/20/02.



RAISED CONCRETE
(SIDEWALKS)

TW01	NCAC 2L	
C	24	50
L	13.9	15

FORMER
UST

UST1323-TMW01

FORMER
UST EXCAVATION

CONCRETE

VEHICLE
SERVICING
BAYS

BUILDING ENTRANCE

BUILDING 1323

LEGEND

- ⊕ UST1323-TMW01 TEMPORARY MONITORING WELL LOCATION
- — — — — EXISTING PRODUCT LINE
- - - - - FORMER PRODUCT LINE
- - - - - FIBER OPTICS LINE (COMMUNICATIONS)
- - - - - ELECTRICAL LINE (UNDERGROUND)
- - - - - SEWER LINE

NOTE: DATA LEGEND

C=CHROMIUM
L=LEAD
ug/L=MICROGRAMS PER LITER (PPB)

CONTAMINANT

GROUNDWATER
SAMPLE I.D.

STATE
GROUNDWATER
STANDARD (ug/L)

TW01	NCAC 2L	
C	24	50

CONCENTRATION
(ug/L)

FORMER
REMOTE FILL

ENTRANCE TO
SERVICE AREA

0 5'
SCALE: 1"= 5'

MID-ATLANTIC
ASSOCIATES, INC.
Engineering & Environmental Solutions

GROUNDWATER SAMPLE LABORATORY RESULTS
CHROMIUM AND LEAD
LUST 1323-3
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

DRAWN BY:

DRAFT CHECK:

ENG CHECK:

APPROVAL:

DATE: APRIL 2003

JOB NO: 000R1243.60

CAD NO: 01-124310-60

DWG NO: 6.8

REFERENCE: J.A. JONES ENVIRONMENTAL SERVICES SITE MAP, DATED 3/20/02.

APPENDIX A

PREVIOUS SOIL SAMPLE LOCATIONS AND LABORATORY RESULTS, J.A. JONES



TABLES

Table 1 **Summary of Soil Sample Analytical Results**
(3/20/02 Sampling Event)

Sample ID	Date	Depth (ft bls)	TPH-DRO (ppm)	TPH-GRO (ppm)	Total Pb (ppm)	Total Cr (ppm)
1323-3-1	3/20/02	7.3	130	BDL	2.6	7.5
1323-3-2	3/20/02	6.75	11	BDL	BDL	5.8
1323-3-3	3/20/02	6.75	BDL	BDL	3.2	8.3
1323-3-4	3/20/02	6	460	BDL	BDL	6.4
1323-3-5	3/20/02	6	240	BDL	2.2	5.0

BDL --- Below Detection Limit

Table 2 **Summary of Soil Analytical Results**
(4/2/02 Sampling Events)

SAMPLE ID	SAMPLE DATE	DAPTH	COMPOUND CONCENTRATION (in ppm)		
			C9-C22 Aromatics	C9-C18 Aliphatics	C19-C36 Aliphatics
1323-3-1R	4/2/02	8	36		310
1323-3-2R	4/2/02	7.25			
1323-3-4R	4/2/02	6.5	730	110	1800
1323-3-5R	4/2/02	6.5			
Residential Soil Cleanup Levels	---	---	469	9386	93860
Industrial/Commercial Soil Cleanup Levels	---	---	12264	245280	#
Soil-to-Water Maximum Contaminant Concentration	---	---	34	3255	##

- Notes: 1. Only those compounds whose concentration is above Method Detection Limit are listed
 2. A no-entry-cell indicates compound concentration below Method Detection Limit
 3. # Health based level > 100%
 4. ## Considered immobile

APPENDIX B

BORING LOGS AND WELL CONSTRUCTION/ ABANDONMENT RECORDS

WELL CONSTRUCTION RECORD

North Carolina - Department of Environment and Natural Resources - Division of Water Quality - Groundwater Section

WELL CONTRACTOR (INDIVIDUAL) NAME (print) MR. BILL MILLER

CERTIFICATION # 2927

WELL CONTRACTOR COMPANY NAME CATLIN ENGINEERS & SCIENTISTS

PHONE # (910) 452-5861

STATE WELL CONSTRUCTION PERMIT# _____
(if applicable)

ASSOCIATED WQ PERMIT# _____
(if applicable)

1. WELL USE (Check Applicable Box): Residential ☐ Municipal/Public ☐ Industrial ☐ Agricultural ☐
Monitoring ☒ Recovery ☐ Heat Pump Water Injection ☐ Other ☐ If Other, List Use _____

2. WELL LOCATION:

Nearest Town: CAMP LEJEUNE County ONSLOW

BUILDING 1323, CEDAR & O STREET, MCB CAMP LEJEUNE

(Street Name, Numbers, Community, Subdivision, Lot No., Zip Code)

3. OWNER: COMMANDING GENERAL

Address ATTN: I&E/EMD/EOB MARINE CORPS BASE

PSC BOX 20004 (Street or Route No.)

CAMP LEJEUNE, NC 28542-0004

City or Town State Zip Code

(910) 451-5068

Area code- Phone number

4. DATE DRILLED 3-24-2003

5. TOTAL DEPTH: 20 FT.

6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒

7. STATIC WATER LEVEL Below Top of Casing: 13.5 FT.

(Use "+" if Above Top of Casing)

8. TOP OF CASING IS 0 (FLUSH) FT. Above Land Surface*

*Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C .0118.

9. YIELD (gpm): N/A METHOD OF TEST N/A

10. WATER ZONES (depth): BELOW 13.5 FT.

11. DISINFECTION: Type N/A Amount N/A

12. CASING:

From	To	Depth	Diameter	Wall Thickness or Weight/Ft.	Material
From <u>0</u>	To <u>10</u>	Ft. <u>2 INCH</u>	<u>SCH 40</u>	<u>PVC</u>	
From _____	To _____	Ft. _____	_____	_____	_____
From _____	To _____	Ft. _____	_____	_____	_____

13. GROUT:

From	To	Depth	Material	Method
From <u>6.5</u>	To <u>8.5</u>	Ft. <u>BENTONITE</u>	<u>POUR</u>	
From _____	To _____	Ft. _____	_____	_____

14. SCREEN:

From	To	Depth	Diameter	Slot Size	Material
From <u>10</u>	To <u>20</u>	Ft. <u>2 in.</u>	<u>.010 in.</u>	<u>PVC</u>	
From _____	To _____	Ft. _____	_____	_____	_____

15. SAND/GRAVEL PACK:

From	To	Depth	Size	Material
From <u>8.5</u>	To <u>20</u>	Ft. <u>NO. 2</u>	<u>GRAVEL PACK</u>	
From _____	To _____	Ft. _____	_____	_____

16. REMARKS: TEMPORARY WELL. ABANDONED ON MARCH 25, 2003.

Topographic/Land setting
☐ Ridge ☐ Slope ☐ Valley ☒ Flat
(check appropriate box)

Latitude/longitude of well location

77° 19' 47.74" W; 34° 39' 55.12" N

(degrees/minutes/seconds)

Latitude/longitude source: ☐ GPS ☐ Topographic map ☒ ArcView
(check box) 8.2 G. Software ESR

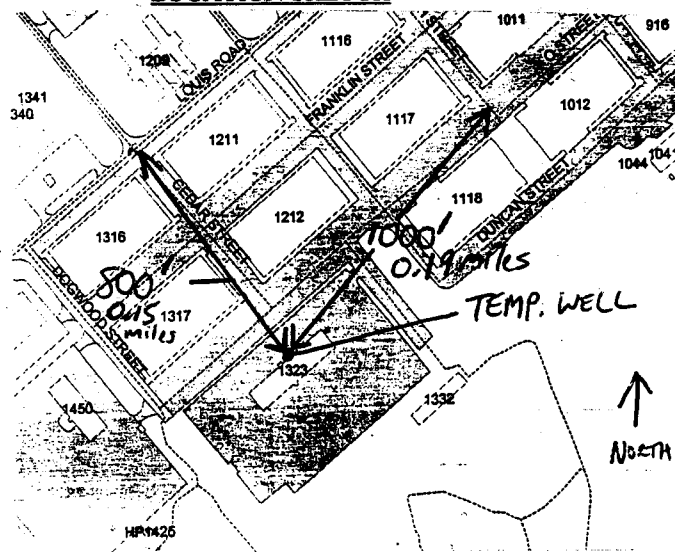
DEPTH
From To
SEE BORING LOG FOR

DRILLING LOG
Formation Description
MORE DETAILED INFO.

0 - 8
8 - 9
9 - 12
12 - 14
14 - 18
18 - 20

SAND BACKFILL (SP)
F. SAND Some Clay (SC)
St. Clayey F. SAND (SP)
F. SAND (SP)
Not Sampled
F. to M. SAND (SP)

LOCATION SKETCH



I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER

[Signature]

SIGNATURE OF PERSON CONSTRUCTING THE WELL

4/7/03
DATE

Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 733-3221, within 30 days.

GW-1 REV. 07/2001

SOIL BORING/MONITORING WELL LOG

Project Name: Phase I LSA, UST 1323-3		Project No.: 0001243.60		
Boring/MW No.: UST1323-3-TW01		Date: March 24, 2003		
Installation Method: HSA with SPT		Borehole Diameter: Approx. 8 inches		
Weather Conditions: Sunny. Dry conditions previous 48 hours.				
Depth [Split- spoon] Interval (ft.)	Blow Counts	Field Screening Results (ppm)	Lithology (soil type, color, etc.)	Soil Conditions (dry, moist, petroleum odor)
0 – 0.3 0.3 – 8		Soil samples not collected for screening	Reinforced concrete Tan-brown fine SAND (SP) (Backfill)	Backfill placed in excavation to approximately 8 feet BLS
9 [8-10]	1/12" 2	8-10' = 15.8	8-9' = Gray fine SAND with some clay (SC)	Blue-black staining 8- 8.5 feet, petroleum odor
12 [10-12]	4	10-12' = 8.5	9-12' = White-brown slightly clayey fine SAND (SP)	Blue-black stained soil at top (suspect cave-in soils from 8-8.5')
14 [12-14]	5	12-14' = 11.1	12-14' = White-brown fine SAND (SP)	Wet soils
20 [18-20]	3	18-20' (not screened, wet sample)	18-20' = White-brown fine to medium SAND (SP)	Wet soils, saturated
Notes: Temporary well. Static Water Level = 13.5 feet BLS (3/25/03). Soil sample from 8 to 9 Ft. BLS submitted to laboratory.				
WELL CONSTRUCTION DETAILS (if applicable)				
Total Depth: 20 feet		Well Diameter: 2 inches		
Screened Interval: 10 to 20 feet		Sand Interval: 8.5 to 20 feet		
Bentonite Interval: 6.5 to 8.5 feet		Grout Interval: N/A, Temporary Well		
Outer Casing Interval: N/A		Outer Casing Diameter: N/A		

WELL ABANDONMENT RECORDWELL CONTRACTOR BILL MILLER, CATLIN ENG. & SCIENTISTSWELL CONTRACTOR CERTIFICATION # 29271. WELL USE (Check Applicable Box): Residential ☐ Municipal ☐ Industrial ☐ Agricultural ☐ Monitoring ☒
Recovery ☐ Heat Pump Water Injection ☐ Other ☐ If Other, List Use: _____

2. WELL LOCATION: (Show a sketch of the location on back of form.)

Nearest Town: CAMP LEJEUNECounty ONSLOWBLDG 1323, CEDAR & O STREET, MCB CAMP LEJEUNE

(Road Name and Number, Community, Subdivision, Lot No.)

Quadrangle No. _____

3. OWNER: COMMANDING GENERAL, ATTN: I&E/EMD/EQBMARINE CORPS BASE4. ADDRESS: PSC BOX 20004, CAMP LEJEUNE, NC 28542-00045. TOPOGRAPHY: ☐ draw, ☐ slope, ☐ hilltop, ☐ valley, ☒ flat
(circle one)6. TOTAL DEPTH: 20 FT. DIAMETER 2 IN.

7. CASING REMOVED:

20 feet1" SCREEN, RISER diameter8. DISINFECTION: N/A

(Amount of 70% hypochlorite used:)

9. SEALING MATERIAL:

Neat Cement

bags of cement _____

gallons of water _____

Sand Cement

bags of cement _____

gallons of water _____

OtherType material BENTONITEAmount 1 BAG

10. EXPLAIN METHOD EMPLACEMENT OF MATERIAL.

CASING WAS REMOVED FROM THE WELL. BENTONITE WAS THENADDED TO THE BORING ANNULAR SPACE AND HYDRATED. THEWAS PATCHED AT SURFACE TO MATCH EXISTING PAVEMENT.11. DATE WELL ABANDONED 3-25-2003

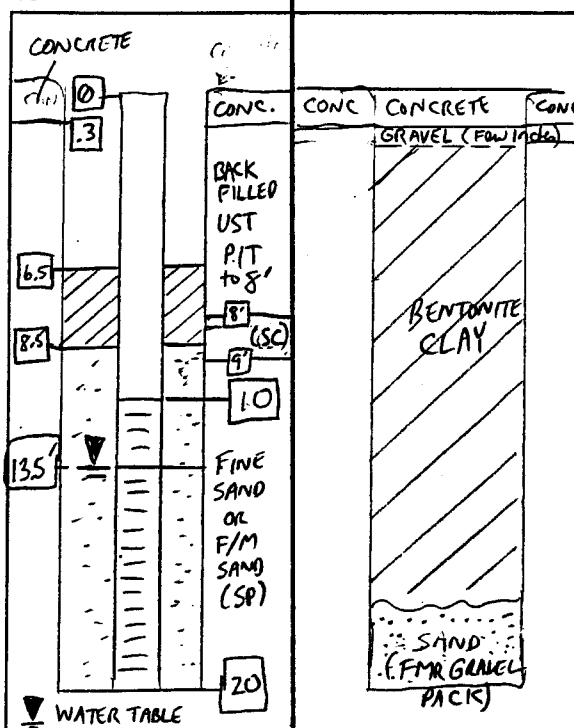
I do hereby certify that this well was abandoned in accordance with 15A NCAC 2C, well construction standards, and that a copy of the record has been provided to the well owner.

Signature of person abandoning the well [Signature]Date 4/1/03

WELL LOCATION: Draw a location sketch on the reverse of this sheet, showing the direction and distance of the well to at least two (2) nearby reference points such as roads, intersections and streams. Identify roads with State Highway road identification numbers.

Submit original to the Division of Water Quality, Groundwater Section, one copy to the owner within 30 days from completion of abandonment.

WELL DIAGRAM: Draw a detailed sketch of the well showing total depth, depth and diameter of screens remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.



SOIL BORING/MONITORING WELL LOG

Project Name: Phase I LSA, UST 1323-3		Project No.: 0001243.60		
Boring/MW No.: UST1323-3-SB01		Date: March 19, 2003		
Installation Method: Hand Auger/ Power Probe		Borehole Diameter: Approx. 2 to 3.5 inches		
Weather Conditions: Light rain. Precipitation previous 48 hours.				
Depth Interval (ft.)	Blow Counts	Field Screening Results (ppm)	Lithology (soil type, color, etc.)	Soil Conditions (dry, moist, petroleum odor)
0 – 0.9			Concrete	
0.9 – 2		1-2' = 3.7	Fine GRAVEL (crushed limestone) with little light gray fine sand and clay (GW)	
2 – 4		2-3' = 2.7 3-4' = 1.7	Brown fine SAND with little clay (SP)	
4 – 5		4-5' = 3.1	Tan-brown slightly clayey fine SAND (SP)	
Notes: Soil boring advanced by hand auger to 2.3 feet BLS through pea gravel. Gravel repeatedly caved-in, requiring use of PowerProbe™ to continue boring.				
Total Depth: 5 feet				
Soil Samples Collected (Depth/Time):		1 to 2 feet – 1430 hours		

APPENDIX C
STANDARD PROCEDURES

MID-ATLANTIC STANDARD METHODS OF INVESTIGATION

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 is 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, and subsurface building structures.

1.2.1 Horizontal Survey

Horizontal survey data is 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

All necessary permits are applied for and obtained in accordance with federal, state, and local requirements prior to any drilling or well construction 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 previously 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 truck or trailer mounted drill rig. Continuous flight auger types used vary upon the site and situation; ranging from the 4-inch solid stem to the 8-inch 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 limited to depths of less than 15 feet.

Other Methods

Other drilling methods, such as mud and air rotary, rock coring, cable tool, and large bucket augering are not widely used except under appropriate conditions.

Regardless of the drilling method used, drill rig(s) and all drilling tools are thoroughly cleaned between boreholes to prevent cross introduction of hydrocarbons. Split spoon samples are collected and field-described at intervals of five feet, and cuttings are continuously monitored. 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 accordance 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. The hydropunches are advanced into the water-bearing zone by a trailer-mounted drilling rig. 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.

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. As-built well construction records are field generated.

1.3.4 Well Development

Wells are developed by overpumping or surging using appropriate pumps, blocks, or bailers. Through development, unwanted fine materials are removed and water generated during development is containerized and properly disposed of.

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.

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 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; geophysical logging; and resistivity surveys.

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 Photoionization Detector or HNU meter.
- 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 and accepted industry standards. 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 headspace using containerized samples which 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:

- **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, one volume is removed prior to obtaining a sample.

Samples are collected and containerized in a manner which 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.

Surface Water Samples

- **Creeks/Lakes/Etc.**

Grab samples are obtained.

2.0 DATA EVALUATION

Data obtained as a result of the site investigation is compiled and evaluated and a report is prepared for distribution to the appropriate agencies, on behalf of the client. The data collected is evaluated both individually and in context with the rest of the data collected. Generally, specific data is evaluated as follows:

- Background data is evaluated in context with the suspected or confirmed problem.
- Survey data is utilized to develop site maps and to evaluate contaminant receptors.
- Well construction records are compiled and presented as part of the Comprehensive Site Assessment. As-built information is used in combination with other data to evaluate subsurface conditions and 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 is used to develop contour maps, flow nets and other constructions. The data is also used to calculate various hydrogeologic parameters which describe aquifer characteristics.
- Hydrocarbon data is utilized to develop various plume geometry and isocon maps.
- All data is compiled and utilized for making specific recommendations with regard to remedial action alternatives.

APPENDIX D

LABORATORY ANALYTICAL REPORT AND CHAIN-OF CUSTODY RECORDS - SOIL SAMPLE UST1323-3-SB1, 1-2 FEET (DELIVERY LINE SAMPLE)

PARADIGM ANALYTICAL LABORATORIES, INC.

2627 Northchase Parkway S.E.
Wilmington, North Carolina 28405
(910) 350-1903
Fax (910) 350-1557

RECEIVED
1 2 3 4

BY:.....

Mr. Eric Aufderhaar
Mid-Atlantic Associates
409 Rogersview Ct.
Raleigh, NC 27610

March 31, 2003

Report Number: G122-2090

Client Project ID: Bldg 1323, Line Boring

Dear Mr. Aufderhaar,

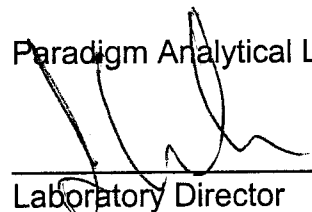
Enclosed are the results of the analytical services performed under the referenced project. Copies of this report and supporting data will be retained in our files for a period of five years in the event they are required for future reference. Any samples submitted to our laboratory will be retained 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 for assistance. We will be happy to answer any questions or concerns which you may have.

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

Sincerely,

Paradigm Analytical Laboratories, Inc.



Laboratory Director
J. Patrick Weaver

PARADIGM ANALYTICAL LABORATORIES, INC.**Results for Volatiles**

by GCMS 8260B/5035

Client Sample ID: UST1323-3-SB1 1-2FT

Client Project ID: Bldg 1323, Line Boring

Lab Sample ID: 65973

Lab Project ID: G122-2090

Matrix: Soil

%Solids: 89.4

Date Analyzed: 3/20/03

Analyzed By: EKR

Date Collected: 3/19/03

Date Received: 3/20/03

Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Acetone	56	BQL
Acrolein	110	BQL
Acrylonitrile	110	BQL
Benzene	5.6	BQL
Bromobenzene	5.6	BQL
Bromochloromethane	5.6	BQL
Bromodichloromethane	5.6	BQL
Bromoform	5.6	BQL
Bromomethane	5.6	BQL
2-Butanone	28	BQL
n-Butylbenzene	5.6	BQL
sec-Butylbenzene	5.6	BQL
tert-Butylbenzene	5.6	BQL
Carbon disulfide	5.6	BQL
Carbon tetrachloride	5.6	BQL
Chlorobenzene	5.6	BQL
Chloroethane	5.6	BQL
Chloroform	5.6	BQL
Chloromethane	5.6	BQL
2-Chlorotoluene	5.6	BQL
4-Chlorotoluene	5.6	BQL
Dibromochloromethane	5.6	BQL
1,2-Dibromo-3-chloropropane	5.6	BQL
Dibromomethane	5.6	BQL
1,2-Dibromoethane (EDB)	5.6	BQL
1,2-Dichlorobenzene	5.6	BQL
1,3-Dichlorobenzene	5.6	BQL
1,4-Dichlorobenzene	5.6	BQL
trans-1,4-Dichloro-2-butene	5.6	BQL
1,1-Dichloroethane	5.6	BQL
1,1-Dichloroethene	5.6	BQL
1,2-Dichloroethane	5.6	BQL
cis-1,2-Dichloroethene	5.6	BQL
trans-1,2-dichloroethene	5.6	BQL
1,2-Dichloropropane	5.6	BQL
1,3-Dichloropropane	5.6	BQL
2,2-Dichloropropane	5.6	BQL
1,1-Dichloropropene	5.6	BQL
cis-1,3-Dichloropropene	5.6	BQL
trans-1,3-Dichloropropene	5.6	BQL
Dichlorodifluoromethane	5.6	BQL
Diisopropyl ether (DIPE)	5.6	BQL
Ethylbenzene	5.6	BQL
Hexachlorobutadiene	5.6	BQL
2-Hexanone	5.6	BQL

Flags: BQL = Below Quantitation Limit

Reviewed by: MLC

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GCMS 8260B/5035

Client Sample ID: UST1323-3-SB1 1-2FT

Date Analyzed: 3/20/03

Client Project ID: Bldg 1323, Line Boring

Analyzed By: EKR

Lab Sample ID: 65973

Date Collected: 3/19/03

Lab Project ID: G122-2090

Date Received: 3/20/03

Matrix: Soil

%Solids: 89.4

Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Iodomethane	5.6	BQL
Isopropylbenzene	5.6	BQL
4-Isopropyltoluene	5.6	BQL
Methylene chloride	22	BQL
4-Methyl-2-pentanone	5.6	BQL
Methyl-tert-butyl ether (MTBE)	5.6	BQL
Naphthalene	5.6	BQL
n-Propyl benzene	5.6	BQL
Styrene	5.6	BQL
1,1,1,2-Tetrachloroethane	5.6	BQL
1,1,2,2-Tetrachloroethane	5.6	BQL
Tetrachloroethene	5.6	BQL
Toluene	5.6	BQL
1,2,3-Trichlorobenzene	5.6	BQL
1,2,4-Trichlorobenzene	5.6	BQL
Trichloroethene	5.6	BQL
1,1,1-Trichloroethane	5.6	BQL
1,1,2-Trichloroethane	5.6	BQL
Trichlorofluoromethane	5.6	BQL
1,2,3-Trichloropropane	5.6	BQL
1,2,4-Trimethylbenzene	5.6	BQL
1,3,5-Trimethylbenzene	5.6	BQL
Vinyl chloride	5.6	BQL
m-,p-Xylene	11	BQL
o-Xylene	5.6	BQL

Surrogate Spike Recoveries

Compound	Spike Added (ug/KG)	Surrogate Result (ug/KG)	%Rec
Bromofluorobenzene	50	51.1	102
1,2-Dichloroethane-d4	50	46.4	93
Toluene-d8	50	49.0	98

Comments:

All results are corrected for dilution.

Flags: BQL = Below Quantitation Limit

Reviewed by: pkh

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Mid-Atlantic AssociatesProject Name: Bldg 1323, Line Boring

Sample Information and Analytical Results	
Sample Identification	UST1323-3-SB1 1-2FT
Sample Matrix	Soil
Collection Option (for Soil)*	3
Date Collected	03/19/03
Date Received	03/20/03
Date Extracted	03/19/03
Date Analyzed	03/21/03
Dry Weight	89
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	140***

* = 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: G122-2090-65973

Reviewed By: mtc

VPH Laboratory Reporting Form

Calibration and QA/QC Information

FID Initial Calibration Date: 12/26/02PID Initial Calibration Date: 12/26/02

Calibration Ranges and Limits

Range	MDL		ML		RL	
	($\mu\text{g/L}$)	(mg/Kg)	($\mu\text{g/L}$)	(mg/Kg)	($\mu\text{g/L}$)	(mg/Kg)
C ₅ -C ₈ Aliphatics	9.3	0.41	29.4	1.3	100	10
C ₉ -C ₁₂ Aliphatics	7.9	0.3	25.2	0.97	100	10
C ₉ -C ₁₀ Aromatics	0.5	0.04	1.5	0.14	100	10

Calibration Concentration Levels

Range	Levels		%RSD or CCC	Method of Quantitation
	($\mu\text{g/L}$)	(mg/Kg)		
C ₅ -C ₈ Aliphatics	20	2	4.0	Calibration Factor
	80	8		
	200	20		
	800	80		
	2000	200		
C ₉ -C ₁₂ Aliphatics	15	1.5	12.3	Calibration Factor
	60	6		
	150	15		
	600	60		
	1500	150		
C ₉ -C ₁₀ Aromatics	32.5	3.25	11.3	Calibration Factor
	130	13		
	325	32.5		
	1300	130		
	3250	325		

Calibration Check Date: 03/21/03

Calibration Check

Range	Levels		RPD
	($\mu\text{g/L}$)	(mg/Kg)	
C ₅ -C ₈ Aliphatics	200	20	-4.4
C ₉ -C ₁₂ Aliphatics	150	15	-0.3
C ₉ -C ₁₀ Aromatics	325	32.5	3.2

MDL = Method Detection Limit

ML = Minimum Limit

RL = Reportable Limit

RPD = Relative Percent Difference

%RSD = Percent Relative Standard Deviation

CCC = Correlation Coefficient of Curve

Reviewed By: MLC

EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Mid-Atlantic AssociatesProject Name: Bldg 1323, Line Boring

Sample Information and Analytical Results	
Sample Identification	UST1323-3-SB1 1-2FT
Sample Matrix	Soil
Date Collected	03/19/03
Date Received	03/20/03
Date Extracted	03/20/03
Date Analyzed	03/21/03
Dry Weight	89.4
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	88
Aromatic Surrogate % Recovery	87

Comments:

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

Lab info: G122-2090-65973

Reviewed By: mrc

PARADIGM ANALYTICAL LABORATORIES, INC.

Attachment 3

EPH Laboratory Reporting Form

Calibration and QA/QC Information

Initial Calibration Date: 03/19/03

Calibration Ranges and Limits

Range	MDL (mg/Kg)	(µg/L)	ML (mg/Kg)	(µg/L)	RL (mg/Kg)	(µg/L)
C ₉ -C ₁₈ Aliphatics	0.1	0.8	0.3	2.6	100	10
C ₁₉ -C ₃₆ Aliphatics	0.1	1.6	0.3	5	100	10
C ₁₁ -C ₂₂ Aromatics	0.2	2.1	0.6	6.7	100	10

Calibration Concentration Levels

Range	Levels (µg/L)	(mg/Kg)	%RSD or CCC	Method of Quantitation
C ₉ -C ₁₈ Aliphatics	0.06	1	5.00	Calibration Factor
	0.15	2.5		
	0.3	5		
	0.6	10		
	1.2	20		
C ₁₉ -C ₃₆ Aliphatics	0.08	1.33	2.4	Calibration Factor
	0.2	3.33		
	0.4	6.67		
	0.8	13.3		
	1.6	26.7		
C ₁₁ -C ₂₂ Aromatics	0.17	2.83	4.3	Calibration Factor
	0.425	7.08		
	0.85	14.2		
	1.7	28.3		
	3.4	56.7		

Calibration Check Date: 03/21/03

Calibration Check

Range	Levels (µg/mL)	(mg/Kg)	RPD
C ₉ -C ₁₈ Aliphatics	0.6	10	-4.1
C ₁₉ -C ₃₆ Aliphatics	0.8	13.3	-6.8
C ₁₁ -C ₂₂ Aromatics	1.7	28.3	-4.6

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

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

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Semivolatiles

by GCMS 8270

Client Sample ID: UST1323-3-SB1 1-2FT

Client Project ID: Bldg 1323, Line Boring

Lab Sample ID: 65973

Lab Project ID: G122-2090

Matrix: Soil

%Solids: 89.4

Date Collected: 3/19/2003

Date Received: 3/20/2003

Date Analyzed: 3/26/2003

Analyzed By: MRC

Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Acenaphthene	340	BQL
Acenaphthylene	340	BQL
Anthracene	340	BQL
Benzo[a]anthracene	340	BQL
Benzo[a]pyrene	340	BQL
Benzo[b]fluoranthene	340	BQL
Benzo[g,h,i]perylene	340	BQL
Benzo[k]fluoranthene	340	BQL
Benzoic Acid	690	BQL
Bis(2-chloroethoxy)methane	340	BQL
Bis(2-chloroethyl)ether	340	BQL
Bis(2-chloroisopropyl)ether	340	BQL
Bis(2-ethylhexyl)phthalate	340	BQL
4-bromophenyl phenyl ether	340	BQL
Butylbenzylphthalate	340	BQL
4-Chloroaniline	1700	BQL
4-Chloro-3-methylphenol	340	BQL
2-Chloronaphthalene	340	BQL
2-Chlorophenol	340	BQL
4-Chlorophenyl phenyl ether	340	BQL
Chrysene	340	BQL
Di-n-Butylphthalate	340	BQL
Di-n-octylphthalate	340	BQL
Dibenzo[a,h]anthracene	340	BQL
Dibenzofuran	340	BQL
1,2-Dichlorobenzene	340	BQL
1,3-Dichlorobenzene	340	BQL
1,4-Dichlorobenzene	340	BQL
3,3'-Dichlorobenzidine	690	BQL
2,4-Dichlorophenol	340	BQL
Diethylphthalate	340	BQL
2,4-Dimethylphenol	340	BQL
Dimethylphthalate	340	BQL
4,6-Dinitro-2-methylphenol	1700	BQL
2,4-Dinitrophenol	1700	BQL
2,4-Dinitrotoluene	340	BQL
2,6-Dinitrotoluene	340	BQL
Fluoranthene	340	BQL
Fluorene	340	BQL
Hexachlorobenzene	340	BQL

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Semivolatiles

by GCMS 8270

Client Sample ID: UST1323-3-SB1 1-2FT

Client Project ID: Bldg 1323, Line Boring

Lab Sample ID: 65973

Lab Project ID: G122-2090

Matrix: Soil

%Solids: 89.4

Date Collected: 3/19/2003

Date Received: 3/20/2003

Date Analyzed: 3/26/2003

Analyzed By: MRC

Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Hexachlorobutadiene	340	BQL
Hexachlorocyclopentadiene	690	BQL
Hexachloroethane	340	BQL
Indeno(1,2,3-c,d)pyrene	340	BQL
Isophorone	340	BQL
2-Methylnaphthalene	340	BQL
2-Methylphenol	340	BQL
3- & 4-Methylphenol	340	BQL
N-Nitrosodi-n-propylamine	340	BQL
N-Nitrosodiphenylamine	340	BQL
Naphthalene	340	BQL
2-Nitroaniline	340	BQL
3-Nitroaniline	1700	BQL
4-Nitroaniline	1700	BQL
Nitrobenzene	340	BQL
2-Nitrophenol	340	BQL
4-Nitrophenol	1700	BQL
Pentachlorophenol	1700	BQL
Phenanthrene	340	BQL
Phenol	340	BQL
Pyrene	340	BQL
1,2,4-Trichlorobenzene	340	BQL
2,4,5-Trichlorophenol	340	BQL
2,4,6-Trichlorophenol	340	BQL

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovered
2-Fluorobiphenyl	10	9.6	96
2-Fluorophenol	10	9.0	90
Nitrobenzene-d5	10	9.5	95
Phenol-d6	10	9.0	90
2,4,6-Tribromophenol	10	10.3	103
4-Terphenyl-d14	10	10.1	101

Comments:

Results are corrected for %solids and dilution where applicable.

Flags:

BQL = Below Quantitation Limit.

Reviewed By: mmc

PARADIGM ANALYTICAL LABORATORIES, INC.

Results of Library Search for Semivolatile Compounds
by GCMS

Client Sample ID: UST1323-3-SB1 1-2FT

Client Project ID: Bldg 1323, Line Boring

Lab Sample ID: 65973

Lab Project ID: G122-2090

Matrix: Soil

% SOLIDS: 89.4

Date Collected: 3/19/2003

Date Received: 3/20/2003

Date Analyzed: 3/26/2003

Analyzed By: MRC

Dilution: 1

No.	Compound	Retention Time	CAS#	Match Probability	Result (ug/KG)
1	Unknown	15.62			140
2					
3					
4					
5					
6					
7					
8					
9					
10					

Comment:

Tentatively Identified Compound (TIC) refers to substances which are not present in the list of target compounds. Therefore, not all TICs are identified and quantitated using individual standards. TIC listings are prepared utilizing a computerized library search of electron impact mass spectral data and evaluation of the relevant data by a mass spectral data specialist.

Quantitation is accomplished by relative peak area of the compound compared to that of the nearest internal standard from the total ion chromatogram. TICs are identified and quantitated only if the peak area is equal to or greater than 10% of that of the nearest internal standard. Quantitation provided is an estimate.

Reviewed by: MRC

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Metals

Client Sample ID: UST1323-3-SB1 1-2FT

Client Project ID: Bldg 1323, Line Boring

Lab Sample ID: 65973

Lab Project ID: G122-2090

Batch ID: 2654

Analyzed By: PSW

Date Collected: 3/19/03

Date Received: 3/20/03

Matrix: Soil

Solids 89.39

Metals	Result	Quantitation Limit	DF	Units	Method	Date Analyzed
Chromium	9.09	0.948	1	MG/KG	6010B	3/21/03
Lead	BQL	0.948	1	MG/KG	6010B	3/21/03

Comments

BQL = Below Quantitation Limits

DF = Dilution Factor

J = Between MDL and RL

APPENDIX E

LABORATORY ANALYTICAL REPORT AND CHAIN-OF CUSTODY RECORD

- SOIL SAMPLES UST1323-TW01, 8-9' AND
UST1323-TW01, 8-9' DUPL**
- GROUNDWATER SAMPLES UST1323-3-TW01 AND
UST1323-3-TW01 DUPL**

PARADIGM ANALYTICAL LABORATORIES, INC.

2627 Northchase Parkway S.E.
Wilmington, North Carolina 28405
(910) 350-1903
Fax (910) 350-1557

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APR 21 2003

BY: _____

Mr. Eric Aufderhaar
Mid-Atlantic Associates
409 Rogersview Ct.
Raleigh, NC 27610

April 18, 2003

Report Number: G122-2100

Client Project ID: UST1323-3

Dear Mr. Aufderhaar,

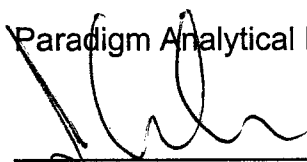
Enclosed are the results of the analytical services performed under the referenced project. Copies of this report and supporting data will be retained in our files for a period of five years in the event they are required for future reference. Any samples submitted to our laboratory will be retained 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 for assistance. We will be happy to answer any questions or concerns which you may have.

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

Sincerely,

Paradigm Analytical Laboratories, Inc.



Laboratory Director
J. Patrick Weaver

CASE NARRATIVE

Date: April 16, 2003

Mid Atlantic and Associates project ID: UST1323-3

Paradigm Analytical project ID: G122-2100

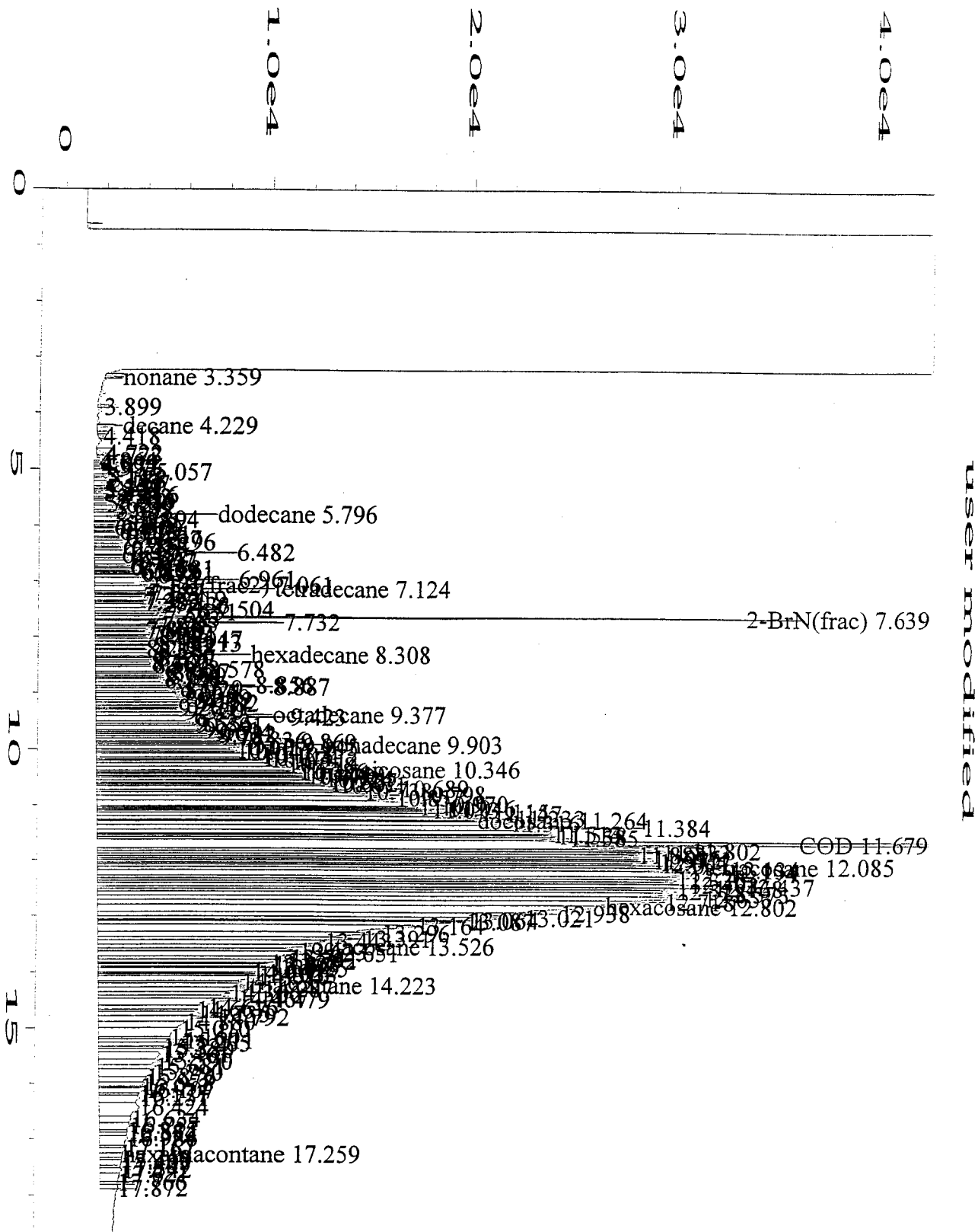
Four samples were submitted to the laboratory on March 25, 2003 for analysis as indicated on the chain of custody. The samples were received in good condition, within temperature and holding time limits.

All extractions and analyses were completed within holding time limits.

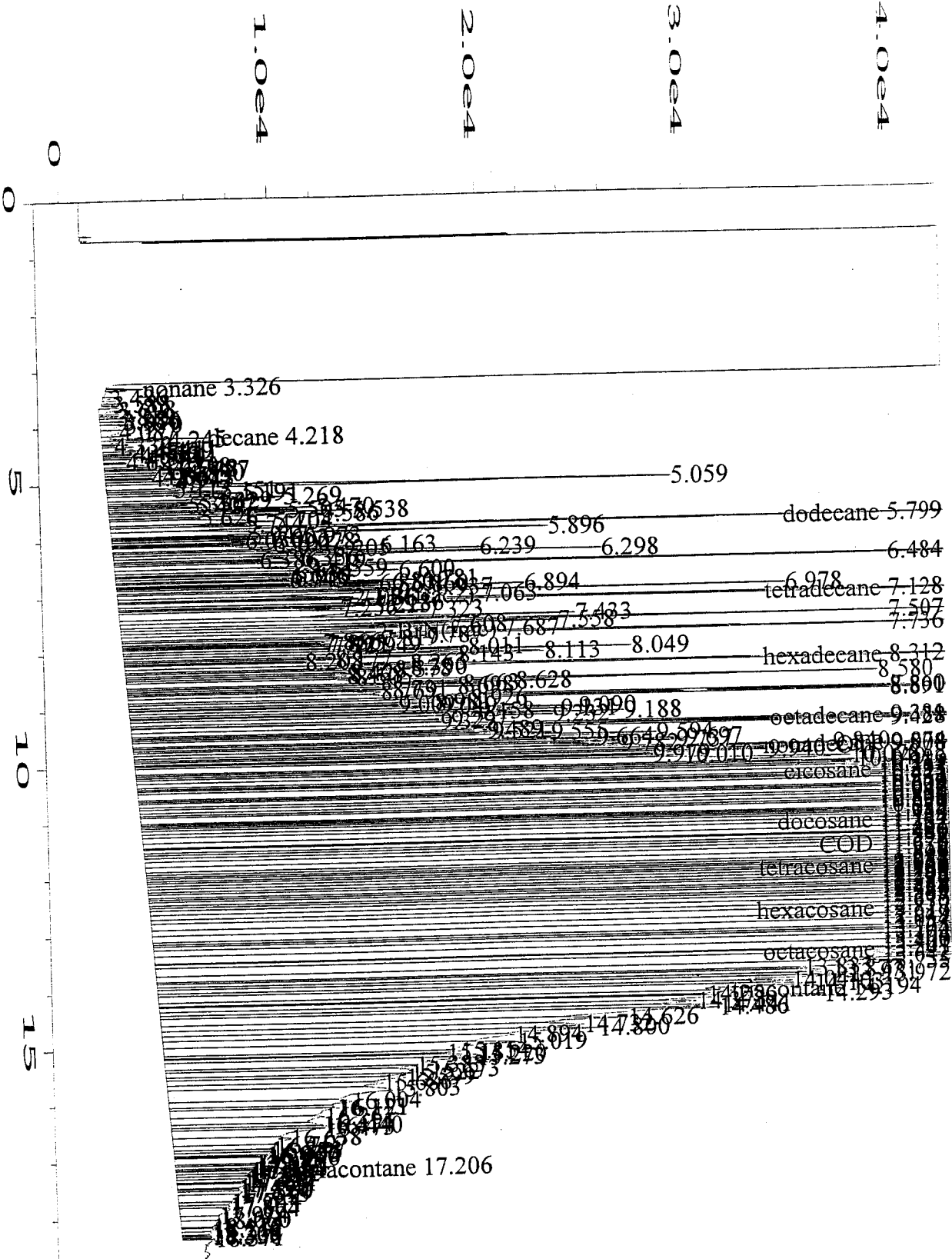
The EPH result for UST 1323-TW01 8 to 9' and its duplicate did not match in the first set of analysis on these samples. The samples were re-extracted and re-analyzed. The two sets of data confirm the results reported in the attached data summaries.

It appears this soil sample is a non-homogenous matrix as each of the four data sets yielded different results.

UST1323-TW01 8 to 9 G, First Extraction



US11323-TW01 8+09 4 DUPLICATE, First Extension



user modified

Data File Name	: C:\HPCHEM\2\DATA\EP040203\083R0101.D	Page Number	: 1
Operator	: bms	Vial Number	: 83
Instrument	: FID #2	Injection Number	: 1
Sample Name	: 66462 x1 K	Sequence Line	: 1
Run Time Bar Code		Instrument Method	: PROEPH.MTH
Acquired on	: 02 Apr 03 11:55 PM	Analysis Method	: EPHTK_R.MTH
Report Created on	: 03 Apr 03 07:38 AM	Sample Amount	: 0
Last Recalib on	: 24 FEB 03 09:38 AM	ISTD Amount	:
Multiplier	: 1		

Data File Name	: C:\HPCHEM\2\DATA\EP041103\053R0101.D		
Operator	: bms	Page Number	: 1
Instrument	: FID #2	Vial Number	: 53
Sample Name	: 66459 x1 T Rx	Injection Number	: 1
Time Bar Code:		Sequence Line	: 1
Acquired on	: 11 Apr 03 09:55 AM	Instrument Method:	PROEPH.MTH
Report Created on:	11 Apr 03 01:43 PM	Analysis Method	: EPHTK_R.MTH
Last Recalib on	: 24 FEB 03 09:38 AM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Chromatogram showing detector response versus time. The x-axis is labeled 'Time' and ranges from 0 to 15 minutes. The y-axis is labeled 'Response' and ranges from 0 to 100. The chromatogram shows a series of peaks corresponding to different compounds. The peaks are labeled with their retention times and names: decane (4.214), dodecane (5.804), tetradecane (6.706), 2-BrN(trac) (6.750), hexadecane (7.106), octadecane (7.506), nonadecane (7.806), eicosane (8.106), docosane (8.406), COD (8.706), tetracosane (9.006), hexacosane (9.306), octacosane (9.606), and triacontane (10.006). The peak for triacontane is the largest and occurs at the end of the run.

```

Data File Name      : C:\HPCHEM\2\DATA\EP
Operator            : bms
Instrument           : FID #2
Sample Name         : 66462 x1 T Rx
In Time Bar Code   :
Required on         : 11 Apr 03   10:23 AM
Report Created on   : 15 Apr 03   08:08 AM
Last Recalib on    : 24 FEB 03   09:38 AM
Multiplier         : 1

```

```

Page Number      : 1
Vial Number      : 54
Injection Number  : 1
Sequence Line    : 1
Instrument Method: PROEPH.MTH
Analysis Method   : EPHTK_R.MTH
Sample Amount     : 0
ISTD Amount       :

```

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Mid-Atlantic AssociatesProject Name: UST1323-3

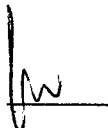
Sample Information and Analytical Results	
Sample Identification	UST1323-TW01 8 to 9ft.
Sample Matrix	Soil
Collection Option (for Soil)*	3
Date Collected	03/24/03
Date Received	03/25/03
Date Extracted	03/24/03
Date Analyzed	03/29/03
Dry Weight	83
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 10 (mg/Kg)
C ₉ -C ₁₂ Aliphatics**	31 (mg/Kg)
C ₉ -C ₁₀ Aromatics**	< 10 (mg/Kg)
Surrogate % Recovery - PID	89
Surrogate % Recovery - FID	200***

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

** = Excludes any surrogates or internal standards.

***= High surrogate recovery due to matrix interference

Lab Info: G122-2100-66459

Reviewed By: 

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Mid-Atlantic AssociatesProject Name: UST1323-3

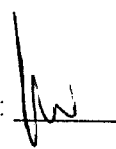
Sample Information and Analytical Results	
Sample Identification	UST1323-3-TW01
Sample Matrix	Water
Collection Option (for Soil)*	
Date Collected	03/25/03
Date Received	03/25/03
Date Extracted	03/28/03
Date Analyzed	03/28/03
Dry Weight	
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 100 (µg/L)
C ₉ -C ₁₂ Aliphatics**	160 (µg/L)
C ₉ -C ₁₀ Aromatics**	< 100 (µg/L)
Surrogate % Recovery - PID	110
Surrogate % Recovery - FID	160***

* = 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: G122-2100-66460

Reviewed By: 

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Mid-Atlantic AssociatesProject Name: UST1323-3

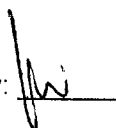
Sample Information and Analytical Results	
Sample Identification	UST1323-TW01 8to9 ft. DUPL
Sample Matrix	Soil
Collection Option (for Soil)*	3
Date Collected	03/25/03
Date Received	03/25/03
Date Extracted	03/25/03
Date Analyzed	03/29/03
Dry Weight	84
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 10 (mg/Kg)
C ₉ -C ₁₂ Aliphatics**	25 (mg/Kg)
C ₉ -C ₁₀ Aromatics**	< 10 (mg/Kg)
Surrogate % Recovery - PID	87
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: G122-2100-66462

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Attachment 2

VPH Laboratory Reporting Form

Calibration and QA/QC Information

FID Initial Calibration Date: 12/26/02

PID Initial Calibration Date: 12/26/02

Calibration Ranges and Limits

Range	MDL		ML		RL	
	(µg/L)	(mg/Kg)	(µg/L)	(mg/Kg)	(µg/L)	(mg/Kg)
C ₅ -C ₈ Aliphatics	9.3	0.41	29.4	1.3	100	10
C ₉ -C ₁₂ Aliphatics	7.9	0.3	25.2	0.97	100	10
C ₉ -C ₁₀ Aromatics	0.5	0.04	1.5	0.14	100	10

Calibration Concentration Levels

Range	Levels		%RSD or CCC	Method of Quantitation
	(µg/L)	(mg/Kg)		
C ₅ -C ₈ Aliphatics	20	2	4.0	Calibration Factor
	80	8		
	200	20		
	800	80		
	2000	200		
C ₉ -C ₁₂ Aliphatics	15	1.5	12.3	Calibration Factor
	60	6		
	150	15		
	600	60		
	1500	150		
C ₉ -C ₁₀ Aromatics	32.5	3.25	11.3	Calibration Factor
	130	13		
	325	32.5		
	1300	130		
	3250	325		

Calibration Check Date: 03/28/03

Calibration Check

Range	Levels		RPD
	(µg/L)	(mg/Kg)	
C ₅ -C ₈ Aliphatics	200	20	-0.7
C ₉ -C ₁₂ Aliphatics	150	15	11.5
C ₉ -C ₁₀ Aromatics	325	32.5	-1.4

MDL = Method Detection Limit

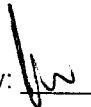
ML = Minimum Limit

RL = Reportable Limit

RPD = Relative Percent Difference

%RSD = Percent Relative Standard Deviation

CCC = Correlation Coefficient of Curve

Reviewed By: 

EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

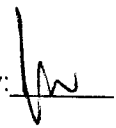
Client Name: Mid-Atlantic AssociatesProject Name: UST1323-3

Sample Information and Analytical Results	
Sample Identification	UST1323-TW01 8 to 9ft.
Sample Matrix	Soil
Date Collected	03/24/03
Date Received	03/25/03
Date Extracted	03/27/03
Date Analyzed	03/31/03
Dry Weight	82.5
Dilution Factor	1
C ₉ -C ₁₈ Aliphatics*	< 10 (mg/Kg)
C ₁₉ -C ₃₆ Aliphatics*	30 (mg/Kg)
C ₁₁ -C ₂₂ Aromatics*	25 (mg/Kg)
Aliphatic Surrogate % Recovery	76
Aromatic Surrogate % Recovery	73
Fractionation Surrogate 1 % Recovery	71

Comments:

* = Excludes any surrogates or internal standards.

Lab info: G122-2100-66459

Reviewed By: 

EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

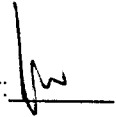
Client Name: Mid-Atlantic AssociatesProject Name: UST1323-3

Sample Information and Analytical Results	
Sample Identification	UST1323-3-TW01
Sample Matrix	Water
Date Collected	03/25/03
Date Received	03/25/03
Date Extracted	04/01/03
Date Analyzed	04/08/03
Dry Weight	
Dilution Factor	1
C ₉ -C ₁₈ Aliphatics*	< 100 (µg/L)
C ₁₉ -C ₃₆ Aliphatics*	< 100 (µg/L)
C ₁₁ -C ₂₂ Aromatics*	< 100 (µg/L)
Aliphatic Surrogate % Recovery	26
Aromatic Surrogate % Recovery	25
Fractionation Surrogate 1 % Recovery	91

Comments:

* = Excludes any surrogates or internal standards.
Low surrogate confirmed by duplicate analysis.

Lab info: G122-2100-66460

Reviewed By: 

EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Mid-Atlantic AssociatesProject Name: UST1323-3

Sample Information and Analytical Results	
Sample Identification	UST1323-TW01 8to9 ft. DUPL
Sample Matrix	Soil
Date Collected	03/25/03
Date Received	03/25/03
Date Extracted	03/27/03
Date Analyzed	04/02/03
Dry Weight	83.7
Dilution Factor	1
C ₉ -C ₁₈ Aliphatics*	17 (mg/Kg)
C ₁₉ -C ₃₆ Aliphatics*	140 (mg/Kg)
C ₁₁ -C ₂₂ Aromatics*	250 (mg/Kg)
Aliphatic Surrogate % Recovery	47
Aromatic Surrogate % Recovery	68
Fractionation Surrogate 1 % Recovery	100

Comments:

* = Excludes any surrogates or internal standards.

Lab info: G122-2100-66462

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Attachment 3

EPH Laboratory Reporting Form

Calibration and QA/QC Information

Initial Calibration Date: 03/19/03

Calibration Ranges and Limits

Range	MDL (µg/L) (mg/Kg)		ML (µg/L) (mg/Kg)		RL (µg/L) (mg/Kg)	
C ₉ -C ₁₈ Aliphatics	0.1	0.8	0.3	2.6	100	10
C ₁₉ -C ₃₆ Aliphatics	0.1	1.6	0.3	5	100	10
C ₁₁ -C ₂₂ Aromatics	0.2	2.1	0.6	6.7	100	10

Calibration Concentration Levels

Range	Levels (µg/L) (mg/Kg)		%RSD or CCC	Method of Quantitation
C ₉ -C ₁₈ Aliphatics	0.06	1	5.00	Calibration Factor
	0.15	2.5		
	0.3	5		
	0.6	10		
	1.2	20		
C ₁₉ -C ₃₆ Aliphatics	0.08	1.33	2.4	Calibration Factor
	0.2	3.33		
	0.4	6.67		
	0.8	13.3		
	1.6	26.7		
C ₁₁ -C ₂₂ Aromatics	0.17	2.83	1.3	Calibration Factor
	0.425	7.08		
	0.85	14.2		
	1.7	28.3		
	3.4	56.7		

Calibration Check Date: 03/31/03

Calibration Check

Range	Levels (µg/mL) (mg/Kg)		RPD
C ₉ -C ₁₈ Aliphatics	0.6	10	-7.1
C ₁₉ -C ₃₆ Aliphatics	0.8	13.3	-6.9
C ₁₁ -C ₂₂ Aromatics	1.7	28.3	-7.0

MDL = Method Detection Limit

ML = Minimum Limit

RL = Reportable Limit

RPD = Relative Percent Difference

%RSD = Percent Relative Standard Deviation

CCC = Correlation Coefficient of Curve

PARADIGM ANALYTICAL LABORATORIES, INC.

Attachment 3

EPH Laboratory Reporting Form

Calibration and QA/QC Information

Initial Calibration Date: 03/19/03

Calibration Ranges and Limits

Range	MDL (mg/Kg)	(µg/L)	ML (mg/Kg)	(µg/L)	RL (mg/Kg)	(µg/L)
C ₉ -C ₁₈ Aliphatics	0.1	0.8	0.3	2.6	100	10
C ₁₉ -C ₃₆ Aliphatics	0.1	1.6	0.3	5	100	10
C ₁₁ -C ₂₂ Aromatics	0.2	2.1	0.6	6.7	100	10

Calibration Concentration Levels

Range	Levels (µg/L) (mg/Kg)	%RSD or CCC	Method of Quantitation
C ₉ -C ₁₈ Aliphatics	0.06 1	5.00	Calibration Factor
	0.15 2.5		
	0.3 5		
	0.6 10		
	1.2 20		
C ₁₉ -C ₃₆ Aliphatics	0.08 1.33	2.4	Calibration Factor
	0.2 3.33		
	0.4 6.67		
	0.8 13.3		
	1.6 26.7		
C ₁₁ -C ₂₂ Aromatics	0.17 2.83	1.3	Calibration Factor
	0.425 7.08		
	0.85 14.2		
	1.7 28.3		
	3.4 56.7		

Calibration Check Date: 04/02/03

Calibration Check

Range	Levels (µg/mL) (mg/Kg)	RPD
C ₉ -C ₁₈ Aliphatics	0.6 10	-6.1
C ₁₉ -C ₃₆ Aliphatics	0.8 13.3	2.5
C ₁₁ -C ₂₂ Aromatics	1.7 28.3	1.0

MDL = Method Detection Limit

ML = Minimum Limit

RL = Reportable Limit

RPD = Relative Percent Difference

%RSD = Percent Relative Standard Deviation

CCC = Correlation Coefficient of Curve

PARADIGM ANALYTICAL LABORATORIES, INC.

Attachment 3

EPH Laboratory Reporting Form

Calibration and QA/QC Information

Initial Calibration Date: 03/19/03

Calibration Ranges and Limits

Range	MDL (mg/Kg)	(µg/L)	ML (mg/Kg)	(µg/L)	RL (mg/Kg)	(µg/L)
C ₉ -C ₁₈ Aliphatics	0.1	0.8	0.3	2.6	100	10
C ₁₉ -C ₃₆ Aliphatics	0.1	1.6	0.3	5	100	10
C ₁₁ -C ₂₂ Aromatics	0.2	2.1	0.6	6.7	100	10

Calibration Concentration Levels

Range	Levels (µg/L)	(mg/Kg)	%RSD or CCC	Method of Quantitation
C ₉ -C ₁₈ Aliphatics	0.06	1	5.00	Calibration Factor
	0.15	2.5		
	0.3	5		
	0.6	10		
	1.2	20		
C ₁₉ -C ₃₆ Aliphatics	0.08	1.33	2.4	Calibration Factor
	0.2	3.33		
	0.4	6.67		
	0.8	13.3		
	1.6	26.7		
C ₁₁ -C ₂₂ Aromatics	0.17	2.83	1.3	Calibration Factor
	0.425	7.08		
	0.85	14.2		
	1.7	28.3		
	3.4	56.7		

Calibration Check Date: 04/07/03

Calibration Check

Range	Levels (µg/mL)	(mg/Kg)	RPD
C ₉ -C ₁₈ Aliphatics	0.6	10	-11.1
C ₁₉ -C ₃₆ Aliphatics	0.8	13.3	2.6
C ₁₁ -C ₂₂ Aromatics	1.7	28.3	-4.4

MDL = Method Detection Limit

ML = Minimum Limit

RL = Reportable Limit

RPD = Relative Percent Difference

%RSD = Percent Relative Standard Deviation

CCC = Correlation Coefficient of Curve

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GCMS 8260B/5035

Client Sample ID: UST1323-TW01 8 to 9ft.

Date Analyzed: 4/7/03

Client Project ID: UST1323-3

Analyzed By: EKR

Lab Sample ID: 66459

Date Collected: 3/24/03

Lab Project ID: G122-2100

Date Received: 3/25/03

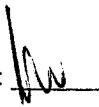
Matrix: Soil

%Solids: 82.5

Dilution: 50

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Acetone	1500	BQL
Acrolein	6100	BQL
Acrylonitrile	6100	BQL
Benzene	61	BQL
Bromobenzene	61	BQL
Bromochloromethane	61	BQL
Bromodichloromethane	61	BQL
Bromoform	61	BQL
Bromomethane	61	BQL
2-Butanone	1500	BQL
n-Butylbenzene	61	140
sec-Butylbenzene	61	73
tert-Butylbenzene	61	BQL
Carbon disulfide	61	BQL
Carbon tetrachloride	61	BQL
Chlorobenzene	61	BQL
Chloroethane	61	BQL
Chloroform	61	BQL
Chloromethane	61	BQL
2-Chlorotoluene	61	BQL
4-Chlorotoluene	61	BQL
Dibromochloromethane	61	BQL
1,2-Dibromo-3-chloropropane	300	BQL
Dibromomethane	61	BQL
1,2-Dibromoethane (EDB)	61	BQL
1,2-Dichlorobenzene	61	BQL
1,3-Dichlorobenzene	61	BQL
1,4-Dichlorobenzene	61	BQL
trans-1,4-Dichloro-2-butene	300	BQL
1,1-Dichloroethane	61	BQL
1,1-Dichloroethene	61	BQL
1,2-Dichloroethane	61	BQL
cis-1,2-Dichloroethene	61	BQL
trans-1,2-dichloroethene	61	BQL
1,2-Dichloropropane	61	BQL
1,3-Dichloropropane	61	BQL
2,2-Dichloropropane	61	BQL
1,1-Dichloropropene	61	BQL
cis-1,3-Dichloropropene	61	BQL
trans-1,3-Dichloropropene	61	BQL
Dichlorodifluoromethane	300	BQL
Diisopropyl ether (DIPE)	61	BQL
Ethylbenzene	61	BQL
Hexachlorobutadiene	61	BQL
2-Hexanone	300	BQL

Flags: BQL = Below Quantitation Limit

Reviewed by: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GCMS 8260B/5035

Client Sample ID: UST1323-TW01 8 to 9ft.

Date Analyzed: 4/7/03

Client Project ID: UST1323-3

Analyzed By: EKR

Lab Sample ID: 66459

Date Collected: 3/24/03

Lab Project ID: G122-2100

Date Received: 3/25/03

Matrix: Soil

%Solids: 82.5

Dilution: 50

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Iodomethane	61	BQL
Isopropylbenzene	61	BQL
4-Isopropyltoluene	61	63
Methylene chloride	300	BQL
4-Methyl-2-pentanone	300	BQL
Methyl-tert-butyl ether (MTBE)	61	BQL
Naphthalene	61	260
n-Propyl benzene	61	BQL
Styrene	61	BQL
1,1,1,2-Tetrachloroethane	61	BQL
1,1,2,2-Tetrachloroethane	61	BQL
Tetrachloroethene	61	BQL
Toluene	61	BQL
1,2,3-Trichlorobenzene	61	BQL
1,2,4-Trichlorobenzene	61	BQL
Trichloroethene	61	BQL
1,1,1-Trichloroethane	61	BQL
1,1,2-Trichloroethane	61	BQL
Trichlorofluoromethane	61	BQL
1,2,3-Trichloropropane	61	BQL
1,2,4-Trimethylbenzene	61	410
1,3,5-Trimethylbenzene	61	120
Vinyl chloride	61	BQL
m,p-Xylene	120	150
o-Xylene	61	82

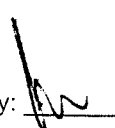
Surrogate Spike Recoveries

Compound	Spike Added (ug/KG)	Surrogate Result (ug/KG)	%Rec
Bromofluorobenzene	10	10.9	109
1,2-Dichloroethane-d4	10	9.9	99
Toluene-d8	10	9.9	99

Comments:

All results are corrected for dilution.

Flags: BQL = Below Quantitation Limit

Reviewed by: 

N.C. Certification #481 S.C. Certification #99029

Page 2 of 2

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Semivolatiles

by GCMS 8270

Client Sample ID: UST1323-TW01 8 to 9ft.

Date Collected: 3/24/2003

Client Project ID: UST1323-3

Date Received: 3/25/2003

Lab Sample ID: 66459

Date Analyzed: 4/3/2003

Lab Project ID: G122-2100

Analyzed By: MRC

Matrix: Soil

%Solids: 82.5

Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Acenaphthene	380	BQL
Acenaphthylene	380	BQL
Anthracene	380	BQL
Benzo[a]anthracene	380	BQL
Benzo[a]pyrene	380	BQL
Benzo[b]fluoranthene	380	BQL
Benzo[g,h,i]perylene	380	BQL
Benzo[k]fluoranthene	380	BQL
Benzoic Acid	760	BQL
Bis(2-chloroethoxy)methane	380	BQL
Bis(2-chloroethyl)ether	380	BQL
Bis(2-chloroisopropyl)ether	380	BQL
Bis(2-ethylhexyl)phthalate	380	BQL
4-bromophenyl phenyl ether	380	BQL
Butylbenzylphthalate	380	BQL
4-Chloroaniline	1900	BQL
4-Chloro-3-methylphenol	380	BQL
2-Chloronaphthalene	380	BQL
2-Chlorophenol	380	BQL
4-Chlorophenyl phenyl ether	380	BQL
Chrysene	380	BQL
Di-n-Butylphthalate	380	BQL
Di-n-octylphthalate	380	BQL
Dibenzo[a,h]anthracene	380	BQL
Dibenzofuran	380	BQL
1,2-Dichlorobenzene	380	BQL
1,3-Dichlorobenzene	380	BQL
1,4-Dichlorobenzene	380	BQL
3,3'-Dichlorobenzidine	760	BQL
2,4-Dichlorophenol	380	BQL
Diethylphthalate	380	BQL
2,4-Dimethylphenol	380	BQL
Dimethylphthalate	380	BQL
4,6-Dinitro-2-methylphenol	1900	BQL
2,4-Dinitrophenol	1900	BQL
2,4-Dinitrotoluene	380	BQL
2,6-Dinitrotoluene	380	BQL
Fluoranthene	380	BQL
Fluorene	380	BQL
Hexachlorobenzene	380	BQL

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Semivolatiles

by GCMS 8270

Client Sample ID: UST1323-TW01 8 to 9ft.

Client Project ID: UST1323-3

Lab Sample ID: 66459

Lab Project ID: G122-2100

Matrix: Soil

%Solids: 82.5

Date Collected: 3/24/2003

Date Received: 3/25/2003

Date Analyzed: 4/3/2003

Analyzed By: MRC

Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Hexachlorobutadiene	380	BQL
Hexachlorocyclopentadiene	760	BQL
Hexachloroethane	380	BQL
Indeno(1,2,3-c,d)pyrene	380	BQL
Isophorone	380	BQL
2-Methylnaphthalene	380	BQL
2-Methylphenol	380	BQL
3- & 4-Methylphenol	380	BQL
N-Nitrosodi-n-propylamine	380	BQL
N-Nitrosodiphenylamine	380	BQL
Naphthalene	380	BQL
2-Nitroaniline	380	BQL
3-Nitroaniline	1900	BQL
4-Nitroaniline	1900	BQL
Nitrobenzene	380	BQL
2-Nitrophenol	380	BQL
4-Nitrophenol	1900	BQL
Pentachlorophenol	1900	BQL
Phenanthrene	380	BQL
Phenol	380	BQL
Pyrene	380	BQL
1,2,4-Trichlorobenzene	380	BQL
2,4,5-Trichlorophenol	380	BQL
2,4,6-Trichlorophenol	380	BQL

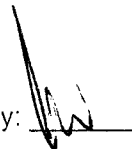
Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovered
2-Fluorobiphenyl	10	8.5	85
2-Fluorophenol	10	8.4	84
Nitrobenzene-d5	10	8.2	82
Phenol-d6	10	8.5	85
2,4,6-Tribromophenol	10	9.4	94
4-Terphenyl-d14	10	9.0	90

Comments:

Results are corrected for %solids and dilution where applicable.

Flags:

BQL = Below Quantitation Limit.

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results of Library Search for Semivolatile Compounds

by GCMS

Client Sample ID: UST1323-TW01 8 to 9ft.

Client Project ID: UST1323-3

Lab Sample ID: 66459

Lab Project ID: G122-2100

Matrix: Soil

% SOLIDS: 82.5

Date Collected: 3/24/2003

Date Received: 3/25/2003

Date Analyzed: 4/3/2003

Analyzed By: MRC

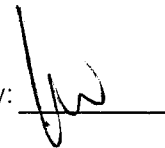
Dilution: 1

No.	Compound	Retention Time	CAS#	Match Probability	Result (ug/KG)
1	Unknown	13.36			560
2	Alkane, Unknown	14.56			440
3	Alkane, Unknown	11.32			420
4	Alkane, Unknown	14.51			380
5	Unknown	10.52			360
6	Alkane, Unknown	13.77			350
7	Alkane, Unknown	13.00			340
8	Unknown	13.79			330
9	Unknown	10.39			320
10	Alkane, Unknown	15.87			310

Comment:

Tentatively Identified Compound (TIC) refers to substances which are not present in the list of target compounds. Therefore, not all TICs are identified and quantitated using individual standards. TIC listings are prepared utilizing a computerized library search of electron impact mass spectral data and evaluation of the relevant data by a mass spectral data specialist.

Quantitation is accomplished by relative peak area of the compound compared to that of the nearest internal standard from the total ion chromatogram. TICs are identified and quantitated only if the peak area is equal to or greater than 10% of that of the nearest internal standard. Quantitation provided is an estimate.

Reviewed by: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Semivolatiles

by GCMS 625

Client Sample ID: UST1323-3-TW01

Client Project ID: UST1323-3

Lab Sample ID: 66460

Lab Project ID: G122-2100

Matrix: Water

Date Collected: 3/25/2003

Date Received: 3/25/2003

Date Analyzed: 3/29/2003

Analyzed By: MRC

Dilution: 1

Compound	Quantitation Limit (ug/L)	Result (ug/L)	
Acenaphthene	10	BQL	
Acenaphthylene	10	BQL	
Anthracene	10	BQL	
Benzo[a]anthracene	10	BQL	
Benzo[a]pyrene	10	BQL	
Benzo[b]fluoranthene	10	BQL	
Benzo[g,h,i]perylene	10	BQL	
Benzo[k]fluoranthene	10	BQL	
Bis(2-chloroethoxy)methane	10	BQL	
Bis(2-chloroethyl)ether	10	BQL	
Bis(2-chloroisopropyl)ether	10	BQL	
Bis(2-ethylhexyl)phthalate	10	6.4	J
4-bromophenyl phenyl ether	10	BQL	
Butylbenzylphthalate	10	BQL	
4-Chloro-3-methylphenol	10	BQL	
2-Chloronaphthalene	10	BQL	
2-Chlorophenol	10	BQL	
4-Chlorophenyl phenyl ether	10	BQL	
Chrysene	10	BQL	
Di-n-Butylphthalate	10	BQL	
Di-n-octylphthalate	10	BQL	
Dibenzo[a,h]anthracene	10	BQL	
1,2-Dichlorobenzene	10	BQL	
1,3-Dichlorobenzene	10	BQL	
1,4-Dichlorobenzene	10	BQL	
3,3'-Dichlorobenzidine	20	BQL	
2,4-Dichlorophenol	10	BQL	
Diethylphthalate	10	BQL	
2,4-Dimethylphenol	10	BQL	
Dimethylphthalate	10	BQL	
4,6-Dinitro-2-methylphenol	50	BQL	
2,4-Dinitrophenol	50	BQL	
2,4-Dinitrotoluene	10	BQL	
2,6-Dinitrotoluene	10	BQL	
Fluoranthene	10	BQL	
Fluorene	10	BQL	
Hexachlorobenzene	10	BQL	
Hexachlorobutadiene	10	BQL	
Hexachlorocyclopentadiene	20	BQL	
Hexachloroethane	10	BQL	

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Semivolatiles by GCMS 625

Client Sample ID: UST1323-3-TW01
 Client Project ID: UST1323-3
 Lab Sample ID: 66460
 Lab Project ID: G122-2100
 Matrix: Water

Date Collected: 3/25/2003
 Date Received: 3/25/2003
 Date Analyzed: 3/29/2003
 Analyzed By: MRC
 Dilution: 1

Compound	Quantitation Limit (ug/L)	Result (ug/L)
Indeno(1,2,3-c,d)pyrene	10	BQL
Isophorone	10	BQL
N-Nitrosodi-n-propylamine	10	BQL
N-Nitrosodiphenylamine	10	BQL
Naphthalene	10	BQL
Nitrobenzene	10	BQL
2-Nitrophenol	10	BQL
4-Nitrophenol	50	BQL
Pentachlorophenol	50	BQL
Phenanthrene	10	BQL
Phenol	10	BQL
Pyrene	10	BQL
1,2,4-Trichlorobenzene	10	BQL
2,4,6-Trichlorophenol	10	BQL

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovered
2-Fluorobiphenyl	10	8.7	87
2-Fluorophenol	10	7.7	77
Nitrobenzene-d5	10	8.8	88
Phenol-d6	10	6.4	64
2,4,6-Tribromophenol	10	11.3	113
4-Terphenyl-d14	10	5.7	57

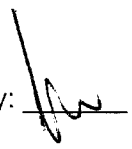
Comments:

Results are corrected for %solids and dilution where applicable.

Flags:

BQL = Below Quantitation Limit.

J = Detected below the quantitation limit.

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results of Library Search for Semivolatile Compounds

by GCMS

Client Sample ID: UST1323-3-TW01

Client Project ID: UST1323-3

Lab Sample ID: 66460

Lab Project ID: G122-2100

Matrix: Water

Date Collected: 3/25/2003

Date Received: 3/25/2003

Date Analyzed: 3/29/2003

Analyzed By: MRC

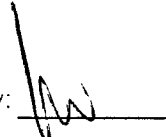
Dilution: 1

No.	Compound	Retention Time	CAS#	Match Probability	Result (ug/L)
1	No library search compounds detected.				
2					
3					
4					
5					
6					
7					
8					
9					
10					

Comment:

Tentatively Identified Compound (TIC) refers to substances which are not present in the list of target compounds. Therefore, not all TICs are identified and quantitated using individual standards. TIC listings are prepared utilizing a computerized library search of electron impact mass spectral data and evaluation of the relevant data by a mass spectral data specialist.

Quantitation is accomplished by relative peak area of the compound compared to that of the nearest internal standard from the total ion chromatogram. TICs are identified and quantitated only if the peak area is equal to or greater than 10% of that of the nearest internal standard. Quantitation provided is an estimate.

Reviewed by: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Metals

Client Sample ID: UST1323-TW01 8 to 9ft.
Client Project ID: UST1323-3
Lab Sample ID: 66459
Lab Project ID: G122-2100
Batch ID: 2667

Analyzed By: RML
Date Collected: 3/24/03
Date Received: 3/25/03
Matrix: Soil
Solids 82.55

Metals	Result	Quantitation Limit	DF	Units	Method	Date Analyzed
Chromium	12.3	1.03	1	MG/KG	6010B	4/7/03
Lead	6.18	1.03	1	MG/KG	6010B	4/7/03

Comments

BQL = Below Quantitation Limits
DF = Dilution Factor
J = Between MDL and RL

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Metals

Client Sample ID: UST1323-3-TW01

Client Project ID: UST1323-3

Lab Sample ID: 66460

Lab Project ID: G122-2100

Batch ID: 2659

Analyzed By: RML

Date Collected: 3/25/03

Date Received: 3/25/03

Matrix: Water

Metals	Result	Quantitation Limit	DF	Units	Method	Date Analyzed
Chromium	0.0240	0.0100	1	MG/L	6010B	3/31/03
Lead	0.0139	0.0100	1	MG/L	6010B	3/31/03

Comments

BQL = Below Quantitation Limits

DF = Dilution Factor

J = Between MDL and RL

Sample prepared by 3030C.

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GC 602

Client Sample ID: UST1323-3-TW01

Analyzed By: JTF

Client Project ID: UST1323-3

Date Collected: 3/25/03

Lab Sample ID: 66460

Date Received: 3/25/03

Lab Project ID: G122-2100

Matrix: Water

Analyte	Result ug/L	Report Limit ug/L	Dilution Factor	Date Analyzed
Benzene	BQL	1.0	1	3/28/03
Diisopropyl ether (DIPE)	BQL	1.0	1	3/28/03
Ethylbenzene	BQL	1.0	1	3/28/03
Methyl-tert butyl ether (MTBE)	BQL	2.0	1	3/28/03
Toluene	BQL	1.0	1	3/28/03
m/p-Xylene	BQL	2.0	1	3/28/03
o-Xylene	BQL	2.0	1	3/28/03

Surrogate Spike Recoveries

	Spike Added	Spike Result	Percent Recovery
Trifluorotoluene	40	40.8	102

Comments:

All values corrected for dilution.

BQL = Below quantitation limit.

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GC 602

Client Sample ID: UST1323-3-TW01 DUPL

Analyzed By: DCS

Client Project ID: UST1323-3

Date Collected: 3/25/03

Lab Sample ID: 66461

Date Received: 3/25/03

Lab Project ID: G122-2100

Matrix: Water

Analyte	Result ug/L	Report Limit ug/L	Dilution Factor	Date Analyzed
Benzene	BQL	1.0	1	3/28/03
Diisopropyl ether (DIPE)	BQL	1.0	1	3/28/03
Ethylbenzene	BQL	1.0	1	3/28/03
Methyl-tert butyl ether (MTBE)	BQL	2.0	1	3/28/03
Toluene	BQL	1.0	1	3/28/03
m/p-Xylene	BQL	2.0	1	3/28/03
o-Xylene	BQL	2.0	1	3/28/03

Surrogate Spike Recoveries

	Spike Added	Spike Result	Percent Recovery
Trifluorotoluene	40	41.4	103

Comments:

All values corrected for dilution.

BQL = Below quantitation limit.

Client: MID-ATLANTIC ASSOC
address: 409 ROGERS VIEW CT
address: RALEIGH, NC 27609
note #: _____

Project ID: UST1323-3
 Contact: E. Avila-Lopez
 Phone: (919) 871-4777
 Fax: (919) 250-9950

250
Date: 3-24-2003
Turnaround: Standard
Job Number: 000R1243.60
P.O. Number:

Report To: ENCA

Invoice To: same

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