

## **Bill Barrett Corporation**

### **Land Application of Water-Based Bentonitic Drilling Fluids & Associated Drill Cuttings**

**Krier #4 Spreadfield** COGCC Facility ID 454282

This document outlines the operational practices that will be employed when applying water-based bentonitic drilling fluids and associated drill cuttings via land application at the above referenced location. These practices will be employed to maintain compliance with the Colorado Oil and Gas Conservation Commission (COGCC) Rule 907.d.(3) and COGCC Policy on Drill Cuttings Management dated September 15, 2014. These materials are applied as a beneficial soil amendment.

Only water-based bentonitic drilling fluids and drill cuttings generated by Bill Barrett Corporation (BBC) will be applied at this site. No other E&P waste shall be deposited at this site. The plan detailed below follows the COGCC Land Application Plan Checklist, which is included as Attachment 1.

#### **Disposal Location Information**

1. Facility entrance is located at 40.473856, -104.204372. The center of the facility is located at 40.477333, -104.197561
2. Map illustrating section and surface water features is included as an attachment.
3. The land use is crop land - dry land agricultural, and non-crop land - rangeland.
4. Weld County Assessor's data lists the land use as agricultural. Mr. Krier has indicated that he intends to convert the rangeland portion of the acreage to dry land agricultural use. The clay rich properties of the mud and cuttings will benefit the sandy soils through the introduction of the bentonite based clays to help stabilize the soil and increase water retention in the soils. The site will be returned to dry land agriculture use following land application closure.
5. The proposed land application site is not in a sensitive area (determined utilizing COGCC GIS mapping data). Depth to groundwater is estimated to be greater than 74 feet (Water Well Permit # 259305 located north of spreadfield). The soil type is vona loamy sand and ascalon sandy loam (determined utilizing COGCC GIS mapping data). The soil will be incorporated onsite and mixed until soil concentrations are below table 910-1, thus the risk to migration to groundwater is minimal.

6. The land application facility is not in a mapped Sensitive Wildlife Habitat or Restricted Surface Occupancy as defined by mapped areas on COGCC GIS Online map.
7. Background arsenic and COGCC Table 910-1 metals (excluding Boron), pH, electrical conductivity (EC), and sodium adsorption ratio (SAR) soil concentrations were collected and additional background samples will be collected adjacent to the land application site as needed. Ongoing oil and gas activities are occurring at the Carlson #22-1, E2NW of Section 22-T6N-R61W; therefore, baseline hydrocarbon concentrations were collected (see attached).
8. The surface owner is Michael Krier and can be contacted at (970)396-5598. BBC and the surface owner entered into an agreement signed 3/8/2018.
9. When requested by the COGCC, BBC shall arrange access to the site via Michael Krier.
10. The site is located in unincorporated Weld County. Land application is consistent with local zoning land use policy.
11. The site is on private property and no sign preventing access from the public is necessary at this time.
12. The native soil will have the added benefit of increased clay content. When the site is converted back to dry land farming the soil will retain more moisture, which will enhance dry land farming practices.

### **Material Volume**

1. Approximately 30,000 yards of cuttings and 100,000 bbls of bentonitic drilling fluids will be applied to the land application facility in 2018.

### **Material Handling**

1. The cuttings will be stacked and dried as they come off the rig. Sawdust, EcoSponge, or another solidification/drying product will be utilized. The cuttings will be staged at the drill site in a bermed storage area prior to beneficial reuse.
2. The material will be stockpiled onsite in a bermed storage area. The material will be solidified onsite and then trucked to the land application facility. There is no indication that material will need to be separated and disposed of at a different facility.

3. The volume of material will be documented during drilling activities. The volume will be calculated based on drilling plans and saved by BBC in the well files. Manifests will be created for trucking as an additional tracking measure.
4. Solidification will occur as the cuttings and drilling fluids come off the rig. The cuttings will be staged in a bermed area. The cuttings will be transported to the land application site and evenly distributed in a lift not to exceed 3-inches. The soil will be disked to ensure proper incorporation within 10 days of application. A water truck will be utilized if dust suppression is needed. The material shall remain stockpiled at the drilling location in an onsite berm until weather permits incorporation without interruption.
5. The facility will not receive fluids/cuttings for more than three years from the date of first use.

### **Post Application Sampling and Closure Requirements**

1. During closeout, soil samples will be collected from a depth of 0-8 inches bgs. All soil samples will be analyzed for total petroleum hydrocarbons (TPH), including gasoline range organics (GRO) and diesel range organics (DRO). Soil samples will also be analyzed for benzene, toluene, ethylbenzene, xylenes (BTEX), electrical conductivity (EC), sodium adsorption ratio (SAR), pH, and arsenic. Soil samples will be collected until compliance with Table 910-1 standards is achieved. The attached Site Map illustrates proposed soil sample locations.
2. To receive closure BBC shall:
  - Submit a Form 4 to the COGCC
  - Submit sample results and sample map.
  - Verify soils comply with Table 910-1.
  - Verify that all cuttings and fluids have been thoroughly incorporated.
  - Verify that sediment controls have been removed.
  - Verify that the surface owner is satisfied with the final condition of the property.
  - Verify that surface reclamation has been performed.

#### **Attachments:**

- Figure 1 – Site Location Map
- Figure 2 – Site Map
- Figure 3 – Soil Location Map
- Attachment 1 – COGCC Land Application Plan Checklist
- Attachment 2 – Soil Samples Analytical Results

- Attachment 3 – Surface Owner Land Application Agreement

## FIGURES

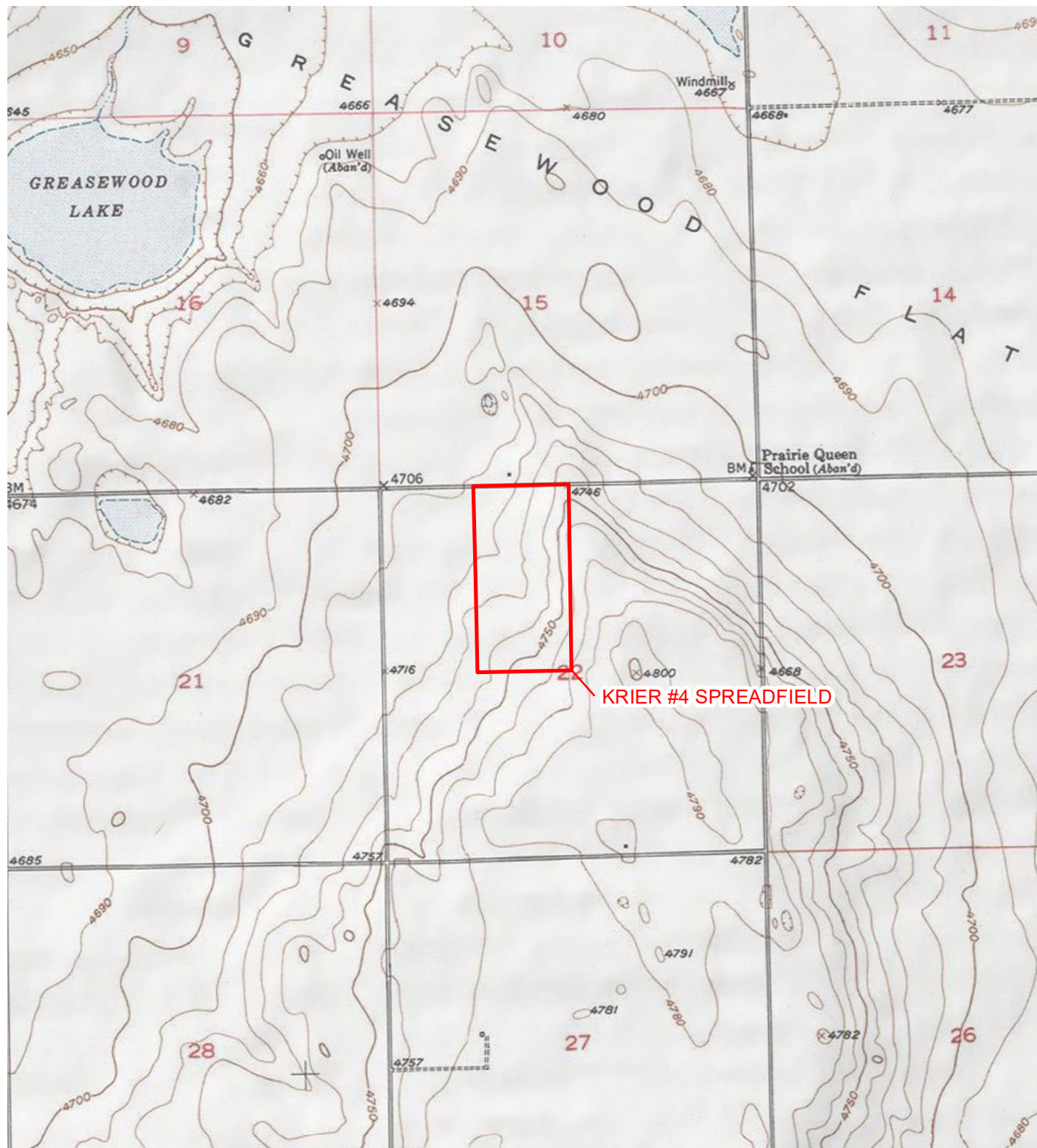
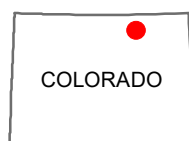


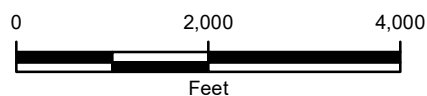
IMAGE COURTESY OF ESRI/USGS

# LEGEND

SPREADFIELD BOUNDARY



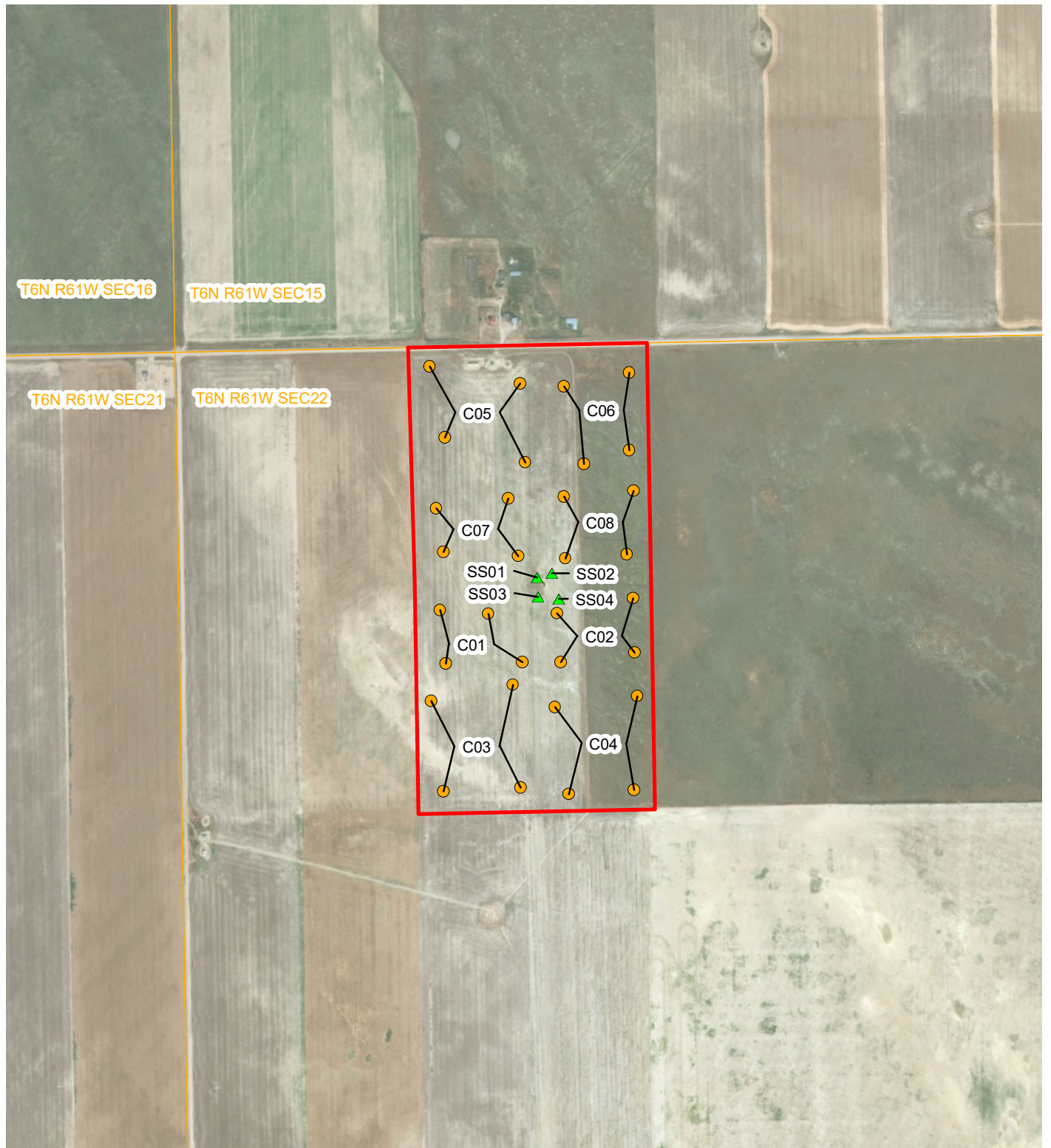
COLORADO



**FIGURE 1**  
**SITE LOCATION MAP**  
**KRIER #4 SPREADFIELD**  
**SEC 22-T6N-R61W**  
**WELD COUNTY, COLORADO**  
**BILL BARRETT CORPORATION**







# LEGEND

- ▲ GRAB SOIL SAMPLE
- COMPOSITE SOIL SAMPLE

SPREADFIELD BOUNDARY

IMAGE COURTESY OF ESRI

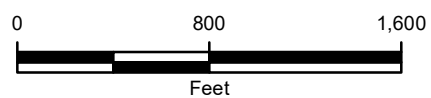


FIGURE 2  
SITE MAP  
KRIER #4 SPREADFIELD  
SEC 22-T6N-R61W  
WELD COUNTY, COLORADO  
BILL BARRETT CORPORATION



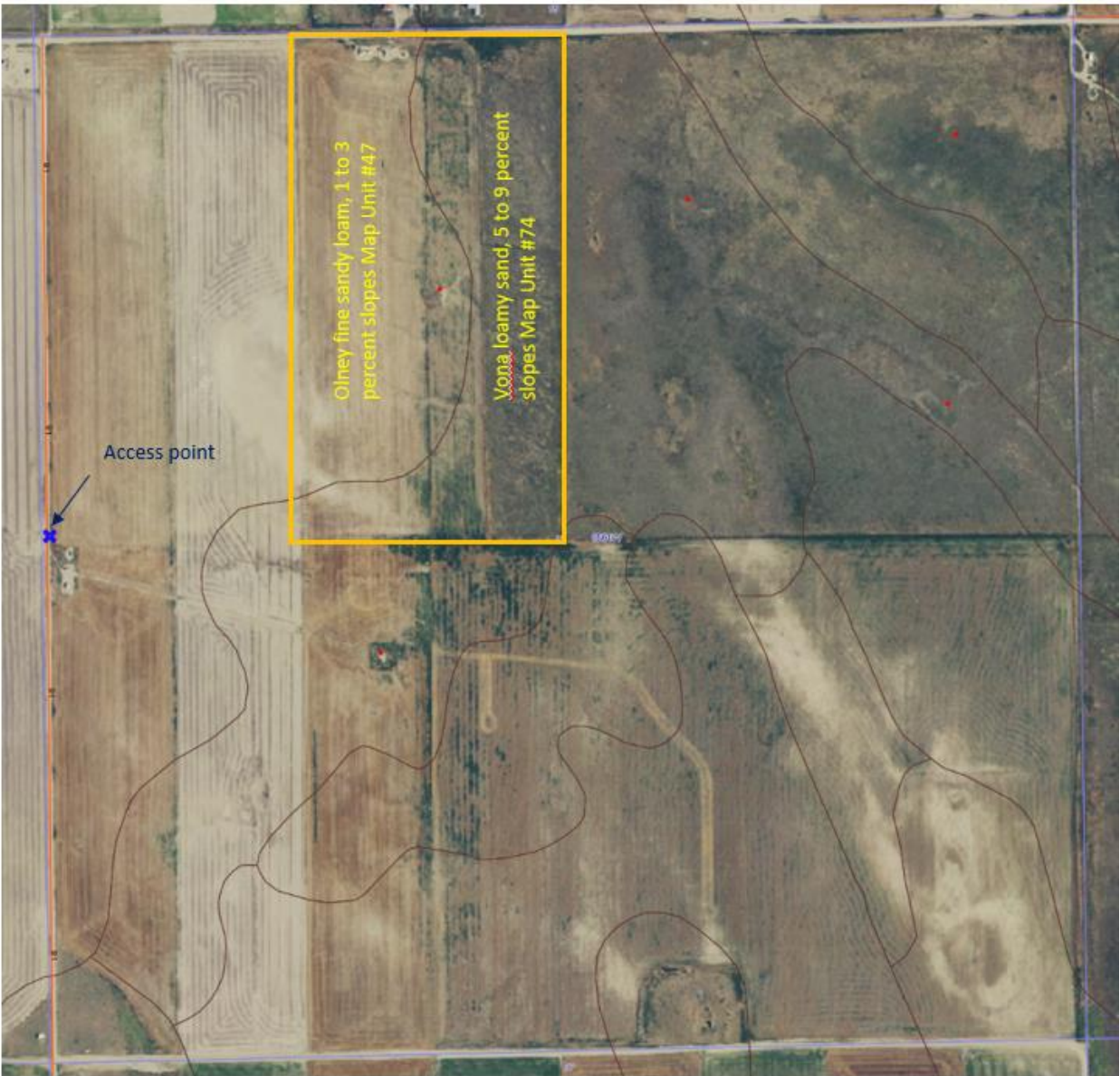


FIGURE 3  
SOIL LOCATION MAP  
KRIER #4 SPREADFIELD  
SEC 22-T6N-R61W  
WELD COUNTY, COLORADO



**ATTACHMENT 1**

**COGCC Land Application Plan Checklist**

## COLORADO OIL & GAS CONSERVATION COMMISSION

### Land Application Plan - Checklist for Water-based Bentonitic Drilling Fluids and Associated Cuttings

#### Instructions

This document was developed to assist operators in preparing a plan for land application of allowable drilling fluids and/or associated drill cuttings generated from drilling with water based bentonitic drilling fluids only.

The intent of a Land Application Plan ("LAP") is to enable COGCC to better track the final disposition of drilling fluids and drill cuttings, to ensure the material is being fully incorporated into the land while minimizing run-off or other impacts to adjacent land or surface water, and to verify that resulting soils comply with Table 910-1 standards after incorporation. This Checklist provides operators with guidance on uniform information to be included in the LAP, and is intended to help ensure consistency during the COGCC approval process.

The LAP should be submitted via eForm 4, Sundry Notice. The following items should be included in the LAP, along with a copy of this checklist to aid in timely review and approval of the plans.

#### Recommended Information:

#### Included

Sundry eForm 4



Process to Receive Facility ID Number for eForm 4 Submittal:











- The operator shall contact staff area Environmental Protection Specialist by email and provide the following information:
  - Facility name;
  - GPS coordinates of the entrance to the facility or other relevant feature that will remain fixed over the life of the facility;
  - Topographic map or aerial photograph with boundaries of the land application area.
- Upon receipt of the lat/long, facility name and map, COGCC staff will create a Land Application Facility and reply to the operator with the Facility ID # to be used on the eForm 4 for submittal of the additional information.
- COGCC will process the eForm 4 and approve when appropriate. Operator shall not begin land application until approval of the eForm 4.

#### Disposal Location Information


#### Included

- 1) Latitude and Longitude of the physical entrance to the facility or other relevant feature that will remain fixed over the life of the facility.
- 2) Map showing the governmental Section, Township and Range as well as nearby hydrologic features (all surface water features and known water wells within 1/4 mile of the facility boundaries). The map shall be at an appropriate scale to illustrate the surface hydrology





- 3) Land use (Crop Land: dry land agricultural, irrigated, improved pasture, hay meadow, CRP; Non-Crop Land: rangeland, timber, recreational, industrial, commercial, residential) 
- 4) If land use is Non-Crop Land, provide a justification for the application of drilling fluids and/or cuttings as a beneficial amendment for Non-Crop Land, along with a detailed surface reclamation plan for the land application site. 
- 5) Is the proposed land application site in a Sensitive Area? On what data has the determination been made? Include actual depth to groundwater, if available, or estimated depth based on available information; soil type and proximity to surface waters and wetlands should also be considered. 
- 6) Verification that the land application facility is not in a mapped Sensitive Wildlife Habitat or Restricted Surface Occupancy Area as defined by mapped areas available on COGCC GIS Online map. 
- 7) Background sampling and analysis plan to establish pre-application conditions and a listing of parameters being analyzed. Samples should include, at a minimum, background parameters listed in COGCC table 910-1. 
- 8) Surface Owner contact information and a date of signature for the agreement between the surface owner and the operator approving this activity. 
- 9) Operator shall provide means of access to land application site when requested by COGCC for purposes of inspection. 
- 10) Verification that land application of drilling fluids/cuttings is consistent with local (City, County) zoning land use policy (refer to existing permit number or determination that permits were not required). 
- 11) Description of site control measures, including proposed signage, to prevent unauthorized dumping or access by the public if appropriate. 
- 12) Description of the benefit to native soil that application of the water based bentonitic fluids and/or drill cuttings will achieve. 

**Material Volume****Included**

- 1) Estimate of the maximum volume of drilling fluids/cuttings to be applied at the facility in a given year based on anticipated loading rates. 

**Material Handling****Included**

- 1) Description of any plan for treating drilling fluids/cuttings prior to land application (bioremediation, solidification, etc.) 
- 2) Description of any stockpiling or segregation of drilling fluids/cuttings prior to leaving the well site (e.g. note whether material that cannot be treated onsite or transported 

directly to a land application site will be disposed at a landfill and/or transported to a centralized waste management facility).

3) Method of material tracking (manifests/haul tickets). Tracking information will be retained by the operator and provided to the COGCC upon request as per Rule 907.b.



4) Description of material handling and best management practices that will be implemented at the land application facility to address the following as applicable:



- stockpiling, mixing
- method of incorporation (thickness, machinery for spreading and incorporating)
- timeframe for incorporation within 10 days of application
- runoff/sediment controls
- tracking control
- dust control
- odor control
- contingency for frozen or muddy conditions that would prevent timely incorporation

5) Confirm that the facility will receive drilling fluids/cuttings for less than 3 years consecutively from the date of waste management plan approval, or from the date of first land application as reported to COGCC via Sundry Notice eForm 4.



#### **Post Application Sampling and Closure Requirements**

**Included**

1) Provide a post-application sampling and analysis plan that includes proposed sampling locations to support a closure request.

☐

2) To receive closure:

☐

- The operator shall notify the COGCC via Form 4 requesting closure of the land application facility.
- Submit post-application sample results along with a sample location map
- Verify that site soils comply with Table 910-1.
- Verify that all drilling fluids and associated drill cuttings have been thoroughly incorporated.
- Verify that any temporary runoff/sediment controls have been removed.
- Verify that surface owner is satisfied with final condition of property.
- Verify that surface reclamation has been performed, if appropriate. (Verification can include photo-documentation, email correspondence, dates of work performed, etc.)

## **ATTACHMENT 2**

### **Soil Samples Analytical Results**





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

Project: Krier #4 Spreadfeld

Project Number: [none]  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 16:32

### ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
C01	1803008-01	Soil	02/28/18 16:28	03/01/18 09:20
C02	1803008-02	Soil	02/28/18 16:10	03/01/18 09:20
C03	1803008-03	Soil	02/28/18 15:30	03/01/18 09:20
C04	1803008-04	Soil	02/28/18 15:45	03/01/18 09:20
C05	1803008-05	Soil	02/28/18 17:01	03/01/18 09:20
C6	1803008-06	Soil	02/28/18 17:23	03/01/18 09:20
C7	1803008-07	Soil	02/28/18 16:46	03/01/18 09:20
C8	1803008-08	Soil	02/28/18 17:44	03/01/18 09:20

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.*

## 1803008

303-277-9310 ♦ 303-374-5933 Fax

Page 1 of 1

Project Manager: Jeremy Pike  
E-Mail: jpike@ltnv.com  
Project Name: Krier #4 Spreadfield  
Project Number:

				Preservative				Matrix				Analyze For:								Special Instructions
Sample Description	Date Sampled	Time Sampled	Number of Containers	HCl	HNO <sub>3</sub>	None	Other (Specify)	Groundwater	Soil	Air - Canister Serial #	Other (Specify)	COGCC Table 910-1 Metals (minus Boron)	pH	Electrical Conductivity	Sodium Adsorption Ratio					
C05	2/28/18	16:28	2			X			X			X	X	X	X					
C06	2/28/18	16:10	2			X			X			X	X	X	X					
C07	2/28/18	15:30	2			X			X			X	X	X	X					
C08	2/28/18	15:45	2			X			X			X	X	X	X					
C09	2/28/18	17:01	2			X			X			X	X	X	X					
C10	2/28/18	17:23	2			X			X			X	X	X	X					
C11	2/28/18	16:46	2			X			X			X	X	X	X					
C12	2/28/18	17:44	2			X			X			X	X	X	X					

Relinquished by: *New Buller*
Date/Time: *3/1/18 920*

Relinquished by:
Date/Time:

Relinquished by:
Date/Time:

Received by:
Date/Time:

Received by:
Date/Time:

Received in Lab by: *[Signature]*
Date/Time: *3-1-18 920*

Turn Around Time (Check)

Same Day ☐
24 Hours ☐
48 Hours ☒

72 Hours ☐
Standard ☒

Sample Integrity:
Temperature Upon Receipt: *2.1*
Intact: Yes ☒ No ☐

Notes: *48 HOUR turn a*

1803008

## Sample Receipt Checklist

S2 Work Order: \_\_\_\_\_

Client: LT Env.Client Project ID: Krier #4 SpreadfieldShipped Via: H.D.

(UPS, FedEx, Hand Delivered, Pick-up, etc.)

Airbill #: \_\_\_\_\_

Matrix (check all that apply):      Air   X   Soil/Solid      Water      Other: \_\_\_\_\_  
(Describe)

Cooler ID					
Temp (°C)	2.1				

Thermometer ID: 61857155-K

	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature at 4°C +/- 2°C <sup>(1)</sup> ? NOTE: If samples are delivered the same day of sampling, this requirement is met provided that there is evidence that cooling has begun.	X			
Were all samples received intact <sup>(1)</sup> ?	X			
Was adequate sample volume provided <sup>(1)</sup> ?	X			
If custody seals are present, are they intact <sup>(1)</sup> ?			X	
Are short holding time analytes or samples with HTs due within 48 hours present?	X			
Is a chain-of-custody (COC) form present and filled out completely <sup>(1)</sup> ?	X			
Does the COC agree with the number and type of sample bottles received <sup>(1)</sup> ?	X			
Do the sample IDs on the bottle labels match the COC <sup>(1)</sup> ?	X			
Is the COC properly relinquished by the client w/ date and time recorded <sup>(1)</sup> ?	X			
For volatiles in water – is there headspace present? If yes, contact client and note in narrative.			X	
Are samples preserved that require preservation (excluding cooling) <sup>(1)</sup> ? Note the type of preservative in the Comments column – HCl, H2SO4, NaOH, HNO3, ect			X	
If samples are acid preserved for metals, is the pH ≤ 2 <sup>(1)</sup> ? Record the pH in Comments.			X	
If dissolved metals are requested, were samples field filtered?			X	
Additional Comments (if any):				
<sup>(1)</sup> If NO, then contact the client before proceeding with analysis and note in case narrative.				

Custodian Printed Name: PavSignature or Initials of Custodian: PA 3-1-18Date/Time: 12:40





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

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 16:32

**C01**  
**1803008-01 (Soil)**

**Summit Scientific**

**Total Metals by EPA Method 6020 - Dry Weight Basis**

Date Sampled: <b>02/28/18 16:28</b>									
Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Arsenic	1.01	0.228	mg/kg dry	1	1803029	03/02/18	03/03/18	EPA 6020A	
Barium	69.9	0.456	"	"	"	"	"	"	
Cadmium	ND	0.114	"	"	"	"	"	"	
Chromium	6.49	0.569	"	"	"	"	"	"	
Copper	7.40	0.569	"	"	"	"	"	"	
Lead	7.68	0.228	"	"	"	"	"	"	
Nickel	6.08	0.114	"	"	"	"	"	"	
Selenium	ND	0.456	"	"	"	"	"	"	
Silver	ND	0.114	"	"	"	"	"	"	
Zinc	39.9	11.4	"	"	"	"	"	"	

**Total Mercury by EPA Method 7471**

Date Sampled: <b>02/28/18 16:28</b>									
Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Mercury	ND	0.0569	mg/kg dry	1	1803030	03/02/18	03/05/18	EPA 7471	

**Hexavalent Chromium by EPA 7196**

Date Sampled: <b>02/28/18 16:28</b>									
Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	0.300	mg/kg dry	1	1803033	03/01/18	03/02/18	EPA 7196	

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

Date Sampled: <b>02/28/18 16:28</b>									
Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	1480	11.4	mg/kg dry	1	1803043	03/05/18	03/05/18	EPA 6020/Mod. USDA60 6(2, 3A)	
Magnesium	697	5.69	"	"	"	"	"	"	
Sodium	76.8	5.69	"	"	"	"	"	"	

Summit Scientific

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Arvada CO, 80003

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 16:32

**C01**  
**1803008-01 (Soil)**

**Summit Scientific**

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

<b>Sodium Adsorption Ratio</b>	<b>0.412</b>	units	1	1803063	03/06/18	03/06/18	EPA 6020/Mod. USDA60 6(2, 3A)
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**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **02/28/18 16:28**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>% Solids</b>	<b>87.8</b>		%	1	1803045	03/05/18	03/06/18	% calculation	
<b>pH</b>	<b>8.40</b>	0.100	pH Units	"	1803048	03/05/18	03/05/18	EPA 9045	

**Specific Conductance by EPA120.1**

Date Sampled: **02/28/18 16:28**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Specific Conductance (EC)</b>	<b>0.704</b>	0.0100	mmhos/cm	1	1803046	03/05/18	03/05/18	EPA 120.1	

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

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 16:32

**C02**  
**1803008-02 (Soil)**

**Summit Scientific**

**Total Metals by EPA Method 6020 - Dry Weight Basis**

Date Sampled: **02/28/18 16:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Arsenic</b>	<b>1.03</b>	0.229	mg/kg dry	1	1803029	03/02/18	03/03/18	EPA 6020A	
<b>Barium</b>	<b>84.8</b>	0.458	"	"	"	"	"	"	
Cadmium	ND	0.115	"	"	"	"	"	"	
<b>Chromium</b>	<b>6.15</b>	0.573	"	"	"	"	"	"	
<b>Copper</b>	<b>8.53</b>	0.573	"	"	"	"	"	"	
<b>Lead</b>	<b>9.01</b>	0.229	"	"	"	"	"	"	
<b>Nickel</b>	<b>7.40</b>	0.115	"	"	"	"	"	"	
Selenium	ND	0.458	"	"	"	"	"	"	
Silver	ND	0.115	"	"	"	"	"	"	
<b>Zinc</b>	<b>47.3</b>	11.5	"	"	"	"	"	"	

**Total Mercury by EPA Method 7471**

Date Sampled: **02/28/18 16:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Mercury	ND	0.0573	mg/kg dry	1	1803030	03/02/18	03/05/18	EPA 7471	

**Hexavalent Chromium by EPA 7196**

Date Sampled: **02/28/18 16:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	0.300	mg/kg dry	1	1803033	03/01/18	03/02/18	EPA 7196	

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

Date Sampled: **02/28/18 16:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Calcium</b>	<b>2180</b>	11.5	mg/kg dry	1	1803043	03/05/18	03/05/18	EPA 6020/Mod. USDA60 6(2, 3A)	
<b>Magnesium</b>	<b>561</b>	5.73	"	"	"	"	"	"	
<b>Sodium</b>	<b>56.7</b>	5.73	"	"	"	"	"	"	

Summit Scientific

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

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 16:32

**C02**  
**1803008-02 (Soil)**

**Summit Scientific**

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

<b>Sodium Adsorption Ratio</b>	<b>0.280</b>	units	1	1803063	03/06/18	03/06/18	EPA 6020/Mod. USDA60 6(2, 3A)
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**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **02/28/18 16:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>pH</b>	<b>8.01</b>	0.100	pH Units	1	1803048	03/05/18	03/05/18	EPA 9045	
<b>% Solids</b>	<b>87.3</b>		%	"	1803045	03/05/18	03/06/18	% calculation	

**Specific Conductance by EPA120.1**

Date Sampled: **02/28/18 16:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Specific Conductance (EC)</b>	<b>2.39</b>	0.0100	mmhos/cm	1	1803046	03/05/18	03/05/18	EPA 120.1	

Summit Scientific

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

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 16:32

**C03**  
**1803008-03 (Soil)**

**Summit Scientific**

**Total Metals by EPA Method 6020 - Dry Weight Basis**

Date Sampled: **02/28/18 15:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Arsenic</b>	<b>1.48</b>	0.220	mg/kg dry	1	1803029	03/02/18	03/03/18	EPA 6020A	
<b>Barium</b>	<b>46.8</b>	0.440	"	"	"	"	"	"	
Cadmium	ND	0.110	"	"	"	"	"	"	
<b>Chromium</b>	<b>4.42</b>	0.550	"	"	"	"	"	"	
<b>Copper</b>	<b>5.15</b>	0.550	"	"	"	"	"	"	
<b>Lead</b>	<b>5.44</b>	0.220	"	"	"	"	"	"	
<b>Nickel</b>	<b>3.91</b>	0.110	"	"	"	"	"	"	
Selenium	ND	0.440	"	"	"	"	"	"	
Silver	ND	0.110	"	"	"	"	"	"	
<b>Zinc</b>	<b>30.1</b>	11.0	"	"	"	"	"	"	

**Total Mercury by EPA Method 7471**

Date Sampled: **02/28/18 15:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Mercury	ND	0.0550	mg/kg dry	1	1803030	03/02/18	03/05/18	EPA 7471	

**Hexavalent Chromium by EPA 7196**

Date Sampled: **02/28/18 15:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	0.300	mg/kg dry	1	1803033	03/01/18	03/02/18	EPA 7196	

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

Date Sampled: **02/28/18 15:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Calcium</b>	<b>1400</b>	11.0	mg/kg dry	1	1803043	03/05/18	03/05/18	EPA 6020/Mod. USDA60 6(2, 3A)	
<b>Magnesium</b>	<b>487</b>	5.50	"	"	"	"	"	"	
<b>Sodium</b>	<b>36.9</b>	5.50	"	"	"	"	"	"	

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

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 16:32

**C03**  
**1803008-03 (Soil)**

**Summit Scientific**

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

Sodium Adsorption Ratio	0.216	units	1	1803063	03/06/18	03/06/18	EPA 6020/Mod. USDA60 6(2, 3A)
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**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **02/28/18 15:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	8.62	0.100	pH Units	1	1803048	03/05/18	03/05/18	EPA 9045	
% Solids	90.9		%	"	1803045	03/05/18	03/06/18	% calculation	

**Specific Conductance by EPA120.1**

Date Sampled: **02/28/18 15:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	0.513	0.0100	mmhos/cm	1	1803046	03/05/18	03/05/18	EPA 120.1	

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

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

Reported:  
03/06/18 16:32

**C04**  
**1803008-04 (Soil)**

**Summit Scientific**

**Total Metals by EPA Method 6020 - Dry Weight Basis**

Date Sampled: **02/28/18 15:45**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Arsenic	1.20	0.229	mg/kg dry	1	1803029	03/02/18	03/03/18	EPA 6020A	
Barium	65.5	0.458	"	"	"	"	"	"	
Cadmium	ND	0.115	"	"	"	"	"	"	
Chromium	6.61	0.573	"	"	"	"	"	"	
Copper	7.72	0.573	"	"	"	"	"	"	
Lead	8.47	0.229	"	"	"	"	"	"	
Nickel	6.54	0.115	"	"	"	"	"	"	
Selenium	ND	0.458	"	"	"	"	"	"	
Silver	ND	0.115	"	"	"	"	"	"	
Zinc	46.7	11.5	"	"	"	"	"	"	

**Total Mercury by EPA Method 7471**

Date Sampled: **02/28/18 15:45**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Mercury	ND	0.0573	mg/kg dry	1	1803030	03/02/18	03/05/18	EPA 7471	

**Hexavalent Chromium by EPA 7196**

Date Sampled: **02/28/18 15:45**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	0.300	mg/kg dry	1	1803033	03/01/18	03/02/18	EPA 7196	

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

Date Sampled: **02/28/18 15:45**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	1290	11.5	mg/kg dry	1	1803043	03/05/18	03/05/18	EPA 6020/Mod. USDA60 6(2, 3A)	
Magnesium	533	5.73	"	"	"	"	"	"	
Sodium	22.9	5.73	"	"	"	"	"	"	

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

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 16:32

**C04**  
**1803008-04 (Soil)**

**Summit Scientific**

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

<b>Sodium Adsorption Ratio</b>	<b>0.135</b>	units	1	1803063	03/06/18	03/06/18	EPA 6020/Mod. USDA60 6(2, 3A)
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**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **02/28/18 15:45**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>pH</b>	<b>8.55</b>	0.100	pH Units	1	1803048	03/05/18	03/05/18	EPA 9045	
<b>% Solids</b>	<b>87.3</b>		%	"	1803045	03/05/18	03/06/18	% calculation	

**Specific Conductance by EPA120.1**

Date Sampled: **02/28/18 15:45**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Specific Conductance (EC)</b>	<b>0.419</b>	0.0100	mmhos/cm	1	1803046	03/05/18	03/05/18	EPA 120.1	

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

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

Reported:  
03/06/18 16:32

**C05**  
**1803008-05 (Soil)**

**Summit Scientific**

**Total Metals by EPA Method 6020 - Dry Weight Basis**

Date Sampled: **02/28/18 17:01**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Arsenic	1.10	0.229	mg/kg dry	1	1803029	03/02/18	03/03/18	EPA 6020A	
Barium	92.4	0.458	"	"	"	"	"	"	
Cadmium	0.117	0.115	"	"	"	"	"	"	
Chromium	6.77	0.573	"	"	"	"	"	"	
Copper	9.30	0.573	"	"	"	"	"	"	
Lead	8.77	0.229	"	"	"	"	"	"	
Nickel	7.47	0.115	"	"	"	"	"	"	
Selenium	ND	0.458	"	"	"	"	"	"	
Silver	ND	0.115	"	"	"	"	"	"	
Zinc	44.8	11.5	"	"	"	"	"	"	

**Total Mercury by EPA Method 7471**

Date Sampled: **02/28/18 17:01**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Mercury	ND	0.0573	mg/kg dry	1	1803030	03/02/18	03/05/18	EPA 7471	

**Hexavalent Chromium by EPA 7196**

Date Sampled: **02/28/18 17:01**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	0.300	mg/kg dry	1	1803033	03/01/18	03/02/18	EPA 7196	

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

Date Sampled: **02/28/18 17:01**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	2590	11.5	mg/kg dry	1	1803043	03/05/18	03/05/18	EPA 6020/Mod. USDA60 6(2, 3A)	
Magnesium	551	5.73	"	"	"	"	"	"	
Sodium	79.4	5.73	"	"	"	"	"	"	

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

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 16:32

**C05**  
**1803008-05 (Soil)**

**Summit Scientific**

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

Sodium Adsorption Ratio	0.370	units	1	1803063	03/06/18	03/06/18	EPA 6020/Mod. USDA60 6(2, 3A)
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**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **02/28/18 17:01**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	8.39	0.100	pH Units	1	1803048	03/05/18	03/05/18	EPA 9045	
% Solids	87.3		%	"	1803045	03/05/18	03/06/18	% calculation	

**Specific Conductance by EPA120.1**

Date Sampled: **02/28/18 17:01**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	0.662	0.0100	mmhos/cm	1	1803046	03/05/18	03/05/18	EPA 120.1	

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

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

Reported:  
03/06/18 16:32

**C6**  
**1803008-06 (Soil)**

**Summit Scientific**

**Total Metals by EPA Method 6020 - Dry Weight Basis**

Date Sampled: 02/28/18 17:23									
Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Arsenic	0.849	0.225	mg/kg dry	1	1803029	03/02/18	03/03/18	EPA 6020A	
Barium	35.9	0.451	"	"	"	"	"	"	
Cadmium	ND	0.113	"	"	"	"	"	"	
Chromium	3.21	0.564	"	"	"	"	"	"	
Copper	3.43	0.564	"	"	"	"	"	"	
Lead	4.76	0.225	"	"	"	"	"	"	
Nickel	1.86	0.113	"	"	"	"	"	"	
Selenium	ND	0.451	"	"	"	"	"	"	
Silver	ND	0.113	"	"	"	"	"	"	
Zinc	26.6	11.3	"	"	"	"	"	"	

**Total Mercury by EPA Method 7471**

Date Sampled: 02/28/18 17:23									
Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Mercury	ND	0.0564	mg/kg dry	1	1803030	03/02/18	03/05/18	EPA 7471	

**Hexavalent Chromium by EPA 7196**

Date Sampled: 02/28/18 17:23									
Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	0.300	mg/kg dry	1	1803033	03/01/18	03/02/18	EPA 7196	

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

Date Sampled: 02/28/18 17:23									
Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	1820	11.3	mg/kg dry	1	1803043	03/05/18	03/05/18	EPA 6020/Mod. USDA60 6(2, 3A)	
Magnesium	377	5.64	"	"	"	"	"	"	
Sodium	ND	5.64	"	"	"	"	"	"	

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

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 16:32

**C6**  
**1803008-06 (Soil)**

**Summit Scientific**

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

<b>Sodium Adsorption Ratio</b>	<b>0.00543</b>	units	1	1803063	03/06/18	03/06/18	EPA 6020/Mod. USDA60 6(2, 3A)
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**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **02/28/18 17:23**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>% Solids</b>	<b>88.7</b>		%	1	1803045	03/05/18	03/06/18	% calculation	
<b>pH</b>	<b>8.27</b>	0.100	pH Units	"	1803048	03/05/18	03/05/18	EPA 9045	

**Specific Conductance by EPA120.1**

Date Sampled: **02/28/18 17:23**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Specific Conductance (EC)</b>	<b>0.472</b>	0.0100	mmhos/cm	1	1803046	03/05/18	03/05/18	EPA 120.1	

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

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 16:32

**C7**  
**1803008-07 (Soil)**

**Summit Scientific**

**Total Metals by EPA Method 6020 - Dry Weight Basis**

Date Sampled: **02/28/18 16:46**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Arsenic</b>	<b>1.01</b>	0.229	mg/kg dry	1	1803029	03/02/18	03/03/18	EPA 6020A	
<b>Barium</b>	<b>82.4</b>	0.458	"	"	"	"	"	"	
Cadmium	ND	0.115	"	"	"	"	"	"	
<b>Chromium</b>	<b>6.08</b>	0.573	"	"	"	"	"	"	
<b>Copper</b>	<b>8.29</b>	0.573	"	"	"	"	"	"	
<b>Lead</b>	<b>7.93</b>	0.229	"	"	"	"	"	"	
<b>Nickel</b>	<b>6.37</b>	0.115	"	"	"	"	"	"	
Selenium	ND	0.458	"	"	"	"	"	"	
Silver	ND	0.115	"	"	"	"	"	"	
<b>Zinc</b>	<b>43.5</b>	11.5	"	"	"	"	"	"	

**Total Mercury by EPA Method 7471**

Date Sampled: **02/28/18 16:46**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Mercury	ND	0.0573	mg/kg dry	1	1803030	03/02/18	03/06/18	EPA 7471	

**Hexavalent Chromium by EPA 7196**

Date Sampled: **02/28/18 16:46**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	0.300	mg/kg dry	1	1803033	03/01/18	03/02/18	EPA 7196	

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

Date Sampled: **02/28/18 16:46**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Calcium</b>	<b>2500</b>	11.5	mg/kg dry	1	1803043	03/05/18	03/05/18	EPA 6020/Mod. USDA60 6(2, 3A)	
<b>Magnesium</b>	<b>575</b>	5.73	"	"	"	"	"	"	
<b>Sodium</b>	<b>16.0</b>	5.73	"	"	"	"	"	"	

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

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 16:32

**C7**  
**1803008-07 (Soil)**

**Summit Scientific**

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

Sodium Adsorption Ratio	0.0750	units	1	1803063	03/06/18	03/06/18	EPA 6020/Mod. USDA60 6(2, 3A)
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**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **02/28/18 16:46**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
% Solids	87.3		%	1	1803045	03/05/18	03/06/18	% calculation	
pH	8.29	0.100	pH Units	"	1803048	03/05/18	03/05/18	EPA 9045	

**Specific Conductance by EPA120.1**

Date Sampled: **02/28/18 16:46**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	0.827	0.0100	mmhos/cm	1	1803046	03/05/18	03/05/18	EPA 120.1	

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

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 16:32

**C8**  
**1803008-08 (Soil)**

**Summit Scientific**

**Total Metals by EPA Method 6020 - Dry Weight Basis**

Date Sampled: **02/28/18 17:44**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Arsenic</b>	<b>1.14</b>	0.230	mg/kg dry	1	1803029	03/02/18	03/03/18	EPA 6020A	
<b>Barium</b>	<b>52.3</b>	0.461	"	"	"	"	"	"	
Cadmium	ND	0.115	"	"	"	"	"	"	
<b>Chromium</b>	<b>5.54</b>	0.576	"	"	"	"	"	"	
<b>Copper</b>	<b>7.31</b>	0.576	"	"	"	"	"	"	
<b>Lead</b>	<b>7.96</b>	0.230	"	"	"	"	"	"	
<b>Nickel</b>	<b>5.03</b>	0.115	"	"	"	"	"	"	
Selenium	ND	0.461	"	"	"	"	"	"	
Silver	ND	0.115	"	"	"	"	"	"	
<b>Zinc</b>	<b>39.4</b>	11.5	"	"	"	"	"	"	

**Total Mercury by EPA Method 7471**

Date Sampled: **02/28/18 17:44**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Mercury	ND	0.0576	mg/kg dry	1	1803030	03/02/18	03/06/18	EPA 7471	

**Hexavalent Chromium by EPA 7196**

Date Sampled: **02/28/18 17:44**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	0.300	mg/kg dry	1	1803033	03/01/18	03/02/18	EPA 7196	

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

Date Sampled: **02/28/18 17:44**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Calcium</b>	<b>3980</b>	11.5	mg/kg dry	1	1803043	03/05/18	03/05/18	EPA 6020/Mod. USDA60 6(2, 3A)	
<b>Magnesium</b>	<b>569</b>	5.76	"	"	"	"	"	"	
<b>Sodium</b>	<b>31.8</b>	5.76	"	"	"	"	"	"	

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

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 16:32

**C8**  
**1803008-08 (Soil)**

**Summit Scientific**

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

<b>Sodium Adsorption Ratio</b>	<b>0.125</b>	units	1	1803063	03/06/18	03/06/18	EPA 6020/Mod. USDA60 6(2, 3A)
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**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **02/28/18 17:44**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>pH</b>	<b>7.90</b>	0.100	pH Units	1	1803048	03/05/18	03/05/18	EPA 9045	
<b>% Solids</b>	<b>86.8</b>		%	"	1803045	03/05/18	03/06/18	% calculation	

**Specific Conductance by EPA120.1**

Date Sampled: **02/28/18 17:44**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Specific Conductance (EC)</b>	<b>7.06</b>	0.0100	mmhos/cm	1	1803046	03/05/18	03/05/18	EPA 120.1	

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

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 16:32

## Total Metals by EPA Method 6020 - Dry Weight Basis - Quality Control

### Summit Scientific

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

#### Batch 1803029 - EPA 3050B

##### Blank (1803029-BLK1)

Prepared: 03/02/18 Analyzed: 03/03/18

Arsenic	ND	0.200	mg/kg wet
Barium	ND	0.400	"
Cadmium	ND	0.100	"
Chromium	ND	0.500	"
Copper	ND	0.500	"
Lead	ND	0.200	"
Nickel	ND	0.100	"
Selenium	ND	0.400	"
Silver	ND	0.100	"
Zinc	ND	10.0	"

##### LCS (1803029-BS1)

Prepared: 03/02/18 Analyzed: 03/03/18

Arsenic	39.3	0.200	mg/kg wet	40.0	98.2	56.9-110
Barium	40.5	0.400	"	40.0	101	59.3-113
Cadmium	1.70	0.100	"	2.00	85.1	63.1-113
Chromium	38.5	0.500	"	40.0	96.3	57.4-110
Copper	38.7	0.500	"	40.0	96.6	64.6-110
Lead	20.7	0.200	"	20.0	103	64-110
Nickel	37.8	0.100	"	40.0	94.6	63.2-110
Selenium	3.93	0.400	"	4.00	98.1	55.2-110
Silver	1.61	0.100	"	2.00	80.4	53.1-114
Zinc	40.2	10.0	"	40.0	100	62-110

##### Duplicate (1803029-DUP1)

Source: 1802274-01

Prepared: 03/02/18 Analyzed: 03/03/18

Arsenic	1.07	0.230	mg/kg dry	1.12	4.88	20
Barium	111	0.461	"	107	3.74	20
Cadmium	0.147	0.115	"	0.123	17.8	20
Chromium	6.65	0.576	"	6.29	5.52	20
Copper	7.59	0.576	"	7.07	7.10	20
Lead	7.35	0.230	"	6.75	8.55	20
Nickel	6.34	0.115	"	5.90	7.18	20
Selenium	0.414	0.461	"	0.406	1.98	20
Silver	0.0784	0.115	"	0.0781	0.446	20
Zinc	35.3	11.5	"	31.6	11.1	20

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

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

Reported:  
03/06/18 16:32

**Total Metals by EPA Method 6020 - Dry Weight Basis - Quality Control**  
**Summit Scientific**

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

**Batch 1803029 - EPA 3050B**

Matrix Spike (1803029-MS1)		Source: 1802274-01			Prepared: 03/02/18		Analyzed: 03/03/18			
Arsenic	37.7	0.230	mg/kg dry	46.1	1.12	79.3	75-125			
Barium	161	0.461	"	46.1	107	117	75-125			
Cadmium	2.30	0.115	"	2.30	0.123	94.6	75-125			
Chromium	44.3	0.576	"	46.1	6.29	82.6	75-125			
Copper	41.8	0.576	"	46.1	7.07	75.4	75-125			
Lead	27.6	0.230	"	23.0	6.75	90.6	75-125			
Nickel	44.1	0.115	"	46.1	5.90	83.0	75-125			
Selenium	4.51	0.461	"	4.61	0.406	89.2	75-125			
Silver	1.82	0.115	"	2.30	0.0781	75.8	75-125			
Zinc	75.0	11.5	"	46.1	31.6	94.4	75-125			

Matrix Spike Dup (1803029-MSD1)		Source: 1802274-01			Prepared: 03/02/18		Analyzed: 03/03/18			
Arsenic	45.1	0.230	mg/kg dry	46.1	1.12	95.4	75-125	17.9	25	
Barium	160	0.461	"	46.1	107	115	75-125	0.584	25	
Cadmium	1.91	0.115	"	2.30	0.123	77.7	75-125	18.5	25	
Chromium	44.0	0.576	"	46.1	6.29	81.9	75-125	0.742	25	
Copper	43.8	0.576	"	46.1	7.07	79.7	75-125	4.63	25	
Lead	27.3	0.230	"	23.0	6.75	89.2	75-125	1.20	25	
Nickel	42.8	0.115	"	46.1	5.90	80.1	75-125	3.13	25	
Selenium	4.39	0.461	"	4.61	0.406	86.4	75-125	2.84	25	
Silver	1.83	0.115	"	2.30	0.0781	76.0	75-125	0.193	25	
Zinc	74.7	11.5	"	46.1	31.6	93.6	75-125	0.465	25	

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

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

Reported:  
03/06/18 16:32

**Total Mercury by EPA Method 7471 - Quality Control**  
**Summit Scientific**

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

**Batch 1803030 - EPA 7471A**

**Blank (1803030-BLK1)**

Prepared: 03/02/18 Analyzed: 03/05/18

Mercury ND 0.0500 mg/kg wet

**LCS (1803030-BS1)**

Prepared: 03/02/18 Analyzed: 03/05/18

Mercury 0.550 0.0500 mg/kg wet 0.500 110 80-120

**Duplicate (1803030-DUP1)**

Source: 1802274-01

Prepared: 03/02/18 Analyzed: 03/05/18

Mercury 0.0391 0.0576 mg/kg dry 0.0449 13.7 20

**Matrix Spike (1803030-MS1)**

Source: 1802274-01

Prepared: 03/02/18 Analyzed: 03/05/18

Mercury 0.652 0.0576 mg/kg dry 0.576 0.0449 105 80-120

**Matrix Spike Dup (1803030-MSD1)**

Source: 1802274-01

Prepared: 03/02/18 Analyzed: 03/05/18

Mercury 0.630 0.0576 mg/kg dry 0.576 0.0449 102 80-120 3.41 20

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

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 16:32

**Hexavalent Chromium by EPA 7196 - Quality Control**  
**Summit Scientific**

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

**Batch 1803033 - 3060A Mod**

**Blank (1803033-BLK1)**

Prepared: 03/01/18 Analyzed: 03/02/18

Chromium, Hexavalent ND 0.300 mg/kg wet

**LCS (1803033-BS1)**

Prepared: 03/01/18 Analyzed: 03/02/18

Chromium, Hexavalent 19.5 0.300 mg/kg wet 19.9 97.7 85-115

**Duplicate (1803033-DUP1)**

**Source: 1802156-01**

Prepared: 03/01/18 Analyzed: 03/02/18

Chromium, Hexavalent ND 0.300 mg/kg dry ND 20

**Matrix Spike (1803033-MS1)**

**Source: 1802156-01**

Prepared: 03/01/18 Analyzed: 03/02/18

Chromium, Hexavalent 19.2 0.300 mg/kg dry 20.6 ND 93.3 85-115

**Matrix Spike (1803033-MS2)**

**Source: 1803008-01**

Prepared: 03/01/18 Analyzed: 03/02/18

Chromium, Hexavalent 21.6 0.300 mg/kg dry 22.7 ND 95.3 85-115

**Post Spike (1803033-PS1)**

**Source: 1802156-01**

Prepared: 03/01/18 Analyzed: 03/02/18

Chromium, Hexavalent 0.481 mg/kg 0.498 0.00 96.5 85-115

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

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

Reported:  
03/06/18 16:32

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

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

**Batch 1803043 - General Preparation**

**Blank (1803043-BLK1)**

Prepared & Analyzed: 03/05/18

Calcium	ND	10.0	mg/kg wet
Magnesium	ND	5.00	"
Sodium	ND	5.00	"

**LCS (1803043-BS1)**

Prepared & Analyzed: 03/05/18

Calcium	486	10.0	mg/kg wet	500	97.2	82.9-118
Magnesium	497	5.00	"	500	99.3	77.1-123
Sodium	502	5.00	"	500	100	71-129

**Duplicate (1803043-DUP1)**

Source: 1803008-01

Prepared & Analyzed: 03/05/18

Calcium	1510	11.4	mg/kg dry	1480	1.94	200
Magnesium	632	5.69	"	697	9.77	200
Sodium	83.0	5.69	"	76.8	7.67	200

**Matrix Spike (1803043-MS1)**

Source: 1803008-01

Prepared & Analyzed: 03/05/18

Calcium	1950	11.4	mg/kg dry	569	1480	81.3	75-125
Magnesium	1170	5.69	"	569	697	83.9	75-125
Sodium	632	5.69	"	569	76.8	97.6	75-125

**Matrix Spike Dup (1803043-MSD1)**

Source: 1803008-01

Prepared & Analyzed: 03/05/18

Calcium	2040	11.4	mg/kg dry	569	1480	97.2	75-125	4.54	25
Magnesium	1210	5.69	"	569	697	90.4	75-125	3.12	25
Sodium	611	5.69	"	569	76.8	93.8	75-125	3.45	25

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

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 16:32

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

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

**Batch 1803048 - General Preparation**

LCS (1803048-BS1)				Prepared & Analyzed: 03/05/18		
pH	9.18	0.100	pH Units	9.16	100	95-105
LCS (1803048-BS2)				Prepared & Analyzed: 03/05/18		
pH	9.18	0.100	pH Units	9.16	100	95-105
Duplicate (1803048-DUP1)		Source: 1803008-01		Prepared & Analyzed: 03/05/18		
pH	8.37	0.100	pH Units	8.40	0.358	20
Duplicate (1803048-DUP2)		Source: 1803051-01		Prepared & Analyzed: 03/05/18		
pH	8.13	0.100	pH Units	9.11	11.4	20

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

Project: Krier #4 Spreadfeld  
Project Number: [none]  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 16:32

**Specific Conductance by EPA120.1 - Quality Control**  
**Summit Scientific**

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

**Batch 1803046 - General Preparation**

**Blank (1803046-BLK1)** Prepared & Analyzed: 03/05/18

Specific Conductance (EC) ND 0.0100 mmhos/cm

**Blank (1803046-BLK2)** Prepared & Analyzed: 03/05/18

Specific Conductance (EC) ND 0.0100 mmhos/cm

**LCS (1803046-BS1)** Prepared & Analyzed: 03/05/18

Specific Conductance (EC) 0.754 0.0100 mmhos/cm 90-110

**LCS (1803046-BS2)** Prepared & Analyzed: 03/05/18

Specific Conductance (EC) 0.751 0.0100 mmhos/cm 90-110

**Duplicate (1803046-DUP1)** **Source: 1803008-01** Prepared & Analyzed: 03/05/18

Specific Conductance (EC) 0.692 0.0100 mmhos/cm 0.704 1.72 20

**Duplicate (1803046-DUP2)** **Source: 1803051-01** Prepared & Analyzed: 03/05/18

Specific Conductance (EC) 1.61 0.0100 mmhos/cm 1.62 0.0929 20

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

Project: Krier #4 Spreadfeld

Project Number: [none]  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 16:32

### 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



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

Project: Krier #4 Spreadfeld  
Project Number: 027318009  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 15:15

### ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SS01	1803009-01	Soil	02/28/18 14:21	03/01/18 09:20
SS02	1803009-02	Soil	02/28/18 14:14	03/01/18 09:20
SS03	1803009-03	Soil	02/28/18 14:44	03/01/18 09:20
SS04	1803009-04	Soil	02/28/18 14:55	03/01/18 09:20

Summit Scientific

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## 1803009

303-277-9310 ♦ 303-374-5933 Fax

Page 1 of 1

Sampler Name: Drew Bullinger

Project Number: 027318609

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

Project: Krier #4 Spreadfeld  
Project Number: 027318009  
Project Manager: Jeremy Pike

Reported:  
03/06/18 15:15

**SS01**  
**1803009-01 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **02/28/18 14:21**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1803027	03/02/18	03/03/18	8015M	
C28-C36 (ORO)	ND	50	"	"	"	"	"	"	

Date Sampled: **02/28/18 14:21**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: o-Terphenyl		93.8 %	70-130		"	"	"	"	

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

Date Sampled: **02/28/18 14:21**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0020	mg/kg	1	1803025	03/02/18	03/02/18	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: **02/28/18 14:21**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		96.6 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		103 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		85.7 %	21-167		"	"	"	"	

Summit Scientific

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

Project: Krier #4 Spreadfeld  
Project Number: 027318009  
Project Manager: Jeremy Pike

Reported:  
03/06/18 15:15

**SS02**  
**1803009-02 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **02/28/18 14:14**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1803027	03/02/18	03/03/18	8015M	
C28-C36 (ORO)	ND	50	"	"	"	"	"	"	

Date Sampled: **02/28/18 14:14**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: o-Terphenyl		101 %	70-130		"	"	"	"	

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

Date Sampled: **02/28/18 14:14**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0020	mg/kg	1	1803025	03/02/18	03/03/18	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: **02/28/18 14:14**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		97.0 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		103 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		85.3 %	21-167		"	"	"	"	

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

Project: Krier #4 Spreadfeld  
Project Number: 027318009  
Project Manager: Jeremy Pike

Reported:  
03/06/18 15:15

**SS03**  
**1803009-03 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **02/28/18 14:44**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1803027	03/02/18	03/03/18	8015M	
C28-C36 (ORO)	ND	50	"	"	"	"	"	"	

Date Sampled: **02/28/18 14:44**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: o-Terphenyl		83.7 %	70-130		"	"	"	"	

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

Date Sampled: **02/28/18 14:44**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0020	mg/kg	1	1803025	03/02/18	03/03/18	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: **02/28/18 14:44**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		94.6 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		102 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		84.4 %	21-167		"	"	"	"	

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

Project: Krier #4 Spreadfeld  
Project Number: 027318009  
Project Manager: Jeremy Pike

Reported:  
03/06/18 15:15

**SS04**  
**1803009-04 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **02/28/18 14:55**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1803027	03/02/18	03/03/18	8015M	
C28-C36 (ORO)	ND	50	"	"	"	"	"	"	

Date Sampled: **02/28/18 14:55**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: o-Terphenyl		93.5 %	70-130		"	"	"	"	

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

Date Sampled: **02/28/18 14:55**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0020	mg/kg	1	1803025	03/02/18	03/03/18	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: **02/28/18 14:55**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		97.1 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		103 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		84.4 %	21-167		"	"	"	"	

Summit Scientific

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

Project: Krier #4 Spreadfeld  
Project Number: 027318009  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 15:15

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

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

**Batch 1803027 - EPA 3550A**

**Blank (1803027-BLK1)**

Prepared: 03/02/18 Analyzed: 03/03/18

C10-C28 (DRO)	ND	50	mg/kg
C28-C36 (ORO)	ND	50	"

Surrogate: o-Terphenyl	11.2		"	12.5	89.8	70-130
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**LCS (1803027-BS1)**

Prepared: 03/02/18 Analyzed: 03/03/18

C10-C28 (DRO)	405	50	mg/kg
C28-C36 (ORO)	ND	50	"

Surrogate: o-Terphenyl	12.9		"	12.5	103	70-130
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**Matrix Spike (1803027-MS1)**

Source: 1803005-01

Prepared: 03/02/18 Analyzed: 03/03/18

C10-C28 (DRO)	498	50	mg/kg
C28-C36 (ORO)	ND	50	"

Surrogate: o-Terphenyl	13.3		"	12.5	107	70-130
------------------------	------	--	---	------	-----	--------

**Matrix Spike Dup (1803027-MSD1)**

Source: 1803005-01

Prepared: 03/02/18 Analyzed: 03/03/18

C10-C28 (DRO)	467	50	mg/kg
C28-C36 (ORO)	ND	50	"

Surrogate: o-Terphenyl	12.6		"	12.5	101	70-130
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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: Krier #4 Spreadfeld  
Project Number: 027318009  
Project Manager: Jeremy Pike

Reported:  
03/06/18 15:15

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

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

**Batch 1803025 - EPA 5030 Soil MS**

**Blank (1803025-BLK1)**

Prepared & Analyzed: 03/02/18

Benzene	ND	0.0020	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	0.0387		"	0.0400		96.7	23-173			
Surrogate: Toluene-d8	0.0412		"	0.0400		103	20-170			
Surrogate: 4-Bromofluorobenzene	0.0344		"	0.0400		86.1	21-167			

**LCS (1803025-BS1)**

Prepared & Analyzed: 03/02/18

Benzene	0.0882	0.0020	mg/kg	0.100		88.2	58-130			
Toluene	0.0833	0.0050	"	0.100		83.3	61-134			
Ethylbenzene	0.0879	0.0050	"	0.0992		88.6	74-139			
m,p-Xylene	0.169	0.010	"	0.200		84.7	73-137			
o-Xylene	0.0867	0.0050	"	0.0980		88.5	73-141			
Xylenes (total)	0.256	0.0050	"				30-150			
Gasoline Range Hydrocarbons	1.97	0.50	"				30-150			
Surrogate: 1,2-Dichloroethane-d4	0.0369		"	0.0400		92.2	23-173			
Surrogate: Toluene-d8	0.0423		"	0.0400		106	20-170			
Surrogate: 4-Bromofluorobenzene	0.0334		"	0.0400		83.6	21-167			

**Matrix Spike (1803025-MS1)**

Source: 1803005-01

Prepared & Analyzed: 03/02/18

Benzene	0.0906	0.0020	mg/kg	0.100	ND	90.6	30-131			
Toluene	0.0858	0.0050	"	0.100	ND	85.8	30-134			
Ethylbenzene	0.0878	0.0050	"	0.0992	ND	88.5	22-153			
m,p-Xylene	0.169	0.010	"	0.200	ND	84.6	10-159			
o-Xylene	0.0870	0.0050	"	0.0980	ND	88.8	31-151			
Xylenes (total)	0.256	0.0050	"		ND		30-150			
Gasoline Range Hydrocarbons	2.00	0.50	"		ND		30-150			
Surrogate: 1,2-Dichloroethane-d4	0.0382		"	0.0400		95.5	23-173			
Surrogate: Toluene-d8	0.0424		"	0.0400		106	20-170			
Surrogate: 4-Bromofluorobenzene	0.0333		"	0.0400		83.2	21-167			

Summit Scientific

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

Project: Krier #4 Spreadfeld  
Project Number: 027318009  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 15:15

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

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

**Batch 1803025 - EPA 5030 Soil MS**

Matrix Spike Dup (1803025-MSD1)		Source: 1803005-01			Prepared & Analyzed: 03/02/18					
Benzene	0.0868	0.0020	mg/kg	0.100	ND	86.8	30-131	4.26	34	
Toluene	0.0829	0.0050	"	0.100	ND	82.9	30-134	3.42	30	
Ethylbenzene	0.0848	0.0050	"	0.0992	ND	85.5	22-153	3.48	24	
m,p-Xylene	0.164	0.010	"	0.200	ND	82.3	10-159	2.81	68	
o-Xylene	0.0845	0.0050	"	0.0980	ND	86.2	31-151	2.90	38	
Xylenes (total)	0.249	0.0050	"		ND		30-150	2.84	20	
Gasoline Range Hydrocarbons	1.89	0.50	"		ND		30-150	5.61	20	
Surrogate: 1,2-Dichloroethane-d4	0.0385		"	0.0400		96.2	23-173			
Surrogate: Toluene-d8	0.0430		"	0.0400		107	20-170			
Surrogate: 4-Bromofluorobenzene	0.0334		"	0.0400		83.5	21-167			

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: Krier #4 Spreadfeld

Project Number: 027318009  
Project Manager: Jeremy Pike

**Reported:**  
03/06/18 15:15

### 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

**TABLE 1**  
**SOIL ANALYTICAL RESULTS**  
**KRIER #3 SPREADFIELD**  
**WELD COUNTY, COLORADO**  
**BILL BARRETT CORPORATION**

PARAMETER	COGCC Table 910-1 Concentration Levels	UNITS	Sample ID: SS01	Sample ID: SS02	Sample ID: SS03	Sample ID: SS04
			2/28/2018	2/28/2018	2/28/2018	2/28/2018
Benzene	0.17	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020
Toluene	85	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050
Ethylbenzene	100	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050
Total Xylenes	175	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050
TPH-GRO	--	mg/kg	<0.50	<0.50	<0.50	<0.50
TPH-DRO	--	mg/kg	<50	<50	<50	<50
TPH-ORO	--	mg/kg	<50	<50	<50	<50
TPH	500	mg/kg	<100.50	<100.50	<100.50	<100.50

**NOTES:**

mg/kg - milligrams per kilogram

DRO - diesel range organics

GRO - gasoline range organics

ORO - oil range organics

TPH - total petroleum hydrocarbons is the sum of GRO, DRO, and ORO

< - less than the stated reporting limit

-- - not applicable

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





**TABLE 2**  
**COMPOSITE SOIL SAMPLE ANALYTICAL RESULTS**

**KRIER #4 SPREAD FIELD**  
**WELD COUNTY, COLORADO**  
**BILL BARRETT CORPORATION**

PARAMETER	COGCC Table 910-1 Concentration Levels	UNITS	Sample ID: C01	Sample ID: C02	Sample ID: C03	Sample ID: C04
Sample Date			2/28/2018	2/28/2018	2/28/2018	2/28/2018
Arsenic	0.39	mg/kg	<b>1.01</b>	<b>1.03</b>	<b>1.48</b>	<b>1.20</b>
Barium	15,000	mg/kg	69.9	84.8	46.8	65.5
Cadmium	70	mg/kg	<0.114	<0.115	<0.110	<0.115
Chromium (III)	120,000	mg/kg	6.49	6.15	4.42	6.61
Chromium (VI)	23	mg/kg	<0.300	<0.300	<0.300	<0.300
Copper	3,100	mg/kg	7.40	8.53	5.15	7.72
Lead	400	mg/kg	7.68	9.01	5.44	8.47
Mercury	23	mg/kg	<0.0569	<0.0573	<0.0550	<0.0573
Nickel	1,600	mg/kg	6.08	7.40	3.91	6.54
Selenium	390	mg/kg	<0.456	<0.458	<0.440	<0.458
Silver	390	mg/kg	<0.114	<0.115	<0.110	<0.115
Zinc	23,000	mg/kg	39.9	47.3	30.1	46.7
EC	4.0	mmhos/cm	0.704	2.39	0.513	0.419
pH	6 - 9	SU	8.40	8.01	8.62	8.55
SAR	12	unitless	0.412	0.280	0.216	0.135



**TABLE 2**  
**COMPOSITE SOIL SAMPLE ANALYTICAL RESULTS**

**KRIER #4 SPREAD FIELD**  
**WELD COUNTY, COLORADO**  
**BILL BARRETT CORPORATION**

PARAMETER	COGCC Table 910-1 Concentration Levels	UNITS	Sample ID: C05	Sample ID: C6	Sample ID: C7	Sample ID: C8
Sample Date			2/28/2018	2/28/2018	2/28/2018	2/28/2018
Arsenic	0.39	mg/kg	<b>1.10</b>	<b>0.849</b>	<b>1.01</b>	<b>1.14</b>
Barium	15,000	mg/kg	92.4	35.9	82.4	52.3
Cadmium	70	mg/kg	0.117	<0.113	<0.115	<0.115
Chromium (III)	120,000	mg/kg	6.77	3.21	6.08	5.54
Chromium (VI)	23	mg/kg	<0.300	<0.300	<0.300	<0.300
Copper	3,100	mg/kg	9.30	3.43	8.29	7.31
Lead	400	mg/kg	8.77	4.76	7.93	7.96
Mercury	23	mg/kg	<0.0573	<0.0564	<0.0573	<0.0576
Nickel	1,600	mg/kg	7.47	1.86	6.37	5.03
Selenium	390	mg/kg	<0.458	<0.451	<0.458	<0.461
Silver	390	mg/kg	<0.115	<0.113	<0.115	<0.115
Zinc	23,000	mg/kg	44.8	26.6	43.5	39.4
EC	4.0	mmhos/cm	0.662	0.472	0.827	7.06
pH	6 - 9	SU	8.39	8.27	8.29	7.90
SAR	12	unitless	0.370	0.00543	0.0750	0.125

**NOTES:**

mg/kg - milligrams per kilogram

mmhos/cm - millimhos per centimeter in saturated paste extract

EC - electrical conductivity

SU - standard unit

SAR - sodium adsorption ratio

TPH-DRO - total petroleum hydrocarbons-diesel range organics

TPH-GRO - total petroleum hydrocarbons-gasoline range organics

Total TPH - combination of TPH-DRO and TPH-GRO

< - less than the stated reporting limit

NA - not analyzed

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



**ATTACHMENT 3**

**Surface Owner Land Application Agreement**

## LAND APPLICATION AGREEMENT

This Land Application Agreement ("Agreement") is entered into on March 8<sup>th</sup>, 2018 by and between Michael Krier, Surface Owner, whose address is 31125 CR 91 Orchard, CO 80649 and Bill Barrett Corporation ("BBC"), whose address is 1099 19<sup>th</sup> Street, Suite 2300, Denver, Colorado, 80202. Surface Owner consents to the land application of drilling mud and cuttings on the below-described lands, as follows:

Lot located in the E ½ of NW ¼ of Section 22, Township 6 North, Range 61 West of the 6th P.M., Weld County, Colorado

☐ BBC shall conduct the land application operations; or

☒ Surface Owner agrees to conduct the land application operations on behalf of BBC.

Qtr/Qtr	Section	Township	Range	Total Acreage
E ½ of NW 1/4	22	6N	61W	80

Land application of the water-based bentonitic drilling mud and cuttings will be conducted in compliance with Colorado Oil and Gas Conservation Commission ("COGCC") Rule 907.d(3)B and the COGCC Policy on Drill Cuttings Management, dated September 15, 2014 (attached hereto), which rule and policy include limits on the depth of drilling mud and cuttings applied, the timely incorporation of such materials into the native soil, and the control of drainage or runoff.

This Agreement shall become effective upon execution and shall remain in full force and effect for a period not to exceed three consecutive years from the date of first land application as reported to COGCC.

Michael Krier

Landowner

Michael Krier

Casey Lauer

Bill Barrett Corp.

Casey Lauer