

STATE OF  
COLORADO

02144395

Fischer - DNR, Alex &lt;alex.fischer@state.co.us&gt;

**FW: Lone Pine Margaret Spaulding Analytical Results, Tables, and Figures**

1 message

James Hix &lt;jhix@olssonassociates.com&gt;

Thu, Aug 29, 2013 at 1:53 PM

To: "Fischer, Alex (Alex.Fischer@state.co.us)" &lt;Alex.Fischer@state.co.us&gt;

Alex,

I wanted to get this data put together and sent to you before calling you back. Attached are the laboratory analytical results from Accutest for the soil confirmation samples that I collected, and also the results for the background soil samples and the excavation soil samples. I have also included tables and figures showing the results and comparing them to the COGCC Table 910-1 Concentration Levels. A table with the TP Environmental results from Trace Analysis in Lubbock, Texas is also attached.

The results show that the diesel range organics (DRO) concentrations for the samples that Olsson collected from the treated stockpile are all above 500 mg/kg, and that benzo(a)pyrene is above its concentration level of 0.022 mg/kg. The other PAH compounds were either not detected or were below the COGCC Table 910-1 concentration level for that compound. Concentrations of BTEX were not detected, or were below the T 910-1 level, as were gasoline range organic (GRO) concentrations.

Arsenic was the only inorganic parameter that exceeded the COGCC T 910-1 concentration level of 0.39 mg/kg, but arsenic levels were higher in the three background soil samples than they were in the eight stockpile soil samples.

I am also going to forward the email messages from Trace Analysis and from Accutest regarding the DRO results. I confirmed with Summit Scientific laboratory that EPA modified Method 8015 B is an earlier version of the method than 8015D, but it doesn't change how the test is performed or reported. Summit Scientific said that 8015 B came out before national environmental laboratory accreditation conference (NELAC) in November 2006. Both Trace Analysis and Accutest indicate that there is a wide variation in the DRO results from one laboratory to another. Variation can come from sampling, the extraction methods, and the laboratory instrumentation.

James

James W. Hix, PG| **Olsson Associates**

4690 Table Mountain Drive, Suite 200 | Golden, CO 80403 | jhix@olssonassociates.com

TEL 303.237.2072 | DIR 303.374.3139 | CELL 303.589.1572 | FAX 303.237.2659



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**5 attachments**



**D48350.PDF**  
1878K



**D49462.PDF**  
4414K



**TABLES.pdf**  
26K



**FIGURES.pdf**  
2349K



**TP Environmental Stockpile Summary Results Aug 2013.pdf**  
83K

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# TABLES

TABLE 1

**CM Production LLC**  
**Lone Pine Oil Field - Stockpile Confirmation Soil Samples**

Sample ID	Date	GRO (mg/Kg)	DRO (mg/Kg)	Benzene (mg/Kg)	Toluene (mg/Kg)	Ethylbenzene (mg/Kg)	Total Xylenes (mg/Kg)
COGCC 910-1		500	500	0.17	85	100	175
CMLP-TSP1	7/17/2013	97.5	<b>4800</b>	< 0.062	< 0.12	< 0.12	< 0.25
CMLP-TSP2	8/15/2013	56.9	<b>4810</b>	< 0.062	< 0.12	< 0.12	< 0.25
CMLP-TSP3	8/15/2013	215	<b>7120</b>	< 0.058	< 0.12	0.0676 J	0.215 J
CMLP-TSP4	8/15/2013	127	<b>4980</b>	< 0.063	< 0.13	0.758 J	< 0.25
CMLP-TSP5	8/15/2013	30.5	<b>5560</b>	< 0.061	< 0.12	< 0.12	< 0.24
CMLP-TSP6	8/15/2013	56.2	<b>6910</b>	< 0.068	< 0.14	< 0.14	< 0.27
CMLP-TSP7	8/15/2013	306	<b>6330</b>	< 0.060	< 0.12	0.112 J	< 0.24
CMLP-TSP8	8/15/2013	85.2	<b>4050</b>	< 0.059	< 0.12	0.0285 J	< 0.24

## Notes:

COGCC 910-1: Colorado Oil and Gas Conservation Commission Table 910-1 Concentration Levels

mg/Kg: milligrams per Kilogram

GRO: Gasoline Range Organics by EPA Method 8260B

DRO: Diesel Range Organics by EPA Method 8015B

BTEX: Benzene, Toluene, Ethylbenzene, and Xylenes by EPA Method 8260B

<: Analyte was not detected at or above the laboratory reporting limit

J: Estimated value above the laboratory method detection limit (MDL) and reporting limit (RL)

Values in bold exceed the COGCC Table 910-1 Concentration Level of 500 mg/Kg DRO.

TABLE 2

CM Production LLC  
Lone Pine Field - Polycyclic Aromatic Hydrocarbon Confirmation Soil Sample Results

Sample ID	Date	Acenaphthene (mg/Kg)	Anthracene (mg/Kg)	Benzo(a) anthracene (mg/Kg)	Benzo(b) fluoranthene (mg/Kg)	Benzo(k) fluoranthene (mg/Kg)	Benzo(a) pyrene (mg/Kg)	Chrysene (mg/Kg)	Dibenzo(a,h) anthracene (mg/Kg)	Fluoranthene (mg/Kg)	Fluorene (mg/Kg)	Indeno (1,2,3-cd) pyrene (mg/Kg)	Naphthalene (mg/Kg)	Pyrene (mg/Kg)
COGCC 910-1		1000	1000	0.22	0.22	2.2	0.022	22	0.022	1000	1000	0.22	23	1000
CMLP-TSP1	7/17/2013	< 0.038	< 0.038	< 0.038	< 0.038	0.186	0.467	0.94	< 0.038	< 0.038	0.632	< 0.038	0.0825	0.426
CMLP-TSP2	8/15/2013	< 0.13	< 0.13	< 0.13	< 0.13	0.437	1.31	1.95	< 0.13	< 0.13	< 0.13	< 0.13	< 0.18	1.18
CMLP-TSP3	8/15/2013	< 0.14	< 0.14	< 0.14	< 0.14	0.528	1.29	2.44	< 0.14	< 0.14	0.987	< 0.14	< 0.19	1.42
CMLP-TSP4	8/15/2013	< 0.13	< 0.13	< 0.13	< 0.13	0.462	1.21	2.13	< 0.13	< 0.13	0.876	< 0.13	0.329	1.29
CMLP-TSP5	8/15/2013	< 0.11	< 0.11	< 0.11	< 0.11	0.494	1.36	1.94	< 0.11	< 0.11	< 0.11	< 0.11	< 0.16	1.25
CMLP-TSP6	8/15/2013	< 0.099	< 0.099	< 0.099	< 0.099	0.349	0.908	1.56	0.0575 J	< 0.099	0.474	< 0.099	0.208	0.934
CMLP-TSP7	8/15/2013	< 0.13	< 0.13	< 0.13	< 0.13	0.438	1.13	2.19	< 0.13	< 0.13	1.97	< 0.13	0.671	1.32
CMLP-TSP8	8/15/2013	< 0.091	< 0.091	< 0.091	< 0.091	0.432	1.17	2.07	< 0.091	< 0.091	1.15	< 0.091	0.345	1.19

## Notes:

COGCC 910-1: Colorado Oil and Gas Conservation Commission Table 910-1 Concentration Levels  
mg/Kg: milligrams per Kilogram

< : Analyte was not detected at or above the laboratory reporting limit

J: Estimated value above the laboratory method detection limit (MDL) and reporting limit (RL)

Values in bold exceed the COGCC Table 910-1 Concentration Level for Benzo(a)pyrene of 0.022 mg/Kg. Benzo(a) pyrene is a member of a class of compounds known as polycyclic aromatic hydrocarbons (PAHs), also known as semi-volatile organic compounds, that occur as complex mixtures and not as single compounds. According to the US EPA, benzo(a)pyrene along with other PAHs is a suspected human carcinogen. It is bioaccumulative, does not break down easily in the environment, and the primary exposure pathway is through inhalation. Benzo(a)pyrene is found in tar and asphalt, tires, and combustion of diesel by on-road vehicles.

TABLE 3

CM Production LLC  
Lone Pine Field - Confirmation Soil Sample Inorganic Compound Results

Sample ID	Date	Arsenic (mg/Kg)	Barium (mg/Kg)	Boron (mg/Kg)*	Cadmium (mg/Kg)	Chromium (mg/Kg)	Hexavalent Chromium (mg/Kg)	Trivalent Chromium (mg/Kg)	Copper (mg/Kg)	Lead (mg/Kg)	Mercury (mg/Kg)	Nickel (mg/Kg)	Selenium (mg/Kg)	Silver (mg/Kg)	Zinc (mg/Kg)	Specific Conductance (mmhos/cm)	pH (s.u.)	Calcium (mg/Kg)	Magnesium (mg/Kg)	Sodium (mg/Kg)	SAR
COGCC 910-1		0.39	15,000	2*	70	NA	23	120,000	3,100	400	23	1,600	390	390	23,000	< 4	>6 < 9	NA	NA	NA	< 12
CMLP-BG1	7/17/2013	8.4	98.4	< 5.2	< 1.0	7.9	< 5	7.9	9.5	7.6	< 0.085	5.9	< 5.2	< 3.1	44.5	0.238	7.08	22	4.16	10.5	0.538
CMLP-BG2	7/17/2013	5.2	136	< 5.2	1.2	13.3	< 10	< 11	17.3	13.6	< 0.085	9.3	< 5.2	< 3.1	65.2	0.196	6.06	23.9	4.47	8.16	0.402
CMLP-BG3	7/17/2013	7.8	86.6	< 3.0	< 0.59	9.3	< 1	9.3	10.3	7.2	< 0.098	6.8	< 3.0	< 1.8	36.6	0.146	7.00	13.9	2.79	7.40	0.473
CMLP-TSP1	7/17/2013	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
CMLP-TSP2	8/15/2013	3.5	257	< 5.6	< 1.1	14.9	< 1	14.9	17.3	20.4	< 0.094	11.7	< 5.6	< 3.4	420	0.59	8.95	35.5	5.26	64.1	2.65
CMLP-TSP3	8/15/2013	2.8	268	< 5.4	< 1.1	8.7	< 1	8.7	17.7	8.6	< 0.091	10.3	< 5.4	< 3.2	579	0.362	8.64	22.6	3.36	39.7	2.06
CMLP-TSP4	8/15/2013	3.7	225	< 5.6	< 1.1	12.5	< 1	12.5	16.2	11.4	< 0.096	10.3	< 5.6	< 3.4	354	0.429	8.87	24.6	3.64	58.5	2.91
CMLP-TSP5	8/15/2013	3.3	285	< 5.6	< 1.1	12.8	< 1	12.8	14.9	11.4	< 0.094	10.2	< 5.6	< 3.3	193	0.555	8.57	42.6	7.23	59	2.2
CMLP-TSP6	8/15/2013	3.5	210	< 5.9	< 1.2	13.2	< 1	13.2	16.2	12.1	< 0.098	11.1	< 5.9	< 3.5	390	0.596	8.72	36.7	5.88	65.5	2.65
CMLP-TSP7	8/15/2013	4.1	216	< 5.4	< 1.1	14.3	< 1	14.3	23.8	18.1	< 0.092	12	< 5.4	< 3.2	301	0.58	8.76	27.2	5.18	80.3	3.7
CMLP-TSP8	8/15/2013	4.2	303	< 5.4	< 1.1	14.4	< 1	14.4	17.8	16.6	< 0.093	12.2	< 5.4	< 3.3	228	0.859	8.7	45.8	8.15	78.4	2.8

## Notes:

COGCC 910-1: Colorado Oil and Gas Conservation Commission Table 910-1 Concentration Levels

mg/Kg: milligrams per Kilogram

&lt; : Analyte was not detected at or above the laboratory reporting limit

NA: Not Applicable - The COGCC Table 910-1 does not have listed concentration levels for total chromium, calcium, magnesium, or sodium.

NS: Not Sampled (Sample CMLP-TSP1 was a split sample with TP Environmental's soil sample SP-1 collected on 07/17/13 sent to Trace Analysis, Inc. in Lubbock, Texas).

Specific Conductance: Measure of the salinity or metals in the soil and the ability to conduct electricity measured by electrical conductivity (EC) in the soil.

mmhos/cm: Millimhos per centimeter (measure of specific conductance)

pH: Standard units for measuring the pH of the soil

SAR: Sodium Adsorption Ratio - a ratio of sodium as compared to calcium and magnesium in the soil.

J: Estimated value above the laboratory method detection limit (MDL) and reporting limit (RL)

Values in bold exceed the COGCC Table 910-1 Concentration Level for Arsenic of 0.39 mg/Kg

However, the three background soil samples collected from the east and south of the water treatment ponds from unimpacted soils shows that natural background arsenic concentrations are higher than concentrations in the treated soil stockpile.

Therefore, arsenic is naturally occurring and does not appear to be an issue affecting the treatment of the soil stockpiles.

The COGCC Table 910-1 Boron concentration level is based on "Hot Water Soluble" boron reported in milligrams per liter rather than milligrams per kilogram as reported by the laboratory. Boron was not detected at or above the laboratory reporting limits.

The pH results, calcium, magnesium, sodium, and SAR are likely affected by the TP Environmental Inc. peroxide treatment as compared to natural background conditions; however, the pH and SAR values do not exceed the COGCC Table 910-1 concentration levels.

calcium, magnesium, and sodium are common soil constituents and the COGCC does not have concentration levels for these elements.

TABLE 4

**CM Production LLC**  
**Lone Pine Oil Field - Stockpile Confirmation Soil Samples**

Sample ID	Date	GRO (mg/Kg)	DRO (mg/Kg)	ORO (mg/kg)	Benzene (mg/Kg)	Toluene (mg/Kg)	Ethylbenzene (mg/Kg)	Total Xylenes (mg/Kg)
COGCC 910-1		<b>500</b>	<b>500</b>	<b>500</b>	<b>0.17</b>	<b>85</b>	<b>100</b>	<b>175</b>
CMLP-EX-E @24'	7/17/2013	40.8	<b>6040</b>	<b>3910</b>	NS	NS	NS	NS
CMLP-EX-N @24'	7/17/2013	26.8	<b>2960</b>	<b>2410</b>	NS	NS	NS	NS
CMLP-EX-NW @ 24'	7/17/2013	< 15	241	469	NS	NS	NS	NS
CMLP-EX-SW @ 24'	7/17/2013	< 11	< 7.1	10.5 J	NS	NS	NS	NS
CMLP-EX6	8/15/2013	< 11	111	NS	NS	NS	NS	NS
CMLP-EX7	8/15/2013	< 11	<b>1280</b>	NS	NS	NS	NS	NS

## Notes:

COGCC 910-1: Colorado Oil and Gas Conservation Commission Table 910-1 Concentration Levels

mg/Kg: milligrams per Kilogram

GRO: Gasoline Range Organics by EPA Method 8260B (C6-C10)

DRO: Diesel Range Organics by EPA Method 8015B (C10-C28)

ORO: Oil Range Organics by EPA Method 8015B (C28-C40)

BTEX: Benzene, Toluene, Ethylbenzene, and Xylenes by EPA Method 8260B

< : Analyte was not detected at or above the laboratory reporting limit

J: Estimated value above the laboratory method detection limit (MDL) and reporting limit (RL)

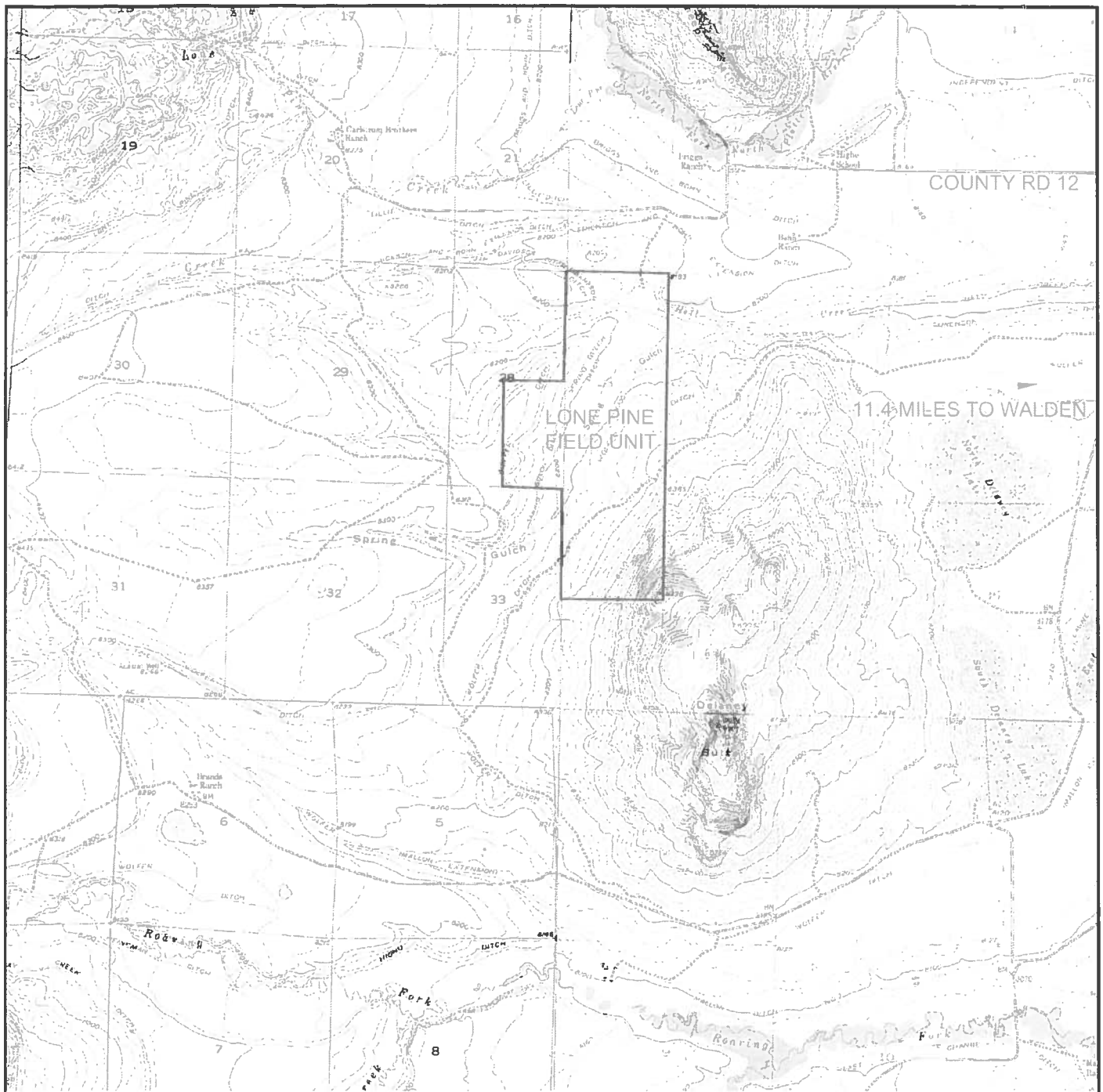
NS: Not Sampled

Values in bold exceed the COGCC Table 910-1 Concentration Level of 500 mg/Kg DRO and ORO.

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## FIGURES





LOCATION MAP



0 1/4 1/2 1 MILES

PROJECT: 009-1153

DRAWN BY: SDS

DATE: 09.21.10

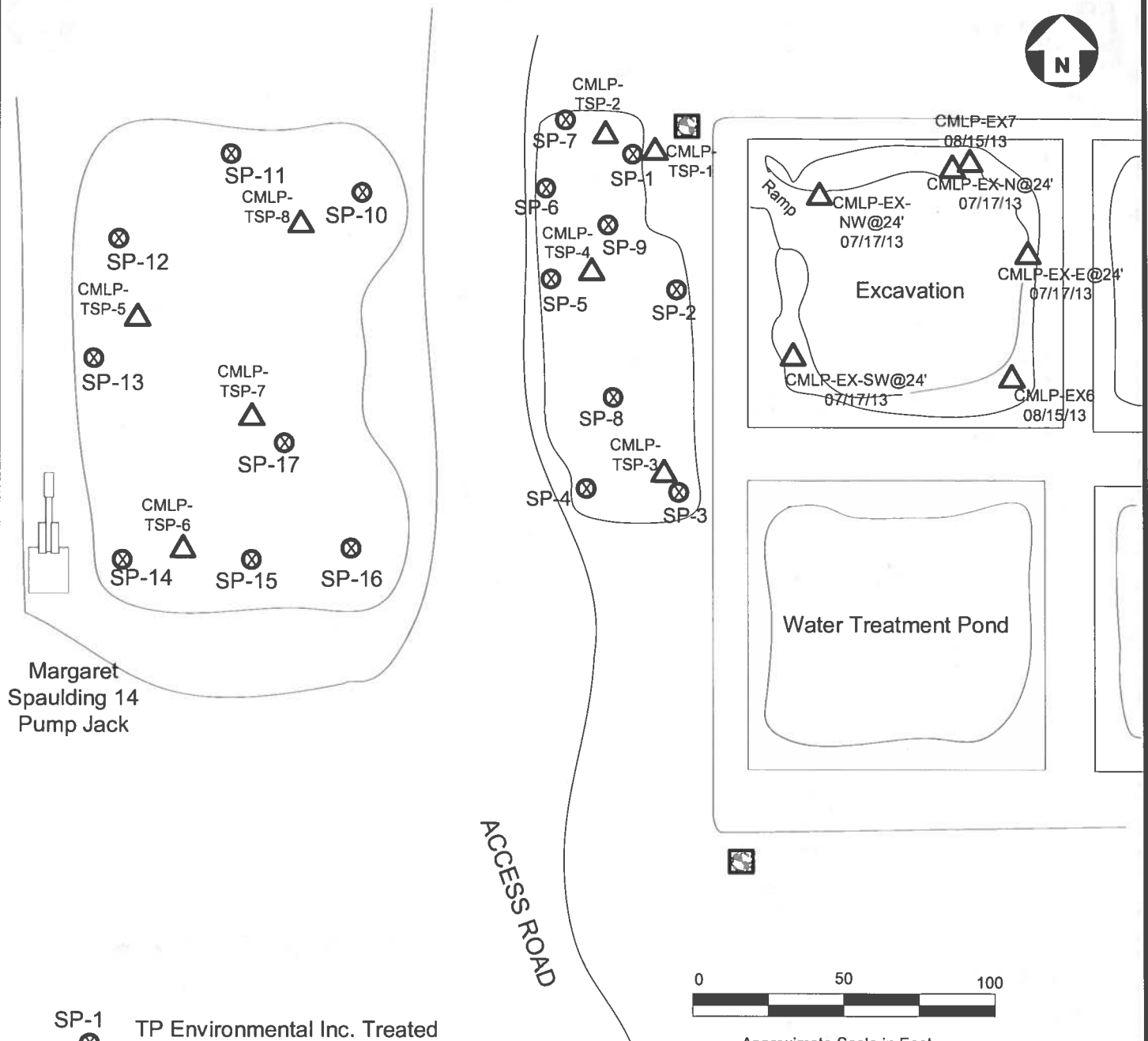
SITE LOCATION MAP  
LONE PINE GAS, INC.  
LONE PINE FIELD UNIT  
SEC 28 AND 33, T9N, R81W  
JACKSON COUNTY, COLORADO

**OLSSON**  
ASSOCIATES

4690 TABLE MOUNTAIN DRIVE  
SUITE 200  
GOLDEN, CO 80403  
TEL 303.237.2072  
FAX 303.237.2659

FIGURE

1

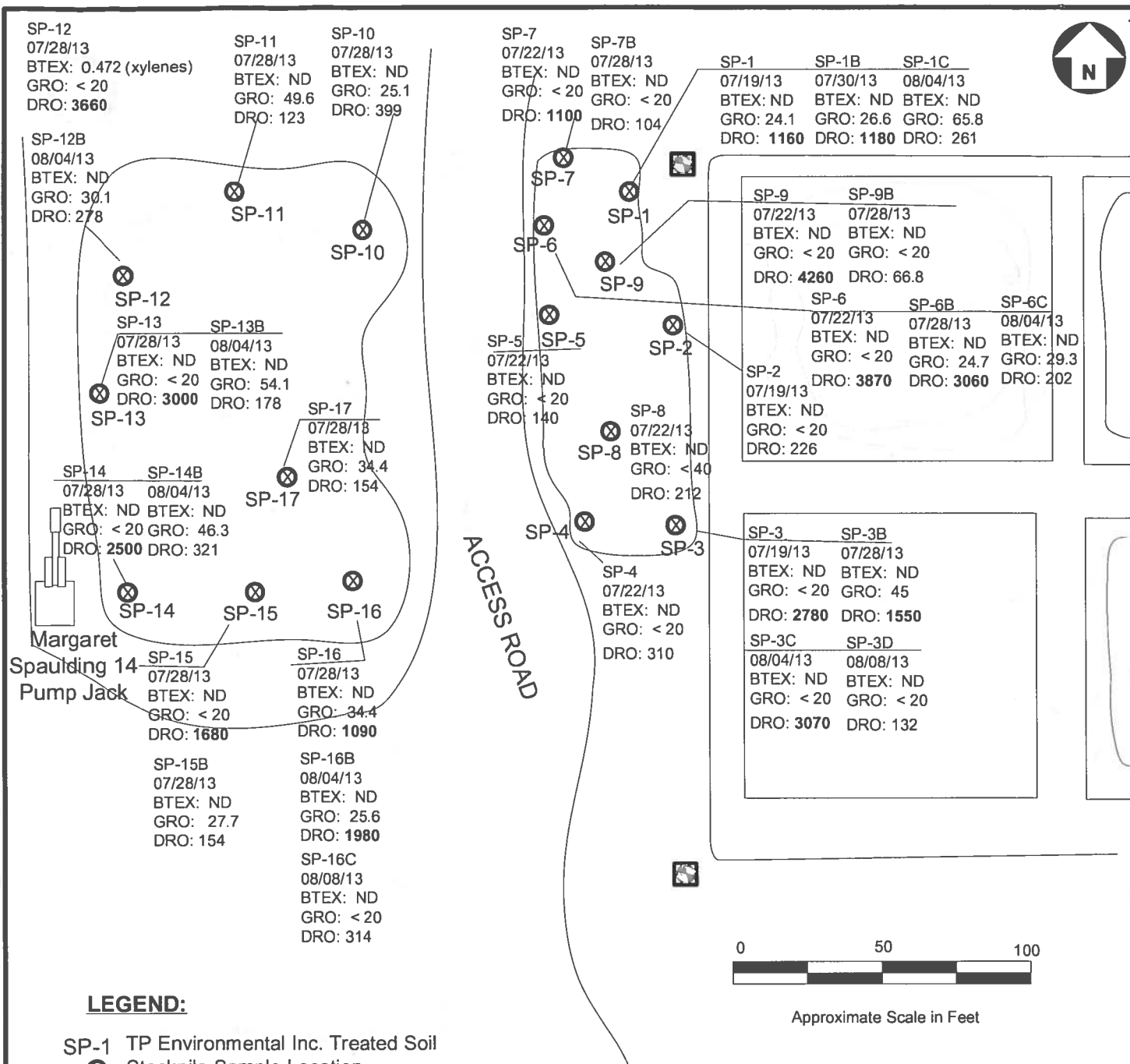


- SP-1 TP Environmental Inc. Treated Soil Stockpile Sample Location
- CMLP-TSP-1 Olsson Associates Treated Soil Stockpile Sample Location
- CMLP-EX-E@24' Olsson Associates Excavation Soil Sample Location and Depth in Feet
- Groundwater Monitoring Well Location

**FIGURE 2**  
**CM Production, LLC**  
 Margaret Spaulding Soil Stockpile Treatment  
 Soil Sample Locations  
 Lone Pine Field – Jackson County, Colorado

Revision Date:	
Revision Number	
Revised by:	JWH
Approved by:	
Project Number:	013-1489
Scale:	

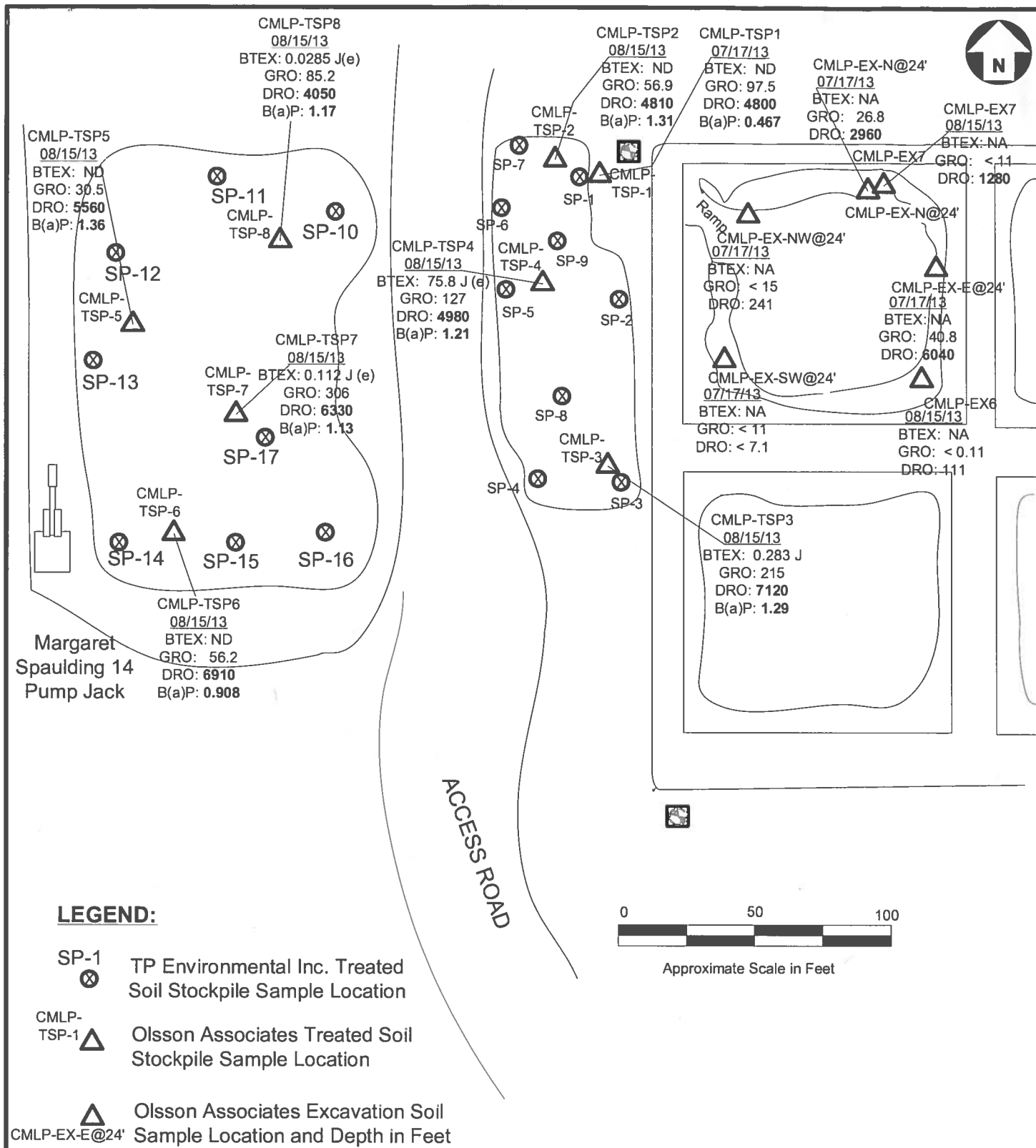
**OLSSON**  
 ASSOCIATES



**FIGURE 3**  
CM Production, LLC  
Margaret Spaulding Soil Stockpile Treatment  
TP Environmental Soil Sample Results  
Lone Pine Field – Jackson County, Colorado

Revision Date:	
Revision Number:	
Revised by:	JWH
Approved by:	
Project Number:	013-1489
Scale:	

**OLSSON**  
ASSOCIATES



**FIGURE 4**  
**CM Production, LLC**  
 Margaret Spaulding Soil Stockpile Treatment  
 Olsson Associates Soil Sample Locations  
 Lone Pine Field – Jackson County, Colorado

Revision Date:	
Revision Number:	
Revised by:	JWH
Approved by:	
Project Number:	013-1489
Scale:	

**OLSSON ASSOCIATES**

BTEX: Benzene, Toluene, Ethylbenzene, and Xylenes  
 GRO: Gasoline Range Organics  
 DRO: Diesel Range Organics  
 B(a)P: Benzo(a)Pyrene

Note: All analytical results shown in milligrams per kilogram (mg/Kg)  
 Values in **bold type** exceed the Table 910-1 concentration levels  
 DRO: 500 mg/Kg; B(a)P: 0.022 mg/Kg



**TABLE 1**  
**SUMMARY OF SOIL ANALYTICAL DATA**  
**CM PRODUCTION, LLC**  
**LONE PINE SOIL REMEDIATION SITE**  
**NEAR WALDEN, COLORADO**

Sample Location	Sample Depth (fbgs)	Date Sampled	Concentration (mg/kg)							TPH		
			Benzene	Toluene	Ethyl-benzene	Xylenes	Total BTEX	TPH-GRO C6-C12	TPH-DRO >C12-C28	Total TPH C6-C28		
Colorado Oil & Gas Conservation Commission Cleanup Levels			0.17	85	100	175	N/A	N/A	N/A	500		
Treated Composite Soil Samples												
SP-1	-	07/17/13	<0.0200	<0.0200	<0.0200	<0.0200	<0.0200	24.1	1,160	1,184		
SP-2	-	07/18/13	<0.0200	<0.0200	<0.0200	<0.0200	<0.0200	<20.0	226	226		
SP-3	-	07/18/13	<0.0200	<0.0200	<0.0200	<0.0200	<0.0200	<20.0	2780	2,780		
SP-4	-	07/22/13	<0.100	<0.100	<0.100	<0.100	<0.100	<20.0	310	310		
SP-5	-	07/22/13	<0.100	<0.100	<0.100	<0.100	<0.100	<20.0	140	140		
SP-6	-	07/22/13	<0.100	<0.100	<0.100	<0.100	<0.100	<20.0	3,870	3,870		
SP-7	-	07/22/13	<0.100	<0.100	<0.100	<0.100	<0.100	<20.0	1,100	1,100		
SP-8	-	07/22/13	<0.200	<0.200	<0.200	<0.200	<0.200	<40.0	212	212		
SP-9	-	07/22/13	<0.100	<0.100	<0.100	<0.100	<0.100	<20.0	4,260	4,260		
SP-10	-	07/28/13	<0.100	<0.100	<0.100	<0.100	<0.100	25.1	399	424		
SP-11	-	07/28/13	<0.100	<0.100	<0.100	<0.100	<0.100	49.6	123	173		
SP-12	-	07/28/13	<0.100	<0.100	<0.100	0.472	0.472	<20.0	3,660	3,660		
SP-13	-	07/28/13	<0.100	<0.100	<0.100	<0.100	<0.100	<20.0	3,000	3,000		
SP-14	-	07/28/13	<0.100	<0.100	<0.100	<0.100	<0.100	<20.0	2,500	2,500		
SP-15	-	07/28/13	<0.100	<0.100	<0.100	<0.100	<0.100	<20.0	1,680	1,680		
SP-16	-	07/28/13	<0.100	<0.100	<0.100	<0.100	<0.100	32.4	1,090	1,122		
SP-17	-	07/28/13	<0.100	<0.100	<0.100	<0.100	<0.100	34.4	154	188		
1st Re-Treat Composite Soil Samples												
SP-1B	-	07/28/13	<0.100	<0.100	<0.100	<0.100	<0.100	26.6	1,180	1,207		
SP-3B	-	07/28/13	<0.100	<0.100	<0.100	<0.100	<0.100	45.0	1,550	1,595		
SP-6B	-	07/28/13	<0.100	<0.100	<0.100	<0.100	<0.100	24.7	3,060	3,085		
SP-7B	-	07/28/13	<0.100	<0.100	<0.100	<0.100	<0.100	<20.0	104	104		
SP-9B	-	07/28/13	<0.100	<0.100	<0.100	<0.100	<0.100	<20.0	66.8	67		
SP-12B	-	08/04/13	<0.0400	<0.0400	<0.0400	0.400	0.400	30.1	278	308		
SP-13B	-	08/04/13	<0.0400	<0.0400	<0.0400	<0.0400	<0.0400	54.1	178	232		
SP-14B	-	08/04/13	<0.0400	<0.0400	<0.0400	<0.0400	<0.0400	46.3	321	367		
SP-15B	-	08/04/13	<0.0400	<0.0400	<0.0400	<0.0400	<0.0400	27.7	154	182		
SP-16B	-	08/04/13	<0.0400	<0.0400	<0.0400	<0.0400	<0.0400	25.6	1,980	2,006		
2nd Re-Treat Composite Soil Samples												
SP-1C	-	08/04/13	<0.0400	<0.0400	<0.0400	<0.0400	<0.0400	65.8	261	327		
SP-3C	-	08/04/13	<0.0400	<0.0400	<0.0400	0.0694	0.0694	<20.0	3,070	3,070		
SP-6C	-	08/04/13	<0.0400	<0.0400	<0.0400	<0.0400	<0.0400	29.3	202	231		
SP-16C	-	08/08/13	<0.100	<0.100	<0.100	<0.100	<0.100	<20.0	314	314		
3rd Re-Treat Composite Soil Samples												
SP-3D	-	08/08/13	<0.100	<0.100	<0.100	<0.100	<0.100	<20.0	132	132		

**Notes:**

1. BTEX = Benzene, toluene, ethylbenzene and xylene; analyzed by EPA Method 8021B
2. TPH = Total Petroleum Hydrocarbon; analyzed by EPA Method 8015D
3. N/A = Not Applicable
4. Bold results indicate detectable concentration; and shaded results indicated concentrations that exceed applicable category cleanup level.
5. Soil analyzed by TraceAnalysis in Lubbock, TX
6. fbgs = Feet below ground surface.