



February 8, 2013

Mr. John Axelson  
Northeast Region Environmental Protection Specialist  
Colorado Oil and Gas Conservation Commission  
1120 Lincoln Street, Suite 801  
Denver, Colorado 80203

**RE: Western Operating Company  
Nelson A-6 Pit Closure / Salt Impact Remediation  
Facility #219024  
Document #667500003  
Remediation #7315  
NWNW Sec. 17T8N R54W, 6<sup>th</sup> Principal Meridian  
Logan County, Colorado**

Dear Mr. Axelson:

LT Environmental, Inc. (LTE), on behalf of Western Operating Company (WOC), conducted pit closure sampling and documentation activities at the Nelson A-6 Tank Battery (Site) located in Logan County, Colorado (Figure 1). The purpose of the produced water and oil skim pit closure and related remediation activities are to satisfy the requirements set forth in a recent inspection summary (Document #667500003), which resulted in a violation filed by the Colorado Oil and Gas Conservation Commission (COGCC).

### **Background**

On April 10, 2012, the COGCC issued a violation to WOC following an on-site inspection. The inspection summary requires multiple action items be completed to obtain satisfactory conditions at the Site. LTE assisted with the following tasks at the Site:

- Provided recommendations on produced water pit and oil skim pit closure and reclamation;
- Collection of soil samples within the produced water pit and oil skim pit confirming soil is compliant with COGCC Table 910-1 standards;
- Provided recommendations on assessment of salt-impacted soil downgradient of the produced water pit;
- Collection of soil samples within the salt-impacted area to characterize the level of soil impact to determine the proper reclamation method; and
- Oversight of salt impact remediation and disturbed area reclamation activities, including soil tilling and final reseeding.



## **Initial Site Investigation**

On June 29, 2012, LTE personnel were present for an initial investigation of the oil skim pit, produced water pit, and salt-impacted area. Four-point composite soil samples were collected from the oil skim pit (OS-01) and produced water pit (PW-01) as illustrated in Figure 2. The composite soil samples were submitted to Summit Scientific, Inc. (Summit) of Golden, Colorado, for analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX), naphthalene, and total petroleum hydrocarbons (TPH)-gasoline range organics (GRO) by United States Environmental Protection Agency (EPA) Method 8260B and TPH-diesel range organics (DRO) by EPA Modified Method 8015.

Two aliquot samples (SS01 and SS02) were composited to characterize the salt-impacted area (Figure 3). Soil borings were advanced at each sample location, with a hand auger, to a total depth of 2 feet below ground surface (bgs). Composite soil samples were collected from each location at depths of 0-6 inches bgs and 18-24 inches bgs. The 18-24 inch samples were placed on hold for laboratory analysis only if the 0-6 inch samples exceeded COGCC Table 910-1 Concentration Levels. After the samples were composited, they were screened for volatile organic compounds (VOCs) using a hand held organic vapor analyzer equipped with a photoionization detector (PID). After field screening for VOCs, the composite soil samples were transferred into laboratory prepared 4-ounce, wide mouth, glass jars. Samples were submitted to Summit for laboratory analysis of pH by EPA Method 9045, specific conductance (EC) by Standard Method 2510B, and sodium adsorption ratio (SAR) by the United States Department of Agriculture Handbook 60 Method. A background soil sample (BG01) was collected to establish local pH, EC, and SAR background concentration levels.

Soil analytical results from the initial site investigation sampling indicated the produced water pit was in compliance with the COGCC Table 910-1 Concentration Levels. The oil skim pit was compliant with Table 910-1 Concentration Levels with the exception of the TPH concentration level (OS-01). Analytical results indicated TPH in the oil skim pit exceeded the COGCC Table 910-1 Concentration Level at 2,430 milligrams per kilogram (mg/kg). Analytical results for the produced water pit and oil skim pit are summarized in Table 1. The laboratory analytical reports are included as Attachment 1.

Soil analytical results from the initial site investigation sampling indicated the salt-impacted area exceeded the COGCC Table 910-1 Concentration Levels for pH, EC, and SAR in both SS01 and SS02 at both depths. Laboratory analytical results also indicate SS01 and SS02 exceed local background levels for pH, EC, and SAR as represented by BG01. Analytical results for the salt-impacted area and background sample are summarized in Table 1. The laboratory analytical reports are included as Attachment 1.

## **Produced Water and Oil Skim Pit Closure**

The produced water pit was not excavated due to the compliant analytical results. The produced water pit was not originally excavated below the ground surface. It appears the previous operations used berms to increase containment volume above the ground surface.



The previous berms have long since eroded back to the ground level and vegetation is growing where the produced water pit previously existed.

Upon LTE's recommendation, WOC contractors removed additional hydrocarbon impacted soil from the surface of the oil skim pit. Any hydrocarbon material removed from the oil skim pit will be added to on-site stockpile for disposal at a licensed disposal facility. The soil removed from the oil skim pit will be combined with the stockpiled soil previously removed from the tank battery area. LTE is currently working to get the soil profiled and transported for disposal at a licensed disposal facility.

As a result of the TPH concentrations identified in the oil skim pit during the initial investigation, additional excavation and confirmation sampling was conducted on October 10, 2012 and October 31, 2012 (Figure 4). LTE personnel were present to oversee additional excavation activities, field screen soil, document site activities, conduct health and safety monitoring, and collect confirmation samples for laboratory analysis. Composite soil samples were collected from the excavation bottom and were field screened for volatile organic compounds and TPH with a photo-ionization detector and a PetroFLAG TPH screening kit to evaluate if additional excavation was required. During the initial excavation of the oil skim pit, bedrock was encountered at 4 feet below ground surface. This bedrock swale outcrops immediately west of the produced water pit. To determine if the hydrocarbon impact extended into the weathered bedrock, LTE collected a soil sample from the bottom of the excavation (OS01 Test). As the laboratory analytical results indicated the bedrock surface was compliant, LTE directed the excavation contractor to remove the remaining soil on the eastern half of the oil skim pit to the corresponding depth of sample OS01 Test. The western half of the oil skim pit bottom was field screened to be clean at approximately 2 feet bgs. When the remaining soil on the eastern half had been removed, LTE personnel screened the pit bottom and a final confirmation sample (OS01) was composited from the base of the oil skim pit. The soil samples were submitted to Summit for laboratory analysis of BTEX, TPH-GRO, and TPH-DRO. The final dimensions of the oil skim pit excavation were 20 feet by 25 feet by 4 feet deep (Figure 4).

Soil analytical results from the additional excavation and confirmation sampling indicated the oil skim pit is in compliance with the COGCC Table 910-1 Concentration Levels. Analytical results for the oil skim pit and produced water pit are summarized in Table 1. The laboratory analytical reports are attached.

Following the excavation activities conducted at the Site, WOC contractors intend to backfill the oil skim pit to grade. The soil stockpiled on-site will be disposed of at a licensed disposal facility. The oil skim pit will be backfilled to grade and re-seeded with a native mix as necessary to prevent blow-sand conditions. WOC will submit the soil disposal records in a future Form 4 update once the soil has been removed from the site and transported for final disposal.

As COGCC cleanup standards have been achieved for the pit closure activities, WOC is requesting authorization to close both the produced water pit and oil skim pit.



### **Salt-Impacted Soil Assessment**

LTE conducted oversight while a third-party contractor tilled and incorporated a soil amendment into the salt-impacted area to mitigate elevated pH, EC, and SAR concentration levels on December 14, 2012. Remediation and reclamation activities were conducted to foster revegetation of the salt impacted area during subsequent growing seasons. A soil amendment was applied to the impacted area, which was delineated by the stressed vegetation. The liquid calcium amendment was then incorporated and the contractor reseeded the disturbed area. These remediation activities are covered in greater detail in the Nelson A-6 Soil Remediation Concept Plan, which is included as Attachment 2.

### **Additional COGCC Information Requests**

- The location of the produced water pit is: 40.665672, -103.446228.
- The location of the oil skim pit is: 40.665604, -103.446010.
- The concrete footer from a previously decommissioned well was hauled offsite to be crushed and recycled. The transportation and disposal was handled by Baney Well Service, Inc. The invoice for the work associated with the concrete debris removal is included as Attachment 3. Clean fill dirt was imported to return the area where the concrete debris was removed back to previous grade.

Should you have any questions, please contact Steven James with WOC at (303) 893-2438.

Sincerely,

LT ENVIRONMENTAL, INC.

A handwritten signature in black ink, appearing to read 'Michael Wicker', written in a cursive style.

Michael Wicker  
Staff Geologist

A handwritten signature in black ink, appearing to read 'Brian Dodek', written in a cursive style.

Brian Dodek, P.G.  
Client Manager/Senior Geologist

Attachments:

Figure 1 - Site Location Map

Figure 2 - Produced Water and Oil Skim Pit Samples June 29, 2012

Figure 3 - Salt-Impacted Area Sample Locations

Figure 4 - Oil Skim Pit Samples October 10 & 31, 2012

Table 1 - Soil Analytical Results

Attachment 1 - Laboratory Analytical Reports

Attachment 2 - Nelson A-6 Soil Remediation Concept Plan

Attachment 3 - Concrete Debris Disposal Invoice

## FIGURES



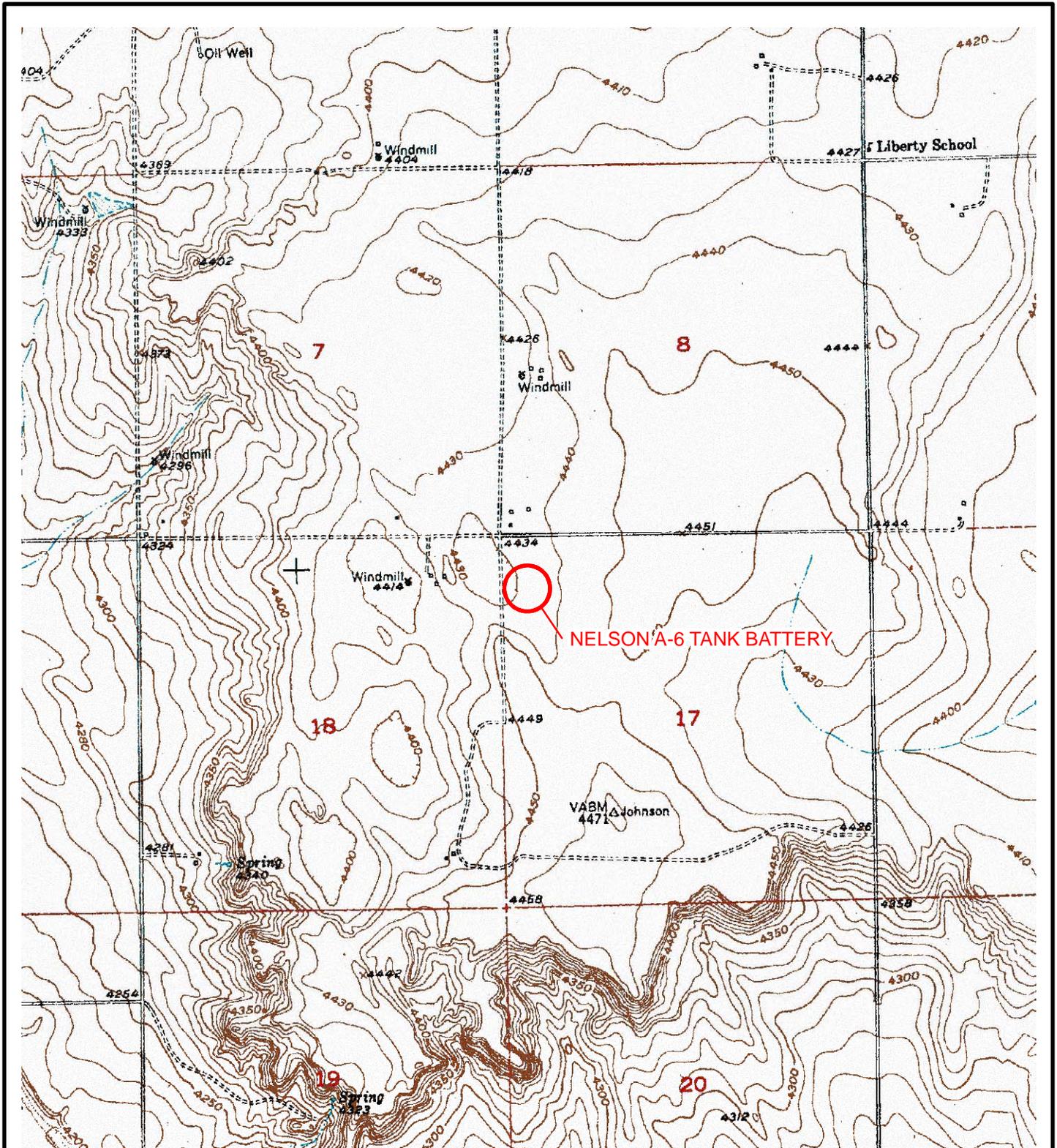
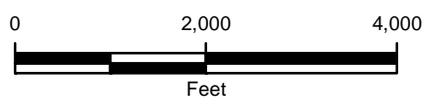


IMAGE COURTESY OF USDA/NRCS, VARIOUS DATES

**LEGEND**

 SITE LOCATION



**FIGURE 1**  
SITE LOCATION MAP  
NELSON A-6 TANK BATTERY  
LOGAN COUNTY, COLORADO



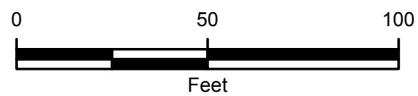
**WESTERN OPERATING COMPANY**



IMAGE COURTESY OF ESRI/BING MAPS

**LEGEND**

- OIL SKIM PIT SAMPLE
- ⬠ PRODUCED WATER PIT COMPOSITE SAMPLE
- OIL SKIM PIT EXCAVATION
- PRODUCED WATER PIT



**FIGURE 2**  
**PRODUCED WATER AND OIL SKIM PIT SAMPLES**  
**JUNE 29, 2012**  
**NELSON A-6 TANK BATTERY**  
**LOGAN COUNTY, COLORADO**  
**WESTERN OPERATING COMPANY**

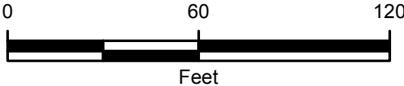




IMAGE COURTESY OF USDA/NRCS, 2011

**LEGEND**

-  SALT-IMPACTED COMPOSITE SAMPLE
-  BACKGROUND SAMPLE
-  SALT-IMPACTED AREA



**FIGURE 3**  
**SALT-IMPACTED AREA SAMPLE LOCATIONS**  
**NELSON A-6 TANK BATTERY**  
**LOGAN COUNTY, COLORADO**

**WESTERN OPERATING COMPANY**

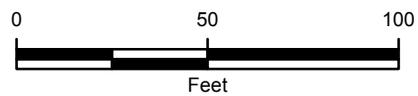




IMAGE COURTESY OF ESRI/BING MAPS

**LEGEND**

- OIL SKIM PIT SAMPLE
- OIL SKIM PIT EXCAVATION
- PRODUCED WATER PIT



**FIGURE 4**  
OIL SKIM PIT SAMPLES OCTOBER 10 & 31, 2012  
NELSON A-6 TANK BATTERY  
LOGAN COUNTY, COLORADO



**WESTERN OPERATING COMPANY**

**TABLE**



**TABLE 1**  
**SOIL ANALYTICAL RESULTS**  
**NELSON A-6 TANK BATTERY**  
**LOGAN COUNTY, COLORADO**  
**WESTERN OPERATING COMPANY**

Parameter	COGCC Table 910-1 Concentration Level	Units	OS-01	OS-1 (Test)	OS-01	PW-01	SS01	SS01	SS02	SS02	BG01
Sample Date			6/29/2012	10/10/2012	10/31/2012	6/29/2012	6/29/2012	6/29/2012	6/29/2012	6/29/2012	6/29/2012
Sample Depth			2	4	2 - 4	0-0.5	0-0.5	1.5 - 2	0 - 0.5	1.5 - 2	0 - 0.5
Benzene	0.17	mg/kg	0.068	<0.0050	<0.0050	<0.0050	--	--	--	--	--
Toluene	85	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--	--	--
Ethylbenzene	100	mg/kg	0.044	<0.0050	<0.0050	<0.0050	--	--	--	--	--
Total Xylenes	175	mg/kg	0.065	0.0073	<0.0050	<0.0150	--	--	--	--	--
Naphthalene	23	mg/kg	0.037	--	--	<0.0050	--	--	--	--	--
TPH-GRO		mg/kg	230	18	<0.50	<0.50	--	--	--	--	--
TPH-DRO		mg/kg	2,200	150	<50	<50	--	--	--	--	--
Total TPH	500	mg/kg	<b>2,430</b>	168	<50.50	<50.50	--	--	--	--	--
EC	<4	mmhos/cm	--	--	--	--	<b>7.03</b>	<b>5.74</b>	<b>13.0</b>	<b>6.90</b>	0.329
pH	6 - 9	SU	--	--	--	--	<b>10</b>	<b>9.4</b>	<b>9.8</b>	<b>9.1</b>	8.0
SAR	<12	unitless	--	--	--	--	<b>50.0</b>	<b>44.1</b>	<b>65.0</b>	<b>31.9</b>	1.37

**NOTES:**

-- - not analyzed

< - less than the stated laboratory method reporting limit

COGCC - Colorado Oil and Gas Conservation Commission

EC - specific conductance

mg/kg - milligrams per kilogram

mmhos/cm - millimhos per centimeter

SAR - sodium adsorption ratio

SU - standard units

TPH-GRO - Total Petroleum Hydrocarbons-Gasoline Range Organics

TPH-DRO - Total Petroleum Hydrocarbons-Diesel Range Organics

Total TPH - sum of TPH-DRO and TPH-GRO

**BOLD** - indicates result exceeds the applicable Colorado Oil and Gas Conservation Commission (COGCC) Table 910-1 Concentration Level.



**ATTACHMENT 1**  
**LABORATORY ANALYTICAL REPORTS**



# Summit Scientific

---

741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

July 08, 2012

Brian Dodek  
LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada, CO 80003  
RE: WOC - Nelson A-6

Enclosed are the results of analyses for samples received by Summit Scientific on 06/29/12 16:50. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to be 'BS', with a long, sweeping horizontal line extending to the right.

Ben Shrewsbury  
President / Laboratory Director



LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

**Reported:**  
07/08/12 17:05

### ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
OS01	R207005-01	Soil	06/29/12 11:45	06/29/12 16:50
PW01	R207005-02	Soil	06/29/12 12:15	06/29/12 16:50
SS02 (0"-6")	R207005-03	Soil	06/29/12 12:30	06/29/12 16:50
SS02 (18"-24")	R207005-04	Soil	06/29/12 12:35	06/29/12 16:50
SS01 (0"-6")	R207005-05	Soil	06/29/12 12:40	06/29/12 16:50
SS01 (18"-24")	R207005-06	Soil	06/29/12 12:45	06/29/12 16:50
BG01	R207005-07	Soil	06/29/12 12:50	06/29/12 16:50

Summit Scientific

*The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.*



LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

Reported:  
07/08/12 17:05

R207005

# Summit Scientific

S<sub>1</sub>

741 Corporate Circle Suite 1 • Golden, Colorado 80401  
303-277-9510 • 303-277-9531 Fax

Page 1 of 1

Client: LT Environmental, Inc. Project Manager: Brian Dodek  
Address: 4600 West 60th Avenue E-Mail: bdodek@ltenv.com  
City/State/Zip: Arvada, CO 80003 Project Name: Nelson A-6  
Phone: (303) 433-9788 Fax: (303) 433-1432 Project Number: 0284-12002  
Sampler Name: Devita Girtin

Sample Description	Date Sampled	Time Sampled	Number of Containers	Preservative				Matrix				Analyze For:				Special Instructions			
				HCl	HNO <sub>3</sub>	None	Other (Specify)	Groundwater	Soil	Air - Canister Serial #	Other (Specify)	DRD	GRTEX	PH / EC	SAR		Table 910.1 metals		
OS 01	6-29-12	1145	1			X				X									
714 01		1215																	
5502 (6"-6")		1230																	
5502 (8"-24")		1235																	
5501 (6"-6")		1240																	
5501 (8"-24")		1245																	
B601		1250																	

Relinquished by: <i>Albert</i>	Date Time: 6-29-12 6:29:50	Received by: <i>[Signature]</i>	Date Time: 6-29-12 4:50
Relinquished by:	Date Time:	Received by:	Date Time:
Relinquished by:	Date Time:	Received in Lab by:	Date Time:

Turn Around Time (Check)	72 Hours <input type="checkbox"/>	Standard <input checked="" type="checkbox"/>
Some Day	24 Hours	48 Hours
Sample Integrity:	Temperature Upon Receipt: 5.0	Intact: (Yes) No

Notes:



LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

Reported:  
07/08/12 17:05

**OS01**  
**R207005-01 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **06/29/12 11:45**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>C10-C28 (DRO)</b>	<b>2200</b>	50	mg/kg	1	2070610	07/06/12	07/06/12	8015 Full Carbon Chain	

Date Sampled: **06/29/12 11:45**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: o-Terphenyl</i>		121 %	30-150		"	"	"	"	

**Volatile Organic Compounds by EPA Method 8260B**

Date Sampled: **06/29/12 11:45**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Naphthalene</b>	<b>0.037</b>	0.0050	mg/kg	1	2070206	07/02/12	07/03/12	EPA 8260B	
<b>Benzene</b>	<b>0.068</b>	0.0050	"	"	"	"	"	"	
Toluene	ND	0.0050	"	"	"	"	"	"	
<b>Ethylbenzene</b>	<b>0.044</b>	0.0050	"	"	"	"	"	"	
<b>m,p-Xylene</b>	<b>0.054</b>	0.010	"	"	"	"	"	"	
<b>o-Xylene</b>	<b>0.011</b>	0.0050	"	"	"	"	"	"	
<b>Gasoline Range Hydrocarbons</b>	<b>230</b>	5.0	"	10	"	"	"	"	

Date Sampled: **06/29/12 11:45**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		101 %	30-150		"	"	"	"	
<i>Surrogate: Toluene-d8</i>		122 %	30-150		"	"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>		89.0 %	30-150		"	"	"	"	

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

Reported:  
07/08/12 17:05

**PW01**  
**R207005-02 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **06/29/12 12:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	2070610	07/06/12	07/06/12	8015 Full Carbon Chain	

Date Sampled: **06/29/12 12:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: <i>o</i> -Terphenyl		103 %	30-150		"	"	"	"	

**Volatile Organic Compounds by EPA Method 8260B**

Date Sampled: **06/29/12 12:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Naphthalene	ND	0.0050	mg/kg	1	2070206	07/02/12	07/03/12	EPA 8260B	
Benzene	ND	0.0050	"	"	"	"	"	"	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
m,p-Xylene	ND	0.010	"	"	"	"	"	"	
o-Xylene	ND	0.0050	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: **06/29/12 12:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		107 %	30-150		"	"	"	"	
Surrogate: Toluene-d8		99.8 %	30-150		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		97.5 %	30-150		"	"	"	"	

Summit Scientific

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LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

Reported:  
07/08/12 17:05

**SS02 (0''-6'')**  
**R207005-03 (Soil)**

**Summit Scientific**

**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **06/29/12 12:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	13.0	0.00100	mmhos/cm	1	2070204	07/02/12	07/02/12	SM 2510B	

Date Sampled: **06/29/12 12:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	9.8		pH Units	"	2070201	07/02/12	07/02/12	EPA 9045B	

**Soluble Nutrients by EPA 6020/Mod. USDA60 6(2, 3A) - Dry Weight Basis**

Date Sampled: **06/29/12 12:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	151	2.50	mg/kg	1	2070203	07/02/12	07/03/12	EPA 6020/Mod. USDA60 6(2, 3A)	
Magnesium	83.6	1.00	"	"	"	"	"	"	
Sodium	4040	5.00	"	"	"	"	"	"	

Date Sampled: **06/29/12 12:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	65.0		units	"	2070317	07/03/12	07/03/12	"	

Summit Scientific

*The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.*



LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

**Reported:**  
07/08/12 17:05

**SS02 (18''-24'')**  
**R207005-04 (Soil)**

**Summit Scientific**

**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **06/29/12 12:35**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	<b>6.90</b>	0.00100	mmhos/cm	1	2070204	07/02/12	07/02/12	SM 2510B	

Date Sampled: **06/29/12 12:35**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	<b>9.1</b>		pH Units	"	2070201	07/02/12	07/02/12	EPA 9045B	

**Soluble Nutrients by EPA 6020/Mod. USDA60 6(2, 3A) - Dry Weight Basis**

Date Sampled: **06/29/12 12:35**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	<b>189</b>	2.50	mg/kg	1	2070203	07/02/12	07/03/12	EPA 6020/Mod. USDA60 6(2, 3A)	
Magnesium	<b>175</b>	1.00	"	"	"	"	"	"	
Sodium	<b>2530</b>	5.00	"	"	"	"	"	"	

Date Sampled: **06/29/12 12:35**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	<b>31.9</b>		units	"	2070317	07/03/12	07/03/12	"	

Summit Scientific

*The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.*



LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

Reported:  
07/08/12 17:05

**SS01 (0''-6'')**  
**R207005-05 (Soil)**

**Summit Scientific**

**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **06/29/12 12:40**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	7.03	0.00100	mmhos/cm	1	2070204	07/02/12	07/02/12	SM 2510B	

Date Sampled: **06/29/12 12:40**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	10		pH Units	"	2070201	07/02/12	07/02/12	EPA 9045B	

**Soluble Nutrients by EPA 6020/Mod. USDA60 6(2, 3A) - Dry Weight Basis**

Date Sampled: **06/29/12 12:40**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	102	2.50	mg/kg	1	2070203	07/02/12	07/03/12	EPA 6020/Mod. USDA60 6(2, 3A)	
Magnesium	63.5	1.00	"	"	"	"	"	"	
Sodium	2610	5.00	"	"	"	"	"	"	

Date Sampled: **06/29/12 12:40**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	50.0		units	"	2070317	07/03/12	07/03/12	"	

Summit Scientific

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LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

Reported:  
07/08/12 17:05

**SS01 (18''-24'')**  
**R207005-06 (Soil)**

**Summit Scientific**

**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **06/29/12 12:45**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	5.74	0.00100	mmhos/cm	1	2070204	07/02/12	07/02/12	SM 2510B	

Date Sampled: **06/29/12 12:45**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	9.4		pH Units	"	2070201	07/02/12	07/02/12	EPA 9045B	

**Soluble Nutrients by EPA 6020/Mod. USDA60 6(2, 3A) - Dry Weight Basis**

Date Sampled: **06/29/12 12:45**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	71.1	2.50	mg/kg	1	2070203	07/02/12	07/03/12	EPA 6020/Mod. USDA60 6(2, 3A)	
Magnesium	136	1.00	"	"	"	"	"	"	
Sodium	2750	5.00	"	"	"	"	"	"	

Date Sampled: **06/29/12 12:45**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	44.1		units	"	2070317	07/03/12	07/03/12	"	

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LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

Reported:  
07/08/12 17:05

**BG01**  
**R207005-07 (Soil)**

**Summit Scientific**

**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **06/29/12 12:50**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	<b>0.329</b>	0.00100	mmhos/cm	1	2070204	07/02/12	07/02/12	SM 2510B	

Date Sampled: **06/29/12 12:50**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	<b>8.0</b>		pH Units	"	2070201	07/02/12	07/02/12	EPA 9045B	

**Soluble Nutrients by EPA 6020/Mod. USDA60 6(2, 3A) - Dry Weight Basis**

Date Sampled: **06/29/12 12:50**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	<b>292</b>	2.50	mg/kg	1	2070203	07/02/12	07/03/12	EPA 6020/Mod. USDA60 6(2, 3A)	
Magnesium	<b>40.4</b>	1.00	"	"	"	"	"	"	
Sodium	<b>94.4</b>	5.00	"	"	"	"	"	"	

Date Sampled: **06/29/12 12:50**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	<b>1.37</b>		units	"	2070317	07/03/12	07/03/12	"	

Summit Scientific

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LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

**Reported:**  
07/08/12 17:05

**Extractable Petroleum Hydrocarbons by 8015 - Quality Control**  
**Summit Scientific**

Analyte	Result	Reporting		Spike Level	Source		%REC		RPD		Notes
		Limit	Units		Result	%REC	Limits	RPD	Limit		

**Batch 2070610 - EPA 3550A**

<b>Blank (2070610-BLK1)</b>		Prepared: 07/06/12 Analyzed: 07/07/12									
C10-C28 (DRO)	ND	50	mg/kg								
<b>LCS (2070610-BS1)</b>		Prepared: 07/06/12 Analyzed: 07/07/12									
C10-C28 (DRO)	541	50	mg/kg	501	108	79.3-126					
<b>LCS Dup (2070610-BSD1)</b>		Prepared: 07/06/12 Analyzed: 07/07/12									
C10-C28 (DRO)	534	50	mg/kg	501	107	79.3-126	1.34		11		
<b>Matrix Spike (2070610-MS1)</b>		<b>Source: R207027-01</b>		Prepared: 07/06/12 Analyzed: 07/07/12							
C10-C28 (DRO)	518	50	mg/kg	501	45.6	94.2	45.1-150				
<b>Matrix Spike Dup (2070610-MSD1)</b>		<b>Source: R207027-01</b>		Prepared: 07/06/12 Analyzed: 07/07/12							
C10-C28 (DRO)	458	50	mg/kg	501	45.6	82.4	45.1-150	12.2		25	

Summit Scientific

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LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

Reported:  
07/08/12 17:05

**Volatile Organic Compounds by EPA Method 8260B - Quality Control**  
**Summit Scientific**

Analyte	Reporting			Spike	Source	%REC		RPD		Notes
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	

**Batch 2070206 - EPA 5030 Soil MS**

**Blank (2070206-BLK1)**

Prepared & Analyzed: 07/02/12

Naphthalene	ND	0.0050	mg/kg							
Benzene	ND	0.0050	"							
Toluene	ND	0.0050	"							
Ethylbenzene	ND	0.0050	"							
m,p-Xylene	ND	0.010	"							
o-Xylene	ND	0.0050	"							
Gasoline Range Hydrocarbons	ND	0.50	"							
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0367</i>		<i>"</i>	<i>0.0397</i>	<i>92.5</i>	<i>30-150</i>				
<i>Surrogate: Toluene-d8</i>	<i>0.0392</i>		<i>"</i>	<i>0.0400</i>	<i>98.1</i>	<i>30-150</i>				
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0392</i>		<i>"</i>	<i>0.0400</i>	<i>98.0</i>	<i>30-150</i>				

**LCS (2070206-BS1)**

Prepared & Analyzed: 07/02/12

Naphthalene	ND	0.0050	mg/kg			85.7-124				
Benzene	0.114	0.0050	"	0.100	114	58.1-115				
Toluene	0.112	0.0050	"	0.100	112	56.7-123				
Ethylbenzene	0.115	0.0050	"	0.100	115	61.4-138				
m,p-Xylene	0.230	0.010	"	0.200	115	63.6-128				
o-Xylene	0.111	0.0050	"	0.100	111	62.6-134				
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0385</i>		<i>"</i>	<i>0.0397</i>	<i>97.0</i>	<i>30-150</i>				
<i>Surrogate: Toluene-d8</i>	<i>0.0397</i>		<i>"</i>	<i>0.0400</i>	<i>99.2</i>	<i>30-150</i>				
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0389</i>		<i>"</i>	<i>0.0400</i>	<i>97.3</i>	<i>30-150</i>				

**LCS Dup (2070206-BSD1)**

Prepared & Analyzed: 07/02/12

Naphthalene	ND	0.0050	mg/kg			85.7-124			12.6	
Benzene	0.107	0.0050	"	0.100	107	58.1-115	6.35	20		
Toluene	0.107	0.0050	"	0.100	107	56.7-123	4.96	20		
Ethylbenzene	0.110	0.0050	"	0.100	110	61.4-138	4.23	12.2		
m,p-Xylene	0.221	0.010	"	0.200	110	63.6-128	4.06	13.2		
o-Xylene	0.107	0.0050	"	0.100	107	62.6-134	3.38	12.2		
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0372</i>		<i>"</i>	<i>0.0397</i>	<i>93.7</i>	<i>30-150</i>				
<i>Surrogate: Toluene-d8</i>	<i>0.0402</i>		<i>"</i>	<i>0.0400</i>	<i>100</i>	<i>30-150</i>				
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0390</i>		<i>"</i>	<i>0.0400</i>	<i>97.4</i>	<i>30-150</i>				

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LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

Reported:  
07/08/12 17:05

**Volatile Organic Compounds by EPA Method 8260B - Quality Control**  
**Summit Scientific**

Analyte	Reporting			Spike	Source		%REC		RPD		Notes
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit		

**Batch 2070206 - EPA 5030 Soil MS**

**Matrix Spike (2070206-MS1)**

Source: R207003-02

Prepared & Analyzed: 07/02/12

Naphthalene	ND	0.0050	mg/kg	0.00	0.00		34-148			
Benzene	0.106	0.0050	"	0.100	0.00	106	47.2-120			
Toluene	0.105	0.0050	"	0.100	0.00	105	47.7-125			
Ethylbenzene	0.103	0.0050	"	0.100	0.00	103	34.5-150			
m,p-Xylene	0.209	0.010	"	0.200	0.00	104	30-150			
o-Xylene	0.103	0.0050	"	0.100	0.00	103	30-150			
Surrogate: 1,2-Dichloroethane-d4	0.0404		"	0.0397		102	30-150			
Surrogate: Toluene-d8	0.0400		"	0.0400		100	30-150			
Surrogate: 4-Bromofluorobenzene	0.0384		"	0.0400		96.1	30-150			

**Matrix Spike Dup (2070206-MSD1)**

Source: R207003-02

Prepared & Analyzed: 07/02/12

Naphthalene	ND	0.0050	mg/kg	0.00	0.00		34-148		23.9	
Benzene	0.101	0.0050	"	0.100	0.00	101	47.2-120	4.00	15.1	
Toluene	0.0997	0.0050	"	0.100	0.00	99.7	47.7-125	5.50	16.8	
Ethylbenzene	0.0997	0.0050	"	0.100	0.00	99.7	34.5-150	3.75	10.1	
m,p-Xylene	0.199	0.010	"	0.200	0.00	99.6	30-150	4.59	17.2	
o-Xylene	0.0982	0.0050	"	0.100	0.00	98.2	30-150	4.68	15.2	
Surrogate: 1,2-Dichloroethane-d4	0.0405		"	0.0397		102	30-150			
Surrogate: Toluene-d8	0.0397		"	0.0400		99.2	30-150			
Surrogate: 4-Bromofluorobenzene	0.0384		"	0.0400		96.1	30-150			

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LT Environmental, Inc.  
 4600 West 60th Avenue  
 Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
 Project Manager: Brian Dodek

**Reported:**  
 07/08/12 17:05

**Physical Parameters by APHA/ASTM/EPA Methods - Quality Control**  
**Summit Scientific**

Analyte	Reporting			Spike	Source	%REC			RPD	Notes
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	

**Batch 2070201 - General Preparation**

<b>Duplicate (2070201-DUP1)</b>		<b>Source: R206221-01</b>			Prepared & Analyzed: 07/02/12					
pH	7.9		pH Units		7.9			0.254	4.95	

**Batch 2070204 - General Preparation**

<b>Duplicate (2070204-DUP1)</b>		<b>Source: R207005-03</b>			Prepared & Analyzed: 07/02/12					
Specific Conductance (EC)	12.6	0.00100	mmhos/cm		13.0			2.34	15.5	

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LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

Reported:  
07/08/12 17:05

**Soluble Nutrients by EPA 6020/Mod. USDA60 6(2, 3A) - Dry Weight Basis - Quality Control**  
**Summit Scientific**

Analyte	Reporting			Spike	Source	%REC		RPD		Notes
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	

**Batch 2070203 - General Preparation**

**Blank (2070203-BLK1)**

Prepared: 07/02/12 Analyzed: 07/03/12

Calcium	ND	2.50	mg/kg							
Magnesium	ND	1.00	"							
Sodium	ND	5.00	"							

**LCS (2070203-BS1)**

Prepared: 07/02/12 Analyzed: 07/03/12

Calcium	361	2.50	mg/kg	400		90.2	70-130			
Magnesium	194	1.00	"	200		96.8	70-130			
Sodium	783	5.00	"	800		97.9	70-130			

**LCS Dup (2070203-BSD1)**

Prepared: 07/02/12 Analyzed: 07/03/12

Calcium	365	2.50	mg/kg	400		91.2	70-130	1.10	25	
Magnesium	200	1.00	"	200		99.8	70-130	3.08	25	
Sodium	798	5.00	"	800		99.8	70-130	1.93	25	

**Matrix Spike (2070203-MS1)**

Source: R207005-03

Prepared: 07/02/12 Analyzed: 07/03/12

Calcium	482	2.50	mg/kg	421	151	78.6	70-130			
Magnesium	268	1.00	"	210	83.6	87.8	70-130			
Sodium	4410	5.00	"	841	4040	44.7	70-130			QM-07

**Matrix Spike Dup (2070203-MSD1)**

Source: R207005-03

Prepared: 07/02/12 Analyzed: 07/03/12

Calcium	522	2.50	mg/kg	417	151	88.8	70-130	7.96	25	
Magnesium	280	1.00	"	209	83.6	94.0	70-130	4.14	25	
Sodium	4700	5.00	"	835	4040	78.8	70-130	6.20	25	

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LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

**Reported:**  
07/08/12 17:05

### Notes and Definitions

- QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS/LCSD recovery.
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis
- RPD Relative Percent Difference

# Summit Scientific

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741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

December 11, 2012

Brian Dodek  
LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada, CO 80003  
RE: WOC - Nelson A-6

Enclosed are the results of analyses for samples received by Summit Scientific on 10/10/12 17:10. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read "Joseph J. Egry IV". The signature is fluid and cursive, with a distinct "IV" at the end.

Joseph J Egry IV For Ben Shrewsbury  
President / Laboratory Manager



LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

Reported:  
12/11/12 11:27

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
OS-01 (TEST)	R210095-01	Soil	10/10/12 13:00	10/10/12 17:10

R210095  
Summit Scientific

741 Corporate Circle Suite 1 • Golden, Colorado 80401  
303-277-9310 • 303-277-9311 Fax

Client: LT Environmental, Inc.  
Address: 4600 West 60th Avenue  
City/State/Zip: Arvada, CO 80003  
Phone: (303) 433-9788  
Sample Name: 12-11-12  
Project Manager: Brian Dodek  
E-Mail: bdodek@lteni.com  
Project Name: WOC - Nelson A-6  
Project Number: 0284-12002

Page 1 of 1

Sample Description	Date Sampled	Time Sampled	Number of Containers	Preservative	Matrix	Analyze For:	Special Instructions	Notes
Soil - 0.5g (10/10/12) 1700 12-11-12 10-10-12	10/10/12	1700		HCl HNO <sub>3</sub> Zone Other (Specify)	Soil Groundwater Other (Specify)	Table 910.1 metals SAR PH / EC BTEX GBTEX DRO Other (Specify)	10/10/12 13:00 10/10/12 17:10 48 HAT	
Retiquished by: <u>BD</u>	Date Time: <u>10/10/12 1700</u>	Received by: <u>BD</u>	Date Time: <u>10/10/12 17:10</u>	Turn Around Time (Check)	Same Day	72 Hours	Standard	Sample Integrity: Temperature Upon Receipt: <u>50</u> Intact: Yes / No
Retiquished by:	Date Time:	Received by:	Date Time:	48 Hours				
Retiquished by:	Date Time:	Received in Lab by:	Date Time:					

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LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

Reported:  
12/11/12 11:27

**OS-01 (TEST)**  
**R210095-01 (Soil)**

**Summit Scientific**

**Total Petroleum Hydrocarbons by 8015**

Date Sampled: 10/10/12 13:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>C10-C28 (DRO)</b>	<b>150</b>	44	mg/kg	1	2102212	10/22/12	10/23/12	8015 DRO	

Date Sampled: 10/10/12 13:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: o-Terphenyl</i>		83.0 %	30-150		"	"	"	"	

**Volatile Organic Compounds by EPA Method 8260B**

Date Sampled: 10/10/12 13:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0050	mg/kg	1	2102211	10/22/12	10/22/12	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
<b>Xylenes (total)</b>	<b>0.0073</b>	0.0050	"	"	"	"	"	"	
<b>Gasoline Range Hydrocarbons</b>	<b>18</b>	0.50	"	"	"	"	"	"	

Date Sampled: 10/10/12 13:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		113 %	30-150		"	"	"	"	
<i>Surrogate: Toluene-d8</i>		88.8 %	30-150		"	"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>		120 %	30-150		"	"	"	"	

Summit Scientific

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LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

**Reported:**  
12/11/12 11:27

**Total Petroleum Hydrocarbons by 8015 - Quality Control**  
**Summit Scientific**

Analyte	Result	Reporting		Spike Level	Source		%REC		RPD		Notes
		Limit	Units		Result	%REC	Limits	RPD	Limit		

**Batch 2102212 - EPA 3550A**

<b>Blank (2102212-BLK1)</b>		Prepared: 10/22/12 Analyzed: 10/23/12									
C10-C28 (DRO)	ND	50	mg/kg								
<b>LCS (2102212-BS1)</b>		Prepared: 10/22/12 Analyzed: 10/23/12									
C10-C28 (DRO)	508	50	mg/kg	501	101	73-134					
<b>LCS Dup (2102212-BSD1)</b>		Prepared: 10/22/12 Analyzed: 10/23/12									
C10-C28 (DRO)	535	50	mg/kg	501	107	73-134	5.25	11			
<b>Matrix Spike (2102212-MS1)</b>		<b>Source: R210170-01</b>		Prepared: 10/22/12 Analyzed: 10/23/12							
C10-C28 (DRO)	473	50	mg/kg	479	ND	98.7	50-148				
<b>Matrix Spike Dup (2102212-MSD1)</b>		<b>Source: R210170-01</b>		Prepared: 10/22/12 Analyzed: 10/23/12							
C10-C28 (DRO)	483	50	mg/kg	485	ND	99.8	50-148	2.27	13		

Summit Scientific

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LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

Reported:  
12/11/12 11:27

**Volatile Organic Compounds by EPA Method 8260B - Quality Control**  
**Summit Scientific**

Analyte	Result	Reporting		Spike Level	Source		%REC		RPD		Notes
		Limit	Units		Result	%REC	Limits	RPD	Limit		

**Batch 2102211 - EPA 5030 Soil MS**

**Blank (2102211-BLK1)**

Prepared & Analyzed: 10/22/12

Benzene	ND	0.0050	mg/kg								
Toluene	ND	0.0050	"								
Ethylbenzene	ND	0.0050	"								
Xylenes (total)	ND	0.0050	"								
Gasoline Range Hydrocarbons	ND	0.50	"								
Surrogate: 1,2-Dichloroethane-d4	0.0448		"	0.0397	113	30-150					
Surrogate: Toluene-d8	0.0442		"	0.0400	111	30-150					
Surrogate: 4-Bromofluorobenzene	0.0386		"	0.0400	96.6	30-150					

**LCS (2102211-BS1)**

Prepared & Analyzed: 10/22/12

Benzene	0.0938	0.0050	mg/kg	0.100	93.8	58-130					
Toluene	0.0998	0.0050	"	0.100	99.8	61-134					
Ethylbenzene	0.0993	0.0050	"	0.100	99.3	74-139					
m,p-Xylene	0.200	0.010	"	0.200	99.8	73-137					
o-Xylene	0.103	0.0050	"	0.100	103	73-141					
Surrogate: 1,2-Dichloroethane-d4	0.0423		"	0.0397	107	30-150					
Surrogate: Toluene-d8	0.0407		"	0.0400	102	30-150					
Surrogate: 4-Bromofluorobenzene	0.0382		"	0.0400	95.6	30-150					

**LCS Dup (2102211-BSD1)**

Prepared & Analyzed: 10/22/12

Benzene	0.0968	0.0050	mg/kg	0.100	96.8	58-130	3.15	13			
Toluene	0.106	0.0050	"	0.100	106	61-134	6.18	16			
Ethylbenzene	0.106	0.0050	"	0.100	106	74-139	6.66	12			
m,p-Xylene	0.211	0.010	"	0.200	106	73-137	5.78	14			
o-Xylene	0.109	0.0050	"	0.100	109	73-141	5.97	12			
Surrogate: 1,2-Dichloroethane-d4	0.0416		"	0.0397	105	30-150					
Surrogate: Toluene-d8	0.0415		"	0.0400	104	30-150					
Surrogate: 4-Bromofluorobenzene	0.0385		"	0.0400	96.3	30-150					

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

Reported:  
12/11/12 11:27

**Volatile Organic Compounds by EPA Method 8260B - Quality Control**  
**Summit Scientific**

Analyte	Reporting			Spike	Source	%REC		RPD		Notes
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	

**Batch 2102211 - EPA 5030 Soil MS**

<b>Matrix Spike (2102211-MS1)</b>	<b>Source: R210173-01</b>			<b>Prepared &amp; Analyzed: 10/22/12</b>						
Benzene	0.0760	0.0050	mg/kg	0.0975	ND	78.0	30-131			
Toluene	0.0653	0.0050	"	0.0975	ND	67.0	30-134			
Ethylbenzene	0.0689	0.0050	"	0.0975	ND	70.7	22-153			
m,p-Xylene	0.129	0.010	"	0.195	ND	66.0	10-159			
o-Xylene	0.0762	0.0050	"	0.0975	ND	78.2	31-151			
Surrogate: 1,2-Dichloroethane-d4	0.0367		"	0.0387		94.8	30-150			
Surrogate: Toluene-d8	0.0395		"	0.0390		101	30-150			
Surrogate: 4-Bromofluorobenzene	0.0391		"	0.0390		100	30-150			

<b>Matrix Spike Dup (2102211-MSD1)</b>	<b>Source: R210173-01</b>			<b>Prepared &amp; Analyzed: 10/22/12</b>						
Benzene	0.0847	0.0050	mg/kg	0.0992	ND	85.4	30-131	10.8	34	
Toluene	0.0769	0.0050	"	0.0992	ND	77.5	30-134	16.3	30	
Ethylbenzene	0.0749	0.0050	"	0.0992	ND	75.4	22-153	8.30	24	
m,p-Xylene	0.141	0.010	"	0.198	ND	70.9	10-159	8.84	68	
o-Xylene	0.0902	0.0050	"	0.0992	ND	90.9	31-151	16.8	38	
Surrogate: 1,2-Dichloroethane-d4	0.0438		"	0.0394		111	30-150			
Surrogate: Toluene-d8	0.0428		"	0.0397		108	30-150			
Surrogate: 4-Bromofluorobenzene	0.0375		"	0.0397		94.6	30-150			

Summit Scientific

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LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

**Reported:**  
12/11/12 11:27

### Notes and Definitions

DET Analyte DETECTED  
ND Analyte NOT DETECTED at or above the reporting limit  
NR Not Reported  
dry Sample results reported on a dry weight basis  
RPD Relative Percent Difference

# Summit Scientific

---

741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

November 02, 2012

Brian Dodek  
LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada, CO 80003  
RE: WOC - Nelson A-6

Enclosed are the results of analyses for samples received by Summit Scientific on 11/01/12 09:40. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read "Joseph J. Egry IV". The signature is fluid and cursive, with a distinct "IV" at the end.

Joseph J Egry IV  
Laboratory Director





LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

Reported:  
11/02/12 16:08

**OS-01**  
**R211004-01 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **10/31/12 09:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	2110110	11/01/12	11/02/12	8015 Full Carbon Chain	

Date Sampled: **10/31/12 09:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: <i>o</i> -Terphenyl		108 %	30-150		"	"	"	"	

**Volatile Organic Compounds by EPA Method 8260B**

Date Sampled: **10/31/12 09:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0050	mg/kg	1	2110109	11/01/12	11/02/12	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: **10/31/12 09:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		105 %	30-150		"	"	"	"	
Surrogate: Toluene-d8		99.2 %	30-150		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		92.8 %	30-150		"	"	"	"	

Summit Scientific

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LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

**Reported:**  
11/02/12 16:08

**Extractable Petroleum Hydrocarbons by 8015 - Quality Control**  
**Summit Scientific**

Analyte	Reporting			Spike	Source	%REC		RPD		Notes
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	

**Batch 2110110 - EPA 3550A**

<b>Blank (2110110-BLK1)</b>				Prepared & Analyzed: 11/01/12						
C10-C28 (DRO)	ND	50	mg/kg							
<b>LCS (2110110-BS1)</b>				Prepared & Analyzed: 11/01/12						
C10-C28 (DRO)	554	50	mg/kg	501		111	73-134			
<b>LCS Dup (2110110-BSD1)</b>				Prepared & Analyzed: 11/01/12						
C10-C28 (DRO)	535	50	mg/kg	501		107	73-134	3.52	11	
<b>Matrix Spike (2110110-MS1)</b>				Source: R211001-01 Prepared & Analyzed: 11/01/12						
C10-C28 (DRO)	543	50	mg/kg	493	ND	110	50-148			
<b>Matrix Spike Dup (2110110-MSD1)</b>				Source: R211001-01 Prepared & Analyzed: 11/01/12						
C10-C28 (DRO)	520	50	mg/kg	481	ND	108	50-148	4.33	13	

Summit Scientific

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LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

Reported:  
11/02/12 16:08

**Volatile Organic Compounds by EPA Method 8260B - Quality Control**  
**Summit Scientific**

Analyte	Reporting			Spike	Source	%REC		RPD		Notes
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	

**Batch 2110109 - EPA 5030 Soil MS**

**Blank (2110109-BLK1)**

Prepared & Analyzed: 11/01/12

Benzene	ND	0.0050	mg/kg							
Toluene	ND	0.0050	"							
Ethylbenzene	ND	0.0050	"							
Xylenes (total)	ND	0.0050	"							
Gasoline Range Hydrocarbons	ND	0.50	"							
Surrogate: 1,2-Dichloroethane-d4	0.0391		"	0.0397	98.4	30-150				
Surrogate: Toluene-d8	0.0392		"	0.0400	97.9	30-150				
Surrogate: 4-Bromofluorobenzene	0.0375		"	0.0400	93.7	30-150				

**LCS (2110109-BS1)**

Prepared & Analyzed: 11/01/12

Benzene	0.0678	0.0050	mg/kg	0.100	67.8	58-130				
Toluene	0.0731	0.0050	"	0.100	73.1	61-134				
Ethylbenzene	0.101	0.0050	"	0.100	101	74-139				
m,p-Xylene	0.184	0.010	"	0.200	91.8	73-137				
o-Xylene	0.102	0.0050	"	0.100	102	73-141				
Surrogate: 1,2-Dichloroethane-d4	0.0385		"	0.0397	97.0	30-150				
Surrogate: Toluene-d8	0.0396		"	0.0400	99.1	30-150				
Surrogate: 4-Bromofluorobenzene	0.0379		"	0.0400	94.8	30-150				

**LCS Dup (2110109-BSD1)**

Prepared & Analyzed: 11/01/12

Benzene	0.0713	0.0050	mg/kg	0.100	71.3	58-130	5.00	13		
Toluene	0.0785	0.0050	"	0.100	78.5	61-134	7.08	16		
Ethylbenzene	0.106	0.0050	"	0.100	106	74-139	4.40	12		
m,p-Xylene	0.190	0.010	"	0.200	94.9	73-137	3.39	14		
o-Xylene	0.107	0.0050	"	0.100	107	73-141	5.31	12		
Surrogate: 1,2-Dichloroethane-d4	0.0394		"	0.0397	99.4	30-150				
Surrogate: Toluene-d8	0.0389		"	0.0400	97.4	30-150				
Surrogate: 4-Bromofluorobenzene	0.0380		"	0.0400	95.0	30-150				

Summit Scientific

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LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

Reported:  
11/02/12 16:08

**Volatile Organic Compounds by EPA Method 8260B - Quality Control**  
**Summit Scientific**

Analyte	Reporting			Spike	Source	%REC		RPD		Notes
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	

**Batch 2110109 - EPA 5030 Soil MS**

<b>Matrix Spike (2110109-MS1)</b>	<b>Source: R211001-01</b>			<b>Prepared &amp; Analyzed: 11/01/12</b>						
Benzene	0.0700	0.0050	mg/kg	0.100	ND	70.0	30-131			
Toluene	0.0754	0.0050	"	0.100	ND	75.4	30-134			
Ethylbenzene	0.102	0.0050	"	0.100	ND	102	22-153			
m,p-Xylene	0.185	0.010	"	0.200	ND	92.7	10-159			
o-Xylene	0.101	0.0050	"	0.100	ND	101	31-151			
Surrogate: 1,2-Dichloroethane-d4	0.0429		"	0.0397		108	30-150			
Surrogate: Toluene-d8	0.0400		"	0.0400		100	30-150			
Surrogate: 4-Bromofluorobenzene	0.0379		"	0.0400		94.6	30-150			

<b>Matrix Spike Dup (2110109-MSD1)</b>	<b>Source: R211001-01</b>			<b>Prepared &amp; Analyzed: 11/01/12</b>						
Benzene	0.0737	0.0050	mg/kg	0.100	ND	73.7	30-131	5.18	34	
Toluene	0.0798	0.0050	"	0.100	ND	79.8	30-134	5.69	30	
Ethylbenzene	0.106	0.0050	"	0.100	ND	106	22-153	3.40	24	
m,p-Xylene	0.190	0.010	"	0.200	ND	95.1	10-159	2.60	68	
o-Xylene	0.104	0.0050	"	0.100	ND	104	31-151	3.07	38	
Surrogate: 1,2-Dichloroethane-d4	0.0444		"	0.0397		112	30-150			
Surrogate: Toluene-d8	0.0401		"	0.0400		100	30-150			
Surrogate: 4-Bromofluorobenzene	0.0370		"	0.0400		92.5	30-150			

Summit Scientific

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LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO, 80003

Project: WOC - Nelson A-6

Project Number: 0284-12002  
Project Manager: Brian Dodek

**Reported:**  
11/02/12 16:08

### Notes and Definitions

DET Analyte DETECTED  
ND Analyte NOT DETECTED at or above the reporting limit  
NR Not Reported  
dry Sample results reported on a dry weight basis  
RPD Relative Percent Difference

**ATTACHMENT 2**  
**NELSON A-6 SOIL REMEDIATION CONCEPT PLAN**





September 28, 2012

Steve James  
President  
Western Operating Company  
518 17th St # 200  
Denver, CO 80202

**RE: Nelson A-6 Soil Remediation Concept Plan  
For Elevated Electrical Conductivity (EC) and Sodium Adsorption Ratio (SAR)  
Logan County, Colorado**

Dear Mr. James:

LT Environmental, Inc. (LTE) is pleased to submit to Western Operating Company, LLC. (Western Operating) this Concept Plan for the remediation of soils at the Nelson A-6 site in Logan County, Colorado (Figure 1). The soils have become impacted due to historical produced water disposal from an evaporation pit westward to a large natural pond. As depicted on Figure 2 the soils between the pit and the pond have become sterile and no longer support dense vegetation due to the accumulated inorganic material deposited by the produced water. Laboratory analytical results indicated that electrical conductivity (EC) and sodium adsorption ratio (SAR) currently exceed Colorado Oil and Gas Conservation Commission (COGCC) Table 910-1 concentration levels. This plan will outline a general approach to restore the soil fertility and re-establish vegetation in the previously sterile soil.

The overall project approach will be to achieve rapid remediation and reclamation of the subject site. The proposed remediation includes the addition of a soil amendment to remove the excess sodium and restore the soil structure to allow for successful re-vegetation. Described below is our proposed step-by-step process.

**Task 1 – Planning and Access**

The Utility Notification Center of Colorado (UNCC) will need to be notified prior to any invasive activities. LTE will provide WOC with prior notification of work to be conducted so there is ample time to contact the landowner to inform them of the forthcoming remediation activities.

**Task 2 – Soil Amendment**

The analytical samples (SS01 and SS02) collected by LTE at the site report the soil exhibits SAR levels up to 65 (Figure 2). This indicates that cation exchange sites are currently dominated by sodium ions. Any remedial option at this site will require the removal of a portion of the excess sodium ions from the cation exchange sites in the soil by adding a compatible cation to sorb onto



the soil. The soil also exhibited EC concentrations up to 13 millimhos/cm. This elevated level of conductivity in soil is detrimental to vegetation growth. LTE proposes a two-fold approach to solve these soil issues: 1) the application of calcium in the form of a liquid gypsum amendment at a rate sufficient to decrease the current SAR levels, which will allow the plants in the specified seed mix to thrive, and 2) the selection of a seed mix which is dominated by vegetation with a moderate to high salinity and drought tolerance.

### **Task 3 – Grading and Discing**

LTE recommends using graders and/or discing equipment to grade and mix the soil at the site. This will distribute the soil amendment and loosen the soil, which will improve the drainage characteristics and increase the potential for vegetation establishment.

### **Task 4 – Re-Seeding**

After soil mixing operations are finished, the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) will be contacted to identify an appropriate seed mix. Seed mix selection will need to address several complicating factors including the elevated salinity of the soil and the average annual precipitation in the area. LTE recommends selection of plants with a moderate to high salinity tolerance to increase the opportunity for long-term success. Initial research has led LTE to consider plants such as four wing saltbush (*Atriplexcanescens*), sand drop seed (*Sporoboluscryptandrus*), and yerba mansa (*Anemopsiscalifornica*) as having a moderate to high salinity tolerance which may be good selections for the site. LTE may recommend a second seed mix as appropriate to address varying grades and areas likely to have water ponding/drainage issues.

In preparation for re-seeding, a cultipacker will be used to crush dirt clods, remove air pockets, and press down small stones, forming a smooth, firm seedbed. The seed should be applied at the recommended rate, drill-seeded into the prepared seedbed, and straw mulch should be spread over the seeded area and crimped. Seeding and mulching should be performed at the appropriate season to promote successful vegetative growth. Depending on Western Operating's schedule for starting this work, the seeding and mulching may be able to be completed before winter sets in, thus allowing the soil and seeds to take advantage of the winter moisture and infiltration during spring thaw. If livestock grazing is a concern, temporary construction fencing maybe installed to deter livestock and wildlife from damaging seed, mulch, and vegetation.

### **Task 5 – Monitoring**

Periodic monitoring of vegetation growth and density, weed growth and density, and other site conditions should be conducted for the duration of the project.



Generally, there is flexibility and crossover in the above tasks. Our intent with this plan is to give Western Operating the approach with the greatest chance of success. If you have any questions regarding this plan or would like to discuss it in more detail, please feel free to call.

Sincerely,

LT ENVIRONMENTAL, INC.

A handwritten signature in black ink that reads "Brian Dodek". The signature is fluid and cursive, with the first name "Brian" and last name "Dodek" clearly legible.

Brian Dodek, P.G.  
Senior Geologist/Client Manager

## FIGURES

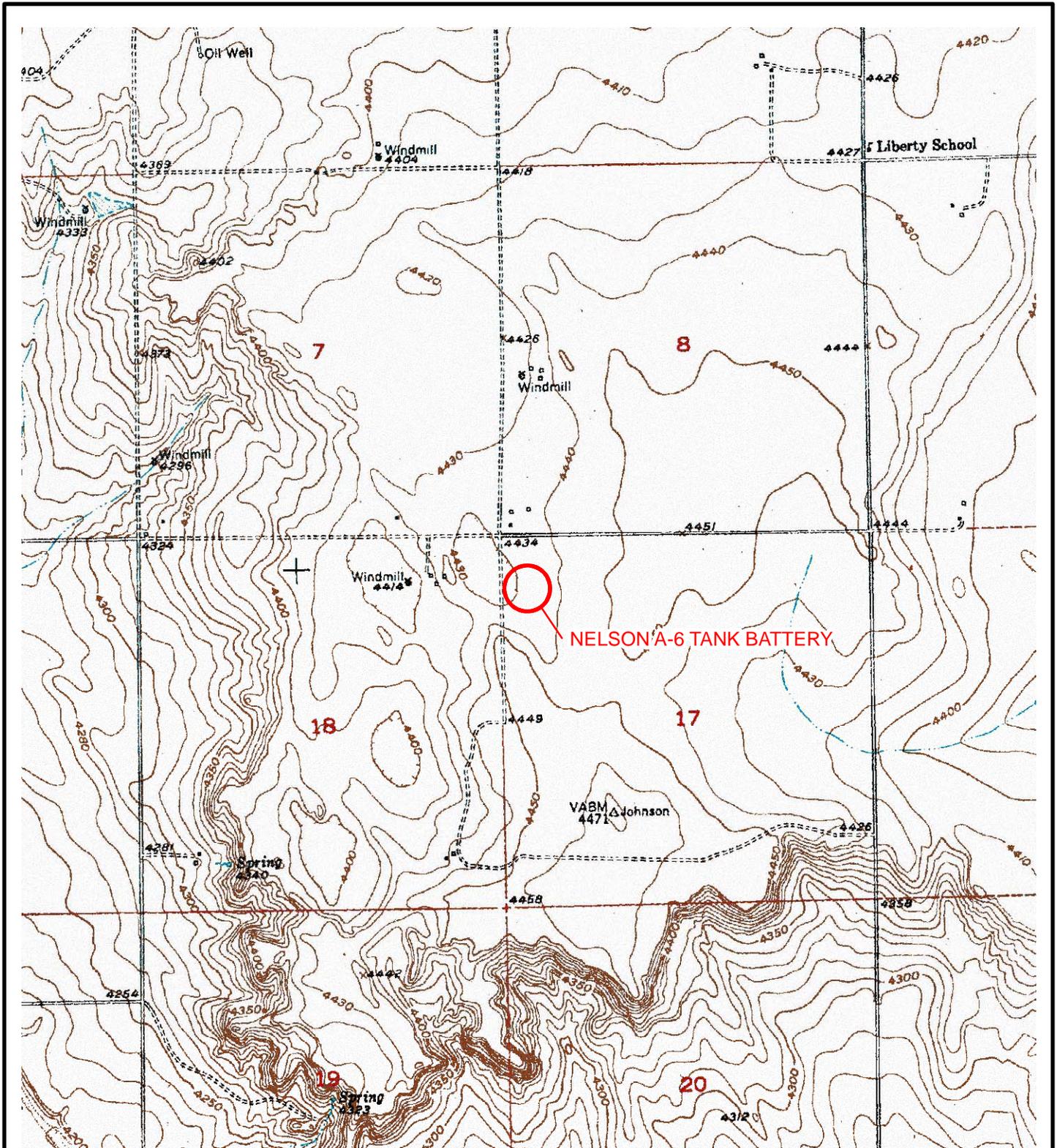
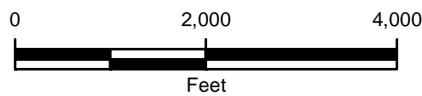


IMAGE COURTESY OF USDA/NRCS, VARIOUS DATES

**LEGEND**

 SITE LOCATION



**FIGURE 1**  
SITE LOCATION MAP  
NELSON A-6 TANK BATTERY  
LOGAN COUNTY, COLORADO



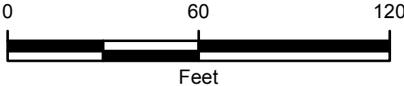
**WESTERN OPERATING COMPANY**



IMAGE COURTESY OF USDA/NRCS, 2011

**LEGEND**

-  SALT-IMPACTED COMPOSITE SAMPLE
-  BACKGROUND SAMPLE
-  SALT-IMPACTED AREA



**FIGURE 2**  
**SALT-IMPACTED AREA SAMPLE LOCATIONS**  
**NELSON A-6 TANK BATTERY**  
**LOGAN COUNTY, COLORADO**

**WESTERN OPERATING COMPANY**



**ATTACHMENT 3**  
**CONCRETE DEBRIS DISPOSAL INVOICE**



# Baney Well Service, Inc.

P.O. Box 686  
 Sterling, CO 80751  
 970-522-2533  
 FEIN 84-0673895

## Invoice

Date	Invoice #
6/21/2012	3249

Bill To
Western Operating Co. 518 17th Street Suite 200 Denver, CO. 80202

P.O. Number	Terms	Lease/Job Name
	30 days net	Nelson

Item	Quantity	Description	Rate	Amount
80 Dump Truck	10	6/15/12 Haul cement off location and disposed of it.	85.00	850.00
Truck/trailer Hourly	2	6/18/12 Haul cement blocks to McAtee for crushing.	110.00	220.00
624 JD Loader	7	6/18/12 Load cement blocks with loader.	125.00	875.00
624 JD Loader	7	6/19/12 Load cement blocks with loader.	125.00	875.00
Truck/trailer Hourly	4	6/19/12 Haul cement blocks to McAtee for crushing.	110.00	440.00
80 Dump Truck	1	6/19/12 Haul small cement off and disposed of it.	85.00	85.00
Other Charges	1	6/20/12 Deliver belly dump load of dirt to location.	325.00	325.00
<b>Total</b>				<b>\$3,670.00</b>