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MCAS CHERRY POINT
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FINAL SITE INVESTIGATION REPORT FOR PIT 13 WITH TRANSMITTAL MCAS CHERRY
POINT NC
12/27/1999
CATLIN ENGINEERS AND SCIENTISTS

CATLIN

ENVIRONMENTAL AND
ENGINEERING CONSULTANTS

LAW

WILMINGTON, N.C.
RALEIGH, N.C.

**SITE INVESTIGATION FOR
PIT 13**

FINAL

**MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA**

December 27, 1999

CONTRACT No. N62470-95-D-6009

DELIVERY ORDER No. 0074

CATLIN Engineers and Scientists Project No. 99185



**Prepared By:
CATLIN Engineers and Scientists
Wilmington, North Carolina
(910) 452-5861**

CATLIN

ENVIRONMENTAL AND
ENGINEERING CONSULTANTS

LAW

WILMINGTON, N.C.
RALEIGH, N.C.

December 30, 1999

Commander
NAVFACENGCOM
Attention: Mr. John G. Kresky, Code 18213
1510 Gilbert Street
Norfolk, Virginia 23511-6287

Re: **SITE INVESTIGATION REPORT FOR PIT 13
MCAS CHERRY POINT
CHERRY POINT, NORTH CAROLINA
CONTRACT NO. N62470-95-D-6009
DELIVERY ORDER NO. 0074
CATLIN Project No. 99185**

Dear Mr. Kresky:

In accordance with Naval Facilities Engineering Command Order for Supplies and Services Contract No. N62470-95-6009, Delivery Order No. 0074, CATLIN Engineers and Scientists (CATLIN) is pleased to provide one copy of the Final Site Investigation for Pit 13 at Marine Corps Air Station (MCAS) Cherry Point.

We offer the following responses to comments received from Mr. John Myers dated November 23, 1999 on the Draft document:

Comment:

1. **Cover - Please rename this document to: Site Investigation for Pit 13.**

Document renamed, as requested.

2. **Please number the various sections of this document (and others in the future) so comments can be provided by referencing the appropriate section number.**

Document numbered, as requested.

3. **Page 3, Subsurface Soils, 2nd Paragraph, last sentence - This statement doesn't appear to confirm with the information provided on the table on page 4. Please review and make appropriate changes, as necessary.**

Conflict resolved, as requested.

RICHARD CATLIN & ASSOC.
220 OLD DAIRY ROAD
P.O. BOX 10279
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(910) 452-5861

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December 30, 1999

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This report is intended for the exclusive property of Atlantic Division Naval Facilities Engineering Command. The contents should not be relied upon by any other parties without the consent of Atlantic Division Naval Facilities Command. The findings are relevant to the dates of our site work and should not be relied upon to represent site conditions on other dates.

We appreciate the opportunity to provide environmental services on this project. If any questions arise, please contact us at (910) 452-5861.

Sincerely,


Gary McSmith, EIT
Project Manager


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

GM/MEM/kns

Enclosure

cc: John Myers, MCAS Cherry Point (w/2 encs.)
Christine Foskey, LANTNAVFACENCOM, Code 02134 (letter only)

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SITE INVESTIGATION FOR PIT 13

**MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA**

DECEMBER 27, 1999

**Contract No. N62470-95-D-6009
Delivery Order No. 0074
CATLIN Engineers and Scientists Project No. 99185**



Prepared by:

**CATLIN ENGINEERS AND SCIENTISTS
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WILMINGTON, NORTH CAROLINA 28405
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**SITE INVESTIGATION FOR PIT 13
MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA**

CATLIN PROJECT NO. 99185

DECEMBER 27, 1999

1.0 PURPOSE

The purpose of this assessment was to investigate possible soil and ground water contamination associated with Pit 13 at the Marine Corps Air Station (MCAS) Cherry Point, North Carolina. Pit 13 is an active heavy aircraft refueling pit (Jet Fuel - JP-5) located adjacent to the cargo plane parking area at the MCAS Cherry Point flightline complex. CATLIN Engineers and Scientists was retained by the Commander, Atlantic Division, Naval Facilities Engineering Command, in accordance with the Order for Supplies Contract No. N62470-95-D-6009, Delivery Order No. 0074.

2.0 METHODS

The Marine Corps Air Station (MCAS) Environmental Affairs Department (EAD) and CATLIN personnel conducted a pre-drill site meeting on September 17, 1999 in order to perform the site reconnaissance and mark the borehole locations. An Arts Manufacturing, Inc. (AMS) PowerProbe™ 9600DC was used to obtain the subsurface soil and ground water samples at five locations (1301 through 1305). The PowerProbe™, utilizing a dual tube, power-assisted direct push sampling system, obtained continuous (1½-inch diameter by 4-foot long sections) soil profiles. At two locations (1304 and 1305), an 8-inch thick concrete pavement was first penetrated with an electric coring drill utilizing a 4-inch diameter core barrel. Retrieved soils were described in accordance with the Unified Soil Classification System (ASTM D-2488) and inspected for any odors indicative of JP-5 fuel.

Soil samples were collected at 2-foot intervals and placed in a plastic bag after each borehole soil profile was examined. After allowing the sample to equilibrate for approximately 15 minutes, the sample headspace was checked with an Organic Vapor Analyzer (OVA) Foxboro Model 128. The soil interval with the highest OVA reading and the interval above the capillary fringe were placed in clean containers and refrigerated (<4°C) during transportation to the analytical laboratory. All soil samples were analyzed for JP-5 constituents at Paradigm Analytical Laboratories, Inc. of Wilmington, North Carolina by the following methods:

- Environmental Protection Agency (EPA) Method 8260
- EPA Method 8270
- Massachusetts Department of Environmental Protection (MADEP) Volatile Petroleum Hydrocarbons (VPH) Aliphatics/ Aromatics
- MADEP Extractable Petroleum Hydrocarbons (EPH) Aliphatics/Aromatics

Once the target borehole depth (+2 feet below soil saturation zone) was achieved, the PowerProbe double tubes were extracted and a 1-inch diameter PVC temporary well (10 feet of casing, 5 feet of screen) was installed in the borehole in order to obtain surficial ground water samples. Utilizing a GeoPump™ (peristaltic pump), two to three gallons of ground water were pumped from each temporary well prior to obtaining a representative surficial ground water sample. Ground water samples were placed in the appropriate preserved and unpreserved clean glassware, then refrigerated (<4°C) during transportation to the analytical laboratory. All ground water samples were analyzed at Paradigm Analytical Laboratory for dissolved JP-5 constituents per the following methods:

- EPA Method 602 and Xylenes
- EPA Method 625 Plus 10 Largest Non-Target Peaks
- EPA Method 8310 Base/Neutral and Acid Extractables
- MADEP VPH Aliphatics/Aromatics
- MADEP EPH Aliphatics/Aromatics

The PVC wells were then removed and each borehole was backfilled with Benseal™ (Bentonite grout).

Pit 13 receives JP-5 through an underground pipeline system from Tank Farms A and B. Tank Farm A has been in operation since the early 1940s to store and distribute JP-5, gasoline, and kerosene in aboveground and underground storage tanks. In 1992, Tank Farm A was renovated including removal of 12 underground storage tanks (USTs) and installation of 5 aboveground storage tanks (ASTs) (Law, 1995). Tank Farm B was constructed in 1943 as an aviation fuel storage facility supporting flightline operations and consists of five underground bulk storage tanks (Law, 1993). Since Pit 13 has historically been served by a predominantly UST system, soil and ground water quality data has been compared to clean-up standards applicable to incidents reported to the North Carolina Department of Environment and Natural Resources (NCDENR) on or after January 2, 1998 in accordance with the *Groundwater Section Guidelines for the Investigation and Remediation of Soil and Groundwater, Volume II, Petroleum Underground Storage Tanks* (Guidelines) January 2, 1998.

3.0 RISK CLASSIFICATION AND LAND USE FORM

(Refer to Appendix A)

To evaluate the possible risk classification for the subject site, a "Limited Site Assessment Risk Classification and Land Use Form" questionnaire was completed (see Appendix A). Review of the risk characterization information reveals the following:

- There are no potable water supply wells within 1,000 feet of the source area.
- There are no non-potable wells within 250 feet of the source area.
- There is no surface body of water within 500 feet of the source area.

- The site is located within the Coastal Plain physiographic province. According to Eimers, et al (1987-1990), the Yorktown confining unit [34 to 49 feet below land surface (BLS)] and the Upper Castle Hayne confining unit (166 to 184 feet BLS) are present at non-potable Well #12 (Production Well 8) located approximately 2,500 feet northwest of Pit 13. However, the surficial ground water within the area of interest does not appear to have been adversely affected by Pit 13 activities and; therefore, does not appear to pose a risk to deeper aquifers.
- Based on the risk classifications criteria defined by North Carolina Administrative Code (NCAC) 2L .0115(d) and shown in Appendix A, the site should received a "Low" risk classification. Therefore, NCDENR Gross Contamination Levels (GCLs) are applicable to evaluate site surficial ground water quality.
- The subject site is part of the Military Aircraft Maintenance Flightline Complex at MCAS Cherry Point. It is unlikely the use of this site will change in the foreseeable future.

Based on the land use factors and the location of this site in the industrial area of the Air Station, the Industrial-Commercial Maximum Soil Contaminant Concentrations (MSCCs) should be applicable to site soil quality considering the current and foreseeable land usage.

4.0 SUBSURFACE SOILS

(Refer to Figure 1 and Appendix B)

As previously stated, boreholes were advanced at five locations at Pit 13. Figure 1 illustrates the location of boreholes Pit 1301 through Pit 1305. The total depth of site boreholes ranged from 12 to 16 feet BLS. The predominant soil type encountered was mottled sandy clay underlain at several locations by a mottled silty sand (see Appendix B for boring logs).

Organic subsurface soils exhibited strong natural odors such as hydrogen sulfide. The OVA instrument will read natural volatiles (methanes, sulfides, etc.) as well as petroleum hydrocarbon vapors. The highest OVA readings were detected in boreholes Pit1302 between two and eight feet BLS and Pit1305 between two and 12 feet BLS.

The following table summarizes the borehole sample intervals, OVA readings, and identifies the samples chosen for laboratory analysis.

Borehole I.D.	Approximate Water Table Depth (Feet BLS)	Sample Interval BLS (Feet)	OVA Reading (PPM)	Sample I.D. Selected for Laboratory Analysis
1301	11	0 - 2	80	PIT 1301-1S PIT 1301-2S
		2 - 4	120	
		4 - 6	90	
		6 - 8	100	
		8 - 10	90	
		10 - 12	90	
1302	11	0 - 2	40	PIT 1302-1S PIT 1302-2S
		2 - 4	500	
		4 - 6	>1,000	
		6 - 8	>1,000	
		8 - 10	400	
		10 - 12	350	
1303	11	0 - 2	<1	PIT 1303-1S PIT 1303-2S
		2 - 4	60	
		4 - 6	60	
		6 - 8	85	
		8 - 10	32	
		10 - 12	15	
1304	11	0 - 2	2	PIT 1304-1S PIT 1304-2S
		2 - 4	360	
		4 - 6	2	
		6 - 8	<1	
		8 - 10	<1	
		10 - 12	<1	
		12 - 14	3	
		14 - 16	3	
1305	11	0 - 2	5	PIT 1305-1S PIT 1305-2S
		2 - 4	>1,000	
		4 - 6	>1,000	
		6 - 8	350	
		8 - 10	100	
		10 - 12	1,000	

Based on land use factors and the location of this site within the Flightline Complex of MCAS Cherry Point, soil quality data should be compared to appropriate Industrial/Commercial MSCCs.

4.1 EPA Method 8260 (Halogenated and Aromatics) - Soil
(Refer to Appendix C)

Laboratory analyses of all site soil samples revealed below quantitation limits (BQL) for all EPA Method 8260 compounds. See Appendix C for the laboratory report.

4.2 EPA Method 8270 (Base/Neutral and Acid Extractables) - Soil
(Refer to Table 1, Figures 2 and 3, and Appendices C and D)

Laboratory analysis of soil samples from boreholes 1302 through 1305 revealed BQL for all EPA Method 8270 compounds. Analysis of soil sample PIT1301-1S (2.0 - 4.0 feet BLS) revealed detectable concentrations of benzoic acid (760 micrograms per kilogram ($\mu\text{g}/\text{kg}$)) and phenol (580 $\mu\text{g}/\text{kg}$). Sample PIT1301-2S (6.0 - 8.0 feet BLS) exhibited a detectable concentrations of phenol (420 $\mu\text{g}/\text{kg}$). The MSCCs have not been officially established by the NCDENR for benzoic acid or phenol. However, proposed benzoic acid and phenol MSCCs may be calculated by utilizing Equation 1 in the Guidelines. Refer to Appendix D for the benzoic acid and phenol Industrial/Commercial MSCC calculations. Based on the calculated MSCC, benzoic acid and phenol concentrations in soil sample PIT1301-1S are compliant. Table 1 summarizes the EPA Method 8270 analyses results. Figures 2 and 3 illustrate the laboratory results for benzoic acid and phenol, respectively. See Appendix C for the laboratory report.

4.3 MADEP EPH and VPH (Aliphatics/Aromatics) - Soil
(Refer to Tables 2A and 2B, and Appendix C)

Massachusetts Department of Environmental Protection - Volatile Petroleum Hydrocarbons and Extractable Petroleum Hydrocarbons (MADEP VPH/EPH) laboratory data is summarized in Table 2A. Table 2B compares the MADEP EPH/VPH hydrocarbon fractions to applicable NCDENR MSCCs. Laboratory analyses revealed that all site soil samples tested compliant per the most restrictive MSCCs. See Appendix C for the laboratory report.

5.0 SURFICIAL GROUND WATER QUALITY
(Refer to Figure 4)

Surficial ground water table was encountered approximately 11 feet BLS. Surficial ground water flow direction, based on data obtained on August 27, 1997 (Law, 1997), in regard to nearby Pit 15, is to the north-northeast (see Figure 4). Based on land use factors and the location of this site within the Flightline Complex at MCAS Cherry Point, ground water quality should be compared to appropriate current NCDENR GCLs. However, GCL standards have not been established for MADEP EPH and VPH hydrocarbon fractions. Therefore, MADEP EPH and VPH analysis results are compared to Reportable Limits in the NCDENR Interim Groundwater Quality Standards.

5.1 EPA Method 602 (Purgeable Aromatics) - Ground Water
(Refer to Table 3 and Appendix C)

Laboratory analysis of surficial ground water samples PIT1302GW, PIT1303GW, PIT1304GW, and PIT1305GW revealed BQL for all EPA Method 602 compounds. Surficial ground water sample PIT1301GW exhibited low levels of ethylbenzene [2 parts per billion (ppb)] and total xylenes (6 ppb) concentrations. These dissolved purgeable aromatic concentrations are well below NCAC 15A:02L Standards and the NCDENR GCLs for ethylbenzene and total xylenes in ground water. Table 3 summarizes the laboratory data. A copy of the laboratory report is included in Appendix C.

5.2 EPA Method 625 (Base/Neutral and Acid Extractables) - Ground Water
(Refer to Table 4 and Appendix C)

EPA Method 625 analysis of all five surficial ground water samples revealed BQL for all analytes.

Results of the "tentatively identified" non-target compounds revealed trace levels of unknown carboxylic acid, unknown semi-volatiles, and an unknown alkane. EPA Method 625 laboratory report findings have been summarized in Table 4. The laboratory report is included in Appendix C.

5.3 EPA Method 8310 (Base/Neutral and Acid Extractables) - Ground Water
(Refer to Table 4 and Appendix C)

EPA Method 625 cannot achieve the low detection limits necessary to compare benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, and dibenzo(a,h)-anthracene; therefore, all five site surficial ground water samples were analyzed per EPA Method 8310. Results of laboratory analysis revealed BQL for all selected compounds in all five site surficial ground water samples. Table 4 summarizes the laboratory data. The laboratory report is included in Appendix C.

5.4 MADEP EPH and VPH (Aliphatics/Aromatics) - Ground Water
(Refer to Tables 5A and 5B and Appendix C)

The MADEP EPH/VPH data is summarized in Table 5A. Table 5B compares the hydrocarbon fraction data to the North Carolina Interim Groundwater Quality Standards. Results of MADEP analysis revealed hydrocarbon fractions in all five site surficial ground water samples were compliant with Interim Groundwater Quality Standards. The laboratory report is included in Appendix C.

5.5 EPA Method 6010B (Lead) - Ground Water

(Refer to Appendix C)

EPA method analysis of all five site surficial ground water samples revealed BQL (<10 ppb) for lead. See Appendix C for the laboratory report.

6.0 CONCLUSIONS

The findings of this site investigation can be summarized as follows:

- Based on the land use factors and the location of the subject site within the Flightline Complex of MCAS Cherry Point, Industrial-Commercial MSCCs should apply to subsurface soil conditions.
- All site soil samples tested compliant for all currently listed EPA Methods 8260 and 8270 compound Industrial/Commercial MSCCs. While soil samples from PIT1301-1S and PIT1301-2S contained concentrations of benzoic acid (760 ppb in PIT1301-1S) and phenol (580 ppb in PIT1301-1S and 420 ppb in PIT1301-2S), which do not have NCDENR MSCCs, these concentrations are below proposed Industrial/Commercial MSCCs as calculated in Appendix D.
- All site soil samples tested compliant for all currently listed MADEP VPH and EPH Industrial/Commercial MSCCs.
- Based on the risk classifications criteria defined by NCAC 2L .0115(d) and shown in Appendix A, the site should received a "Low" risk classification. Therefore, NCDENR GCLs are applicable to evaluate site surficial ground water quality.
- All site surficial ground water samples tested compliant for all currently listed EPA Methods 602 and 625/8310 compound GCLs.
- All site surficial ground water samples tested compliant for all currently listed MADEP fractions reportable limits.
- All site surficial ground water tested compliant for NCAC 15A:02L .0202 Groundwater Quality Standards by EPA Methods 602 and 625/8310. The listed value in NCAC 15A:02L .0202 (g) for benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, and dibenzo(a,h)anthracene is below the practical quantitation limit for these compounds. Therefore, in accordance with NCAC 15A:02L .0202(b)(1), there is no exceedence of the standards.

Recommendations are to submit a copy of this report to the North Carolina Division of Waste Management - UST Section, Washington Regional along with correspondence officially requesting that this project be evaluated for "Site Closure."

7.0 REFERENCES

- Eimers, J.L., Daniel, III C.C., Coble, R.W., Hydrogeology and Simulation of Ground-Water Flow at U.S. Marine Corps Air Station, Cherry Point, North Carolina, 1987-1990; U.S. Geological Survey, Water-Resources Investigation Report 94-4186, U.S. Geological Survey, Raleigh, North Carolina.
- Environmental Protection Agency, Integrated Risk Information System (IRIS) Substance File Web Site, www.epa.gov/iris/subst_0355.htm last revised 07/01/1993, [0088.htm](http://www.epa.gov/iris/subst_0088.htm) last revised 02/01/1990.
- Law Engineering, *Final Report of Underground Fuel Investigation Comprehensive Site Assessment and Corrective Action Plan for Tank Farm B, Marine Corps Air Station, Cherry Point, North Carolina*, October 13, 1993.
- Law Engineering and Environmental Services, *Leaking Pipeline and Underground Storage Tank Site Assessment Report, Marine Corps Air Station, Cherry Point, North Carolina*, January 5, 1995.
- Law Engineering and Environmental Services, *Comprehensive Site Assessment Report, Pit 15, Marine Corps Air Station, Cherry Point, North Carolina*, January 3, 1997.
- Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Eleventh Edition, Rahway, New Jersey, 1989.
- North Carolina Department of Environment and Natural Resources, *Groundwater Section Guidelines for the Investigation and Remediation of Soil and Groundwater, Volume II, Petroleum Underground Storage Tanks*, January 2, 1998.

TABLES

TABLE 1 (Page 1 of 3)

**SUMMARY OF LABORATORY RESULTS - SOIL*
BASE/NEUTRAL AND ACID EXTRACTABLES - EPA METHOD 8270**

**PIT 13
MCAS CHERRY POINT, NORTH CAROLINA**

SAMPLE ID./ DEPTH (BLS)/ DATE SAMPLED	CAS #	Industrial/ Commercial MSCC	Residential MSCC	Soil-to- Groundwater MSCC	PIT1301-1S (2.0'-4.0') (9/29/99)	PIT1301-2S (6.0'-8.0') (9/29/99)	PIT1302-1S (4.0'-6.0') (9/23/99)
ANALYTE							
Benzoic Acid	65-85-0	1,635,200	62,571	112	0.76	<0.74	<0.63
Phenol	108-95-2	245,280**	9,386**	242+	0.58	<0.42	<0.32
Fluorene	86-73-7	16,400,000	620	44	<0.35	<0.37	<0.32
2-Methylnaphthalene	91-57-6	1,635,000	63	3	<0.35	<0.37	<0.32
Naphthalene	91-20-3	1,635,000	63	0.58	<0.35	<0.37	<0.32
Phenanthrene	85-01-8	12,264,000	469	60	<0.35	<0.37	<0.32
Pyrene	129-00-0	12,264,000	469	286	<0.35	<0.37	<0.32
All Other Compounds	Varies	Varies	Varies	Varies	BQL	BQL	BQL

MSCC Maximum Soil Contaminant Concentration

* All results in milligrams per kilogram (mg/kg)

** Proposed MSCC as calculated utilizing Equation 1 in the "Groundwater Section Guidelines for the Investigation and Remediation of Soil and Groundwater, Volume II, Petroleum Underground Storage Tanks" dated January 2, 1998 (Appendix D).

+ Proposed MSCC as calculated utilizing Figure 6, Transport Model in the "Groundwater Section Guidelines for the Investigation and Remediation of Soil and Groundwater, Volume II, Petroleum Underground Storage Tanks" dated January 2, 1998 (Appendix D).

BQL Below Quantitation Limit

Note: All samples were analyzed by Paradigm Analytical Laboratories, Inc.

<#; i.e. <0.74 = Below Quantitation Limits (BQL)

TABLE 1 (Page 2 of 3)

SUMMARY OF LABORATORY RESULTS - SOIL*
BASE/NEUTRAL AND ACID EXTRACTABLES - EPA METHOD 8270

PIT 13
MCAS CHERRY POINT, NORTH CAROLINA

SAMPLE I.D./ DEPTH (BLS)/ DATE SAMPLED	CAS #	Industrial/ Commercial MSCC	Residential MSCC	Soil-to- Groundwater MSCC	PIT1302-2S (6.0'-8.0') (9/23/99)	PIT1303-1S (6.0'-8.0') (9/23/99)	PIT1303-2S (8.0'-10.0') (9/23/99)
ANALYTE							
Benzoic Acid	65-85-0	1,635,200	62,571	112	<0.63	<0.66	<0.73
Phenol	108-95-2	245,280**	9,386**	242+	<0.35	<0.33	<0.36
Fluorene	86-73-7	16,400,000	620	44	<0.35	<0.33	<0.36
2-Methylnaphthalene	91-57-6	1,635,000	63	3	<0.35	<0.33	<0.36
Naphthalene	91-20-3	1,635,000	63	0.58	<0.35	<0.33	<0.36
Phenanthrene	85-01-8	12,264,000	469	60	<0.35	<0.33	<0.36
Pyrene	129-00-0	12,264,000	469	286	<0.35	<0.33	<0.36
All Other Compounds	Varies	Varies	Varies	Varies	BQL	BQL	BQL

MSCC Maximum Soil Contaminant Concentration

* All results in milligrams per kilogram (mg/kg)

** Proposed MSCC as calculated utilizing Equation 1 in the "Groundwater Section Guidelines for the Investigation and Remediation of Soil and Groundwater, Volume II, Petroleum Underground Storage Tanks" dated January 2, 1998 (Appendix D).

+ Proposed MSCC as calculated utilizing Figure 6, Transport Model in the "Groundwater Section Guidelines for the Investigation and Remediation of Soil and Groundwater, Volume II, Petroleum Underground Storage Tanks" dated January 2, 1998 (Appendix D).

BQL Below Quantitation Limit

Note: All samples were analyzed by Paradigm Analytical Laboratories, Inc.

<#, i.e. <0.74 = Below Quantitation Limits (BQL)

TABLE 1 (Page 3 of 3)

SUMMARY OF LABORATORY RESULTS - SOIL*
BASE/NEUTRAL AND ACID EXTRACTABLES - EPA METHOD 8270

PIT 13
MCAS CHERRY POINT, NORTH CAROLINA

SAMPLE ID./ DEPTH (BLS)/ DATE SAMPLED	CAS #	Industrial/ Commercial MSCC	Residential MSCC	Soil-to- Groundwater MSCC	PIT1304-1S (2.0'-4.0') (9/23/99)	PIT1304-2S (8.0'-10.0') (9/23/99)	PIT1305-1S (4.0'-6.0') (9/23/99)	PIT1305-2S (6.0'-8.0') (9/34/99)
ANALYTE								
Benzoic Acid	65-85-0	1,635,200	62,571	112	<0.67	<0.76	<0.78	<0.70
Phenol	108-95-2	245,280**	9,386**	242+	<0.33	<0.38	<0.39	<0.35
Fluorene	86-73-7	16,400,000	620	44	<0.33	<0.38	<0.39	<0.35
2-Methylnaphthalene	91-57-6	1,635,000	63	3	<0.33	<0.38	<0.39	<0.35
Naphthalene	91-20-3	1,635,000	63	0.58	<0.33	<0.38	<0.39	<0.35
Phenanthrene	85-01-8	12,264,000	469	60	<0.33	<0.38	<0.39	<0.35
Pyrene	129-00-0	12,264,000	469	286	<0.33	<0.38	<0.39	<0.35
All Other Compounds	Varies	Varies	Varies	Varies	BQL	BQL	BQL	BQL

MSCC Maximum Soil Contaminant Concentration

* All results in milligrams per kilogram (mg/kg)

** Proposed MSCC as calculated utilizing Equation 1 in the "Groundwater Section Guidelines for the Investigation and Remediation of Soil and Groundwater, Volume II, Petroleum Underground Storage Tanks" dated January 2, 1998 (Appendix D).

+ Proposed MSCC as calculated utilizing Figure 6, Transport Model in the "Groundwater Section Guidelines for the Investigation and Remediation of Soil and Groundwater, Volume II, Petroleum Underground Storage Tanks" dated January 2, 1998 (Appendix D).

BQL Below Quantitation Limit

Note: All samples were analyzed by Paradigm Analytical Laboratories, Inc.

<#; i.e. <0.74 = Below Quantitation Limits (BQL)

TABLE 2A (Page 1 of 3)

SUMMARY OF LABORATORY RESULTS - SOIL
MADEP VPH AND EPH

PIT 13
MCAS CHERRY POINT, NORTH CAROLINA

Sample I.D./Depth BLS	PIT1301-1S/(2'-4')		PIT1301-2S/(6'-8')		PIT1302-1S/(4'-6')		PIT1302-2S/(6'-8')	
	VPH (µg/kg)	EPH (mg/kg)	VPH (µg/kg)	EPH (mg/kg)	VPH (µg/kg)	EPH (mg/kg)	VPH (µg/kg)	EPH (mg/kg)
Date Sampled	9/29/99		9/29/99		9/23/99		9/23/99	
ANALYTICAL FRACTIONS								
C ₅ - C ₈ Aliphatics	<500	--	<500	--	<500	--	<500	--
C ₉ - C ₁₂ Aliphatics	<500	--	<500	--	<500	--	<500	--
C ₉ - C ₁₈ Aliphatics	--	<10	--	<10	--	<10	--	<10
C ₁₉ - C ₃₆ Aliphatics	--	<10	--	<10	--	<10	--	<10
C ₉ - C ₁₀ Aromatics	<500	--	<500	--	<500	--	<500	--
C ₁₁ - C ₁₂ Aromatics	--	<10	--	<10	--	<10	--	<10

BLS Below Land Surface

-- Not Applicable

Note: All samples were analyzed by Paradigm Analytical Laboratories.

TABLE 2A (Page 2 of 3)

SUMMARY OF LABORATORY RESULTS - SOIL
MADEP VPH AND EPH

PIT 13
MCAS CHERRY POINT, NORTH CAROLINA

Sample I.D./Depth BLS	PIT1303-1S/(6'-8')		PIT1303-2S/(8'-10')		PIT1304-1S/(2'-4')		PIT1304-2S/(8'-10')	
	VPH (µg/kg)	EPH (mg/kg)	VPH (µg/kg)	EPH (mg/kg)	VPH (µg/kg)	EPH (mg/kg)	VPH (µg/kg)	EPH (mg/kg)
Date Sampled	9/23/99		9/23/99		9/23/99		9/23/99	
ANALYTICAL FRACTIONS								
C ₅ - C ₈ Aliphatics	<500	--	<500	--	<500	--	<500	--
C ₉ - C ₁₂ Aliphatics	<500	--	<500	--	<500	--	<500	--
C ₉ - C ₁₈ Aliphatics	--	<10	--	<10	--	<10	--	<10
C ₁₉ - C ₃₆ Aliphatics	--	<10	--	<10	--	<10	--	<10
C ₉ - C ₁₀ Aromatics	<500	--	<500	--	<500	--	<500	--
C ₁₁ - C ₁₂ Aromatics	--	<10	--	<10	--	<10	--	<10

BLS Below Land Surface

-- Not Applicable

Note: All samples were analyzed by Paradigm Analytical Laboratories.

TABLE 2A (Page 3 of 3)

SUMMARY OF LABORATORY RESULTS - SOIL
MADEP VPH AND EPH

PIT 13
MCAS CHERRY POINT, NORTH CAROLINA

Sample I.D./Depth BLS	PIT1305-1S/(4'-6')		PIT1305-2S/(6'-8')		TRIP BLANK
	VPH (µg/kg)	EPH (mg/kg)	VPH (µg/kg)	EPH (mg/kg)	VPH (µg/kg)
Date Sampled	9/23/99		9/23/99		9/23/99
ANALYTICAL FRACTIONS					
C ₅ - C ₈ Aliphatics	<500	--	<500	--	<500
C ₉ - C ₁₂ Aliphatics	<500	--	<500	--	<500
C ₉ - C ₁₈ Aliphatics	--	<10	--	<10	--
C ₁₉ - C ₃₆ Aliphatics	--	<10	--	<10	--
C ₉ - C ₁₀ Aromatics	<500	--	<500	--	<500
C ₁₁ - C ₁₂ Aromatics	--	<10	--	<10	--

BLS Below Land Surface

-- Not Applicable

Note: All samples were analyzed by Paradigm Analytical Laboratories.

TABLE 2B (Page 1 of 3)

**SUMMARY OF LABORATORY RESULTS - SOIL*
AS COMPARED TO NCDENR MSCCS**

**PIT 13
MCAS CHERRY POINT, NORTH CAROLINA**

Sample I.D./ Depth BLS	Toxicologically Defined Hydrocarbon Fractions	Industrial/ Commercial MSCCs	Residential MSCCs	Soil-to- Ground- water MSCCs	PIT1301-1S (2'-4')	PIT1301-2S (6'-8')	PIT1302-1S (4'-6')
Date Sampled					9/29/99	9/29/99	9/23/99
ANALYTICAL FRACTIONS							
C ₅ - C ₈ Aliphatics	C ₅ - C ₈ Aliphatics	24,528	939	72	<0.5	<0.5	<0.5
C ₉ - C ₁₂ Aliphatics C ₉ - C ₁₈ Aliphatics	C ₉ - C ₁₈ Aliphatics	245,280	9,386	424,799	<10.5	<10.5	<10.5
C ₁₉ - C ₃₆ Aliphatics	C ₁₉ - C ₃₆ Aliphatics	Health-Based Level >100%	93,860	Considered Immobile	<10	<10	<10
C ₉ - C ₁₀ Aromatics C ₁₁ - C ₂₂ Aromatics	C ₉ - C ₂₂ Aromatics	24,528	938	240	<10.5	<10.5	<10.5

MSCC Maximum Soil Contaminant Concentrations

* Sum of VPH and EPH concentrations in milligrams per kilogram (mg/kg)

BLS Below Land Surface

Note For data comparison, the MSCCs and EPH results have been converted to mg/kg.

TABLE 2B (Page 2 of 3)

**SUMMARY OF LABORATORY RESULTS - SOIL*
AS COMPARED TO NCDENR MSCCS**

**PIT 13
MCAS CHERRY POINT, NORTH CAROLINA**

Sample I.D./ Depth BLS	Toxicologically Defined Hydrocarbon Fractions	Industrial/ Commercial MSCCs	Residential MSCCs	Soil-to- Ground- water MSCCs	PIT1302-2S (6-8')	PIT1303-1S (6-8')	PIT1303-2S (8-10')
Date Sampled					9/23/99	9/23/99	9/23/99
ANALYTICAL FRACTIONS							
C ₅ - C ₈ Aliphatics	C ₅ - C ₈ Aliphatics	24,528	939	72	<0.5	<0.5	<0.5
C ₉ - C ₁₂ Aliphatics C ₉ - C ₁₈ Aliphatics	C ₉ - C ₁₈ Aliphatics	245,280	9,386	424,799	<10.5	<10.5	<10.5
C ₁₉ - C ₃₆ Aliphatics	C ₁₉ - C ₃₆ Aliphatics	Health-Based Level >100%	93,860	Considered Immobile	<10	<10	<10
C ₉ - C ₁₀ Aromatics C ₁₁ - C ₂₂ Aromatics	C ₉ - C ₂₂ Aromatics	24,528	938	240	<10.5	<10.5	<10.5

MSCC Maximum Soil Contaminant Concentrations

* Sum of VPH and EPH concentrations in milligrams per kilogram (mg/kg).

BLS Below Land Surface

Note For data comparison, the MSCCs and EPH results have been converted to mg/kg.

TABLE 2B (Page 3 of 3)

**SUMMARY OF LABORATORY RESULTS - SOIL*
AS COMPARED TO NCDENR MSCCS**

**PIT 13
MCAS CHERRY POINT, NORTH CAROLINA**

Sample I.D./ Depth BLS	Toxicologically Defined Hydrocarbon Fractions	Industrial/ Commercial MSCCs	Residential MSCCs	Soil-to- Ground- water MSCCs	PIT1304-1S (2-4')	PIT1305-1S (4-6')	PIT1305-2S (6-8')
Date Sampled					9/23/99	9/23/99	9/23/99
ANALYTICAL FRACTIONS							
C ₅ - C ₈ Aliphatics	C ₅ - C ₈ Aliphatics	24,528	939	72	<0.5	<0.5	<0.5
C ₉ - C ₁₂ Aliphatics C ₉ - C ₁₈ Aliphatics	C ₉ - C ₁₈ Aliphatics	245,280	9,386	424,799	<10.5	<10.5	<10.5
C ₁₉ - C ₃₆ Aliphatics	C ₁₉ - C ₃₆ Aliphatics	Health-Based Level >100%	93,860	Considered Immobile	<10	<10	<10
C ₉ - C ₁₀ Aromatics C ₁₁ - C ₂₂ Aromatics	C ₉ - C ₂₂ Aromatics	24,528	938	240	<10.5	<10.5	<10.5

MSCC Maximum Soil Contaminant Concentrations

* Sum of VPH and EPH concentrations in milligrams per kilogram (mg/kg).

BLS Below Land Surface

Note For data comparison, the MSCCs and EPH results have been converted to mg/kg.

TABLE 3 (Page 1 of 2)

**SUMMARY OF LABORATORY RESULTS - GROUND WATER*
VOLATILES - GC 602**

**PIT 13
MCAS CHERRY POINT, NORTH CAROLINA**

Sample I.D.	CAS Number	Gross Contamination Levels for Groundwater	NCAC 2L Groundwater Standards	PIT1301GW	PIT1302GW	PIT1303GW
Date Sampled				9/29/99	9/23/99	9/23/99
ANALYTE						
Benzene	71-43-2	5,000	1	<1	<1	<1
Diisopropyl ether	108-20-3	70,000	70	<1	<1	<1
Ethylbenzene	100-41-4	29,000	29	2	<1	<1
Methyl-tert butyl ether (MTBE)	1634-04-4	200,000	200	<2	<2	<2
Toluene	108-88-3	257,500	1,000	<1	<1	<1
Total Xylenes	1330-20-7	87,500	530	6	<2	<2

* All results in micrograms per liter (ug/L)

Note: All samples were analyzed by Paradigm Analytical Laboratories, Inc.

TABLE 3 (Page 2 of 2)

**SUMMARY OF LABORATORY RESULTS - GROUND WATER*
VOLATILES - GC 602**

**PIT 13
MCAS CHERRY POINT, NORTH CAROLINA**

Sample I.D.	CAS Number	Gross Contamination Levels for Groundwater	NCAC 2L Groundwater Standards	PIT1304GW	PIT1305GW
Date Sampled				9/23/99	9/23/99
ANALYTE					
Benzene	71-43-2	5,000	1	<1	<1
Diisopropyl ether	108-20-3	70,000	70	<1	<1
Ethylbenzene	100-41-4	29,000	29	<1	<1
Methyl-tert butyl ether (MTBE)	1634-04-4	200,000	200	<2	<2
Toluene	108-88-3	257,500	1,000	<1	<1
Total Xylenes	1330-20-7	87,500	530	<2	<2

* All results in micrograms per liter (ug/L)

Note: All samples were analyzed by Paradigm Analytical Laboratories, Inc.

TABLE 4 (Page 1 of 3)

**SUMMARY OF LABORATORY RESULTS - GROUND WATER*
BASE/NEUTRAL AND ACID EXTRACTABLES - EPA METHOD 625/8310
PLUS 10 LARGEST NON-TARGET PEAKS**

**PIT 13
MCAS CHERRY POINT, NORTH CAROLINA**

Sample I.D.	CAS Number	Gross Contamination Levels for Groundwater	NCAC 2L Groundwater Standards	PIT1301GW	PIT1302GW
Date Sampled				9/29/99	9/23/99
ANALYTE					
Anthracene	120-12-7	645	2,100	<10	<10
Benzo(a)anthracene	56-55-3	22	0.05	<10	<10
Benzo(b)fluoranthene**	205-99-2	0.6	0.047	<0.50	<0.50
Benzo(k)fluoranthene**	207-08-9	0.47	0.47	<0.45	<0.45
Benzo(a)pyrene**	50-32-8	1.5	0.0047	<0.63	<0.63
Chrysene**	218-01-9	5	5.0	<0.50	<0.50
Dibenzo(a,h)anthracene**	53-70-3	0.25	0.0047	<0.25	<0.25
Fluoranthene	206-44-0	280	280	<10	<10
Fluorene	86-73-7	950	280	<10	<10
Naphthalene	91-20-3	15,500	21	<10	<10
Pyrene	129-00-0	210	210	<10	<10
10 LARGEST NON-TARGET PEAKS					
Unknown Carboxylic Acid	--	--	--	87	--
Unknown Semi-Volatile	--	--	--	16-24	10-15
Unknown Alkane	--	--	--	9-14	--

* All results in micrograms per liter (ug/L)

** Analyzed per EPA Method 8310

-- Not Available

<#; i.e. <10 = Below Quantitation Limits (BQL)

Shaded values indicate that the substance was not detected at or above this practical quantitation limit. Therefore, there is no violation of the standard in accordance with NCAC T15A:02L .0202(b)(1).

Note: All samples were analyzed by Paradigm Analytical Laboratories, Inc.

TABLE 4 (Page 2 of 3)

**SUMMARY OF LABORATORY RESULTS - GROUND WATER*
BASE/NEUTRAL AND ACID EXTRACTABLES - EPA METHOD 625/8310
PLUS 10 LARGEST NON-TARGET PEAKS**

**PIT 13
MCAS CHERRY POINT, NORTH CAROLINA**

Sample I.D.	CAS Number	Gross Contamination Levels for Groundwater	NCAC 2L Groundwater Standards	PIT1303GW	PIT1304GW
Date Sampled				9/23/99	9/23/99
ANALYTE					
Anthracene	120-12-7	645	2,100	<10	<10
Benzo(a)anthracene	56-55-3	22	0.05	<10	<10
Benzo(b)fluoranthene**	205-99-2	0.6	0.047	<0.50	<0.50
Benzo(k)fluoranthene**	207-08-9	0.47	0.47	<0.45	<0.45
Benzo(a)pyrene**	50-32-8	1.5	0.0047	<0.63	<0.63
Chrysene**	218-01-9	5	5.0	<0.50	<0.50
Dibenzo(a,h)anthracene**	53-70-3	0.25	0.0047	<0.25	<0.25
Fluoranthene	206-44-0	280	280	<10	<10
Fluorene	86-73-7	950	280	<10	<10
Naphthalene	91-20-3	15,500	21	<10	<10
Pyrene	129-00-0	210	210	<10	<10
10 LARGEST NON-TARGET PEAKS					
Unknown Carboxylic Acid	--	--	--	--	87
Unknown Semi-Volatile	--	--	--	5-6	16-24
Unknown Alkane	--	--	--	--	9-14

* All results in micrograms per liter (ug/L)

** Analyzed per EPA Method 8310

-- Not Available

<#; i.e. <10 = Below Quantitation Limits (BQL)

Shaded values indicate that the substance was not detected at or above this practical quantitation limit. Therefore, there is no violation of the standard in accordance with NCAC T15A:02L .0202(b)(1).

Note: All samples were analyzed by Paradigm Analytical Laboratories, Inc.

TABLE 4 (Page 3 of 3)

**SUMMARY OF LABORATORY RESULTS - GROUND WATER*
BASE/NEUTRAL AND ACID EXTRACTABLES - EPA METHOD 625/8310
PLUS 10 LARGEST NON-TARGET PEAKS**

**PIT 13
MCAS CHERRY POINT, NORTH CAROLINA**

Sample I.D.	CAS Number	Gross Contamination Levels for Groundwater	NCAC 2L Groundwater Standards	PIT1305GW
Date Sampled				9/23/99
ANALYTE				
Anthracene	120-12-7	645	2,100	<10
Benzo(a)anthracene	56-55-3	22	0.05	<10
Benzo(b)fluoranthene**	205-99-2	0.6	0.047	<0.50
Benzo(k)fluoranthene**	207-08-9	0.47	0.47	<0.45
Benzo(a)pyrene**	50-32-8	1.5	0.0047	<0.63
Chrysene**	218-01-9	5	5.0	<0.50
Dibenzo(a,h)anthracene**	53-70-3	0.25	0.0047	<0.25
Fluoranthene	206-44-0	280	280	<10
Fluorene	86-73-7	950	280	<10
Naphthalene	91-20-3	15,500	21	<10
Pyrene	129-00-0	210	210	<10
10 LARGEST NON-TARGET PEAKS				
Unknown Carboxylic Acid	--	--	--	--
Unknown Semi-Volatile	--	--	--	10-15
Unknown Alkane	--	--	--	--

* All results in micrograms per liter (ug/L)

** Analyzed per EPA Method 8310

-- Not Available

<#; i.e. <10 = Below Quantitation Limits (BQL)

Shaded values indicate that the substance was not detected at or above this practical quantitation limit. Therefore, there is no violation of the standard in accordance with NCAC T15A:02L .0202(b)(1).

Note: All samples were analyzed by Paradigm Analytical Laboratories, Inc.

TABLE 5A (Page 1 of 2)

**SUMMARY OF LABORATORY RESULTS - GROUND WATER*
MADEP VPH AND EPH**

**PIT 13
MCAS CHERRY POINT, NORTH CAROLINA**

Sample I.D.	PIT1301GW		PIT1302GW		PIT1303GW	
	VPH (ug/L)	EPH (ug/L)	VPH (ug/L)	EPH (ug/L)	VPH (ug/L)	EPH (ug/L)
Date Sampled	9/29/99		9/23/99		9/23/99	
ANALYTICAL FRACTIONS						
C ₅ - C ₈ Aliphatics	<10	--	<10	--	<10	--
C ₉ - C ₁₂ Aliphatics	<10	--	<10	--	<10	--
C ₉ - C ₁₈ Aliphatics	--	<1	--	<1	--	<1
C ₁₉ - C ₃₆ Aliphatics	--	<1	--	<1	--	<1
C ₉ - C ₁₀ Aromatics	<10	--	<10	--	<10	--
C ₁₁ - C ₂₂ Aromatics	--	<1	--	<1	--	<1

* All results in micrograms per liter (ug/L)

-- Not Applicable

TABLE 5A (Page 2 of 2)

**SUMMARY OF LABORATORY RESULTS - GROUND WATER*
MADEP VPH AND EPH**

**PIT 13
MCAS CHERRY POINT, NORTH CAROLINA**

Sample I.D.	PIT1304GW		PIT1305GW	
	VPH (ug/L)	EPH (ug/L)	VPH (ug/L)	EPH (ug/L)
Date Sampled	9/23/99		9/23/99	
ANALYTICAL FRACTIONS				
C ₅ - C ₈ Aliphatics	<10	--	<10	--
C ₉ - C ₁₂ Aliphatics	<10	--	<10	--
C ₉ - C ₁₈ Aliphatics	--	<1	--	<1
C ₁₉ - C ₃₆ Aliphatics	--	<1	--	<1
C ₉ - C ₁₀ Aromatics	<10	--	<10	--
C ₁₁ - C ₂₂ Aromatics	--	<1	--	<1

* All results in micrograms per liter (ug/L)

-- Not Applicable

TABLE 5B (Page 1 of 2)

**SUMMARY OF LABORATORY RESULTS - GROUND WATER*
AS COMPARED TO NCDENR INTERIM GROUNDWATER QUALITY
STANDARDS**

**PIT 13
MCAS CHERRY POINT, NORTH CAROLINA**

Sample I.D.	Toxicologically Defined Hydrocarbon Fractions	Interim Standard**	PIT1301GW	PIT1302GW	PIT1303GW
Date Sampled			9/29/99	9/23/99	9/23/99
ANALYTICAL FRACTIONS					
C ₅ - C ₈ Aliphatics	C ₅ - C ₈ Aliphatics	420	<10	<10	<10
C ₉ - C ₁₂ Aliphatics C ₉ - C ₁₈ Aliphatics	C ₉ - C ₁₈ Aliphatics	4,200	<11	<11	<11
C ₁₉ - C ₃₆ Aliphatics	C ₁₉ - C ₃₆ Aliphatics	42,000	<1	<1	<1
C ₉ - C ₁₀ Aromatics C ₁₁ - C ₂₂ Aromatics	C ₉ - C ₂₂ Aromatics	210	<11	<11	<11

* Sum of VPH and EPH concentrations in micrograms per liter (ug/L)

** For data comparison, the NCAC T15A 02L Interim Groundwater Quality Standards and EPH results have been converted from parts per million (ppm) to ppb.

TABLE 5B (Page 2 of 2)

**SUMMARY OF LABORATORY RESULTS - GROUND WATER*
AS COMPARED TO NCDENR INTERIM GROUNDWATER QUALITY
STANDARDS**

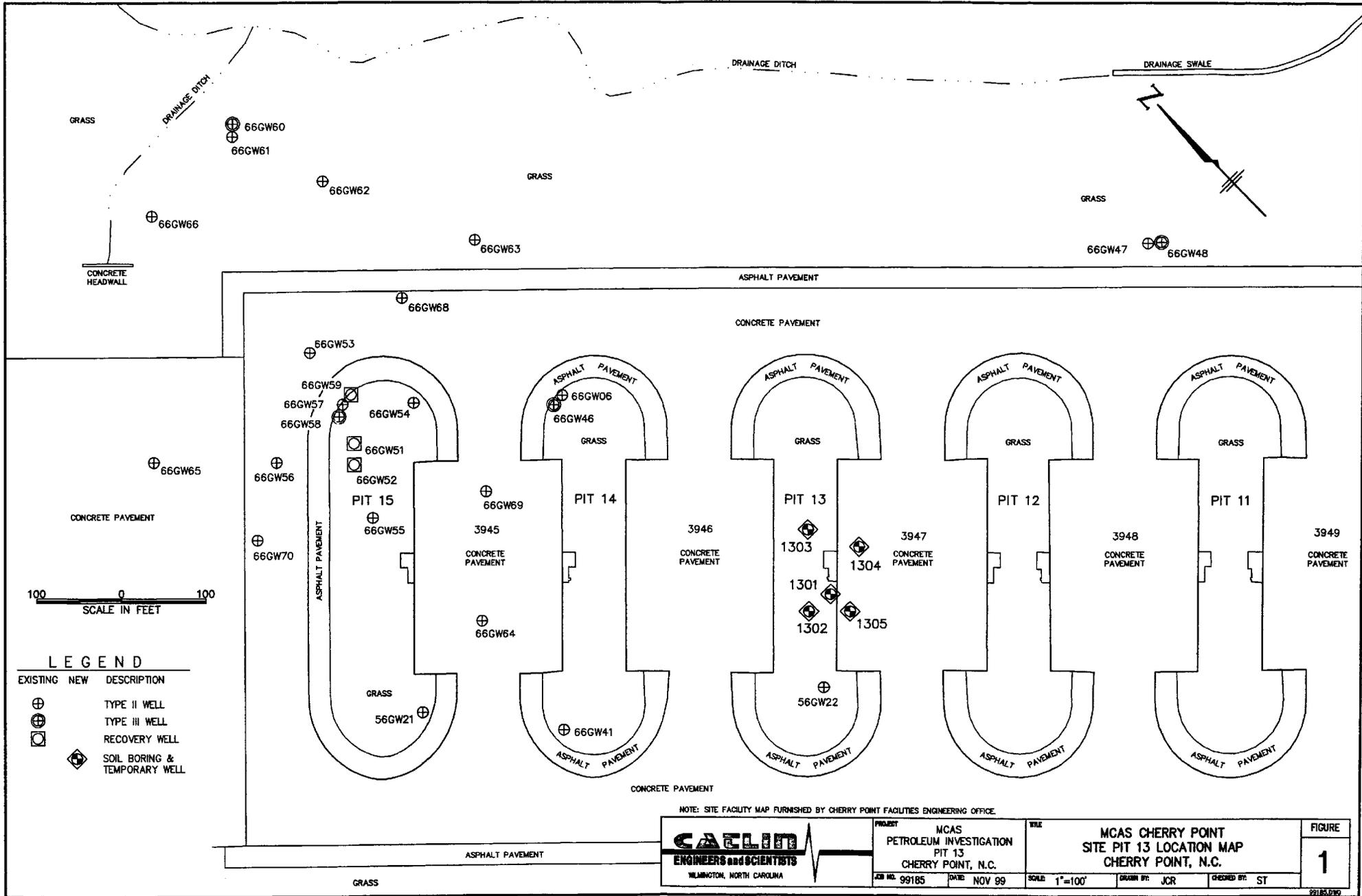
**PIT 13
MCAS CHERRY POINT, NORTH CAROLINA**

Sample I.D.	Toxicologically Defined Hydrocarbon Fractions	Interim Standard**	PIT1304GW	PIT1305GW
Date Sampled			9/23/99	9/23/99
ANALYTICAL FRACTIONS				
C ₅ - C ₈ Aliphatics	C ₅ - C ₈ Aliphatics	420	<10	<10
C ₉ - C ₁₂ Aliphatics C ₉ - C ₁₈ Aliphatics	C ₉ - C ₁₈ Aliphatics	4,200	<11	<11
C ₁₉ - C ₃₆ Aliphatics	C ₁₉ - C ₃₆ Aliphatics	42,000	<1	<1
C ₉ - C ₁₀ Aromatics C ₁₁ - C ₂₂ Aromatics	C ₉ - C ₂₂ Aromatics	210	<11	<11

* Sum of VPH and EPH concentrations in micrograms per liter (ug/L)

** For data comparison, the NCAC T15A 02L Interim Groundwater Quality Standards and EPH results have been converted from parts per million (ppm) to ppb.

FIGURES

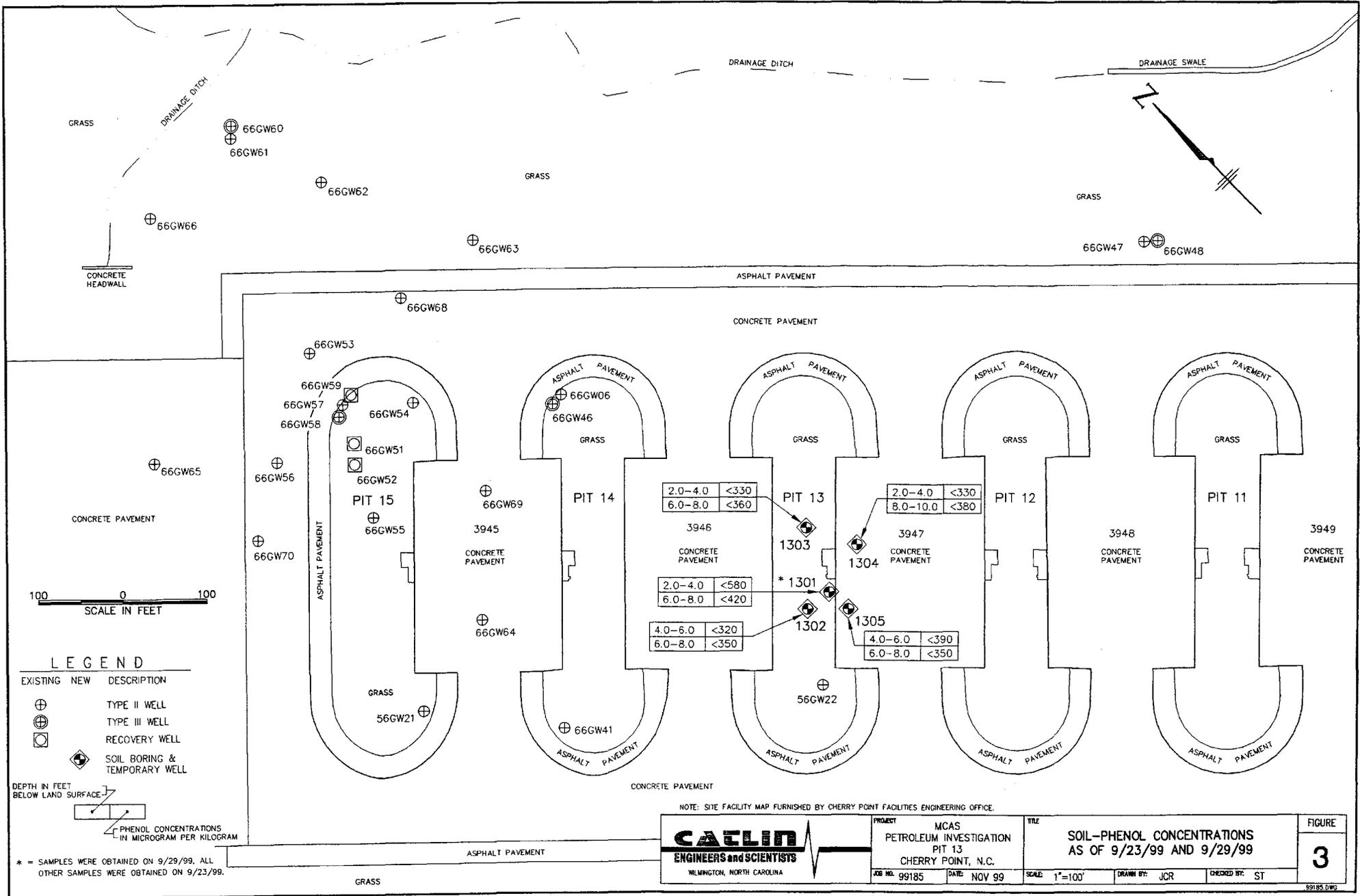


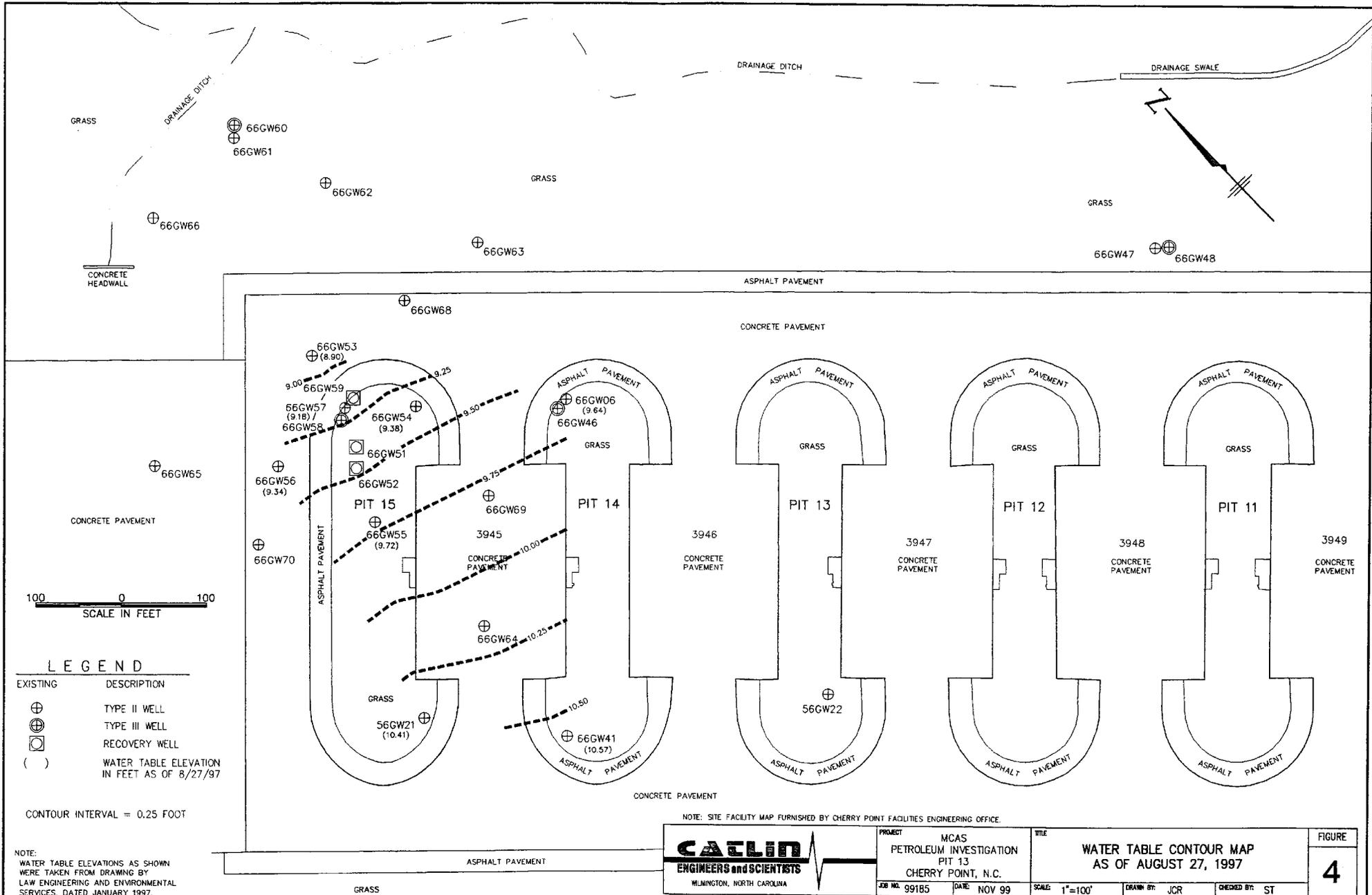
LEGEND

EXISTING	NEW	DESCRIPTION
⊕		TYPE II WELL
⊕		TYPE III WELL
⊕		RECOVERY WELL
⊕		SOIL BORING & TEMPORARY WELL

NOTE: SITE FACILITY MAP FURNISHED BY CHERRY POINT FACILITIES ENGINEERING OFFICE.

 CAELIN ENGINEERS and SCIENTISTS WILMINGTON, NORTH CAROLINA	PROJECT MCAS PETROLEUM INVESTIGATION PIT 13 CHERRY POINT, N.C.	TITLE MCAS CHERRY POINT SITE PIT 13 LOCATION MAP CHERRY POINT, N.C.	FIGURE 1
	JOB NO. 99185	DATE NOV 99	SCALE 1"=100'





NOTE: SITE FACILITY MAP FURNISHED BY CHERRY POINT FACILITIES ENGINEERING OFFICE.

<p>WILMINGTON, NORTH CAROLINA</p>	PROJECT MCAS PETROLEUM INVESTIGATION PIT 13 CHERRY POINT, N.C.	TITLE WATER TABLE CONTOUR MAP AS OF AUGUST 27, 1997	FIGURE 4
	JOB NO. 99185	DATE NOV 99	SCALE 1"=100'

APPENDICES

APPENDIX A

**LIMITED SITE ASSESSMENT RISK CLASSIFICATION
AND LAND USE FORM QUESTIONNAIRE**

Limited Site Assessment Risk Classification and Land Use Form

List of Previous Environmental Reports

This is the first environmental report that directly concerns Pit 13.

Part I - Groundwater/Surface Water/Vapor Impacts

High Risk

1. Has the discharge or release contaminated any water supply well including any used for non-drinking purposes? **YES/NO**
If yes, explain.

The nearest well (Potable Water Supply #3) is located approximately 1,450 feet west-northwest (cross-gradient) of the subject site. Since the surficial ground water at the subject site does not appear to have been adversely impacted by Pit 13 activities, there does not appear to be a risk to deeper aquifers intersected by area supply wells.

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

As stated above in Answer 1., the nearest drinking water supply well is #3, located approximately 1,450 feet west-northwest (cross-gradient) of the subject site.

3. Is a water supply well used for any purpose (e.g., irrigation, washing cars, industrial cooling water, filling swimming pools) located within 250 feet of the source area of the release or discharge? **YES/NO**

4. Does groundwater within 500 feet of the source area of the discharge or release have the potential for future use in that there is no other source of water supply other than the groundwater? **YES/NO**
Explain.

The site and the surrounding 500 feet from the site are on the Marine Corps Air Station. Cherry Point obtains drinking water from a network of supply wells across the Air Station and, therefore, other sources of ground water are available.

5. Do vapors from the discharge or 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? **YES/NO**
If yes, explain.

Results of site subsurface soil analysis for EPA Methods 8260B, 8270, and MADEP EPH/VPH analysis revealed only benzoic acid (760 ug/kg) and phenol (420 to 580 ug/kg) at borehole PIT1301. Review of the current data indicates subsurface soils at Pit 13 are not a potential source for subsurface hydrocarbon vapors.

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? **YES/NO**
If yes, explain.

Pit 13 is an active aircraft refueling station. As long as the equipment is maintained and operated properly, other than an "Act of God" there are no factors that should pose 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**

A review of the Havelock Quadrangle, USGS Topographic Map reveals the nearest body of water is an unnamed branch which drains into Slocum Creek approximately 2,300 feet west of the subject site.

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? **YES/NO**

8. Is the source area of the discharge or release located within a designated wellhead protection area as defined in 42 USC 300h-7(e)? **YES/NO**
If yes, explain.

The EPA has yet to ratify the draft "Wellhead Protection Program" prepared by the NCDENR. In the current draft program provided by MCAS Cherry Point, the subject site is located approximately 950 feet from the closest wellhead protection boundary.

9. Is the discharge or 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**

The site is within Coastal Plain physiographic region.

If yes, is the source area of the discharge or 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**
If yes, explain.

Refer to Section 1, Answer 4.

10. Do the levels of groundwater contamination for any contaminant exceed the gross contamination levels established (See Table 7) by the Department. **YES/NO**

Surficial ground water samples obtained as part of this investigation were analyzed for EPA Methods 602, 625, and MADEP EPH/VPH. Laboratory analysis revealed that site surficial ground water quality is compliant with all applicable GCLs.

Part II - Land Use

Property Containing Source Area of Discharge or 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)? **YES/NO**
Explain.

Pit 13 is part of an aircraft refueling station within the MCAS Cherry Point Flightline Complex.

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

The MCAS Cherry Point Flightline Complex does not include any areas of public assembly.

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? **YES/NO**
Explain.

The subject site is an aircraft refueling station at the MCAS Cherry Point Flightline Complex. The MCAS Cherry Point Flightline Complex includes sub-complexes involved with utility, warehouse, office, and maintenance activities.

4. Do children visit the property? **YES/NO**
Explain.

As an MCAS Flightline Complex refueling station, children should not be allowed to visit the site. Any children that happen to visit the site should be accompanied by a parent or guardian.

5. Is access to the property reliably restricted consistent with its use (e.g., fences, security personnel or both)? **YES/NO**
Explain.

Site restrictions and security are typical for a MCAS Flightline Complex.

6. Do pavement, buildings, or other structures cap the contaminated soil? **YES/NO**
Explain.

If yes, what mechanisms are in place or can be put into place to ensure that the contaminated soil will remain capped in the foreseeable future?

Low Risk - A low risk classification means that the risk posed by the discharge or release does not meet any of the high or intermediate risk criteria or that, based on site-specific information, the release is shown to pose no significant risk.

7. What is the zoning status of the property?

MCAS Cherry Point is not subject to local, city, or county zoning requirements. However, the site is located within an area developed for Military Aircraft Flightline.

8. Is the use of the property likely to change in the next 20 years? YES/NO
Explain.

The current use of this facility is unlikely to change within the foreseeable future.

Property Surrounding Source Area of Discharge or Release

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

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

The nearest temporary housing zone is approximately 4,100 feet southwest of the subject site.

12. 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?

A review of MCAS maps and aerial photographs reveal no evidence of any places of public assembly within 1,500 feet of the subject site.

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

Refer to Section II, Answer 7.

14. Briefly characterize the use and activities of the land in the surrounding area.

Pit 13 is part of an aircraft refueling station within the MCAS Cherry Point Flightline Complex. The surrounding area consists of military aircraft maintenance and operation facilities.

APPENDIX B
BORING LOGS

BORING LOG

BORING NUMBER 1304
 TOTAL DEPTH 16.0'

SITE LOCATION PIT 13
MCAS Cherry Point, North Carolina

DRILLED BY B. Miller
 LOGGED BY G. McSmith

DRILLING DATE 9/23/99

SAMPLE DEPTH (FT.)		SAMPLE DESCRIPTION	USCS	WATER CONTENT	ODOR	PID/FID PPM	BLOW COUNT
0	2	Concrete (8 inches) with crushed stone sub-base.	--	Dry	No	2	--
2	4	Gray/brown SANDY SILT.	OL	Dry	No	360	--
4	6	Tan SANDY CLAY.	OH	Dry	No	2	--
6	8	Tan/orange SANDY CLAY.	OH	Dry	No	<1	--
8	10	Tan/orange SANDY CLAY.	OH	Dry	No	<1	--
10	12	Tan/orange SANDY CLAY.	OH	Capillary Fringe	No	<1	--
12	14	Tan/orange SANDY CLAY.	OH	Wet	No	3	--
14	16	Tan/orange SANDY CLAY.	OH	Wet	No	3	--
		<u>Laboratory I.D.</u> <u>Sample Depth</u>					
		PIT1304-15 2.0' - 4.0'					
		PIT1304-25 8.0' - 10.0'					

REMARKS Depth to Water Table = ±11' BLS

PAGE 1 OF 1

APPENDIX C
LABORATORY ANALYTICAL RESULTS

RECEIVED
DATE 11/2/99

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

Mr. Steve Tyler
Richard Catlin & Assoc. Inc.
P.O. BOX 10279
Wilmington, NC 28405

Date 10-29-99

Report Number: G128-503

Project ID: Pit 13 - 99185

Re: Lower Detection Limits for PAH's

Dear Mr. Tyler:

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 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 service projects. We look forward to working with you again on any additional needs which you may have.

Sincerely,

Paradigm Analytical Laboratories

Laboratory Director
Mark Randall

**Results for Polyaromatic Hydrocarbons
by EPA 8310**

Client Sample ID: Pit 1301-GW
Client Project ID: 99185-F
Lab Sample ID: 73347
Lab Project ID: G128-506
Matrix: Water

Date Analyzed: 10/26/99
Analyzed By: JPW
Date Collected: 9/29/99
Date Received: 10/4/99
Dilution: 1.0

Compound	Quantitation Limit (ug/L)	Result (ug/L)
Benzo[a]pyrene	0.63	BQL
Benzo[b]fluoranthene	0.50	BQL
Benzo[k]fluoranthene	0.45	BQL
Chrysene	0.50	BQL
Dibenzo[a,h]anthracene	0.25	BQL

Comments:

BQL = Below Quantitation Limit

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Polyaromatic Hydrocarbons
by EPA 8310

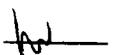
Client Sample ID: Pit 1302 GW
Client Project ID: Pit 13-99185
Lab Sample ID: 72970
Lab Project ID: G128-503
Matrix: Water

Date Analyzed: 10/26/99
Analyzed By: JPW
Date Collected: 9/23/99
Date Received: 9/24/99
Dilution: 1.0

Compound	Quantitation Limit (ug/L)	Result (ug/L)
Benzo[a]pyrene	0.63	BQL
Benzo[b]fluoranthene	0.50	BQL
Benzo[k]fluoranthene	0.45	BQL
Chrysene	0.50	BQL
Dibenzo[a,h]anthracene	0.25	BQL

Comments:

BQL = Below Quantitation Limit

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Polyaromatic Hydrocarbons

by EPA 8310

Client Sample ID: Pit 1304 GW
Client Project ID: Pit 13-99185
Lab Sample ID: 72972
Lab Project ID: G128-503
Matrix: Water

Date Analyzed: 10/26/99
Analyzed By: JPW
Date Collected: 9/23/99
Date Received: 9/24/99
Dilution: 1.0

Compound	Quantitation Limit (ug/L)	Result (ug/L)
Benzo[a]pyrene	0.63	BQL
Benzo[b]fluoranthene	0.50	BQL
Benzo[k]fluoranthene	0.45	BQL
Chrysene	0.50	BQL
Dibenzo[a,h]anthracene	0.25	BQL

Comments:

BQL = Below Quantitation Limit

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Polyaromatic Hydrocarbons
by EPA 8310

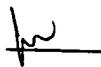
Client Sample ID: Pit 1305 GW
Client Project ID: Pit 13-99185
Lab Sample ID: 72973
Lab Project ID: G128-503
Matrix: Water

Date Analyzed: 10/26/99
Analyzed By: JPW
Date Collected: 9/23/99
Date Received: 9/24/99
Dilution: 1.0

Compound	Quantitation Limit (ug/L)	Result (ug/L)
Benzo[a]pyrene	0.63	BQL
Benzo[b]fluoranthene	0.50	BQL
Benzo[k]fluoranthene	0.45	BQL
Chrysene	0.50	BQL
Dibenzo[a,h]anthracene	0.25	BQL

Comments:

BQL = Below Quantitation Limit

Reviewed By: 

RECEIVED
BY *AS* DATE 11/2/99

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

Mr. Steve Tyler
Richard Catlin & Assoc. Inc.
P.O. BOX 10279
Wilmington, NC 28405

Date 10-29-99

Report Number: G128-506

Project ID: 99185-F

Dear Mr. Tyler:

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 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 service projects. We look forward to working with you again on any additional needs which you may have.

Sincerely,

Paradigm Analytical Laboratories

Laboratory Director
Mark Randall

PARADIGM ANALYTICAL LABORATORIES, INC.

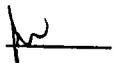
Results for Polyaromatic Hydrocarbons
by EPA 8310

Client Sample ID:	Pit 1301-GW	Date Analyzed:	10/26/99
Client Project ID:	99185-F	Analyzed By:	JPW
Lab Sample ID:	73347	Date Collected:	9/29/99
Lab Project ID:	G128-506	Date Received:	10/4/99
Matrix:	Water	Dilution:	1.0

Compound	Quantitation Limit (ug/L)	Result (ug/L)
Benzo[a]pyrene	0.63	BQL
Benzo[b]fluoranthene	0.50	BQL
Benzo[k]fluoranthene	0.45	BQL
Chrysene	0.50	BQL
Dibenzo[a,h]anthracene	0.25	BQL

Comments:

BQL = Below Quantitation Limit

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GCMS 8260B

Client Sample ID: Pit 1301-1S

Client Project ID: 99185-F

Lab Sample ID: 73345

Lab Project ID: G128-506

Matrix: Soil

%Solids: 85.6

Date Analyzed: 10/9/99

Analyzed By: RNP

Date Collected: 9/29/99

Date Received: 10/4/99

Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Acetone	58	BQL
Acrolein	120	BQL
Acrylonitrile	120	BQL
Benzene	5.8	BQL
Bromobenzene	5.8	BQL
Bromochloromethane	5.8	BQL
Bromodichloromethane	5.8	BQL
Bromoform	5.8	BQL
Bromomethane	5.8	BQL
2-Butanone	29	BQL
n-Butylbenzene	5.8	BQL
sec-Butylbenzene	5.8	BQL
tert-Butylbenzene	5.8	BQL
Carbon disulfide	5.8	BQL
Carbon tetrachloride	5.8	BQL
Chlorobenzene	5.8	BQL
Chloroethane	5.8	BQL
2-Chloroethyl vinyl ether	5.8	BQL
Chloroform	5.8	BQL
Chloromethane	5.8	BQL
2-Chlorotoluene	5.8	BQL
4-Chlorotoluene	5.8	BQL
Dibromochloromethane	5.8	BQL
1,2-Dibromo-3-chloropropane	5.8	BQL
Dibromomethane	5.8	BQL
1,2-Dibromoethane (EDB)	5.8	BQL
1,2-Dichlorobenzene	5.8	BQL
1,3-Dichlorobenzene	5.8	BQL
1,4-Dichlorobenzene	5.8	BQL
trans-1,4-Dichloro-2-butene	5.8	BQL
1,1-Dichloroethane	5.8	BQL
1,1-Dichloroethene	5.8	BQL
1,2-Dichloroethane	5.8	BQL
cis-1,2-Dichloroethene	5.8	BQL
trans-1,2-dichloroethene	5.8	BQL
1,2-Dichloropropane	5.8	BQL
1,3-Dichloropropane	5.8	BQL
2,2-Dichloropropane	5.8	BQL
1,1-Dichloropropene	5.8	BQL
cis-1,3-Dichloropropene	5.8	BQL
trans-1,3-Dichloropropene	5.8	BQL
Dichlorodifluoromethane	5.8	BQL
Diisopropyl ether (DIPE)	5.8	BQL
Ethylbenzene	5.8	BQL
Hexachlorobutadiene	5.8	BQL
2-Hexanone	5.8	BQL
Iodomethane	5.8	BQL
Isopropylbenzene	5.8	BQL

Reviewed by: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GCMS 8260B

Client Sample ID: Pit 1301-1S

Client Project ID: 99185-F

Lab Sample ID: 73345

Lab Project ID: G128-506

Matrix: Soil

%Solids: 85.6

Date Analyzed: 10/9/99

Analyzed By: RNP

Date Collected: 9/29/99

Date Received: 10/4/99

Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
4-Isopropyltoluene	5.8	BQL
Methylene chloride	23	BQL
4-Methyl-2-pentanone	5.8	BQL
Methyl-tert-butyl ether (MTBE)	5.8	BQL
Naphthalene	5.8	BQL
n-Propyl benzene	5.8	BQL
Styrene	5.8	BQL
1,1,1,2-Tetrachloroethane	5.8	BQL
1,1,2,2-Tetrachloroethane	5.8	BQL
Tetrachloroethene	5.8	BQL
Toluene	5.8	BQL
1,2,3-Trichlorobenzene	5.8	BQL
1,2,4-Trichlorobenzene	5.8	BQL
Trichloroethene	5.8	BQL
1,1,1-Trichloroethane	5.8	BQL
1,1,2-Trichloroethane	5.8	BQL
Trichlorofluoromethane	5.8	BQL
1,2,3-Trichloropropane	5.8	BQL
1,2,4-Trimethylbenzene	5.8	BQL
1,3,5-Trimethylbenzene	5.8	BQL
Vinyl chloride	5.8	BQL
m-,p-Xylene	12	BQL
o-Xylene	5.8	BQL

Surrogate Spike Recoveries

Compound	Spike Added (ug/KG)	Surrogate Result (ug/KG)	%Rec
Bromofluorobenzene	50	47.2	94
1,2-Dichloroethane-d4	50	53.6	107
Toluene-d8	50	50.0	100

Comments:

All results are corrected for dilution.

Reviewed by:

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GCMS 8260B

Client Sample ID: Pit 1301-2S

Client Project ID: 99185-F

Lab Sample ID: 73346

Lab Project ID: G128-506

Matrix: Soil

%Solids: 83.5

Date Analyzed: 10/9/99

Analyzed By: RNP

Date Collected: 9/29/99

Date Received: 10/4/99

Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Acetone	60	BQL
Acrolein	120	BQL
Acrylonitrile	120	BQL
Benzene	6	BQL
Bromobenzene	6	BQL
Bromochloromethane	6	BQL
Bromodichloromethane	6	BQL
Bromoform	6	BQL
Bromomethane	6	BQL
2-Butanone	30	BQL
n-Butylbenzene	6	BQL
sec-Butylbenzene	6	BQL
tert-Butylbenzene	6	BQL
Carbon disulfide	6	BQL
Carbon tetrachloride	6	BQL
Chlorobenzene	6	BQL
Chloroethane	6	BQL
2-Chloroethyl vinyl ether	6	BQL
Chloroform	6	BQL
Chloromethane	6	BQL
2-Chlorotoluene	6	BQL
4-Chlorotoluene	6	BQL
Dibromochloromethane	6	BQL
1,2-Dibromo-3-chloropropane	6	BQL
Dibromomethane	6	BQL
1,2-Dibromoethane (EDB)	6	BQL
1,2-Dichlorobenzene	6	BQL
1,3-Dichlorobenzene	6	BQL
1,4-Dichlorobenzene	6	BQL
trans-1,4-Dichloro-2-butene	6	BQL
1,1-Dichloroethane	6	BQL
1,1-Dichloroethene	6	BQL
1,2-Dichloroethane	6	BQL
cis-1,2-Dichloroethene	6	BQL
trans-1,2-dichloroethene	6	BQL
1,2-Dichloropropane	6	BQL
1,3-Dichloropropane	6	BQL
2,2-Dichloropropane	6	BQL
1,1-Dichloropropene	6	BQL
cis-1,3-Dichloropropene	6	BQL
trans-1,3-Dichloropropene	6	BQL
Dichlorodifluoromethane	6	BQL
Diisopropyl ether (DIPE)	6	BQL
Ethylbenzene	6	BQL
Hexachlorobutadiene	6	BQL
2-Hexanone	6	BQL
Iodomethane	6	BQL
Isopropylbenzene	6	BQL

Reviewed by: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GCMS 8260B

Client Sample ID: Pit 1301-2S

Client Project ID: 99185-F

Lab Sample ID: 73346

Lab Project ID: G128-506

Matrix: Soil

%Solids: 83.5

Date Analyzed: 10/9/99

Analyzed By: RNP

Date Collected: 9/29/99

Date Received: 10/4/99

Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
4-Isopropyltoluene	6	BQL
Methylene chloride	24	BQL
4-Methyl-2-pentanone	6	BQL
Methyl-tert-butyl ether (MTBE)	6	BQL
Naphthalene	6	BQL
n-Propyl benzene	6	BQL
Styrene	6	BQL
1,1,1,2-Tetrachloroethane	6	BQL
1,1,2,2-Tetrachloroethane	6	BQL
Tetrachloroethene	6	BQL
Toluene	6	BQL
1,2,3-Trichlorobenzene	6	BQL
1,2,4-Trichlorobenzene	6	BQL
Trichloroethene	6	BQL
1,1,1-Trichloroethane	6	BQL
1,1,2-Trichloroethane	6	BQL
Trichlorofluoromethane	6	BQL
1,2,3-Trichloropropane	6	BQL
1,2,4-Trimethylbenzene	6	BQL
1,3,5-Trimethylbenzene	6	BQL
Vinyl chloride	6	BQL
m-,p-Xylene	12	BQL
o-Xylene	6	BQL

Surrogate Spike Recoveries	Spike Added (ug/KG)	Surrogate Result (ug/KG)	%Rec
Compound			
Bromofluorobenzene	50	47.7	95
1,2-Dichloroethane-d4	50	51.2	102
Toluene-d8	50	50.1	100

Comments:

All results are corrected for dilution.

Reviewed by: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Semivolatiles
by GCMS 8270

Client Sample ID: Pit 1301-1S

Client Project ID: 99185-F

Lab Sample ID: 73345

Lab Project ID: G128-506

Matrix: Soil

%Solids: 85.6

Date Collected: 9/29/99

Date Received: 10/4/99

Date Analyzed: 10/7/99

Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Acenaphthene	350	BQL
Acenaphthylene	350	BQL
Anthracene	350	BQL
Benzo[a]anthracene	350	BQL
Benzo[a]pyrene	350	BQL
Benzo[b]fluoranthene	350	BQL
Benzo[g,h,i]perylene	350	BQL
Benzo[k]fluoranthene	350	BQL
Benzoic Acid	710	760
Bis(2-chloroethoxy)methane	350	BQL
Bis(2-chloroethyl)ether	350	BQL
Bis(2-chloroisopropyl)ether	350	BQL
Bis(2-ethylhexyl)phthalate	350	BQL
4-bromophenyl phenyl ether	350	BQL
Butylbenzylphthalate	350	BQL
4-Chloroaniline	350	BQL
4-Chloro-3-methylphenol	350	BQL
2-Chloronaphthalene	350	BQL
2-Chlorophenol	350	BQL
4-Chlorophenyl phenyl ether	350	BQL
Chrysene	350	BQL
Di-n-Butylphthalate	350	BQL
Di-n-octylphthalate	350	BQL
Dibenzo[a,h]anthracene	350	BQL
Dibenzofuran	350	BQL
1,2-Dichlorobenzene	350	BQL
1,3-Dichlorobenzene	350	BQL
1,4-Dichlorobenzene	350	BQL
3,3'-Dichlorobenzidine	710	BQL
2,4-Dichlorophenol	350	BQL
Diethylphthalate	350	BQL
2,4-Dimethylphenol	350	BQL
Dimethylphthalate	350	BQL
4,6-Dinitro-2-methylphenol	1800	BQL
2,4-Dinitrophenol	1800	BQL
2,4-Dinitrotoluene	350	BQL
2,6-Dinitrotoluene	350	BQL
Fluoranthene	350	BQL
Fluorene	350	BQL
Hexachlorobenzene	350	BQL

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Semivolatiles
by GCMS 8270

Client Sample ID: Pit 1301-1S
Client Project ID: 99185-F
Lab Sample ID: 73345
Lab Project ID: G128-506

Date Collected: 9/29/99
Date Received: 10/4/99
Date Analyzed: 10/7/99
Dilution: 1

Matrix: Soil %Solids: 85.6

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Hexachlorobutadiene	350	BQL
Hexachlorocyclopentadiene	710	BQL
Hexachloroethane	350	BQL
Indeno(1,2,3-c,d)pyrene	350	BQL
Isophorone	350	BQL
2-Methylnaphthalene	350	BQL
2-Methylphenol	350	BQL
4-Methylphenol	350	BQL
N-Nitrosodi-n-propylamine	350	BQL
N-Nitrosodiphenylamine	350	BQL
Naphthalene	350	BQL
2-Nitroaniline	350	BQL
3-Nitroaniline	350	BQL
4-Nitroaniline	350	BQL
Nitrobenzene	350	BQL
2-Nitrophenol	350	BQL
4-Nitrophenol	1800	BQL
Pentachlorophenol	1800	BQL
Phenanthrene	350	BQL
Phenol	350	580
Pyrene	350	BQL
1,2,4-Trichlorobenzene	350	BQL
2,4,5-Trichlorophenol	350	BQL
2,4,6-Trichlorophenol	350	BQL

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovered
2,4,6-Tribromophenol	10	7.2	72
2-Fluorobiphenyl	10	7.5	75
2-Fluorophenol	10	9.6	96
4-Terphenyl-d14	10	8.5	85
Nitrobenzene-d5	10	7.8	78
Phenol-d6	10	10	100

Comments:

Results are corrected for %solids and dilution where applicable.

Analyzed By: MRC

Flags:

BQL = Below Quantitation Limit.

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Semivolatiles
by GCMS 8270

Client Sample ID: Pit 1301-2S
Client Project ID: 99185-F
Lab Sample ID: 73346
Lab Project ID: G128-506
Matrix: Soil

Date Collected: 9/29/99
Date Received: 10/4/99
Date Analyzed: 10/7/99
Dilution: 1

%Solids: 83.5

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Acenaphthene	370	BQL
Acenaphthylene	370	BQL
Anthracene	370	BQL
Benzo[a]anthracene	370	BQL
Benzo[a]pyrene	370	BQL
Benzo[b]fluoranthene	370	BQL
Benzo[g,h,i]perylene	370	BQL
Benzo[k]fluoranthene	370	BQL
Benzoic Acid	740	BQL
Bis(2-chloroethoxy)methane	370	BQL
Bis(2-chloroethyl)ether	370	BQL
Bis(2-chloroisopropyl)ether	370	BQL
Bis(2-ethylhexyl)phthalate	370	BQL
4-bromophenyl phenyl ether	370	BQL
Butylbenzylphthalate	370	BQL
4-Chloroaniline	370	BQL
4-Chloro-3-methylphenol	370	BQL
2-Chloronaphthalene	370	BQL
2-Chlorophenol	370	BQL
4-Chlorophenyl phenyl ether	370	BQL
Chrysene	370	BQL
Di-n-Butylphthalate	370	BQL
Di-n-octylphthalate	370	BQL
Dibenzo[a,h]anthracene	370	BQL
Dibenzofuran	370	BQL
1,2-Dichlorobenzene	370	BQL
1,3-Dichlorobenzene	370	BQL
1,4-Dichlorobenzene	370	BQL
3,3'-Dichlorobenzidine	740	BQL
2,4-Dichlorophenol	370	BQL
Diethylphthalate	370	BQL
2,4-Dimethylphenol	370	BQL
Dimethylphthalate	370	BQL
4,6-Dinitro-2-methylphenol	1800	BQL
2,4-Dinitrophenol	1800	BQL
2,4-Dinitrotoluene	370	BQL
2,6-Dinitrotoluene	370	BQL
Fluoranthene	370	BQL
Fluorene	370	BQL
Hexachlorobenzene	370	BQL

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Semivolatiles

by GCMS 8270

Client Sample ID: Pit 1301-2S

Client Project ID: 99185-F

Lab Sample ID: 73346

Lab Project ID: G128-506

Matrix: Soil

%Solids: 83.5

Date Collected: 9/29/99

Date Received: 10/4/99

Date Analyzed: 10/7/99

Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Hexachlorobutadiene	370	BQL
Hexachlorocyclopentadiene	740	BQL
Hexachloroethane	370	BQL
Indeno(1,2,3-c,d)pyrene	370	BQL
Isophorone	370	BQL
2-Methylnaphthalene	370	BQL
2-Methylphenol	370	BQL
4-Methylphenol	370	BQL
N-Nitrosodi-n-propylamine	370	BQL
N-Nitrosodiphenylamine	370	BQL
Naphthalene	370	BQL
2-Nitroaniline	370	BQL
3-Nitroaniline	370	BQL
4-Nitroaniline	370	BQL
Nitrobenzene	370	BQL
2-Nitrophenol	370	BQL
4-Nitrophenol	1800	BQL
Pentachlorophenol	1800	BQL
Phenanthrene	370	BQL
Phenol	370	420
Pyrene	370	BQL
1,2,4-Trichlorobenzene	370	BQL
2,4,5-Trichlorophenol	370	BQL
2,4,6-Trichlorophenol	370	BQL

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovered
2,4,6-Tribromophenol	10	7	70
2-Fluorobiphenyl	10	7.8	78
2-Fluorophenol	10	9.3	93
4-Terphenyl-d14	10	10.2	102
Nitrobenzene-d5	10	7.6	76
Phenol-d6	10	9.3	93

Comments:

Results are corrected for %solids and dilution where applicable.

Analyzed By: MRC

Flags:

BQL = Below Quantitation Limit.

Reviewed By: 

EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Richard Catlin & Associates

Project Name: 99185-F

Sample Information and Analytical Results	
Sample Identification	Pit 1301-2S
Sample Matrix	Soil
Date Collected	09/29/99
Date Received	10/04/99
Date Extracted	10/07/99
Date Analyzed	10/11/99
Dry Weight	83.5
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	100
Aromatic Surrogate % Recovery	110

Comments:

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

EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Richard Catlin & AssociatesProject Name: 99185-F

Sample Information and Analytical Results	
Sample Identification	Pit 1301-GW
Sample Matrix	Water
Date Collected	09/29/99
Date Received	10/04/99
Date Extracted	10/07/99
Date Analyzed	10/11/99
Dry Weight	
Dilution Factor	1
C ₉ -C ₁₈ Aliphatics*	< 1 (µg/mL)
C ₁₉ -C ₃₆ Aliphatics*	< 1 (µg/mL)
C ₁₁ -C ₂₂ Aromatics*	< 1 (µg/mL)
Aliphatic Surrogate % Recovery	100
Aromatic Surrogate % Recovery	120

Comments:

* = Excludes any surrogates or internal standards.

Sample did not require fractionation.

PARADIGM ANALYTICAL LABORATORIES, INC.

Attachment 3

EPH Laboratory Reporting Form

Calibration and QA/QC Information

Initial Calibration Date: 09/19/99

Calibration Ranges and Limits

Range	MDL		ML		RL	
	($\mu\text{g/mL}$)	(mg/Kg)	($\mu\text{g/mL}$)	(mg/Kg)	($\mu\text{g/mL}$)	(mg/Kg)
C ₉ -C ₁₈ Aliphatics	0.1	2	0.3	6.5	1	10
C ₁₉ -C ₃₈ Aliphatics	0.1	1	0.3	3.1	1	10
C ₁₁ -C ₂₂ Aromatics	0.2	2.5	0.6	8	1	10

Calibration Concentration Levels

Range	Levels		%RSD or CCC	Method of Quantitation
	($\mu\text{g/mL}$)	(mg/Kg)		
C ₉ -C ₁₈ Aliphatics	0.6	10	6.10	Calibration Factor
	1.5	25		
	3	50		
	6	100		
	12	200		
C ₁₉ -C ₃₈ Aliphatics	0.8	13.3	6.6	Calibration Factor
	2	33.3		
	4	66.7		
	8	133		
	16	267		
C ₁₁ -C ₂₂ Aromatics	1.2	20	4.9	Calibration Factor
	3	50		
	6	100		
	12	200		
	24	400		

Calibration Check Date: 10/11/99

Calibration Check

Range	Levels		RPD
	($\mu\text{g/mL}$)	(mg/Kg)	
C ₉ -C ₁₈ Aliphatics	6	100	8.1
C ₁₉ -C ₃₈ Aliphatics	8	133	-19.5
C ₁₁ -C ₂₂ Aromatics	12	200	24.8

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

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

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & AssociatesProject Name: 99185-F

Sample Information and Analytical Results	
Sample Identification	Pit 1301-1S
Sample Matrix	Soil
Collection Option (for Soil)*	3
Date Collected	09/29/99
Date Received	10/04/99
Date Extracted	09/29/99
Date Analyzed	10/07/99
Dry Weight	86
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 500 (µg/Kg)
C ₉ -C ₁₂ Aliphatics**	< 500 (µg/Kg)
C ₉ -C ₁₀ Aromatics**	< 500 (µg/Kg)
Surrogate % Recovery - PID	94
Surrogate % Recovery - FID	95

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

** = Excludes any surrogates or internal standards.

Lab Info: G128-506-73345

Reviewed By: 

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

Project Name: 99185-F

Sample Information and Analytical Results	
Sample Identification	Pit 1301-2S
Sample Matrix	Soil
Collection Option (for Soil)*	3
Date Collected	09/29/99
Date Received	10/04/99
Date Extracted	09/29/99
Date Analyzed	10/07/99
Dry Weight	84
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 500 (µg/Kg)
C ₉ -C ₁₂ Aliphatics**	< 500 (µg/Kg)
C ₉ -C ₁₀ Aromatics**	< 500 (µg/Kg)
Surrogate % Recovery - PID	94
Surrogate % Recovery - FID	93

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

** = Excludes any surrogates or internal standards.

Lab Info: G128-506-73346

Reviewed By:

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

Project Name: 99185-F

Sample Information and Analytical Results	
Sample Identification	Pit 1301-GW
Sample Matrix	Water
Collection Option (for Soil)*	
Date Collected	09/29/99
Date Received	10/04/99
Date Extracted	10/07/99
Date Analyzed	10/07/99
Dry Weight	
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 10 (µg/L)
C ₉ -C ₁₂ Aliphatics**	< 10 (µg/L)
C ₉ -C ₁₀ Aromatics**	< 10 (µg/L)
Surrogate % Recovery - PID	97
Surrogate % Recovery - FID	97

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

** = Excludes any surrogates or internal standards.

Lab Info: G128-506-73347

Reviewed By: pc

Attachment 2

VPH Laboratory Reporting Form

Calibration and QA/QC Information

FID Initial Calibration Date: 10/06/99 PID Initial Calibration Date: 10/06/99

Calibration Ranges and Limits

Range	MDL		ML		RL	
	(µg/L)	(µg/Kg)	(µg/L)	(µg/Kg)	(µg/L)	(µg/Kg)
C ₅ -C ₈ Aliphatics	2.4	120	7.5	380	10	500
C ₉ -C ₁₂ Aliphatics	1.3	65	4.0	210	10	500
C ₉ -C ₁₀ Aromatics	0.5	25	1.6	80	10	500

Calibration Concentration Levels

Range	Levels		%RSD or CCC	Method of Quantitation
	(µg/L)	(µg/Kg)		
C ₅ -C ₈ Aliphatics	40	2000	0.9	Linear Regression
	160	8000		
	400	20000		
	1600	80000		
	4000	200000		
C ₉ -C ₁₂ Aliphatics	30	1500	0.613	Linear Regression
	120	6000		
	300	15000		
	1200	60000		
	3000	150000		
C ₉ -C ₁₀ Aromatics	65	3250	0.919	Linear Regression
	260	13000		
	650	32500		
	2600	130000		
	6500	325000		

Calibration Check Date: 10/06/99

Calibration Check

Range	Levels		RPD
	(µg/L)	(µg/Kg)	
C ₅ -C ₈ Aliphatics	400	20000	-1.4
C ₉ -C ₁₂ Aliphatics	300	15000	-5.1
C ₉ -C ₁₀ Aromatics	650	32500	0.5

MDL = Method Detection Limit

ML = Minimum Limit

RL = Reportable Limit

RPD = Relative Percent Difference

%RSD = Percent Relative Standard Deviation

CCC = Correlation Coefficient of Curve

Reviewed By: W

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Inorganics

Client Sample ID: Pit 1301-GW
Client Project ID: 99185-F
Lab Sample ID: 73347
Lab Project ID: G128-506

Analyzed By: JMF
Date Collected: 9/29/99
Date Received: 10/4/99
Matrix: Water

Metals	Result	Quantitation Limit	Units	Procedure	Date Analyzed
Lead	BQL	0.0100	MG/L	6010B	10/12/99

Comments

BQL = Below Quantitation Limits

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GC 602

Client Sample ID: Pit 1301-GW
 Client Project ID: 99185-F
 Lab Sample ID: 73347
 Lab Project ID: G128-506

Analyzed By: EKR
 Date Collected: 9/29/99
 Date Received: 10/4/99
 Matrix: Water

Compound	Date Analyzed	Dilution	Quantitation Limit (ug/L)	Result (ug/L)
Benzene	10/7/99	1	1	BQL
Diisopropyl ether (DIPE)	10/7/99	1	1	BQL
Ethylbenzene	10/7/99	1	1	2
Methyl-tert-butyl ether (MTBE)	10/7/99	1	2	BQL
Toluene	10/7/99	1	1	BQL
m/p-Xylene	10/7/99	1	2	3
o-Xylene	10/7/99	1	2	3

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovered
Trifluorotoluene	40	41	103

Comments:

All values corrected for dilution.

Flags:

BQL = Below quantitation limit

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Semivolatiles
by GCMS EPA 625

Client Sample ID: Pit 1301-GW
Client Project ID: 99185-F
Lab Sample ID: 73347
Lab Project ID: G128-506
Matrix: Water

Date Collected: 9/29/99
Date Received: 10/4/99
Date Analyzed: 10/7/99
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	BQL
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 EPA 625

Client Sample ID: Pit 1301-GW
Client Project ID: 99185-F
Lab Sample ID: 73347
Lab Project ID: G128-506
Matrix: Water

Date Collected: 9/29/99
Date Received: 10/4/99
Date Analyzed: 10/7/99
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
2,4,6-Tribromophenol	10	10.7	107
2-Fluorobiphenyl	10	9.5	95
2-Fluorophenol	10	10	100
4-Terphenyl-d14	10	10.1	101
Nitrobenzene-d5	10	9.1	91
Phenol-d6	10	11.5	115

Comments:

Results are corrected for %solids and dilution where applicable.

Analyzed By: MRC

Flags:

BQL = Below Quantitation Limit.

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results of Library Search
for Semivolatile Compounds

by GCMS

Client Sample ID: Pit 1301-GW

Client Project ID: 99185-F

Lab Sample ID: 73347

Lab Project ID: G128-506

Matrix: Water

Date Analyzed: 10/7/99

Analyzed By: MRC

Date Collected: 9/29/99

Date Received: 10/4/99

Dilution: 1.0

Num.	Compound	CAS#	Match Probability	Result (ug/L)
1	Unknown Carboxylic Acid			87
2	Unknown			24
3	Unknown			16
4	Unknown			16
5	Unknown Alkane			14
6	Unknown Alkane			12
7	Unknown Alkane			12
8	Unknown Alkane			10
9	Unknown Alkane			9
10	Unknown			

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 height 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 height is equal to or greater than 10% of that of the nearest internal standard. Quantitation provided is an estimate.

Reviewed by: 

Client: CATUN

Project ID: 99185 F

Date: 10-4-99

Report To: CATUN

Address: 220 OLD DAIRY

P.O. Number: 9100499-1

Turnaround: 10 DAY

S. TYLER

Address: _____

Contact: GARY McSWAIN

Job Number: _____

Quote #: _____

Phone: 452-5861

Invoice To: CATUN

Sample ID	Date	Time	Matrix	Preservatives						Analyses						Comments: Please specify any special reporting requirements				
				602 (HCL)	YPH (MST/MABOL)	EPA 8260	EPA 8270	MAD/EP	EPH	MAD/EP	YPH	DD AN	EPA	602+XYLG	EPA 625 + TLNTP		VERIFIED	625+TICS	PER S. TYLER	10/5/99
PIT 1301-1S	8/29/99	1710	SOIL		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	G128-504
PIT 1301-2S	8/29/99	1710	SOIL		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
PIT 1301-GW	9/29	1013	GRAND WTR	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Relinquished By	Date	Time	Received By	Date	Time	Temperature	Sampled By	Airbill #												
<i>[Signature]</i>	10/4/99	1145	Emily Radwin	10/4/99	11:45	Ice-walk in														

S. J. J. J.

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

Mr. Steven Tyler
Richard Catlin & Assoc. Inc.
P.O. BOX 10279
Wilmington, NC 28405

Date 10-12-99

Report Number: G128-503

Project ID: Pit 13-99185

Dear Mr. Tyler:

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 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 service projects. We look forward to working with you again on any additional needs which you may have.

Sincerely,

Paradigm Analytical Laboratories



Laboratory Director
Mark Randall

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GCMS 8260B

Client Sample ID: Pit 1302-1S
 Client Project ID: Pit 13-99185
 Lab Sample ID: 72961
 Lab Project ID: G128-503

Date Analyzed: 10/6/99
 Analyzed By: RNP
 Date Collected: 9/23/99
 Date Received: 9/24/99
 Dilution: 1

Matrix: Soil %Solids: 86.1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Acetone	58	BQL
Acrolein	120	BQL
Acrylonitrile	120	BQL
Benzene	5.8	BQL
Bromobenzene	5.8	BQL
Bromochloromethane	5.8	BQL
Bromodichloromethane	5.8	BQL
Bromoform	5.8	BQL
Bromomethane	5.8	BQL
2-Butanone	29	BQL
n-Butylbenzene	5.8	BQL
sec-Butylbenzene	5.8	BQL
tert-Butylbenzene	5.8	BQL
Carbon disulfide	5.8	BQL
Carbon tetrachloride	5.8	BQL
Chlorobenzene	5.8	BQL
Chloroethane	5.8	BQL
2-Chloroethyl vinyl ether	5.8	BQL
Chloroform	5.8	BQL
Chloromethane	5.8	BQL
2-Chlorotoluene	5.8	BQL
4-Chlorotoluene	5.8	BQL
Dibromochloromethane	5.8	BQL
1,2-Dibromo-3-chloropropane	5.8	BQL
Dibromomethane	5.8	BQL
1,2-Dibromoethane (EDB)	5.8	BQL
1,2-Dichlorobenzene	5.8	BQL
1,3-Dichlorobenzene	5.8	BQL
1,4-Dichlorobenzene	5.8	BQL
trans-1,4-Dichloro-2-butene	5.8	BQL
1,1-Dichloroethane	5.8	BQL
1,1-Dichloroethene	5.8	BQL
1,2-Dichloroethane	5.8	BQL
cis-1,2-Dichloroethene	5.8	BQL
trans-1,2-dichloroethene	5.8	BQL
1,2-Dichloropropane	5.8	BQL
1,3-Dichloropropane	5.8	BQL
2,2-Dichloropropane	5.8	BQL
1,1-Dichloropropene	5.8	BQL
cis-1,3-Dichloropropene	5.8	BQL
trans-1,3-Dichloropropene	5.8	BQL
Dichlorodifluoromethane	5.8	BQL
Diisopropyl ether (DIPE)	5.8	BQL
Ethylbenzene	5.8	BQL
Hexachlorobutadiene	5.8	BQL
2-Hexanone	5.8	BQL
Iodomethane	5.8	BQL
Isopropylbenzene	5.8	BQL

Reviewed by: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles
by GCMS 8260B

Client Sample ID: Pit 1302-1S
Client Project ID: Pit 13-99185
Lab Sample ID: 72961
Lab Project ID: G128-503
Matrix: Soil

%Solids: 86.1

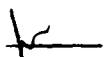
Date Analyzed: 10/6/99
Analyzed By: RNP
Date Collected: 9/23/99
Date Received: 9/24/99
Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
4-Isopropyltoluene	5.8	BQL
Methylene chloride	23	BQL
4-Methyl-2-pentanone	5.8	BQL
Methyl-tert-butyl ether (MTBE)	5.8	BQL
Naphthalene	5.8	BQL
n-Propyl benzene	5.8	BQL
Styrene	5.8	BQL
1,1,1,2-Tetrachloroethane	5.8	BQL
1,1,2,2-Tetrachloroethane	5.8	BQL
Tetrachloroethene	5.8	BQL
Toluene	5.8	BQL
1,2,3-Trichlorobenzene	5.8	BQL
1,2,4-Trichlorobenzene	5.8	BQL
Trichloroethene	5.8	BQL
1,1,1-Trichloroethane	5.8	BQL
1,1,2-Trichloroethane	5.8	BQL
Trichlorofluoromethane	5.8	BQL
1,2,3-Trichloropropane	5.8	BQL
1,2,4-Trimethylbenzene	5.8	BQL
1,3,5-Trimethylbenzene	5.8	BQL
Vinyl chloride	5.8	BQL
m-,p-Xylene	12	BQL
o-Xylene	5.8	BQL

Surrogate Spike Recoveries	Spike Added (ug/KG)	Surrogate Result (ug/KG)	%Rec
Compound			
Bromofluorobenzene	50	48.2	96
1,2-Dichloroethane-d4	50	57.7	115
Toluene-d8	50	49.2	98

Comments:

All results are corrected for dilution.

Reviewed by: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles
by GCMS 8260B

Client Sample ID: Pit 1302-2S
Client Project ID: Pit 13-99185
Lab Sample ID: 72962
Lab Project ID: G128-503
Matrix: Soil

%Solids: 83.2

Date Analyzed: 10/6/99
Analyzed By: RNP
Date Collected: 9/23/99
Date Received: 9/24/99
Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Acetone	60	BQL
Acrolein	120	BQL
Acrylonitrile	120	BQL
Benzene	6	BQL
Bromobenzene	6	BQL
Bromochloromethane	6	BQL
Bromodichloromethane	6	BQL
Bromoform	6	BQL
Bromomethane	6	BQL
2-Butanone	30	BQL
n-Butylbenzene	6	BQL
sec-Butylbenzene	6	BQL
tert-Butylbenzene	6	BQL
Carbon disulfide	6	BQL
Carbon tetrachloride	6	BQL
Chlorobenzene	6	BQL
Chloroethane	6	BQL
2-Chloroethyl vinyl ether	6	BQL
Chloroform	6	BQL
Chloromethane	6	BQL
2-Chlorotoluene	6	BQL
4-Chlorotoluene	6	BQL
Dibromochloromethane	6	BQL
1,2-Dibromo-3-chloropropane	6	BQL
Dibromomethane	6	BQL
1,2-Dibromoethane (EDB)	6	BQL
1,2-Dichlorobenzene	6	BQL
1,3-Dichlorobenzene	6	BQL
1,4-Dichlorobenzene	6	BQL
trans-1,4-Dichloro-2-butene	6	BQL
1,1-Dichloroethane	6	BQL
1,1-Dichloroethene	6	BQL
1,2-Dichloroethane	6	BQL
cis-1,2-Dichloroethene	6	BQL
trans-1,2-dichloroethene	6	BQL
1,2-Dichloropropane	6	BQL
1,3-Dichloropropane	6	BQL
2,2-Dichloropropane	6	BQL
1,1-Dichloropropene	6	BQL
cis-1,3-Dichloropropene	6	BQL
trans-1,3-Dichloropropene	6	BQL
Dichlorodifluoromethane	6	BQL
Diisopropyl ether (DIPE)	6	BQL
Ethylbenzene	6	BQL
Hexachlorobutadiene	6	BQL
2-Hexanone	6	BQL
Iodomethane	6	BQL
Isopropylbenzene	6	BQL

Reviewed by: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles
by GCMS 8260B

Client Sample ID: Pit 1302-2S
 Client Project ID: Pit 13-99185
 Lab Sample ID: 72962
 Lab Project ID: G128-503
 Matrix: Soil

%Solids: 83.2

Date Analyzed: 10/6/99
 Analyzed By: RNP
 Date Collected: 9/23/99
 Date Received: 9/24/99
 Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
4-Isopropyltoluene	6	BQL
Methylene chloride	24	BQL
4-Methyl-2-pentanone	6	BQL
Methyl-tert-butyl ether (MTBE)	6	BQL
Naphthalene	6	BQL
n-Propyl benzene	6	BQL
Styrene	6	BQL
1,1,1,2-Tetrachloroethane	6	BQL
1,1,2,2-Tetrachloroethane	6	BQL
Tetrachloroethene	6	BQL
Toluene	6	BQL
1,2,3-Trichlorobenzene	6	BQL
1,2,4-Trichlorobenzene	6	BQL
Trichloroethene	6	BQL
1,1,1-Trichloroethane	6	BQL
1,1,2-Trichloroethane	6	BQL
Trichlorofluoromethane	6	BQL
1,2,3-Trichloropropane	6	BQL
1,2,4-Trimethylbenzene	6	BQL
1,3,5-Trimethylbenzene	6	BQL
Vinyl chloride	6	BQL
m-,p-Xylene	12	BQL
o-Xylene	6	BQL

Surrogate Spike Recoveries			
Compound	Spike Added (ug/KG)	Surrogate Result (ug/KG)	%Rec
Bromofluorobenzene	50	49.2	98
1,2-Dichloroethane-d4	50	55.7	111
Toluene-d8	50	50.1	100

Comments:

All results are corrected for dilution.

Reviewed by: W

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles
by GCMS 8260B

Client Sample ID: Pit 1303-1S
Client Project ID: Pit 13-99185
Lab Sample ID: 72963
Lab Project ID: G128-503
Matrix: Soil

%Solids: 83.1

Date Analyzed: 10/6/99
Analyzed By: RNP
Date Collected: 9/23/99
Date Received: 9/24/99
Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Acetone	60	BQL
Acrolein	120	BQL
Acrylonitrile	120	BQL
Benzene	6	BQL
Bromobenzene	6	BQL
Bromochloromethane	6	BQL
Bromodichloromethane	6	BQL
Bromoform	6	BQL
Bromomethane	6	BQL
2-Butanone	30	BQL
n-Butylbenzene	6	BQL
sec-Butylbenzene	6	BQL
tert-Butylbenzene	6	BQL
Carbon disulfide	6	BQL
Carbon tetrachloride	6	BQL
Chlorobenzene	6	BQL
Chloroethane	6	BQL
2-Chloroethyl vinyl ether	6	BQL
Chloroform	6	BQL
Chloromethane	6	BQL
2-Chlorotoluene	6	BQL
4-Chlorotoluene	6	BQL
Dibromochloromethane	6	BQL
1,2-Dibromo-3-chloropropane	6	BQL
Dibromomethane	6	BQL
1,2-Dibromoethane (EDB)	6	BQL
1,2-Dichlorobenzene	6	BQL
1,3-Dichlorobenzene	6	BQL
1,4-Dichlorobenzene	6	BQL
trans-1,4-Dichloro-2-butene	6	BQL
1,1-Dichloroethane	6	BQL
1,1-Dichloroethene	6	BQL
1,2-Dichloroethane	6	BQL
cis-1,2-Dichloroethene	6	BQL
trans-1,2-dichloroethene	6	BQL
1,2-Dichloropropane	6	BQL
1,3-Dichloropropane	6	BQL
2,2-Dichloropropane	6	BQL
1,1-Dichloropropene	6	BQL
cis-1,3-Dichloropropene	6	BQL
trans-1,3-Dichloropropene	6	BQL
Dichlorodifluoromethane	6	BQL
Diisopropyl ether (DIPE)	6	BQL
Ethylbenzene	6	BQL
Hexachlorobutadiene	6	BQL
2-Hexanone	6	BQL
Iodomethane	6	BQL
Isopropylbenzene	6	BQL

Reviewed by: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GCMS 8260B

Client Sample ID: Pit 1303-1S
 Client Project ID: Pit 13-99185
 Lab Sample ID: 72963
 Lab Project ID: G128-503
 Matrix: Soil

%Solids: 83.1

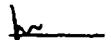
Date Analyzed: 10/6/99
 Analyzed By: RNP
 Date Collected: 9/23/99
 Date Received: 9/24/99
 Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
4-Isopropyltoluene	6	BQL
Methylene chloride	24	BQL
4-Methyl-2-pentanone	6	BQL
Methyl-tert-butyl ether (MTBE)	6	BQL
Naphthalene	6	BQL
n-Propyl benzene	6	BQL
Styrene	6	BQL
1,1,1,2-Tetrachloroethane	6	BQL
1,1,2,2-Tetrachloroethane	6	BQL
Tetrachloroethene	6	BQL
Toluene	6	BQL
1,2,3-Trichlorobenzene	6	BQL
1,2,4-Trichlorobenzene	6	BQL
Trichloroethene	6	BQL
1,1,1-Trichloroethane	6	BQL
1,1,2-Trichloroethane	6	BQL
Trichlorofluoromethane	6	BQL
1,2,3-Trichloropropane	6	BQL
1,2,4-Trimethylbenzene	6	BQL
1,3,5-Trimethylbenzene	6	BQL
Vinyl chloride	6	BQL
m-,p-Xylene	12	BQL
o-Xylene	6	BQL

Surrogate Spike Recoveries	Spike Added (ug/KG)	Surrogate Result (ug/KG)	%Rec
Compound			
Bromofluorobenzene	50	49.2	98
1,2-Dichloroethane-d4	50	54.0	108
Toluene-d8	50	49.6	99

Comments:

All results are corrected for dilution.

Reviewed by: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GCMS 8260B

Client Sample ID: Pit 1303-2S
 Client Project ID: Pit 13-99185
 Lab Sample ID: 72964
 Lab Project ID: G128-503
 Matrix: Soil

%Solids: 80.2

Date Analyzed: 10/6/99
 Analyzed By: RNP
 Date Collected: 9/23/99
 Date Received: 9/24/99
 Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Acetone	62	BQL
Acrolein	120	BQL
Acrylonitrile	120	BQL
Benzene	6.2	BQL
Bromobenzene	6.2	BQL
Bromochloromethane	6.2	BQL
Bromodichloromethane	6.2	BQL
Bromoform	6.2	BQL
Bromomethane	6.2	BQL
2-Butanone	31	BQL
n-Butylbenzene	6.2	BQL
sec-Butylbenzene	6.2	BQL
tert-Butylbenzene	6.2	BQL
Carbon disulfide	6.2	BQL
Carbon tetrachloride	6.2	BQL
Chlorobenzene	6.2	BQL
Chloroethane	6.2	BQL
2-Chloroethyl vinyl ether	6.2	BQL
Chloroform	6.2	BQL
Chloromethane	6.2	BQL
2-Chlorotoluene	6.2	BQL
4-Chlorotoluene	6.2	BQL
Dibromochloromethane	6.2	BQL
1,2-Dibromo-3-chloropropane	6.2	BQL
Dibromomethane	6.2	BQL
1,2-Dibromoethane (EDB)	6.2	BQL
1,2-Dichlorobenzene	6.2	BQL
1,3-Dichlorobenzene	6.2	BQL
1,4-Dichlorobenzene	6.2	BQL
trans-1,4-Dichloro-2-butene	6.2	BQL
1,1-Dichloroethane	6.2	BQL
1,1-Dichloroethene	6.2	BQL
1,2-Dichloroethane	6.2	BQL
cis-1,2-Dichloroethene	6.2	BQL
trans-1,2-dichloroethene	6.2	BQL
1,2-Dichloropropane	6.2	BQL
1,3-Dichloropropane	6.2	BQL
2,2-Dichloropropane	6.2	BQL
1,1-Dichloropropene	6.2	BQL
cis-1,3-Dichloropropene	6.2	BQL
trans-1,3-Dichloropropene	6.2	BQL
Dichlorodifluoromethane	6.2	BQL
Diisopropyl ether (DIPE)	6.2	BQL
Ethylbenzene	6.2	BQL
Hexachlorobutadiene	6.2	BQL
2-Hexanone	6.2	BQL
Iodomethane	6.2	BQL
Isopropylbenzene	6.2	BQL

Reviewed by: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GCMS 8260B

Client Sample ID: Pit 1304-1S
 Client Project ID: Pit 13-99185
 Lab Sample ID: 72965
 Lab Project ID: G128-503
 Matrix: Soil

%Solids: 85.2

Date Analyzed: 10/6/99
 Analyzed By: RNP
 Date Collected: 9/23/99
 Date Received: 9/24/99
 Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Acetone	59	BQL
Acrolein	120	BQL
Acrylonitrile	120	BQL
Benzene	5.9	BQL
Bromobenzene	5.9	BQL
Bromochloromethane	5.9	BQL
Bromodichloromethane	5.9	BQL
Bromoform	5.9	BQL
Bromomethane	5.9	BQL
2-Butanone	29	BQL
n-Butylbenzene	5.9	BQL
sec-Butylbenzene	5.9	BQL
tert-Butylbenzene	5.9	BQL
Carbon disulfide	5.9	BQL
Carbon tetrachloride	5.9	BQL
Chlorobenzene	5.9	BQL
Chloroethane	5.9	BQL
2-Chloroethyl vinyl ether	5.9	BQL
Chloroform	5.9	BQL
Chloromethane	5.9	BQL
2-Chlorotoluene	5.9	BQL
4-Chlorotoluene	5.9	BQL
Dibromochloromethane	5.9	BQL
1,2-Dibromo-3-chloropropane	5.9	BQL
Dibromomethane	5.9	BQL
1,2-Dibromoethane (EDB)	5.9	BQL
1,2-Dichlorobenzene	5.9	BQL
1,3-Dichlorobenzene	5.9	BQL
1,4-Dichlorobenzene	5.9	BQL
trans-1,4-Dichloro-2-butene	5.9	BQL
1,1-Dichloroethane	5.9	BQL
1,1-Dichloroethene	5.9	BQL
1,2-Dichloroethane	5.9	BQL
cis-1,2-Dichloroethene	5.9	BQL
trans-1,2-dichloroethene	5.9	BQL
1,2-Dichloropropane	5.9	BQL
1,3-Dichloropropane	5.9	BQL
2,2-Dichloropropane	5.9	BQL
1,1-Dichloropropene	5.9	BQL
cis-1,3-Dichloropropene	5.9	BQL
trans-1,3-Dichloropropene	5.9	BQL
Dichlorodifluoromethane	5.9	BQL
Diisopropyl ether (DIPE)	5.9	BQL
Ethylbenzene	5.9	BQL
Hexachlorobutadiene	5.9	BQL
2-Hexanone	5.9	BQL
Iodomethane	5.9	BQL
Isopropylbenzene	5.9	BQL

Reviewed by: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GCMS 8260B

Client Sample ID: Pit 1304-1S
 Client Project ID: Pit 13-99185
 Lab Sample ID: 72965
 Lab Project ID: G128-503
 Matrix: Soil

%Solids: 85.2

Date Analyzed: 10/6/99
 Analyzed By: RNP
 Date Collected: 9/23/99
 Date Received: 9/24/99
 Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
4-Isopropyltoluene	5.9	BQL
Methylene chloride	23	BQL
4-Methyl-2-pentanone	5.9	BQL
Methyl-tert-butyl ether (MTBE)	5.9	BQL
Naphthalene	5.9	BQL
n-Propyl benzene	5.9	BQL
Styrene	5.9	BQL
1,1,1,2-Tetrachloroethane	5.9	BQL
1,1,2,2-Tetrachloroethane	5.9	BQL
Tetrachloroethene	5.9	BQL
Toluene	5.9	BQL
1,2,3-Trichlorobenzene	5.9	BQL
1,2,4-Trichlorobenzene	5.9	BQL
Trichloroethene	5.9	BQL
1,1,1-Trichloroethane	5.9	BQL
1,1,2-Trichloroethane	5.9	BQL
Trichlorofluoromethane	5.9	BQL
1,2,3-Trichloropropane	5.9	BQL
1,2,4-Trimethylbenzene	5.9	BQL
1,3,5-Trimethylbenzene	5.9	BQL
Vinyl chloride	5.9	BQL
m-p-Xylene	12	BQL
o-Xylene	5.9	BQL

Surrogate Spike Recoveries	Spike Added (ug/KG)	Surrogate Result (ug/KG)	%Rec
Compound			
Bromofluorobenzene	50	48.0	96
1,2-Dichloroethane-d4	50	57.5	115
Toluene-d8	50	49.2	98

Comments:

All results are corrected for dilution.

Reviewed by: 

PARADIGM ANALYTICAL LABORATORIES, INC.

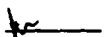
Results for Volatiles
by GCMS 8260B

Client Sample ID: Pit 1304-2S
Client Project ID: Pit 13-99185
Lab Sample ID: 72966
Lab Project ID: G128-503
Matrix: Soil

Date Analyzed: 10/6/99
Analyzed By: RNP
Date Collected: 9/23/99
Date Received: 9/24/99
Dilution: 1

%Solids: 78.2

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Acetone	64	BQL
Acrolein	130	BQL
Acrylonitrile	130	BQL
Benzene	6.4	BQL
Bromobenzene	6.4	BQL
Bromochloromethane	6.4	BQL
Bromodichloromethane	6.4	BQL
Bromoform	6.4	BQL
Bromomethane	6.4	BQL
2-Butanone	32	BQL
n-Butylbenzene	6.4	BQL
sec-Butylbenzene	6.4	BQL
tert-Butylbenzene	6.4	BQL
Carbon disulfide	6.4	BQL
Carbon tetrachloride	6.4	BQL
Chlorobenzene	6.4	BQL
Chloroethane	6.4	BQL
2-Chloroethyl vinyl ether	6.4	BQL
Chloroform	6.4	BQL
Chloromethane	6.4	BQL
2-Chlorotoluene	6.4	BQL
4-Chlorotoluene	6.4	BQL
Dibromochloromethane	6.4	BQL
1,2-Dibromo-3-chloropropane	6.4	BQL
Dibromomethane	6.4	BQL
1,2-Dibromoethane (EDB)	6.4	BQL
1,2-Dichlorobenzene	6.4	BQL
1,3-Dichlorobenzene	6.4	BQL
1,4-Dichlorobenzene	6.4	BQL
trans-1,4-Dichloro-2-butene	6.4	BQL
1,1-Dichloroethane	6.4	BQL
1,1-Dichloroethene	6.4	BQL
1,2-Dichloroethane	6.4	BQL
cis-1,2-Dichloroethene	6.4	BQL
trans-1,2-dichloroethene	6.4	BQL
1,2-Dichloropropane	6.4	BQL
1,3-Dichloropropane	6.4	BQL
2,2-Dichloropropane	6.4	BQL
1,1-Dichloropropene	6.4	BQL
cis-1,3-Dichloropropene	6.4	BQL
trans-1,3-Dichloropropene	6.4	BQL
Dichlorodifluoromethane	6.4	BQL
Diisopropyl ether (DIPE)	6.4	BQL
Ethylbenzene	6.4	BQL
Hexachlorobutadiene	6.4	BQL
2-Hexanone	6.4	BQL
Iodomethane	6.4	BQL
Isopropylbenzene	6.4	BQL

Reviewed by: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles
by GCMS 8260B

Client Sample ID: Pit 1304-2S
 Client Project ID: Pit 13-99185
 Lab Sample ID: 72966
 Lab Project ID: G128-503
 Matrix: Soil

Date Analyzed: 10/6/99
 Analyzed By: RNP
 Date Collected: 9/23/99
 Date Received: 9/24/99
 Dilution: 1

%Solids: 78.2

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
4-Isopropyltoluene	6.4	BQL
Methylene chloride	26	BQL
4-Methyl-2-pentanone	6.4	BQL
Methyl-tert-butyl ether (MTBE)	6.4	BQL
Naphthalene	6.4	BQL
n-Propyl benzene	6.4	BQL
Styrene	6.4	BQL
1,1,1,2-Tetrachloroethane	6.4	BQL
1,1,2,2-Tetrachloroethane	6.4	BQL
Tetrachloroethene	6.4	BQL
Toluene	6.4	BQL
1,2,3-Trichlorobenzene	6.4	BQL
1,2,4-Trichlorobenzene	6.4	BQL
Trichloroethene	6.4	BQL
1,1,1-Trichloroethane	6.4	BQL
1,1,2-Trichloroethane	6.4	BQL
Trichlorofluoromethane	6.4	BQL
1,2,3-Trichloropropane	6.4	BQL
1,2,4-Trimethylbenzene	6.4	BQL
1,3,5-Trimethylbenzene	6.4	BQL
Vinyl chloride	6.4	BQL
m-,p-Xylene	13	BQL
o-Xylene	6.4	BQL

Surrogate Spike Recoveries	Spike Added (ug/KG)	Surrogate Result (ug/KG)	%Rec
Compound			
Bromofluorobenzene	50	49.7	99
1,2-Dichloroethane-d4	50	55.1	110
Toluene-d8	50	50.1	100

Comments:

All results are corrected for dilution.

Reviewed by: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GCMS 8260B

Client Sample ID: Pit 1305-1S
 Client Project ID: Pit 13-99185
 Lab Sample ID: 72967
 Lab Project ID: G128-503
 Matrix: Soil

Date Analyzed: 10/6/99
 Analyzed By: RNP
 Date Collected: 9/23/99
 Date Received: 9/24/99
 Dilution: 1

%Solids: 77.2

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Acetone	65	BQL
Acrolein	130	BQL
Acrylonitrile	130	BQL
Benzene	6.5	BQL
Bromobenzene	6.5	BQL
Bromochloromethane	6.5	BQL
Bromodichloromethane	6.5	BQL
Bromoform	6.5	BQL
Bromomethane	6.5	BQL
2-Butanone	32	BQL
n-Butylbenzene	6.5	BQL
sec-Butylbenzene	6.5	BQL
tert-Butylbenzene	6.5	BQL
Carbon disulfide	6.5	BQL
Carbon tetrachloride	6.5	BQL
Chlorobenzene	6.5	BQL
Chloroethane	6.5	BQL
2-Chloroethyl vinyl ether	6.5	BQL
Chloroform	6.5	BQL
Chloromethane	6.5	BQL
2-Chlorotoluene	6.5	BQL
4-Chlorotoluene	6.5	BQL
Dibromochloromethane	6.5	BQL
1,2-Dibromo-3-chloropropane	6.5	BQL
Dibromomethane	6.5	BQL
1,2-Dibromoethane (EDB)	6.5	BQL
1,2-Dichlorobenzene	6.5	BQL
1,3-Dichlorobenzene	6.5	BQL
1,4-Dichlorobenzene	6.5	BQL
trans-1,4-Dichloro-2-butene	6.5	BQL
1,1-Dichloroethane	6.5	BQL
1,1-Dichloroethene	6.5	BQL
1,2-Dichloroethane	6.5	BQL
cis-1,2-Dichloroethene	6.5	BQL
trans-1,2-dichloroethene	6.5	BQL
1,2-Dichloropropane	6.5	BQL
1,3-Dichloropropane	6.5	BQL
2,2-Dichloropropane	6.5	BQL
1,1-Dichloropropene	6.5	BQL
cis-1,3-Dichloropropene	6.5	BQL
trans-1,3-Dichloropropene	6.5	BQL
Dichlorodifluoromethane	6.5	BQL
Diisopropyl ether (DIPE)	6.5	BQL
Ethylbenzene	6.5	BQL
Hexachlorobutadiene	6.5	BQL
2-Hexanone	6.5	BQL
Iodomethane	6.5	BQL
Isopropylbenzene	6.5	BQL

Reviewed by: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GCMS 8260B

Client Sample ID: Pit 1305-1S
 Client Project ID: Pit 13-99185
 Lab Sample ID: 72967
 Lab Project ID: G128-503
 Matrix: Soil

%Solids: 77.2

Date Analyzed: 10/6/99
 Analyzed By: RNP
 Date Collected: 9/23/99
 Date Received: 9/24/99
 Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
4-Isopropyltoluene	6.5	BQL
Methylene chloride	26	BQL
4-Methyl-2-pentanone	6.5	BQL
Methyl-tert-butyl ether (MTBE)	6.5	BQL
Naphthalene	6.5	BQL
n-Propyl benzene	6.5	BQL
Styrene	6.5	BQL
1,1,1,2-Tetrachloroethane	6.5	BQL
1,1,2,2-Tetrachloroethane	6.5	BQL
Tetrachloroethene	6.5	BQL
Toluene	6.5	BQL
1,2,3-Trichlorobenzene	6.5	BQL
1,2,4-Trichlorobenzene	6.5	BQL
Trichloroethene	6.5	BQL
1,1,1-Trichloroethane	6.5	BQL
1,1,2-Trichloroethane	6.5	BQL
Trichlorofluoromethane	6.5	BQL
1,2,3-Trichloropropane	6.5	BQL
1,2,4-Trimethylbenzene	6.5	BQL
1,3,5-Trimethylbenzene	6.5	BQL
Vinyl chloride	6.5	BQL
m-,p-Xylene	13	BQL
o-Xylene	6.5	BQL

Surrogate Spike Recoveries	Spike Added (ug/KG)	Surrogate Result (ug/KG)	%Rec
Compound			
Bromofluorobenzene	50	48.8	98
1,2-Dichloroethane-d4	50	55.5	111
Toluene-d8	50	50.1	100

Comments:

All results are corrected for dilution.

Reviewed by: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles
by GCMS 8260B

Client Sample ID: Pit 1305-2S
Client Project ID: Pit 13-99185
Lab Sample ID: 72968
Lab Project ID: G128-503
Matrix: Soil

Date Analyzed: 10/6/99
Analyzed By: RNP
Date Collected: 9/23/99
Date Received: 9/24/99
Dilution: 1

%Solids: 77.2

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Acetone	65	BQL
Acrolein	130	BQL
Acrylonitrile	130	BQL
Benzene	6.5	BQL
Bromobenzene	6.5	BQL
Bromochloromethane	6.5	BQL
Bromodichloromethane	6.5	BQL
Bromoform	6.5	BQL
Bromomethane	6.5	BQL
2-Butanone	32	BQL
n-Butylbenzene	6.5	BQL
sec-Butylbenzene	6.5	BQL
tert-Butylbenzene	6.5	BQL
Carbon disulfide	6.5	BQL
Carbon tetrachloride	6.5	BQL
Chlorobenzene	6.5	BQL
Chloroethane	6.5	BQL
2-Chloroethyl vinyl ether	6.5	BQL
Chloroform	6.5	BQL
Chloromethane	6.5	BQL
2-Chlorotoluene	6.5	BQL
4-Chlorotoluene	6.5	BQL
Dibromochloromethane	6.5	BQL
1,2-Dibromo-3-chloropropane	6.5	BQL
Dibromomethane	6.5	BQL
1,2-Dibromoethane (EDB)	6.5	BQL
1,2-Dichlorobenzene	6.5	BQL
1,3-Dichlorobenzene	6.5	BQL
1,4-Dichlorobenzene	6.5	BQL
trans-1,4-Dichloro-2-butene	6.5	BQL
1,1-Dichloroethane	6.5	BQL
1,1-Dichloroethene	6.5	BQL
1,2-Dichloroethane	6.5	BQL
cis-1,2-Dichloroethene	6.5	BQL
trans-1,2-dichloroethene	6.5	BQL
1,2-Dichloropropane	6.5	BQL
1,3-Dichloropropane	6.5	BQL
2,2-Dichloropropane	6.5	BQL
1,1-Dichloropropene	6.5	BQL
cis-1,3-Dichloropropene	6.5	BQL
trans-1,3-Dichloropropene	6.5	BQL
Dichlorodifluoromethane	6.5	BQL
Diisopropyl ether (DIPE)	6.5	BQL
Ethylbenzene	6.5	BQL
Hexachlorobutadiene	6.5	BQL
2-Hexanone	6.5	BQL
Iodomethane	6.5	BQL
Isopropylbenzene	6.5	BQL

Reviewed by: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles
by GCMS 8260B

Client Sample ID: Pit 1305-2S
 Client Project ID: Pit 13-99185
 Lab Sample ID: 72968
 Lab Project ID: G128-503
 Matrix: Soil

%Solids: 77.2

Date Analyzed: 10/6/99
 Analyzed By: RNP
 Date Collected: 9/23/99
 Date Received: 9/24/99
 Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
4-Isopropyltoluene	6.5	BQL
Methylene chloride	26	BQL
4-Methyl-2-pentanone	6.5	BQL
Methyl-tert-butyl ether (MTBE)	6.5	BQL
Naphthalene	6.5	BQL
n-Propyl benzene	6.5	BQL
Styrene	6.5	BQL
1,1,1,2-Tetrachloroethane	6.5	BQL
1,1,2,2-Tetrachloroethane	6.5	BQL
Tetrachloroethene	6.5	BQL
Toluene	6.5	BQL
1,2,3-Trichlorobenzene	6.5	BQL
1,2,4-Trichlorobenzene	6.5	BQL
Trichloroethene	6.5	BQL
1,1,1-Trichloroethane	6.5	BQL
1,1,2-Trichloroethane	6.5	BQL
Trichlorofluoromethane	6.5	BQL
1,2,3-Trichloropropane	6.5	BQL
1,2,4-Trimethylbenzene	6.5	BQL
1,3,5-Trimethylbenzene	6.5	BQL
Vinyl chloride	6.5	BQL
m-,p-Xylene	13	BQL
o-Xylene	6.5	BQL

Surrogate Spike Recoveries	Spike Added (ug/KG)	Surrogate Result (ug/KG)	%Rec
Compound			
Bromofluorobenzene	50	48.5	97
1,2-Dichloroethane-d4	50	53.5	107
Toluene-d8	50	49.9	100

Comments:

All results are corrected for dilution.

Reviewed by: 

Results for Semivolatiles
by GCMS 8270

Client Sample ID: Pit 1302-2S
Client Project ID: Pit 13-99185
Lab Sample ID: 72962
Lab Project ID: G128-503

Date Collected: 9/23/99
Date Received: 9/24/99
Date Analyzed: 9/30/99
Dilution: 1

Matrix: Soil %Solids: 83.2

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Acenaphthene	350	BQL
Acenaphthylene	350	BQL
Anthracene	350	BQL
Benzo[a]anthracene	350	BQL
Benzo[a]pyrene	350	BQL
Benzo[b]fluoranthene	350	BQL
Benzo[g,h,i]perylene	350	BQL
Benzo[k]fluoranthene	350	BQL
Benzoic Acid	700	BQL
Bis(2-chloroethoxy)methane	350	BQL
Bis(2-chloroethyl)ether	350	BQL
Bis(2-chloroisopropyl)ether	350	BQL
Bis(2-ethylhexyl)phthalate	350	BQL
4-bromophenyl phenyl ether	350	BQL
Butylbenzylphthalate	350	BQL
4-Chloroaniline	350	BQL
4-Chloro-3-methylphenol	350	BQL
2-Chloronaphthalene	350	BQL
2-Chlorophenol	350	BQL
4-Chlorophenyl phenyl ether	350	BQL
Chrysene	350	BQL
Di-n-Butylphthalate	350	BQL
Di-n-octylphthalate	350	BQL
Dibenzo[a,h]anthracene	350	BQL
Dibenzofuran	350	BQL
1,2-Dichlorobenzene	350	BQL
1,3-Dichlorobenzene	350	BQL
1,4-Dichlorobenzene	350	BQL
3,3'-Dichlorobenzidine	700	BQL
2,4-Dichlorophenol	350	BQL
Diethylphthalate	350	BQL
2,4-Dimethylphenol	350	BQL
Dimethylphthalate	350	BQL
4,6-Dinitro-2-methylphenol	1700	BQL
2,4-Dinitrophenol	1700	BQL
2,4-Dinitrotoluene	350	BQL
2,6-Dinitrotoluene	350	BQL
Fluoranthene	350	BQL
Fluorene	350	BQL
Hexachlorobenzene	350	BQL

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Semivolatiles

by GCMS 8270

Client Sample ID: Pit 1302-2S

Client Project ID: Pit 13-99185

Lab Sample ID: 72962

Lab Project ID: G128-503

Matrix: Soil

%Solids: 83.2

Date Collected: 9/23/99

Date Received: 9/24/99

Date Analyzed: 9/30/99

Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Hexachlorobutadiene	350	BQL
Hexachlorocyclopentadiene	700	BQL
Hexachloroethane	350	BQL
Indeno(1,2,3-c,d)pyrene	350	BQL
Isophorone	350	BQL
2-Methylnaphthalene	350	BQL
2-Methylphenol	350	BQL
4-Methylphenol	350	BQL
N-Nitrosodi-n-propylamine	350	BQL
N-Nitrosodiphenylamine	350	BQL
Naphthalene	350	BQL
2-Nitroaniline	350	BQL
3-Nitroaniline	350	BQL
4-Nitroaniline	350	BQL
Nitrobenzene	350	BQL
2-Nitrophenol	350	BQL
4-Nitrophenol	1700	BQL
Pentachlorophenol	1700	BQL
Phenanthrene	350	BQL
Phenol	350	BQL
Pyrene	350	BQL
1,2,4-Trichlorobenzene	350	BQL
2,4,5-Trichlorophenol	350	BQL
2,4,6-Trichlorophenol	350	BQL

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovered
2,4,6-Tribromophenol	10	8.9	89
2-Fluorobiphenyl	10	9.8	98
2-Fluorophenol	10	8.6	86
4-Terphenyl-d14	10	10.4	104
Nitrobenzene-d5	10	8.8	88
Phenol-d6	10	8.4	84

Comments:

Results are corrected for %solids and dilution where applicable.

Analyzed By: MRC

Flags:

BQL = Below Quantitation Limit.

Reviewed By: 

Results for Semivolatiles
by GCMS 8270

Client Sample ID: Pit 1303-1S
Client Project ID: Pit 13-99185
Lab Sample ID: 72963
Lab Project ID: G128-503

Date Collected: 9/23/99
Date Received: 9/24/99
Date Analyzed: 9/30/99
Dilution: 1

Matrix: Soil %Solids: 83.1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Acenaphthene	330	BQL
Acenaphthylene	330	BQL
Anthracene	330	BQL
Benzo[a]anthracene	330	BQL
Benzo[a]pyrene	330	BQL
Benzo[b]fluoranthene	330	BQL
Benzo[g,h,i]perylene	330	BQL
Benzo[k]fluoranthene	330	BQL
Benzoic Acid	660	BQL
Bis(2-chloroethoxy)methane	330	BQL
Bis(2-chloroethyl)ether	330	BQL
Bis(2-chloroisopropyl)ether	330	BQL
Bis(2-ethylhexyl)phthalate	330	BQL
4-bromophenyl phenyl ether	330	BQL
Butylbenzylphthalate	330	BQL
4-Chloroaniline	330	BQL
4-Chloro-3-methylphenol	330	BQL
2-Chloronaphthalene	330	BQL
2-Chlorophenol	330	BQL
4-Chlorophenyl phenyl ether	330	BQL
Chrysene	330	BQL
Di-n-Butylphthalate	330	BQL
Di-n-octylphthalate	330	BQL
Dibenzo[a,h]anthracene	330	BQL
Dibenzofuran	330	BQL
1,2-Dichlorobenzene	330	BQL
1,3-Dichlorobenzene	330	BQL
1,4-Dichlorobenzene	330	BQL
3,3'-Dichlorobenzidine	660	BQL
2,4-Dichlorophenol	330	BQL
Diethylphthalate	330	BQL
2,4-Dimethylphenol	330	BQL
Dimethylphthalate	330	BQL
4,6-Dinitro-2-methylphenol	1600	BQL
2,4-Dinitrophenol	1600	BQL
2,4-Dinitrotoluene	330	BQL
2,6-Dinitrotoluene	330	BQL
Fluoranthene	330	BQL
Fluorene	330	BQL
Hexachlorobenzene	330	BQL

Results for Semivolatiles
by GCMS 8270

Client Sample ID: Pit 1303-1S
Client Project ID: Pit 13-99185
Lab Sample ID: 72963
Lab Project ID: G128-503

Date Collected: 9/23/99
Date Received: 9/24/99
Date Analyzed: 9/30/99
Dilution: 1

Matrix: Soil %Solids: 83.1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Hexachlorobutadiene	330	BQL
Hexachlorocyclopentadiene	660	BQL
Hexachloroethane	330	BQL
Indeno(1,2,3-c,d)pyrene	330	BQL
Isophorone	330	BQL
2-Methylnaphthalene	330	BQL
2-Methylphenol	330	BQL
4-Methylphenol	330	BQL
N-Nitrosodi-n-propylamine	330	BQL
N-Nitrosodiphenylamine	330	BQL
Naphthalene	330	BQL
2-Nitroaniline	330	BQL
3-Nitroaniline	330	BQL
4-Nitroaniline	330	BQL
Nitrobenzene	330	BQL
2-Nitrophenol	330	BQL
4-Nitrophenol	1600	BQL
Pentachlorophenol	1600	BQL
Phenanthrene	330	BQL
Phenol	330	BQL
Pyrene	330	BQL
1,2,4-Trichlorobenzene	330	BQL
2,4,5-Trichlorophenol	330	BQL
2,4,6-Trichlorophenol	330	BQL

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovered
2,4,6-Tribromophenol	10	7.8	78
2-Fluorobiphenyl	10	9.2	92
2-Fluorophenol	10	7.8	78
4-Terphenyl-d14	10	10.5	105
Nitrobenzene-d5	10	8.1	81
Phenol-d6	10	7.5	75

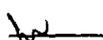
Comments:

Results are corrected for %solids and dilution where applicable.

Analyzed By: MRC

Flags:

BQL = Below Quantitation Limit.

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Semivolatiles

by GCMS 8270

Client Sample ID: Pit 1303-2S

Client Project ID: Pit 13-99185

Lab Sample ID: 72964

Lab Project ID: G128-503

Matrix: Soil

%Solids: 80.2

Date Collected: 9/23/99

Date Received: 9/24/99

Date Analyzed: 9/30/99

Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Acenaphthene	360	BQL
Acenaphthylene	360	BQL
Anthracene	360	BQL
Benzo[a]anthracene	360	BQL
Benzo[a]pyrene	360	BQL
Benzo[b]fluoranthene	360	BQL
Benzo[g,h,i]perylene	360	BQL
Benzo[k]fluoranthene	360	BQL
Benzoic Acid	730	BQL
Bis(2-chloroethoxy)methane	360	BQL
Bis(2-chloroethyl)ether	360	BQL
Bis(2-chloroisopropyl)ether	360	BQL
Bis(2-ethylhexyl)phthalate	360	BQL
4-bromophenyl phenyl ether	360	BQL
Butylbenzylphthalate	360	BQL
4-Chloroaniline	360	BQL
4-Chloro-3-methylphenol	360	BQL
2-Chloronaphthalene	360	BQL
2-Chlorophenol	360	BQL
4-Chlorophenyl phenyl ether	360	BQL
Chrysene	360	BQL
Di-n-Butylphthalate	360	BQL
Di-n-octylphthalate	360	BQL
Dibenzo[a,h]anthracene	360	BQL
Dibenzofuran	360	BQL
1,2-Dichlorobenzene	360	BQL
1,3-Dichlorobenzene	360	BQL
1,4-Dichlorobenzene	360	BQL
3,3'-Dichlorobenzidine	730	BQL
2,4-Dichlorophenol	360	BQL
Diethylphthalate	360	BQL
2,4-Dimethylphenol	360	BQL
Dimethylphthalate	360	BQL
4,6-Dinitro-2-methylphenol	1800	BQL
2,4-Dinitrophenol	1800	BQL
2,4-Dinitrotoluene	360	BQL
2,6-Dinitrotoluene	360	BQL
Fluoranthene	360	BQL
Fluorene	360	BQL
Hexachlorobenzene	360	BQL

Results for Semivolatiles
by GCMS 8270

Client Sample ID: Pit 1303-2S
Client Project ID: Pit 13-99185
Lab Sample ID: 72964
Lab Project ID: G128-503

Date Collected: 9/23/99
Date Received: 9/24/99
Date Analyzed: 9/30/99
Dilution: 1

Matrix: Soil %Solids: 80.2

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Hexachlorobutadiene	360	BQL
Hexachlorocyclopentadiene	730	BQL
Hexachloroethane	360	BQL
Indeno(1,2,3-c,d)pyrene	360	BQL
Isophorone	360	BQL
2-Methylnaphthalene	360	BQL
2-Methylphenol	360	BQL
4-Methylphenol	360	BQL
N-Nitrosodi-n-propylamine	360	BQL
N-Nitrosodiphenylamine	360	BQL
Naphthalene	360	BQL
2-Nitroaniline	360	BQL
3-Nitroaniline	360	BQL
4-Nitroaniline	360	BQL
Nitrobenzene	360	BQL
2-Nitrophenol	360	BQL
4-Nitrophenol	1800	BQL
Pentachlorophenol	1800	BQL
Phenanthrene	360	BQL
Phenol	360	BQL
Pyrene	360	BQL
1,2,4-Trichlorobenzene	360	BQL
2,4,5-Trichlorophenol	360	BQL
2,4,6-Trichlorophenol	360	BQL

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovered
2,4,6-Tribromophenol	10	8.4	84
2-Fluorobiphenyl	10	9	90
2-Fluorophenol	10	8	80
4-Terphenyl-d14	10	10.9	109
Nitrobenzene-d5	10	8.1	81
Phenol-d6	10	7.8	78

Comments:

Results are corrected for %solids and dilution where applicable.
Analyzed By: MRC

Flags:

BQL = Below Quantitation Limit.

Reviewed By: 

Results for Semivolatiles
by GCMS 8270

Client Sample ID: Pit 1304-1S
Client Project ID: Pit 13-99185
Lab Sample ID: 72965
Lab Project ID: G128-503
Matrix: Soil

Date Collected: 9/23/99
Date Received: 9/24/99
Date Analyzed: 10/4/99
Dilution: 1

%Solids: 85.2

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Acenaphthene	330	BQL
Acenaphthylene	330	BQL
Anthracene	330	BQL
Benzo[a]anthracene	330	BQL
Benzo[a]pyrene	330	BQL
Benzo[b]fluoranthene	330	BQL
Benzo[g,h,i]perylene	330	BQL
Benzo[k]fluoranthene	330	BQL
Benzoic Acid	670	BQL
Bis(2-chloroethoxy)methane	330	BQL
Bis(2-chloroethyl)ether	330	BQL
Bis(2-chloroisopropyl)ether	330	BQL
Bis(2-ethylhexyl)phthalate	330	BQL
4-bromophenyl phenyl ether	330	BQL
Butylbenzylphthalate	330	BQL
4-Chloroaniline	330	BQL
4-Chloro-3-methylphenol	330	BQL
2-Chloronaphthalene	330	BQL
2-Chlorophenol	330	BQL
4-Chlorophenyl phenyl ether	330	BQL
Chrysene	330	BQL
Di-n-Butylphthalate	330	BQL
Di-n-octylphthalate	330	BQL
Dibenzo[a,h]anthracene	330	BQL
Dibenzofuran	330	BQL
1,2-Dichlorobenzene	330	BQL
1,3-Dichlorobenzene	330	BQL
1,4-Dichlorobenzene	330	BQL
3,3'-Dichlorobenzidine	670	BQL
2,4-Dichlorophenol	330	BQL
Diethylphthalate	330	BQL
2,4-Dimethylphenol	330	BQL
Dimethylphthalate	330	BQL
4,6-Dinitro-2-methylphenol	1700	BQL
2,4-Dinitrophenol	1700	BQL
2,4-Dinitrotoluene	330	BQL
2,6-Dinitrotoluene	330	BQL
Fluoranthene	330	BQL
Fluorene	330	BQL
Hexachlorobenzene	330	BQL

Results for Semivolatiles
by GCMS 8270

Client Sample ID: Pit 1304-1S
Client Project ID: Pit 13-99185
Lab Sample ID: 72965
Lab Project ID: G128-503
Matrix: Soil

Date Collected: 9/23/99
Date Received: 9/24/99
Date Analyzed: 10/4/99
Dilution: 1

%Solids: 85.2

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Hexachlorobutadiene	330	BQL
Hexachlorocyclopentadiene	670	BQL
Hexachloroethane	330	BQL
Indeno(1,2,3-c,d)pyrene	330	BQL
Isophorone	330	BQL
2-Methylnaphthalene	330	BQL
2-Methylphenol	330	BQL
4-Methylphenol	330	BQL
N-Nitrosodi-n-propylamine	330	BQL
N-Nitrosodiphenylamine	330	BQL
Naphthalene	330	BQL
2-Nitroaniline	330	BQL
3-Nitroaniline	330	BQL
4-Nitroaniline	330	BQL
Nitrobenzene	330	BQL
2-Nitrophenol	330	BQL
4-Nitrophenol	1700	BQL
Pentachlorophenol	1700	BQL
Phenanthrene	330	BQL
Phenol	330	BQL
Pyrene	330	BQL
1,2,4-Trichlorobenzene	330	BQL
2,4,5-Trichlorophenol	330	BQL
2,4,6-Trichlorophenol	330	BQL

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovered
2,4,6-Tribromophenol	10	6.7	67
2-Fluorobiphenyl	10	9.7	97
2-Fluorophenol	10	8.3	83
4-Terphenyl-d14	10	9.1	91
Nitrobenzene-d5	10	8.5	85
Phenol-d6	10	8.1	81

Comments:

Results are corrected for %solids and dilution where applicable.
Analyzed By: MRC

Flags:

BQL = Below Quantitation Limit.

Reviewed By: 

Results for Semivolatiles
by GCMS 8270

Client Sample ID: Pit 1304-2S
 Client Project ID: Pit 13-99185
 Lab Sample ID: 72966
 Lab Project ID: G128-503
 Matrix: Soil

Date Collected: 9/23/99
 Date Received: 9/24/99
 Date Analyzed: 9/30/99
 Dilution: 1

%Solids: 78.2

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	380	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

Results for Semivolatiles

by GCMS 8270

Client Sample ID: Pit 1304-2S

Date Collected: 9/23/99

Client Project ID: Pit 13-99185

Date Received: 9/24/99

Lab Sample ID: 72966

Date Analyzed: 9/30/99

Lab Project ID: G128-503

Dilution: 1

Matrix: Soil

%Solids: 78.2

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
4-Methylphenol	380	BQL
N-Nitrosodi-n-propylamine	380	BQL
N-Nitrosodiphenylamine	380	BQL
Naphthalene	380	BQL
2-Nitroaniline	380	BQL
3-Nitroaniline	380	BQL
4-Nitroaniline	380	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
2,4,6-Tribromophenol	10	8.1	81
2-Fluorobiphenyl	10	8.7	87
2-Fluorophenol	10	8.1	81
4-Terphenyl-d14	10	10	100
Nitrobenzene-d5	10	8.1	81
Phenol-d6	10	7.9	79

Comments:

Results are corrected for %solids and dilution where applicable.

Analyzed By: MRC

Flags:

BQL = Below Quantitation Limit.

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Semivolatiles
by GCMS 8270

Client Sample ID: Pit 1305-1S

Client Project ID: Pit 13-99185

Lab Sample ID: 72967

Lab Project ID: G128-503

Matrix: Soil

%Solids: 77.2

Date Collected: 9/23/99

Date Received: 9/24/99

Date Analyzed: 9/30/99

Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Acenaphthene	390	BQL
Acenaphthylene	390	BQL
Anthracene	390	BQL
Benzo[a]anthracene	390	BQL
Benzo[a]pyrene	390	BQL
Benzo[b]fluoranthene	390	BQL
Benzo[g,h,i]perylene	390	BQL
Benzo[k]fluoranthene	390	BQL
Benzoic Acid	780	BQL
Bis(2-chloroethoxy)methane	390	BQL
Bis(2-chloroethyl)ether	390	BQL
Bis(2-chloroisopropyl)ether	390	BQL
Bis(2-ethylhexyl)phthalate	390	BQL
4-bromophenyl phenyl ether	390	BQL
Butylbenzylphthalate	390	BQL
4-Chloroaniline	390	BQL
4-Chloro-3-methylphenol	390	BQL
2-Chloronaphthalene	390	BQL
2-Chlorophenol	390	BQL
4-Chlorophenyl phenyl ether	390	BQL
Chrysene	390	BQL
Di-n-Butylphthalate	390	BQL
Di-n-octylphthalate	390	BQL
Dibenzo[a,h]anthracene	390	BQL
Dibenzofuran	390	BQL
1,2-Dichlorobenzene	390	BQL
1,3-Dichlorobenzene	390	BQL
1,4-Dichlorobenzene	390	BQL
3,3'-Dichlorobenzidine	780	BQL
2,4-Dichlorophenol	390	BQL
Diethylphthalate	390	BQL
2,4-Dimethylphenol	390	BQL
Dimethylphthalate	390	BQL
4,6-Dinitro-2-methylphenol	2000	BQL
2,4-Dinitrophenol	2000	BQL
2,4-Dinitrotoluene	390	BQL
2,6-Dinitrotoluene	390	BQL
Fluoranthene	390	BQL
Fluorene	390	BQL
Hexachlorobenzene	390	BQL

Results for Semivolatiles

by GCMS 8270

Client Sample ID: Pit 1305-1S

Date Collected: 9/23/99

Client Project ID: Pit 13-99185

Date Received: 9/24/99

Lab Sample ID: 72967

Date Analyzed: 9/30/99

Lab Project ID: G128-503

Dilution: 1

Matrix: Soil

%Solids: 77.2

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Hexachlorobutadiene	390	BQL
Hexachlorocyclopentadiene	780	BQL
Hexachloroethane	390	BQL
Indeno(1,2,3-c,d)pyrene	390	BQL
Isophorone	390	BQL
2-Methylnaphthalene	390	BQL
2-Methylphenol	390	BQL
4-Methylphenol	390	BQL
N-Nitrosodi-n-propylamine	390	BQL
N-Nitrosodiphenylamine	390	BQL
Naphthalene	390	BQL
2-Nitroaniline	390	BQL
3-Nitroaniline	390	BQL
4-Nitroaniline	390	BQL
Nitrobenzene	390	BQL
2-Nitrophenol	390	BQL
4-Nitrophenol	2000	BQL
Pentachlorophenol	2000	BQL
Phenanthrene	390	BQL
Phenol	390	BQL
Pyrene	390	BQL
1,2,4-Trichlorobenzene	390	BQL
2,4,5-Trichlorophenol	390	BQL
2,4,6-Trichlorophenol	390	BQL

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovered
2,4,6-Tribromophenol	10	7.9	79
2-Fluorobiphenyl	10	7.2	72
2-Fluorophenol	10	7.5	75
4-Terphenyl-d14	10	7.8	78
Nitrobenzene-d5	10	3.5	35
Phenol-d6	10	7.4	74

Comments:

Results are corrected for %solids and dilution where applicable.

Analyzed By: MRC

Flags:

BQL = Below Quantitation Limit.

Reviewed By: 

Results for Semivolatiles

by GCMS 8270

Client Sample ID: Pit 1305-2S

Date Collected: 9/23/99

Client Project ID: Pit 13-99185

Date Received: 9/24/99

Lab Sample ID: 72968

Date Analyzed: 9/30/99

Lab Project ID: G128-503

Dilution: 1

Matrix: Soil

%Solids: 77.2

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Acenaphthene	350	BQL
Acenaphthylene	350	BQL
Anthracene	350	BQL
Benzo[a]anthracene	350	BQL
Benzo[a]pyrene	350	BQL
Benzo[b]fluoranthene	350	BQL
Benzo[g,h,i]perylene	350	BQL
Benzo[k]fluoranthene	350	BQL
Benzoic Acid	700	BQL
Bis(2-chloroethoxy)methane	350	BQL
Bis(2-chloroethyl)ether	350	BQL
Bis(2-chloroisopropyl)ether	350	BQL
Bis(2-ethylhexyl)phthalate	350	BQL
4-bromophenyl phenyl ether	350	BQL
Butylbenzylphthalate	350	BQL
4-Chloroaniline	350	BQL
4-Chloro-3-methylphenol	350	BQL
2-Chloronaphthalene	350	BQL
2-Chlorophenol	350	BQL
4-Chlorophenyl phenyl ether	350	BQL
Chrysene	350	BQL
Di-n-Butylphthalate	350	BQL
Di-n-octylphthalate	350	BQL
Dibenzo[a,h]anthracene	350	BQL
Dibenzofuran	350	BQL
1,2-Dichlorobenzene	350	BQL
1,3-Dichlorobenzene	350	BQL
1,4-Dichlorobenzene	350	BQL
3,3'-Dichlorobenzidine	700	BQL
2,4-Dichlorophenol	350	BQL
Diethylphthalate	350	BQL
2,4-Dimethylphenol	350	BQL
Dimethylphthalate	350	BQL
4,6-Dinitro-2-methylphenol	1800	BQL
2,4-Dinitrophenol	1800	BQL
2,4-Dinitrotoluene	350	BQL
2,6-Dinitrotoluene	350	BQL
Fluoranthene	350	BQL
Fluorene	350	BQL
Hexachlorobenzene	350	BQL

Results for Semivolatiles

by GCMS 8270

Client Sample ID: Pit 1305-2S

Client Project ID: Pit 13-99185

Lab Sample ID: 72968

Lab Project ID: G128-503

Matrix: Soil

%Solids: 77.2

Date Collected: 9/23/99

Date Received: 9/24/99

Date Analyzed: 9/30/99

Dilution: 1

Compound	Quantitation Limit (ug/KG)	Result (ug/KG)
Hexachlorobutadiene	350	BQL
Hexachlorocyclopentadiene	700	BQL
Hexachloroethane	350	BQL
Indeno(1,2,3-c,d)pyrene	350	BQL
Isophorone	350	BQL
2-Methylnaphthalene	350	BQL
2-Methylphenol	350	BQL
4-Methylphenol	350	BQL
N-Nitrosodi-n-propylamine	350	BQL
N-Nitrosodiphenylamine	350	BQL
Naphthalene	350	BQL
2-Nitroaniline	350	BQL
3-Nitroaniline	350	BQL
4-Nitroaniline	350	BQL
Nitrobenzene	350	BQL
2-Nitrophenol	350	BQL
4-Nitrophenol	1800	BQL
Pentachlorophenol	1800	BQL
Phenanthrene	350	BQL
Phenol	350	BQL
Pyrene	350	BQL
1,2,4-Trichlorobenzene	350	BQL
2,4,5-Trichlorophenol	350	BQL
2,4,6-Trichlorophenol	350	BQL

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovered
2,4,6-Tribromophenol	10	8.1	81
2-Fluorobiphenyl	10	7.9	79
2-Fluorophenol	10	7.4	74
4-Terphenyl-d14	10	9.9	99
Nitrobenzene-d5	10	6.7	67
Phenol-d6	10	7.5	75

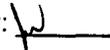
Comments:

Results are corrected for %solids and dilution where applicable.

Analyzed By: MRC

Flags:

BQL = Below Quantitation Limit.

Reviewed By: 

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

Project Name: Pit 13-99185

Sample Information and Analytical Results	
Sample Identification	Pit 1302-1S
Sample Matrix	Soil
Collection Option (for Soil)*	3
Date Collected	09/23/99
Date Received	09/24/99
Date Extracted	09/23/99
Date Analyzed	10/05/99
Dry Weight	86
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 500 (µg/Kg)
C ₉ -C ₁₂ Aliphatics**	< 500 (µg/Kg)
C ₉ -C ₁₀ Aromatics**	< 500 (µg/Kg)
Surrogate % Recovery - PID	68
Surrogate % Recovery - FID	75

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

** = Excludes any surrogates or internal standards.

Lab Info: G128-503-72961

Reviewed By: 

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

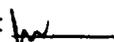
Project Name: Pit 13-99185

Sample Information and Analytical Results	
Sample Identification	Pit 1302-2S
Sample Matrix	Soil
Collection Option (for Soil)*	3
Date Collected	09/23/99
Date Received	09/24/99
Date Extracted	09/23/99
Date Analyzed	10/05/99
Dry Weight	83
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 500 (µg/Kg)
C ₉ -C ₁₂ Aliphatics**	< 500 (µg/Kg)
C ₉ -C ₁₀ Aromatics**	< 500 (µg/Kg)
Surrogate % Recovery - PID	68
Surrogate % Recovery - FID	76

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

** = Excludes any surrogates or internal standards.

Lab Info: G128-503-72962

Reviewed By: 

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

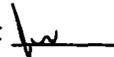
Project Name: Pit 13-99185

Sample Information and Analytical Results	
Sample Identification	Pit 1303-1S
Sample Matrix	Soil
Collection Option (for Soil)*	3
Date Collected	09/23/99
Date Received	09/24/99
Date Extracted	09/23/99
Date Analyzed	10/01/99
Dry Weight	83
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 500 (µg/Kg)
C ₉ -C ₁₂ Aliphatics**	< 500 (µg/Kg)
C ₉ -C ₁₀ Aromatics**	< 500 (µg/Kg)
Surrogate % Recovery - PID	71
Surrogate % Recovery - FID	75

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

** = Excludes any surrogates or internal standards.

Lab Info: G128-503-72963

Reviewed By: 

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & AssociatesProject Name: Pit 13-99185

Sample Information and Analytical Results	
Sample Identification	Pit 1303-2S
Sample Matrix	Soil
Collection Option (for Soil)*	3
Date Collected	09/23/99
Date Received	09/24/99
Date Extracted	09/23/99
Date Analyzed	10/01/99
Dry Weight	80
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 500 (µg/Kg)
C ₉ -C ₁₂ Aliphatics**	< 500 (µg/Kg)
C ₉ -C ₁₀ Aromatics**	< 500 (µg/Kg)
Surrogate % Recovery - PID	71
Surrogate % Recovery - FID	75

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

** = Excludes any surrogates or internal standards.

Lab Info: G128-503-72964

Reviewed By: W

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

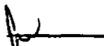
Project Name: Pit 13-99185

Sample Information and Analytical Results	
Sample Identification	Pit 1304-1S
Sample Matrix	Soil
Collection Option (for Soil)*	3
Date Collected	09/23/99
Date Received	09/24/99
Date Extracted	09/23/99
Date Analyzed	10/01/99
Dry Weight	85
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 500 (µg/Kg)
C ₉ -C ₁₂ Aliphatics**	< 500 (µg/Kg)
C ₉ -C ₁₀ Aromatics**	< 500 (µg/Kg)
Surrogate % Recovery - PID	72
Surrogate % Recovery - FID	75

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

** = Excludes any surrogates or internal standards.

Lab Info: G128-503-72965

Reviewed By: 

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

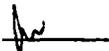
Project Name: Pit 13-99185

Sample Information and Analytical Results	
Sample Identification	Pit 1305-2S
Sample Matrix	Soil
Collection Option (for Soil)*	3
Date Collected	09/23/99
Date Received	09/24/99
Date Extracted	09/23/99
Date Analyzed	10/02/99
Dry Weight	77
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 500 (µg/Kg)
C ₉ -C ₁₂ Aliphatics**	< 500 (µg/Kg)
C ₉ -C ₁₀ Aromatics**	< 500 (µg/Kg)
Surrogate % Recovery - PID	71
Surrogate % Recovery - FID	75

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

** = Excludes any surrogates or internal standards.

Lab Info: G128-503-72968

Reviewed By: 

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

Project Name: Pit 13-99185

Sample Information and Analytical Results	
Sample Identification	Trip Blank
Sample Matrix	Soil
Collection Option (for Soil)*	3
Date Collected	09/23/99
Date Received	09/24/99
Date Extracted	09/23/99
Date Analyzed	10/01/99
Dry Weight	100
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 500 (µg/Kg)
C ₉ -C ₁₂ Aliphatics**	< 500 (µg/Kg)
C ₉ -C ₁₀ Aromatics**	< 500 (µg/Kg)
Surrogate % Recovery - PID	72
Surrogate % Recovery - FID	77

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

** = Excludes any surrogates or internal standards.

Lab Info: G128-503-72969

Reviewed By: 

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

Project Name: Pit 13-99185

Sample Information and Analytical Results	
Sample Identification	Pit 1303 GW
Sample Matrix	Water
Collection Option (for Soil)*	
Date Collected	09/23/99
Date Received	09/24/99
Date Extracted	10/01/99
Date Analyzed	10/01/99
Dry Weight	
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 10 (µg/L)
C ₉ -C ₁₂ Aliphatics**	< 10 (µg/L)
C ₉ -C ₁₀ Aromatics**	< 10 (µg/L)
Surrogate % Recovery - PID	73
Surrogate % Recovery - FID	77

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

** = Excludes any surrogates or internal standards.

Lab Info: G128-503-72971

Reviewed By: hw

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

Project Name: Pit 13-99185

Sample Information and Analytical Results	
Sample Identification	Pit 1304 GW
Sample Matrix	Water
Collection Option (for Soil)*	
Date Collected	09/23/99
Date Received	09/24/99
Date Extracted	10/01/99
Date Analyzed	10/01/99
Dry Weight	
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 10 (µg/L)
C ₉ -C ₁₂ Aliphatics**	< 10 (µg/L)
C ₉ -C ₁₀ Aromatics**	< 10 (µg/L)
Surrogate % Recovery - PID	73
Surrogate % Recovery - FID	77

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

** = Excludes any surrogates or internal standards.

Lab Info: G128-503-72972

Reviewed By: 

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

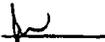
Project Name: Pit 13-99185

Sample Information and Analytical Results	
Sample Identification	Pit 1305 GW
Sample Matrix	Water
Collection Option (for Soil)*	
Date Collected	09/23/99
Date Received	09/24/99
Date Extracted	10/01/99
Date Analyzed	10/01/99
Dry Weight	
Dilution Factor	1
C ₅ -C ₈ Aliphatics**	< 10 (µg/L)
C ₉ -C ₁₂ Aliphatics**	< 10 (µg/L)
C ₉ -C ₁₀ Aromatics**	< 10 (µg/L)
Surrogate % Recovery - PID	73
Surrogate % Recovery - FID	76

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

** = Excludes any surrogates or internal standards.

Lab Info: G128-503-72973

Reviewed By: 

VPH Laboratory Reporting Form

Calibration and QA/QC Information

FID Initial Calibration Date: 09/20/99 PID Initial Calibration Date: 09/20/99

Calibration Ranges and Limits

Range	MDL		ML		RL	
	(µg/L)	(µg/Kg)	(µg/L)	(µg/Kg)	(µg/L)	(µg/Kg)
C ₅ -C ₈ Aliphatics	2.4	120	7.5	380	10	500
C ₉ -C ₁₂ Aliphatics	1.3	65	4.0	210	10	500
C ₉ -C ₁₀ Aromatics	0.5	25	1.6	80	10	500

Calibration Concentration Levels

Range	Levels		%RSD or CCC	Method of Quantitation
	(µg/L)	(µg/Kg)		
C ₅ -C ₈ Aliphatics	40	2000	9.1	Calibration Factor
	160	8000		
	400	20000		
	1600	80000		
	4000	200000		
C ₉ -C ₁₂ Aliphatics	30	1500	0.993	Linear Regression
	120	6000		
	300	15000		
	1200	60000		
	3000	150000		
C ₉ -C ₁₀ Aromatics	65	3250	16.1	Calibration Factor
	260	13000		
	650	32500		
	2600	130000		
	6500	325000		

Calibration Check Date: 10/05/99

Calibration Check

Range	Levels		RPD
	(µg/L)	(µg/Kg)	
C ₅ -C ₈ Aliphatics	400	20000	16.9
C ₉ -C ₁₂ Aliphatics	300	15000	1.2
C ₉ -C ₁₀ Aromatics	650	32500	9.9

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: 

VPH Laboratory Reporting Form

Calibration and QA/QC Information

FID Initial Calibration Date: 09/20/99 PID Initial Calibration Date: 09/20/99

Calibration Ranges and Limits

Range	MDL		ML		RL	
	(µg/L)	(µg/Kg)	(µg/L)	(µg/Kg)	(µg/L)	(µg/Kg)
C ₅ -C ₈ Aliphatics	2.4	120	7.5	380	10	500
C ₉ -C ₁₂ Aliphatics	1.3	65	4.0	210	10	500
C ₉ -C ₁₀ Aromatics	0.5	25	1.6	80	10	500

Calibration Concentration Levels

Range	Levels		%RSD or CCC	Method of Quantitation
	(µg/L)	(µg/Kg)		
C ₅ -C ₈ Aliphatics	40	2000	9.1	Calibration Factor
	160	8000		
	400	20000		
	1600	80000		
	4000	200000		
C ₉ -C ₁₂ Aliphatics	30	1500	0.993	Linear Regression
	120	6000		
	300	15000		
	1200	60000		
	3000	150000		
C ₉ -C ₁₀ Aromatics	65	3250	16.1	Calibration Factor
	260	13000		
	650	32500		
	2600	130000		
	6500	325000		

Calibration Check Date: 09/30/99

Calibration Check

Range	Levels		RPD
	(µg/L)	(µg/Kg)	
C ₅ -C ₈ Aliphatics	400	20000	15.7
C ₉ -C ₁₂ Aliphatics	300	15000	-6.4
C ₉ -C ₁₀ Aromatics	650	32500	3.8

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: Richard Callin & Associates

Project Name: Pit 13-99185

Sample Information and Analytical Results	
Sample Identification	Pit 1303-2S
Sample Matrix	Soil
Date Collected	09/23/99
Date Received	09/24/99
Date Extracted	09/27/99
Date Analyzed	10/04/99
Dry Weight	80.2
Dilution Factor	1
C ₉ -C ₁₈ Aliphatics*	< 10 (mg/Kg)
C ₁₉ -C ₃₈ Aliphatics*	< 10 (mg/Kg)
C ₁₁ -C ₂₂ Aromatics*	< 10 (mg/Kg)
Aliphatic Surrogate % Recovery	97
Aromatic Surrogate % Recovery	100

Comments:

* = Excludes any surrogates or internal standards.

Sample did not require fractionation.

EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Richard Catlin & Associates

Project Name: Pit 13-99185

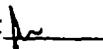
Sample Information and Analytical Results	
Sample Identification	Pit 1304-1S
Sample Matrix	Soil
Date Collected	09/23/99
Date Received	09/24/99
Date Extracted	09/27/99
Date Analyzed	10/04/99
Dry Weight	85.2
Dilution Factor	1
C ₉ -C ₁₈ Aliphatics*	< 10 (mg/Kg)
C ₁₉ -C ₃₈ Aliphatics*	< 10 (mg/Kg)
C ₁₁ -C ₂₂ Aromatics*	< 10 (mg/Kg)
Aliphatic Surrogate % Recovery	100
Aromatic Surrogate % Recovery	110

Comments:

* = Excludes any surrogates or internal standards.

Sample did not require fractionation.

Lab info: G128-503-72965

Reviewed By: 

EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Richard Catlin & Associates

Project Name: Pit 13-99185

Sample Information and Analytical Results	
Sample Identification	Pit 1304-2S
Sample Matrix	Soil
Date Collected	09/23/99
Date Received	09/24/99
Date Extracted	09/27/99
Date Analyzed	10/04/99
Dry Weight	78.2
Dilution Factor	1
C ₉ -C ₁₈ Aliphatics*	< 10 (mg/Kg)
C ₁₉ -C ₃₈ Aliphatics*	< 10 (mg/Kg)
C ₁₁ -C ₂₂ Aromatics*	< 10 (mg/Kg)
Aliphatic Surrogate % Recovery	94
Aromatic Surrogate % Recovery	94

Comments:

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

EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Richard Catlin & AssociatesProject Name: Pit 13-99185

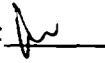
Sample Information and Analytical Results	
Sample Identification	Pit 1305-1S
Sample Matrix	Soil
Date Collected	09/23/99
Date Received	09/24/99
Date Extracted	09/27/99
Date Analyzed	10/04/99
Dry Weight	77.2
Dilution Factor	1
C ₉ -C ₁₈ Aliphatics*	< 10 (mg/Kg)
C ₁₉ -C ₃₆ Aliphatics*	< 10 (mg/Kg)
C ₁₁ -C ₂₂ Aromatics*	< 10 (mg/Kg)
Aliphatic Surrogate % Recovery	65
Aromatic Surrogate % Recovery	70

Comments:

* = Excludes any surrogates or internal standards.

Sample did not require fractionation.

Lab info: G128-503-72967

Reviewed By: 

EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Richard Catlin & Associates

Project Name: Pit 13-99185

Sample Information and Analytical Results	
Sample Identification	Pit 1305-2S
Sample Matrix	Soil
Date Collected	09/23/99
Date Received	09/24/99
Date Extracted	09/27/99
Date Analyzed	10/04/99
Dry Weight	77.2
Dilution Factor	1
C ₉ -C ₁₈ Aliphatics*	< 10 (mg/Kg)
C ₁₉ -C ₃₆ Aliphatics*	< 10 (mg/Kg)
C ₁₁ -C ₂₂ Aromatics*	< 10 (mg/Kg)
Aliphatic Surrogate % Recovery	72
Aromatic Surrogate % Recovery	72

Comments:

* = Excludes any surrogates or internal standards.

Sample did not require fractionation.

Lab info: G128-503-72968

Reviewed By:

EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Richard Catlin & Associates

Project Name: Pit 13-99185

Sample Information and Analytical Results	
Sample Identification	Pit 1303 GW
Sample Matrix	Water
Date Collected	09/23/99
Date Received	09/24/99
Date Extracted	09/27/99
Date Analyzed	09/30/99
Dry Weight	
Dilution Factor	1
C ₉ -C ₁₈ Aliphatics*	< 1 (µg/mL)
C ₁₉ -C ₃₈ Aliphatics*	< 1 (µg/mL)
C ₁₁ -C ₂₂ Aromatics*	< 1 (µg/mL)
Aliphatic Surrogate % Recovery	120
Aromatic Surrogate % Recovery	130

Comments:

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

Lab info: G128-503-72971

Reviewed By:

EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Richard Catlin & Associates

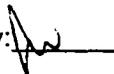
Project Name: Pit 13-99185

Sample Information and Analytical Results	
Sample Identification	Pit 1304 GW
Sample Matrix	Water
Date Collected	09/23/99
Date Received	09/24/99
Date Extracted	09/27/99
Date Analyzed	09/30/99
Dry Weight	
Dilution Factor	1
C ₉ -C ₁₈ Aliphatics*	< 1 (µg/mL)
C ₁₉ -C ₃₈ Aliphatics*	< 1 (µg/mL)
C ₁₁ -C ₂₂ Aromatics*	< 1 (µg/mL)
Aliphatic Surrogate % Recovery	120
Aromatic Surrogate % Recovery	130

Comments:

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

Lab info: G128-503-72972

Reviewed By: 

EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Richard Catlin & Associates

Project Name: Pit 13-99185

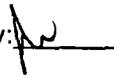
Sample Information and Analytical Results	
Sample Identification	Pit 1305 GW
Sample Matrix	Water
Date Collected	09/23/99
Date Received	09/24/99
Date Extracted	09/27/99
Date Analyzed	09/30/99
Dry Weight	
Dilution Factor	1
C ₉ -C ₁₈ Aliphatics*	< 1 (µg/mL)
C ₁₉ -C ₃₈ Aliphatics*	< 1 (µg/mL)
C ₁₁ -C ₂₂ Aromatics*	< 1 (µg/mL)
Aliphatic Surrogate % Recovery	120
Aromatic Surrogate % Recovery	130

Comments:

* = Excludes any surrogates or internal standards.

Sample did not require fractionation.

Lab info: G128-503-72973

Reviewed By: 

EPH Laboratory Reporting Form

Calibration and QA/QC Information

Initial Calibration Date: 09/19/99

Calibration Ranges and Limits

Range	MDL		ML		RL	
	(µg/mL)	(mg/Kg)	(µg/mL)	(mg/Kg)	(µg/mL)	(mg/Kg)
C ₉ -C ₁₈ Aliphatics	0.1	2	0.3	6.5	1	10
C ₁₉ -C ₃₆ Aliphatics	0.1	1	0.3	3.1	1	10
C ₁₁ -C ₂₂ Aromatics	0.2	2.5	0.6	8	1	10

Calibration Concentration Levels

Range	Levels		%RSD or CCC	Method of Quantitation
	(µg/mL)	(mg/Kg)		
C ₉ -C ₁₈ Aliphatics	0.6	10	6.10	Calibration Factor
	1.5	25		
	3	50		
	6	100		
	12	200		
C ₁₉ -C ₃₆ Aliphatics	0.8	13.3	6.6	Calibration Factor
	2	33.3		
	4	66.7		
	8	133		
	16	267		
C ₁₁ -C ₂₂ Aromatics	1.2	20	4.9	Calibration Factor
	3	50		
	6	100		
	12	200		
	24	400		

Calibration Check Date: 10/07/99

Calibration Check

Range	Levels		RPD
	(µg/mL)	(mg/Kg)	
C ₉ -C ₁₈ Aliphatics	6	100	8.6
C ₁₉ -C ₃₆ Aliphatics	8	133	-20.3
C ₁₁ -C ₂₂ Aromatics	12	200	20.5

MDL = Method Detection Limit

ML = Minimum Limit

RL = Reportable Limit

RPD = Relative Percent Difference

%RSD = Percent Relative Standard Deviation

CCC = Correlation Coefficient of Curve

EPH Laboratory Reporting Form

Calibration and QA/QC Information

Initial Calibration Date: 09/19/99

Calibration Ranges and Limits

Range	MDL		ML		RL	
	(µg/mL)	(mg/Kg)	(µg/mL)	(mg/Kg)	(µg/mL)	(mg/Kg)
C ₉ -C ₁₈ Aliphatics	0.1	2	0.3	6.5	1	10
C ₁₉ -C ₃₆ Aliphatics	0.1	1	0.3	3.1	1	10
C ₁₁ -C ₂₂ Aromatics	0.2	2.5	0.6	8	1	10

Calibration Concentration Levels

Range	Levels		%RSD or CCC	Method of Quantitation
	(µg/mL)	(mg/Kg)		
C ₉ -C ₁₈ Aliphatics	0.6	10	6.10	Calibration Factor
	1.5	25		
	3	50		
	6	100		
	12	200		
C ₁₉ -C ₃₆ Aliphatics	0.8	13.3	6.6	Calibration Factor
	2	33.3		
	4	66.7		
	8	133		
	16	267		
C ₁₁ -C ₂₂ Aromatics	1.2	20	4.9	Calibration Factor
	3	50		
	6	100		
	12	200		
	24	400		

Calibration Check Date: 10/04/99

Calibration Check

Range	Levels		RPD
	(µg/mL)	(mg/Kg)	
C ₉ -C ₁₈ Aliphatics	6	100	19.8
C ₁₉ -C ₃₆ Aliphatics	8	133	-2.6
C ₁₁ -C ₂₂ Aromatics	12	200	20.3

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

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

EPH Laboratory Reporting Form

Calibration and QA/QC Information

Initial Calibration Date: 09/19/99

Calibration Ranges and Limits

Range	MDL		ML		RL	
	(µg/mL)	(mg/Kg)	(µg/mL)	(mg/Kg)	(µg/mL)	(mg/Kg)
C ₉ -C ₁₈ Aliphatics	0.1	2	0.3	6.5	1	10
C ₁₉ -C ₃₈ Aliphatics	0.1	1	0.3	3.1	1	10
C ₁₁ -C ₂₂ Aromatics	0.2	2.5	0.6	8	1	10

Calibration Concentration Levels

Range	Levels		%RSD or CCC	Method of Quantitation
	(µg/mL)	(mg/Kg)		
C ₉ -C ₁₈ Aliphatics	0.6	10	6.10	Calibration Factor
	1.5	25		
	3	50		
	6	100		
	12	200		
C ₁₉ -C ₃₈ Aliphatics	0.8	13.3	6.6	Calibration Factor
	2	33.3		
	4	66.7		
	8	133		
	16	267		
C ₁₁ -C ₂₂ Aromatics	1.2	20	4.9	Calibration Factor
	3	50		
	6	100		
	12	200		
	24	400		

Calibration Check Date: 09/30/99

Calibration Check

Range	Levels		RPD
	(µg/mL)	(mg/Kg)	
C ₉ -C ₁₈ Aliphatics	6	100	23.1
C ₁₉ -C ₃₈ Aliphatics	8	133	-9.6
C ₁₁ -C ₂₂ Aromatics	12	200	7.5

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

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

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GC 602

Client Sample ID: Pit 1302 GW
Client Project ID: Pit 13-99185
Lab Sample ID: 72970
Lab Project ID: G128-503

Analyzed By: EKR
Date Collected: 9/23/99
Date Received: 9/24/99
Matrix: Water

Compound	Date Analyzed	Dilution	Quantitation Limit (ug/L)	Result (ug/L)
Benzene	10/6/99	1	1	BQL
Diisopropyl ether (DIPE)	10/6/99	1	1	BQL
Ethylbenzene	10/6/99	1	1	BQL
Methyl-tert-butyl ether (MTBE)	10/6/99	1	2	BQL
Toluene	10/6/99	1	1	BQL
m/p-Xylene	10/6/99	1	2	BQL
o-Xylene	10/6/99	1	2	BQL

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovered
Trifluorotoluene	40	39	98

Comments:

All values corrected for dilution.

Flags:

BQL = Below quantitation limit

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GC 602

Client Sample ID: Pit 1303 GW
 Client Project ID: Pit 13-99185
 Lab Sample ID: 72971
 Lab Project ID: G128-503

Analyzed By: EKR
 Date Collected: 9/23/99
 Date Received: 9/24/99
 Matrix: Water

Compound	Date Analyzed	Dilution	Quantitation Limit (ug/L)	Result (ug/L)
Benzene	10/6/99	1	1	BQL
Diisopropyl ether (DIPE)	10/6/99	1	1	BQL
Ethylbenzene	10/6/99	1	1	BQL
Methyl-tert-butyl ether (MTBE)	10/6/99	1	2	BQL
Toluene	10/6/99	1	1	BQL
m/p-Xylene	10/6/99	1	2	BQL
o-Xylene	10/6/99	1	2	BQL

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovered
Trifluorotoluene	40	41	103

Comments:

All values corrected for dilution.

Flags:

BQL = Below quantitation limit

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GC 602

Client Sample ID: Pit 1304 GW
 Client Project ID: Pit 13-99185
 Lab Sample ID: 72972
 Lab Project ID: G128-503

Analyzed By: EKR
 Date Collected: 9/23/99
 Date Received: 9/24/99
 Matrix: Water

Compound	Date Analyzed	Dilution	Quantitation Limit (ug/L)	Result (ug/L)
Benzene	10/6/99	1	1	BQL
Diisopropyl ether (DIPE)	10/6/99	1	1	BQL
Ethylbenzene	10/6/99	1	1	BQL
Methyl-tert-butyl ether (MTBE)	10/6/99	1	2	BQL
Toluene	10/6/99	1	1	BQL
m/p-Xylene	10/6/99	1	2	BQL
o-Xylene	10/6/99	1	2	BQL

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovered
Trifluorotoluene	40	41	102

Comments:

All values corrected for dilution.

Flags:

BQL = Below quantitation limit

Reviewed By: hw

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GC 602

Client Sample ID: Pit 1305 GW
Client Project ID: Pit 13-99185
Lab Sample ID: 72973
Lab Project ID: G128-503

Analyzed By: EKR
Date Collected: 9/23/99
Date Received: 9/24/99
Matrix: Water

Compound	Date Analyzed	Dilution	Quantitation Limit (ug/L)	Result (ug/L)
Benzene	10/6/99	1	1	BQL
Diisopropyl ether (DIPE)	10/6/99	1	1	BQL
Ethylbenzene	10/6/99	1	1	BQL
Methyl-tert-butyl ether (MTBE)	10/6/99	1	2	BQL
Toluene	10/6/99	1	1	BQL
m/p-Xylene	10/6/99	1	2	BQL
o-Xylene	10/6/99	1	2	BQL

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovered
Trifluorotoluene	40	42	104

Comments:

All values corrected for dilution.

Flags:

BQL = Below quantitation limit

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Semivolatiles

by GCMS EPA 625

Client Sample ID: Pit 1302 GW

Client Project ID: Pit 13-99185

Lab Sample ID: 72970

Lab Project ID: G128-503

Matrix: Water

Date Collected: 9/23/99

Date Received: 9/24/99

Date Analyzed: 9/29/99

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	BQL
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 of Library Search
for Semi-volatile Compounds
by GCMS

Client Sample ID: Pit 1302 GW
Client Project ID: Pit 13-99185
Lab Sample ID: 72970
Lab Project ID: G128-503
Matrix: Water

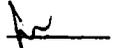
Date Analyzed: 9/29/99
Analyzed By: MRC
Date Collected: 9/23/99
Date Received: 9/24/99
Dilution: 1.0

Num.	Compound	CAS#	Match Probability	Result (ug/L)
1	Unknown			15
2	Unknown			10
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 height 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 height is equal to or greater than 10% of that of the nearest internal standard. Quantitation provided is an estimate.

Reviewed by: 

Results for Semivolatiles
by GCMS EPA 625

Client Sample ID: Pit 1303 GW
Client Project ID: Pit 13-99185
Lab Sample ID: 72971
Lab Project ID: G128-503
Matrix: Water

Date Collected: 9/23/99
Date Received: 9/24/99
Date Analyzed: 9/29/99
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	BQL
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

Results for Semivolatiles
by GCMS EPA 625

Client Sample ID: Pit 1303 GW
Client Project ID: Pit 13-99185
Lab Sample ID: 72971
Lab Project ID: G128-503
Matrix: Water

Date Collected: 9/23/99
Date Received: 9/24/99
Date Analyzed: 9/29/99
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
2,4,6-Tribromophenol	10	9.5	95
2-Fluorobiphenyl	10	9.8	98
2-Fluorophenol	10	8.4	84
4-Terphenyl-d14	10	11.2	112
Nitrobenzene-d5	10	8.8	88
Phenol-d6	10	8.9	89

Comments:

Results are corrected for %solids and dilution where applicable.

Analyzed By: MRC

Flags:

BQL = Below Quantitation Limit.

Reviewed By: 

Results for Semivolatiles
by GCMS EPA 625

Client Sample ID: Pit 1304 GW
Client Project ID: Pit 13-99185
Lab Sample ID: 72972
Lab Project ID: G128-503
Matrix: Water

Date Collected: 9/23/99
Date Received: 9/24/99
Date Analyzed: 9/29/99
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	BQL
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 of Library Search
for Semivolatile Compounds
by GCMS

Client Sample ID: Pit 1304 GW
Client Project ID: Pit 13-99185
Lab Sample ID: 72972
Lab Project ID: G128-503
Matrix: Water

Date Analyzed: 9/29/99
Analyzed By: MRC
Date Collected: 9/23/99
Date Received: 9/24/99
Dilution: 1.0

Num.	Compound	CAS#	Match Probability	Result (ug/L)
1	Unknown			6
2	Unknown			5
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 height 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 height is equal to or greater than 10% of that of the nearest internal standard. Quantitation provided is an estimate.

Reviewed by: 

Results for Semivolatiles
by GCMS EPA 625

Client Sample ID: Pit 1305 GW
 Client Project ID: Pit 13-99185
 Lab Sample ID: 72973
 Lab Project ID: G128-503
 Matrix: Water

Date Collected: 9/23/99
 Date Received: 9/24/99
 Date Analyzed: 9/29/99
 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	BQL
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

Results for Semivolatiles
by GCMS EPA 625

Client Sample ID: Pit 1305 GW
Client Project ID: Pit 13-99185
Lab Sample ID: 72973
Lab Project ID: G128-503
Matrix: Water

Date Collected: 9/23/99
Date Received: 9/24/99
Date Analyzed: 9/29/99
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
2,4,6-Tribromophenol	10	8.6	86
2-Fluorobiphenyl	10	9.1	91
2-Fluorophenol	10	7.8	78
4-Terphenyl-d14	10	9.8	98
Nitrobenzene-d5	10	8.2	82
Phenol-d6	10	7.9	79

Comments:

Results are corrected for %solids and dilution where applicable.

Analyzed By: MRC

Flags:

BQL = Below Quantitation Limit.

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.
Results of Library Search
for Semivolatile Compounds
by GCMS

Client Sample ID: Pit 1305 GW
Client Project ID: Pit 13-99185
Lab Sample ID: 72973
Lab Project ID: G128-503
Matrix: Water

Date Analyzed: 9/29/99
Analyzed By: MRC
Date Collected: 9/23/99
Date Received: 9/24/99
Dilution: 1.0

Num.	Compound	CAS#	Match Probability	Result (ug/L)
1	Unknown			5
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 height 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 height 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 Inorganics

Client Sample ID: Pit 1302 GW
Client Project ID: Pit 13-99185
Lab Sample ID: 72970
Lab Project ID: G128-503

Analyzed By: JMF
Date Collected: 9/23/99
Date Received: 9/24/99
Matrix: Water

Metals	Result	Quantitation Limit	Units	Procedure	Date Analyzed
Lead	BQL	0.0100	MG/L	6010B	10/7/99

Comments

BQL = Below Quantitation Limits

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Inorganics

Client Sample ID: Pit 1303 GW
Client Project ID: Pit 13-99185
Lab Sample ID: 72971
Lab Project ID: G128-503

Analyzed By: JMF
Date Collected: 9/23/99
Date Received: 9/24/99
Matrix: Water

Metals	Result	Quantitation Limit	Units	Procedure	Date Analyzed
Lead	BQL	0.0100	MG/L	6010B	10/7/99

Comments

BQL = Below Quantitation Limits

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Inorganics

Client Sample ID: Pit 1304 GW
Client Project ID: Pit 13-99185
Lab Sample ID: 72972
Lab Project ID: G128-503

Analyzed By: JMF
Date Collected: 9/23/99
Date Received: 9/24/99
Matrix: Water

Metals	Result	Quantitation Limit	Units	Procedure	Date Analyzed
Lead	BQL	0.0100	MG/L	6010B	10/7/99

Comments

BQL = Below Quantitation Limits

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Inorganics

Client Sample ID: Pit 1305 GW
Client Project ID: Pit 13-99185
Lab Sample ID: 72973
Lab Project ID: G128-503

Analyzed By: JMF
Date Collected: 9/23/99
Date Received: 9/24/99
Matrix: Water

Metals	Result	Quantitation Limit	Units	Procedure	Date Analyzed
Lead	BQL	0.0100	MG/L	6010B	10/7/99

Comments

BQL = Below Quantitation Limits

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

2627 Northchase Parkway SE, Wilmington, NC 28405

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

Chain-of Custody Record & Analytical Request

COC# 10638.

Page 1 of 2

Client: Catlin Engineers

Project ID: Pit 13-99185

Date: 9/23/99

Report To: Steve Tyler

Address: PO 10279

P.O. Number: _____

Turnaround: _____

Address: Wilmington, NC 28404

Contact: Gary Smith

Job Number: _____

Quote #: _____

Phone: 452-5861

Invoice To: Project 99185

Sample ID	Date	Time	Matrix	Preservatives				Analyses				Comments: Please specify any special reporting requirements	
				M				8	8	V	E		
Pit 1301-1s	9/23/99		S	✓				8	8	V	E		Not Taken yet
Pit 1301-2s	9/23/99		S	✓				8	8	V	E		Not Taken yet
Pit 1302-1s	9/23/99	1130	S	✓				✓	✓	✓	✓		
Pit 1302-2s		1130		✓				✓	✓	✓	✓		
Pit 1303-1s		1300		✓				✓	✓	✓	✓		
Pit 1303-2s		1300		✓				✓	✓	✓	✓		
Pit 1304-1s		1430		✓				✓	✓	✓	✓		
Pit 1304-2s		1430		✓				✓	✓	✓	✓		
Pit 1305-1s		1530		✓				✓	✓	✓	✓		
Pit 1305-2s		1530		✓				✓	✓	✓	✓		
Relinquished By		Date	Time	Received By				Date	Time	Temperature	Sampled By		Airbill #
G.D. Smith		9/24/99	1500	A. Njony				9/24/99	1500	On ice-walkin			

APPENDIX D

**BENZOIC ACID AND PHENOL
MAXIMUM SOIL CONTAMINANT CONCENTRATIONS (MSCCs) CALCULATIONS**

**Equation 1 - Non-Cancer Risk-Based Industrial/Commercial
Ingestion Concentration - Soil_{nc} (mg/kg)**

$$\text{Soil}_{nc} = \frac{\text{THQ} \times \text{RfD}_o \times \text{BW}_a \times \text{AT}_n}{\text{EF}_o \times \text{ED}_o \times \frac{\text{IRS}_a}{10^6 \text{ mg/kg}} \times \text{FC}}$$

	Parameters	Parameter Values	Units
THQ	Target Hazard Quotient	0.2	unitless
*RfD _o	Oral chronic reference dose	chemical-specific	mg/kg/day
BW _a	Body weight, adult	70	kg
AT _n	Averaging time noncarcinogens	9125	days
EF _o	Exposure frequency	250	days/year
ED _o	Exposure Duration, adult	25	years
IRS _a	Soil ingestion, adult	100	mg/day
FC	Fraction of contaminated soil ingested	0.5	unitless

* Benzoic Acid RfD_o = 4 mg/kg/day ⁽¹⁾

Therefore:

$$\begin{aligned} \text{Benzoic Acid Soil}_{nc} &= \frac{0.2 \times 4 \text{ mg/kg/day} \times 70 \text{ kg} \times 9125 \text{ days}}{250 \text{ days/year} \times 25 \text{ years} \times \frac{100 \text{ mg/day}}{10^6 \text{ mg/kg}} \times 0.5} \\ &= \frac{511,000}{0.3125} \text{ mg/kg} \\ &= 1,635,200 \text{ mg/kg} \end{aligned}$$

(1) Obtained from EPA's Integrated Risk Information System (IRIS) Online IRIS Substance File, 10/22/99

**Equation 1 - Non-Cancer Risk-Based Residential
Ingestion Concentration - Soil_{nc} (mg/kg)**

$$\text{Soil}_{nc} = \frac{\text{THQ} \times \text{RfD}_o \times \text{BW}_c \times \text{AT}_n}{\text{EF}_r \times \text{ED}_c \times \frac{\text{IRS}_c}{10^6 \text{ mg/kg}}}$$

	Parameters	Parameter Values	Units
THQ	Target Hazard Quotient	0.2	unitless
*RfD _o	Oral chronic reference dose	chemical-specific	mg/kg/day
BW _c	Body weight, Age 1 - 6	15	kg
AT _n	Averaging time noncarcinogens	2,190	days
EF _r	Exposure frequency	350	days/year
ED _c	Exposure Duration, Age 1 - 6	6	years
IRS _c	Soil ingestion, Age 1 - 6	200	mg/day

* Phenol RfD_o = 0.6 mg/kg/day ⁽¹⁾

Therefore:

$$\begin{aligned} \text{Phenol Soil}_{nc} &= \frac{0.2 \times 0.6 \text{ mg/kg/day} \times 15 \text{ kg} \times 2190 \text{ days}}{350 \text{ days/year} \times 6 \text{ years} \times \frac{200 \text{ mg/day}}{10^6 \text{ mg/kg}}} \\ &= \frac{3.942}{0.42} \text{ mg/kg} \\ &= 9,386 \text{ mg/kg} \end{aligned}$$

(1) Obtained from EPA's Integrated Risk Information System (IRIS) Online IRIS Substance File, 10/22/99

Transport Model for Calculation of Soil-to-Groundwater Maximum Contaminant Concentrations

$$C_{\text{soil}} = C_{\text{gw}} \left[\frac{k_s + (\theta_w + \theta_a H')}{P_b} \right] \times df$$

	Parameters	Parameter Values	Units
C_{soil}	Maximum Soil Contaminant Concentration	Not Applicable	mg/kg - soil
C_{gw}	Groundwater Quality Standard or Interim Standard	chemical-specific	mg/L - water
df	Dilution factor	20	unitless
k_s	Soil-water partition coefficient for organic constituents $k_s = k_{oc} f_{oc}$ inorganic constituents $k_s = k_d$	chemical-specific	L/kg
k_{oc}	Soil organic carbon-water partition coefficient	chemical-specific	L/kg
f_{oc}	Fraction of organic carbon in subsurface vadose zone	0.001 (0.1%)	kg/kg
k_d	Soil-water partition coefficient for inorganics	chemical-specific (pH = 5.5)	L/kg
θ_w	Water-filled soil porosity - vadose soil	0.3	$L_{\text{water}}/L_{\text{soil}}$
θ_a	Air-filled soil porosity - vadose soil	0.13	$L_{\text{air}}/L_{\text{soil}}$
P_b	Dry bulk density	1.5	kg/L
H'	Henry's Law constant - dimensionless where: H' = Henry's Law constant (atm-m ³ /mole) x conversion factor of 41	chemical-specific	unitless

Where:

$$C_{\text{gw}} = 0.3 \text{ mg/L}$$

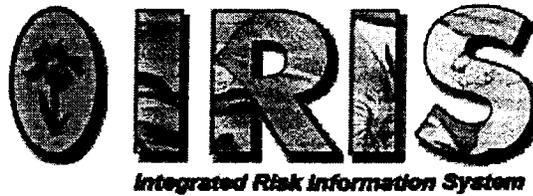
$$k_s = k_{oc} f_{oc} = (14.2 \text{ mg/L}) (0.001 \text{ kg/kg})$$

$$H' = 11.3 \frac{\text{atm-m}^3}{\text{mole}}$$

Therefore:

$$\text{Phenol } C_{\text{soil}} = 0.3 \frac{\text{mg}}{\text{L}} \left[\frac{(14.2 \text{ mg/L}) (0.001 \text{ kg/kg}) + (0.3 L_{\text{water}}/L_{\text{soil}} + 0.13 L_{\text{air}}/L_{\text{soil}} (11.3 \text{ atm-m}^3/\text{mole}) \times 41)}{1.5 \text{ kg/L}} \right] \times 20$$

$$= 242 \text{ mg/kg}$$



Benzoic acid

CASRN 65-85-0

Contents

- I.A. REFERENCE DOSE FOR CHRONIC ORAL EXPOSURE (RfD)
 - I.B. REFERENCE CONCENTRATION FOR CHRONIC INHALATION EXPOSURE (RfC)
 - II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE
 - VI. BIBLIOGRAPHY
 - VII. REVISION HISTORY
 - VIII. SYNONYMS
-

0355
Benzoic acid; CASRN 65-85-0

Health assessment information on a chemical substance is included in IRIS only after a comprehensive review of chronic toxicity data by U.S. EPA health scientists from several Program Offices and the Office of Research and Development. The summaries presented in Sections I and II represent a consensus reached in the review process. Background information and explanations of the methods used to derive the values given in IRIS are provided in the Background Documents.

STATUS OF DATA FOR Benzoic acid

File On-Line 09/07/1988

Category (section)	Status	Last Revised
-----	-----	-----
Oral RfD Assessment (I.A.)	on-line	07/01/1993
Inhalation RfC Assessment (I.B.)	no data	
Carcinogenicity Assessment (II.)	on-line	05/01/1991

I. CHRONIC HEALTH HAZARD ASSESSMENTS FOR NONCARCINOGENIC EFFECTS

I.A. REFERENCE DOSE FOR CHRONIC ORAL EXPOSURE (RfD)

Substance Name -- Benzoic acid
 CASRN -- 65-85-0
 Last Revised -- 07/01/1993

The oral Reference Dose (RfD) is based on the assumption that thresholds exist for certain toxic effects such as cellular necrosis. It is expressed in units of mg/kg-day. In general, the RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. Please refer to the Background Document for an elaboration of these concepts. RfDs can also be derived for the noncarcinogenic health effects of substances that are also carcinogens. Therefore, it is essential to refer to other sources of information concerning the carcinogenicity of this substance. If the U.S. EPA has evaluated this substance for potential human carcinogenicity, a summary of that evaluation will be contained in Section II of this file.

I.A.1. ORAL RfD SUMMARY

Critical Effect	Experimental Doses*	UF	MF	RfD
No adverse effects observed	NOAEL: 34 mg/day benzoic acid and 328 mg/day for sodium benzoate (converted to 312 mg/day benzoic acid)	1	1	4E+0 mg/kg/day
Human daily per capita intakes				
FDA, 1973; Selected Committee on Review of the GRAS List	LOAEL: none			

*Conversion Factors: $328 \text{ mg/day sodium benzoate} \times [122.12 \text{ (MW benzoic acid)} / 144.11 \text{ (MW sodium benzoate)}] = 278 \text{ mg/day benzoic acid}$. $278 \text{ mg/day benzoic acid from sodium benzoate} + 34 \text{ mg/day benzoic acid} = 312 \text{ mg/day}$; assuming adult human body weight of 70 kg, the exposure dose is 312 divided by 70 = 4.4 mg/kg/day.

I.A.2. PRINCIPAL AND SUPPORTING STUDIES (ORAL RfD)

FDA (Food and Drug Administration). 1973. Evaluation of the Health Aspects of Benzoic Acid and Sodium Benzoate as Food Ingredients. DHEW, Washington, DC. Report No. SCOGS-7. NTIS PB-223837/6.

Early studies (Gerlach, 1909) indicate that laboratory animals are inappropriate models for studying the toxicity of benzoic acid in humans (FDRL, 1972) (see Additional Comments). Based on data regarding the amounts of benzoic acid and sodium benzoate produced as a food preservative, FDA (1973) estimated a daily per capita intake of 0.9-34 mg for benzoic acid and 34-328 mg for sodium benzoate. At these levels, there are no reports of toxic effects in humans. These compounds have Generally Recognized as Safe (GRAS) status by FDA. Therefore, the upper ranges can be considered NOAELs for benzoic acid and sodium benzoate. In the stomach, both benzoic acid and sodium benzoate exist in their ionized form, benzoate, which is absorbed rapidly and completely by the GI tract. Therefore, exposure to sodium benzoate is comparable to exposure to benzoic acid if molecular weight

differences are corrected for; here, 328 mg sodium benzoate is equivalent to 278 mg benzoic acid. Adding 278 to the daily intake for benzoic acid of 34 mg yields a total of 312 mg benzoic acid (see Conversion Factors). If no uncertainty factor is used, the RfD is 312 mg/day for a 70 kg human or 4 mg/kg/day.

I.A.3. UNCERTAINTY AND MODIFYING FACTORS (ORAL RfD)

UF -- An uncertainty factor of 10 for the protection of sensitive subgroups was considered unnecessary; although reactions to benzoate and structurally related compounds do occur, an uncertainty factor of 10 would be of little value to the sensitive individuals.

MF -- None

I.A.4. ADDITIONAL COMMENTS (ORAL RfD)

Sodium benzoate appeared to have no maternal toxicity, fetal toxicity, or teratogenicity in mice, rats, hamsters, or rabbits when given orally (FDRL, 1972). The highest doses tested were 175.0 in mice and rats, 300.0 in hamsters, and 250.0 mg/kg/day in rabbits.

The only chronic oral data available involve administration of benzoic acid to rats and mice (Shtenberg and Ignat'ev, 1970; Ignat'ev, 1965; Marquardt, 1960). A dose of 40 mg/kg/day for 17 months was associated with decreased resistance to stress in mice and possibly with reduced food and water intake in rats after 18 months (Shtenberg and Ignat'ev, 1970). However, another report from this laboratory (Ignat'ev, 1965) indicated that 80 mg/kg/day in rats for 18 months was not associated with adverse effects on body weight, survival, or gross or microscopic pathology. If 40 mg/kg/day in mice in the study by Shtenberg and Ignat'ev (1970) is considered to be the LOAEL, application of an uncertainty factor of 1000 would result in an RfD of 0.04 mg/kg/day or 2.8 mg/day, which is near the lower end of the range of the estimated daily human exposure to benzoic acid (not including exposure to sodium benzoate). The lower RfD based on animal data is not unexpected, however, since application of uncertainty factors is intentionally conservative in the absence of human data. Since human data are available in this case, it is not appropriate to use the animal data for the RfD.

Other long-term dietary studies (Marquardt, 1960) showed decreased food intake and body weight in rats fed 1.5% benzoic acid (750 mg/kg/day); at a dose of 1.0% in the diet (50 mg/kg/day) there were no signs of toxicity or adverse reproductive effects.

Gerlach (1909) reported no externally visible effects in humans ingesting benzoic acid at 0.5-1.0 g/day for 44 consecutive days or for 82/86 or 88/92 days. Assuming a human body weight of 70 kg, this level corresponds to a dose of 14 mg/kg/day. Wiley and Bigelow (1908), however, observed irritation, discomfort, weakness, and malaise in humans given oral bolus doses of less than or equal to 1.75 g/day over a 20-day period (25 mg/kg/day). The RfD (4 mg/kg/day) is well below these doses.

I.A.5. CONFIDENCE IN THE ORAL RfD

Study -- Medium
Data Base -- Medium
RfD -- Medium

Medium confidence is placed in the FDA (1973) estimate of per capita intake. Medium confidence in the data base reflects the inappropriateness of using

animal data as the basis of the RfD for humans and the lack of reported effects in humans at the estimated intakes. Thus, confidence in the RfD is medium.

I.A.6. EPA DOCUMENTATION AND REVIEW OF THE ORAL RfD

Source Document -- U.S. EPA, 1987

Limited peer review and extensive Agency-wide review 1987.

Other EPA Documentation -- None

Agency Work Group Review -- 09/17/1987

Verification Date -- 09/17/1987

I.A.7. EPA CONTACTS (ORAL RfD)

Please contact the Risk Information Hotline for all questions concerning this assessment or IRIS, in general, at (513)569-7254 (phone), (513)569-7159 (FAX) or RIH.IRIS@EPAMAIL.EPA.GOV (internet address).

I.B. REFERENCE CONCENTRATION FOR CHRONIC INHALATION EXPOSURE (RfC)

Substance Name -- Benzoic acid
CASRN -- 65-85-0

Not available at this time.

II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Benzoic acid
CASRN -- 65-85-0
Last Revised -- 05/01/1991

Section II provides information on three aspects of the carcinogenic assessment for the substance in question; the weight-of-evidence judgment of the likelihood that the substance is a human carcinogen, and quantitative estimates of risk from oral exposure and from inhalation exposure. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m

air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. The rationale and methods used to develop the carcinogenicity information in IRIS are described in The Risk Assessment Guidelines of 1986 (EPA/600/8-87/045) and in the IRIS Background Document. IRIS summaries developed since the publication of EPA's more recent Proposed Guidelines for Carcinogen Risk Assessment also utilize those Guidelines where indicated (Federal Register 61(79):17960-18011, April 23, 1996). Users are referred to Section I of this IRIS file for information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity

Basis -- No human data and inadequate data from animal bioassays.

II.A.2. HUMAN CARCINOGENICITY DATA

None.

II.A.3. ANIMAL CARCINOGENICITY DATA

Inadequate. In a lifetime study, Toth (1984) administered sodium benzoate (of 99% purity) to 50 male and 50 female 5 week-old albino Swiss mice at a level of 2% in the drinking water. Control groups consisted of 100 mice/sex. The dose level was selected based on results of a subchronic study in which levels of 4 and 8% were considered to be too toxic. The 2% level was equivalent to sodium benzoate doses of 4133 mg/kg/day for males and 3973 mg/kg/day for females. Based on average measured daily water consumptions of 6.2 mL for males and 5.9 mL for females and an assumed average body weight of 0.03 kg. The equivalent benzoic acid doses, adjusted for molecular weight differences between sodium benzoate and benzoic acid, are 3502 mg/kg/day and 3367 mg/kg/day for males and females, respectively. Histopathologic examinations of all mice included 11 organs and all gross lesions. The treatment had no apparent effect on survival or tumor incidence.

As part of a 5-generation reproduction study, Shtenberg and Ignat'ev (1970) administered test compounds in a paste in daily doses of 40 mg/kg benzoic acid combined with 80 mg/kg sodium bisulfite in a paste before feeding an otherwise unspecified basic diet to a group of 50 white cross-bred mice/sex for 17 months. Another group received benzoic acid only; no further details were given. An unspecified number of control animals received only basic diet. Malignant tumors (not otherwise specified) occurred in 8/100 treated mice and 1/8 mice in the third generation of the treated group. Tumor incidences were not reported for untreated mice.

II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Dinerman and Ignat'ev (1966) reported that a 3-month exposure to 0.2% benzoic acid in the diet increased the susceptibility of mice to the

development of carcinomas following intraperitoneal inoculation with Erlich ascites carcinoma cells. Tumors developed in 62/90 (68.8%) of benzoic acid-treated mice and in 16/49 (32.6%) of the control mice.

Benzoic acid and sodium benzoate have been tested for mutagenicity or genotoxicity in prokaryotes (McCann et al., 1975), eukaryotes (Litton Bionetics, Inc., 1974), and several mammalian test systems (Litton Bionetics, Inc., 1974, 1975; Oikawa et al., 1980). No positive results have been reported.

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

__II.D.1. EPA DOCUMENTATION

Source Document -- U.S. EPA, 1987

The 1987 Health and Environmental Effects Document has received OHEA review.

__II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

Agency Work Group Review -- 03/01/1989

Verification Date -- 03/01/1989

__II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Please contact the Risk Information Hotline for all questions concerning this assessment or IRIS, in general, at (513)569-7254 (phone), (513)569-7159 (FAX) or RIH.IRIS@EPAMAIL.EPA.GOV (internet address).

VI. BIBLIOGRAPHY

Substance Name -- Benzoic acid
CASRN -- 65-85-0
Last Revised -- 08/01/1989

VI.A. ORAL RfD REFERENCES

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VI.B. INHALATION RfD REFERENCES

None

VI.C. CARCINOGENICITY ASSESSMENT REFERENCES

Dinerman, A.A and A.D. Ignat'ev. 1966. Effect of certain food preservatives on the development of tumors in mice. Gig. Sanit. 31(9): 38-42. (Eng. trans.)

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U.S. EPA. 1987. Health and Environmental Effects Document for Benzoic Acid. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Solid Waste and Emergency Response, Washington, DC.

VII. REVISION HISTORY

Substance Name -- Benzoic acid
CASRN -- 65-85-0

Date	Section	Description
09/07/1988	I.A.	Oral RfD summary on-line
05/01/1989	II.	Carcinogen assessment now under review
07/01/1989	I.A.	Principal study clarified
07/01/1989	VI.	Bibliography on-line
08/01/1989	II.	Carcinogen summary on-line
08/01/1989	VI.C.	Carcinogen references added
01/01/1991	I.A.	Text edited
01/01/1991	II.	Text edited
05/01/1991	II.A.3.	Text edited
06/01/1991	I.A.1.	Conversion Factor text clarified
01/01/1992	I.A.7.	Secondary contact changed
01/01/1992	IV.	Regulatory Action section on-line
07/01/1993	I.A.6.	Source Doc. year corrected; Other EPA Doc. clarified

VIII. SYNONYMS

Substance Name -- Benzoic acid
CASRN -- 65-85-0
Last Revised -- 09/07/1988

65-85-0
benzenecarboxylic acid
Benzoic acid
carboxybenzene
dracylic acid
phenyl carboxylic acid
phenylformic acid

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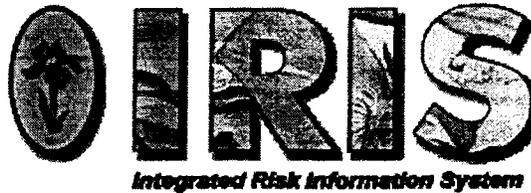


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Phenol

CASRN 108-95-2

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- II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE
- VI. BIBLIOGRAPHY
- VII. REVISION HISTORY
- VIII. SYNONYMS

0088
Phenol; CASRN 108-95-2

Health assessment information on a chemical substance is included in IRIS only after a comprehensive review of chronic toxicity data by U.S. EPA health scientists from several Program Offices and the Office of Research and Development. The summaries presented in Sections I and II represent a consensus reached in the review process. Background information and explanations of the methods used to derive the values given in IRIS are provided in the Background Documents.

STATUS OF DATA FOR Phenol

File On-Line 01/31/1987

Category (section)	Status	Last Revised
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Oral RfD Assessment (I.A.)	on-line	02/01/1990
Inhalation RfC Assessment (I.B.)	message	03/01/1991
Carcinogenicity Assessment (II.)	on-line	11/01/1990

I. CHRONIC HEALTH HAZARD ASSESSMENTS FOR NONCARCINOGENIC EFFECTS

I.A. REFERENCE DOSE FOR CHRONIC ORAL EXPOSURE (RfD)

Substance Name -- Phenol
 CASRN -- 108-95-2
 Last Revised -- 02/01/1990

The oral Reference Dose (RfD) is based on the assumption that thresholds exist for certain toxic effects such as cellular necrosis. It is expressed in units of mg/kg-day. In general, the RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. Please refer to the Background Document for an elaboration of these concepts. RfDs can also be derived for the noncarcinogenic health effects of substances that are also carcinogens. Therefore, it is essential to refer to other sources of information concerning the carcinogenicity of this substance. If the U.S. EPA has evaluated this substance for potential human carcinogenicity, a summary of that evaluation will be contained in Section II of this file.

I.A.1. ORAL RfD SUMMARY

Critical Effect	Experimental Doses*	UF	MF	RfD
Reduced fetal body weight in rats	NOAEL: 60 mg/kg/day LOAEL: 120 mg/kg/day	100	1	6E-1 mg/kg/day
Rat Oral Developmental Study				
NTP, 1983				

*Conversion Factors: none

I.A.2. PRINCIPAL AND SUPPORTING STUDIES (ORAL RfD)

NTP (National Toxicology Program). 1983. Teratologic evaluation of phenol in CD rats and mice. Report prepared by Research Triangle Institute, Research Triangle Park, NC. NTIS PB83-247726. Gov. Rep. Announce. Index. 83(25): 6247.

Developmental effects of phenol were evaluated in timed-pregnant CD rats. Phenol was administered by gavage at 0, 30, 60, and 120 mg/kg/day in distilled water on gestational days 6 to 15. Females were weighed daily during treatment and observed for clinical signs of toxicity. A total of 20 to 22 females/group were confirmed to be pregnant at sacrifice on gestational day 20. Detailed teratological evaluations were conducted at sacrifice. Results of this study did not show any dose-related signs of maternal toxicity or any clinical symptoms of toxicity related to phenol treatment. The number of implantation sites per litter was approximately the same in all groups, as was the number of live fetuses per litter. However, since implantations in this strain take place prior to gestational day 6 (prior to dosing), no relationships between treatment and number of implantation sites can be established. The most important finding, however, was a highly significant reduction in fetal body weights in the high-dose group. The highest fetal NOAEL in this study was 60 mg/kg/day.

I.A.3. UNCERTAINTY AND MODIFYING FACTORS (ORAL RfD)

UF -- Uncertainty factor included 10 for interspecies extrapolation and 10 for sensitive human population.

MF -- None

I.A.4. ADDITIONAL COMMENTS (ORAL RfD)

In NCI (1980) rat and mice 90-day subchronic studies, 10 animals/sex/ group were exposed to 0, 100, 300, 1000, 3000, or 10,000 ppm phenol in water. Decreased water intake and body weight gain were noted for both sexes of rats and mice and rats exposed to the high dose (780 mg/kg/day for rats and 1700 mg/kg/day for mice). Lower doses of phenol exposure did not cause any adverse effects in either rats or mice (234 and 510 mg/kg/day, respectively). The LOAEL for this study was 10,000 ppm.

In a subchronic oral study (Dow, 1945), 10 rats/group were gavaged 5 days/week with 0, 50, or 100 mg/kg (0, 35.7 or 71.4 mg/kg/day) phenol until 135 or 136 doses were administered. Rats in the high-dose group showed a more marked drop in body weight gain than did other groups, but the group rapidly recovered. Rats in both dosage groups showed some degree of unspecific kidney damage yielding a LOAEL of 50 mg/kg, or 5000 ppm, for this study. This difference between the LOAELs of the NCI (1980) and Dow (1945) studies may be attributed to differences in mode of administration, with the Dow gavage study showing the lower LOAEL (possibly explained as a bolus dosage effect).

The Dow research also indicates that the 100% lethal acute dose of phenol is 700 mg/kg (Dow, 1945). In contrast, in a well-designed dose selection study (NCI, 1980) conducted prior to the 2-year bioassay, all rats exposed to 10,000 ppm (780 mg/kg/day) phenol in the drinking water survived a 90-day exposure period. The Dow (1945) study contained several deficiencies, such as limited sample size, lack of details of pertinent experimental design, incomplete histopathological evaluations and unspecific high mortality rate in control and exposed rats during early stages of the study. Therefore, the Dow (1945) study is not considered the best available study for risk assessment.

Other studies indicate no effects on water consumption and weight gain at phenol concentrations as high as 1600 mg/L (1600 ppm) (Deichmann and Oesper, 1940).

In a chronic drinking water study conducted by NCI (1980), rats (F344) and mice (B6C3F1) were dosed with 0, 2500, and 5000 ppm phenol (rats: 0, 153, 344 mg/kg/day; mice: 0, 313, 500 mg/kg/day) in the drinking water for 103 weeks. All the animals were sacrificed 2 weeks after dosing ceased; detailed histopathological and carcinogenic evaluations of target organs were conducted. Results of this bioassay indicated a dose-related depression in mean body weight gain in both sexes of mice and rats. Animals exposed to both dose levels of phenol showed a significant drop in water consumption (water consumption in mice was severely depressed) resulting in significant body weight depression in the high-dose animals. This study also reported an increased incidence of chronic kidney inflammation in all dosed female rats and in the 5000-ppm male rats. The incidence of this lesion in females was: 7/50 (control); 13/50 (2500 ppm); 37/50 (5000 ppm), whereas in male rats the incidence was: 37/50 (control); 37/50 (2500 ppm) and 48/50 (5000 ppm). However, historical control data (Armed Forces Institute of Pathology, 1980) in the F344 rat indicated nephropathy that approaches an incidence of 100%. These rats were the same (comparable) age as the rats killed at the completion of this 2-year NCI (1980) study. In the absence of other toxicological parameters, such as mortality, percent survival, clinical signs of toxicity, and morphological alterations in target organs, the reduction in body weight in both high-dose mice and rats could be related to depressed water intake resulting from phenol exposure. Based on the body weight depression in both exposed mice and rats, the LOAELs in mice and rats, respectively, were 313 and 344 mg/kg/day and the NOAEL in rats was 153 mg/kg/day. A NOAEL for mice was not observed.

Heller and Pursell (1938) reported normal growth and reproduction at phenol concentrations up to 5000 mg/L (400 mg/kg/day) in a multi-generation rat reproduction study.

In a mouse developmental toxicity study (NTP, 1983), phenol was administered by gavage at 0, 70, 140, or 280 mg/kg/day on gestational days 6 to 15. At the highest dose, 4/36 mice died; no deaths occurred in any other groups. Average maternal body weight gain and weight gain in survivors also were significantly reduced at the highest dose; significant clinical signs of toxicity (tremors) also were seen at that dose level. As in the rat study, there was a highly significant dose-related for reduced fetal body weight, statistically different from controls at the highest dose level. An increased incidence of cleft palate was also reported at the highest dose level. The highest NOAEL in this study was 140 mg/kg/day.

In an unpublished developmental toxicity study, Kavlock (1987) gavaged SD rats with phenol at doses of 0, 667, and 1000 mg/kg on gestational day 11; the females were allowed to deliver and postnatal weight, viability, and function were evaluated. Pup body weights at weaning was decreased in the 1000 mg/kg/day group; kidney weight decreased only in female pups at weaning (667 and 1000 mg/kg groups). On days 8 and 9 postnatally, pup kidney weights were increased at both dosages of phenol, while urine osmolality was decreased and urine volume was increased at 1000 mg/kg. The most striking findings were limb abnormalities (paralysis and palsy) produced by phenol (667 and 1000 mg/kg groups) that were evident 10-14 days after birth. The LOAEL in this study was 667 mg/kg/day.

In summary, the evaluations of subchronic, chronic and reproductive/developmental studies indicated that phenol administered to pregnant rats at 120 mg/kg/day caused significant depression in fetal body weights, establishing this endpoint as the critical effect. Therefore, it is inappropriate to use NOAELs of 140 mg/kg/day for mice (NTP, 1983) or 153 mg/kg/day for rats (NCI, 1980). The LOAEL for fetotoxicity was established at 120 mg/kg/day and the highest NOAEL at 60 mg/kg/day (NTP, 1983).

I.A.5. CONFIDENCE IN THE ORAL RfD

Study -- Low
Data Base -- Medium
RfD -- Low

Confidence in the study is low because of the gavage nature of the dose administration. The data base contains several supporting studies (subchronic, chronic, and reproductive/developmental); thus, a medium confidence is recommended. Low-to-medium confidence in the RfD follows.

I.A.6. EPA DOCUMENTATION AND REVIEW OF THE ORAL RfD

Source Document -- U.S. EPA, 1985
Other EPA Documentation -- None
Agency Work Group Review -- 08/05/1985, 10/28/1986, 11/16/1988, 03/22/1989
Verification Date -- 11/16/1988

I.A.7. EPA CONTACTS (ORAL RfD)

Please contact the Risk Information Hotline for all questions concerning this assessment or IRIS, in general, at (513)569-7254 (phone), (513)569-7159 (FAX)

or RIH.IRIS@EPAMAIL.EPA.GOV (internet address).

I.B. REFERENCE CONCENTRATION FOR CHRONIC INHALATION EXPOSURE (RfC)

Substance Name -- Phenol
CASRN -- 108-95-2

The health effects data for phenol have been reviewed by the U.S. EPA RfD/RfC Work Group and determined to be inadequate for derivation of an inhalation RfC. The verification status of this chemical is currently not verifiable. For additional information on the health effects of this chemical, interested parties are referred to the EPA documentation listed below.

U.S. EPA. 1986. Summary Review of the Health Effects Associated with Phenol: Health Issue Assessment. Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Research Triangle Park, NC. EPA/600/8-86/003F.

Agency Work Group Review -- 02/22/1990

EPA Contacts:

Please contact the Risk Information Hotline for all questions concerning this assessment or IRIS, in general, at (513)569-7254 (phone), (513)569-7159 (FAX) or RIH.IRIS@EPAMAIL.EPA.GOV (internet address).

II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Phenol
CASRN -- 108-95-2
Last Revised -- 11/01/1990

Section II provides information on three aspects of the carcinogenic assessment for the substance in question; the weight-of-evidence judgment of the likelihood that the substance is a human carcinogen, and quantitative estimates of risk from oral exposure and from inhalation exposure. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. The rationale and methods used to develop the carcinogenicity information in IRIS are described in The Risk Assessment Guidelines of 1986 (EPA/600/8-87/045) and in the IRIS Background Document. IRIS summaries developed since the publication of EPA's more recent Proposed Guidelines for Carcinogen Risk Assessment also utilize those Guidelines where indicated (Federal Register 61(79):17960-18011, April 23, 1996). Users are referred to Section I of this IRIS file for information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY**II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION**

Classification -- D; not classifiable as to human carcinogenicity

Basis -- Based on no human carcinogenicity data and inadequate animal data.

II.A.2. HUMAN CARCINOGENICITY DATA

None.

II.A.3. ANIMAL CARCINOGENICITY DATA

Inadequate. In carcinogenicity bioassays conducted by the National Cancer Institute (NCI, 1980), B6C3F1 mice (50/sex/dose) and F344 rats (50/sex/dose) were administered analytical grade phenol (approximately 98.5% pure) in the drinking water at concentrations of 0, 2500 or 5000 ppm for 103 weeks. Dose-related decreases in weight gain in treated mice were attributed to decreased water consumption. No other clinical signs of toxicity were observed, and mortality rates (approximately 14%) were comparable between experimental and control groups. Histopathological examination and statistical analyses revealed no phenol-related toxic or carcinogenic effects in mice.

At the end of the study the survival rate of male rats was comparable among the three groups (approximately 52%) and the survival rate among the female rat groups was comparable (approximately 76%). No trends in cancer incidence were seen when compared with controls, however, low-dose male rats had, by pair-wise comparison, a statistically significant increase in the incidences of pheochromocytomas of the adrenal medulla (13/50, 22/50 and 9/50 in the control, low-, and high-dose groups, respectively), interstitial cell tumors of the testes (42/48, 49/50 and 47/50), and leukemias or lymphomas (18/50, 31/50 and 25/50). There was no significant increase in tumor incidence in any tissue in female rats. Based on a high spontaneous tumor rate in matched controls, comparable survival patterns with no major fall off, and the lack of a positive association between phenol administration and tumor incidence in high-dose male rats, NCI concluded that, under these conditions, phenol was not carcinogenic in mice or rats (NCI, 1980).

II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Studies indicate that phenol may be a promoter and/or weak skin carcinogen in specially inbred sensitive mouse strains. Boutwell and Bosch (1959) demonstrated that repeated dermal applications of phenol promoted the development of skin papillomas and carcinomas in Sutter, Holtzman, CHF1, and C3H mouse strains exposed to a single dermal application of an initiator, 7,12-dimethylbenz[a]anthracene (DMBA, 75 ug). In this series of studies, groups of 23 to 30 mice/sex were treated twice a week for up to 72 weeks with equivalent volumes of benzene- or acetone-based solutions containing 10% phenol. Housing conditions were not described. Papillomas first appeared at 6 weeks and a 95% response had occurred by week 13; carcinomas first appeared at 19 weeks with a 73% response by week 42. In mice receiving only the 10% phenol treatments (no initiator), 4% of the mice had papillomas at week 12 and 36% had papillomas at week 32. The incidence of carcinomas was not reported.

In the same series of studies, groups of 30 female mice/dose received twice-weekly dermal applications of 5, 10 or 20% phenol in benzene after an initial treatment of benzene (control) or benzene with 75 ug DMBA. In the noninitiated groups (those receiving only the dermal phenol applications) the percentage of mice bearing papillomas was 74, 100 and 100% in the 5, 10 and 20% phenol treatment groups, respectively, and in the groups receiving the initial DMBA application, 56, 95 and 90% of the mice bore papillomas in the 5, 10 and 20% treatment groups, respectively. Papillomas occurred in 11% of the mice treated with benzene alone. The percentage of mice bearing carcinomas (between weeks 38 and 40) in the noninitiated groups was 26, 93 and 70% in the 5, 10 and 20% phenol groups. In the groups receiving the initial DMBA application, the percentage of mice bearing carcinomas was 12, 68 and 65% in the 5, 10 and 20% phenol groups. No carcinomas were reported in the group receiving only benzene.

Similar results were obtained by Salaman and Glendenning (1957). "S" strain albino mice (20 mice/group) showed strong tumor-promoting activity after initiation with 0.15% DMBA and subsequent, repeated weekly applications of 5 or 20% phenol (w/v in acetone) for 24 to 32 weeks. At the 20% level, phenol induced ulceration of the skin and had a strong promoting effect on tumor induction. At the 0.5% level, no ulceration was found; phenol had a moderate promoting effect but did not act as an initiator. Housing conditions of the animals were not indicated.

Analytical grade phenol (99.9% pure) (up to 10 mg/plate) was not mutagenic in *Salmonella typhumurium* strains TA98, TA100, TA1535, TA1537, or TA1538 with or without addition of rat liver homogenates (Florin et al., 1980; Pool and Lin, 1982; Haworth et al., 1983). However, Gocke et al. (1981) reported that phenol was mutagenic in TA98 with hepatic homogenates. Phenol was not mutagenic in *Neurospora crassa* (Dickey et al., 1949) and was not positive in the micronucleus test on mouse bone marrow from male and female NMRI mice treated in vivo (Gocke et al., 1981). In a study by Demerec et al. (1951), phenol exhibited mutagenic activity in *Escherichia coli* but only at highly toxic concentrations (0.1-0.2%).

II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

None.

II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

None.

II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

II.D.1. EPA DOCUMENTATION

Source Document -- U.S. EPA, 1988

The 1988 Health Effects Assessment for Phenol has received Agency review.

II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

Agency Work Group Review -- 08/02/1989

Verification Date -- 08/02/1989

II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Please contact the Risk Information Hotline for all questions concerning this assessment or IRIS, in general, at (513)569-7254 (phone), (513)569-7159 (FAX) or RIH.IRIS@EPAMAIL.EPA.GOV (internet address).

VI. BIBLIOGRAPHY

Substance Name -- Phenol
CASRN -- 108-95-2
Last Revised -- 03/01/1991

VI.A. ORAL RfD REFERENCES

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Dow Chemical Co. 1945. The toxicity of phenol. Biochem. Res. Lab. Unpublished report dated 04/12/1945.

Heller, V.G. and L. Pursell. 1938. J. Pharmacol. Exp. Ther. 63: 99. (Cited in Deichmann and Oesper, 1940)

Kavlock, R.J. 1987. Interim Report on Structure-Activity Relationships in the Developmental Toxicity of Substituted Phenols. Health Effects Research Laboratory, Research Triangle Park, NC.

NCI (National Cancer Institute). 1980. Bioassay of phenol for possible carcinogenicity in F344 rats and B6C3F1 mice. NIH Publ. No. 80-1759. August 1980.

NTP (National Toxicology Program). 1983. Teratologic evaluation of phenol in CD rats and mice. Report prepared by Research Triangle Institute, Research Triangle Park, NC. NTIS PB83-247726. Gov. Rep. Announce. Index. 83(25): 6247.

U.S. EPA. 1985. Health and Environmental Effects Profile for Phenol. Errata, 1986. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Solid Waste and Emergency Response, Washington, DC.

VI.B. INHALATION RfC REFERENCES

U.S. EPA. 1986. Summary Review of the Health Effects Associated with Phenol: Health Issue Assessment. Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Research Triangle Park, NC. EPA/600/8-86/003F.

VI.C. CARCINOGENICITY ASSESSMENT REFERENCES

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VII. REVISION HISTORY