

**SUBSURFACE INVESTIGATION  
THREE HISTORIC PRODUCED WATER PITS**

**TERRACE GAS PLANT**

**And**

**KERN 43-33 WELL and TANK BATTERY**

**Weld County, Colorado**

**Prepared For:**



**Whiting Petroleum Corporation  
P.O. Box 460  
Wellington, Colorado 80549**

**Prepared by:**



**Ben Baugh, James Hix  
Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden, CO 80403**

**Olsson Project No. 012-0790**

**July 2012**

## TABLE OF CONTENTS

<b>1.0 INTRODUCTION .....</b>	<b>1</b>
<b>2.0 SITE LOCATIONS.....</b>	<b>1</b>
2.1 Terrace Gas Plant .....	1
2.2 Kern 43-33 Battery .....	1
<b>3.0 GEOLOGY AND HYDROGEOLOGY .....</b>	<b>1</b>
3.1 Terrace Gas Plant .....	2
3.2 Kern 43-33 Battery .....	2
<b>4.0 FIELD ACTIVITIES .....</b>	<b>3</b>
4.1 Terrace Gas Plant .....	3
4.2 Kern 43-33 Battery .....	4
<b>5.0 LABORATORY ANALYTICAL RESULTS .....</b>	<b>4</b>
5.1 Terrace Gas Plant: Pit 1 .....	5
5.2 Terrace Gas Plant: Pit 2 .....	5
5.3 Kern 43-33 Battery: Pit 3 .....	6
<b>6.0 CONCLUSIONS .....</b>	<b>6</b>
<b>7.0 RECOMMENDATIONS .....</b>	<b>7</b>
<b>8.0 REFERENCES .....</b>	<b>7</b>

### List of Tables

- Table 1 – Soil Sampling Depths and Observations.
- Table 2 – Analytical Results for Pit 1, BTEX, TPH and PAHs
- Table 3 – Analytical Results for Pit 1, Metals and Physical Parameters
- Table 4 – Analytical Results for Pit 2, BTEX, TPH and PAHs
- Table 5 – Analytical Results for Pit 2, Metals and Physical Parameters
- Table 6 – Analytical Results for Pit 3, BTEX, TPH and PAHs
- Table 7 – Analytical Results for Pit 3, Metals and Physical Parameters
- Table 8 – Groundwater Wells near Terrace Gas Plant and the Kern 43-33 Battery

### List of Figures

- Figure 1 – General Location Map of Terrace Gas Plant
- Figure 2 – Sampling Locations for Pit 1, Terrace Gas Plant
- Figure 3 – Sampling Locations for Pit 2, Terrace Gas Plant
- Figure 4 – Sampling Locations for Pit 3, Kern 43-33 Well and Tank Battery

### List of Appendices

- Appendix A – Laboratory Reports
- Appendix B – Photographic Log

## **1.0 INTRODUCTION**

Olsson Associates, Inc. was contracted by Whiting Petroleum Corporation to perform subsurface investigations of three unlined produced water pits in Weld County to assess potential soil and groundwater (if encountered) impact. Two pits (Pit 1 and Pit 2) are associated with the Terrace Gas Plant. The third pit (Pit 3) is associated with the Kern 43-33 well and tank battery. Soil samples were collected for laboratory analysis for comparison to the cleanup levels listed Colorado Oil and Gas Conservation Commission (COGCC) Table 910-1.

This report presents site specific information, a description of the local geology and hydrogeology, a description of work, a summary of the laboratory analysis, and conclusions and recommendations.

## **2.0 SITE LOCATIONS**

A general location map for Terrace Gas Plant and the Kern 43-33 Battery is presented as Figure 1.

### **2.1 Terrace Gas Plant**

The Terrace Gas Plant is located in the northwest quarter of the northeast quarter of Section 18, Township 10 North, Range 58 West, of the Sixth Principal Meridian, approximately 40 miles north of the town of Fort Morgan. Pit 1 is located on the western most portion of Terrace Gas Plant (latitude 40.84553, longitude -103.91039). Pit 2 is associated with Terrace Gas Plant and is located on the south side of County Road 118 approximately 800 feet west of the Plant (latitude 40.84568, longitude -103.91354).

### **2.2 Kern 43-33 Battery**

The Kern 43-33 well and associated tank battery is located in the northeast quarter of the southeast quarter of Section 33, Township 12 North, Range 62 West of the Sixth principal Meridian, approximately one mile southwest of the town of Hereford. Pit 3 is located northwest of the tank battery (latitude 40.9642, longitude -104.31692).

## **3.0 GEOLOGY AND HYDROGEOLOGY**

Surficial geology within the area surrounding Terrace Gas Plant and the Kern 43-33 well and tank battery consists of fluvial deposits of the lower Ogallala Formation (To). These deposits are Miocene in age and are composed of gray to brown and semi-consolidated, ashy sand and silt beds with volcanic ash beds. The lower part of the Ogallala Formation can be as much as

150 feet thick (Scott 1978). However, thickness of the formation around the Terrace Gas Plant and Kern 43-33 Well and Tank Battery and the depth to the underlying Arikaree Formation, cannot be determined from well completion logs of nearby water wells.

### **3.1 Terrace Gas Plant**

According to the Soil Survey of Weld County, Colorado Northern Part, soil in the area of Terrace Gas Plant consists of the Kim-Mitchell complex, 0 to 6 percent slopes. The Kim-Mitchell complex is characterized by calcareous loamy alluvium with moderate permeability (0.6 to 2.0 inches/hour). Salinity for the Kim-Mitchell complex is typically less than 2 millimhos per centimeter (mmhos/cm).

Three permitted groundwater wells exist within 0.5 and 3.0 miles of Terrace Gas Plant. Static water levels, locations, completion dates, and distance to the plant are presented in Table 8. Boring logs for these wells report static water levels ranging from 80 feet to 104 feet below ground surface (fbgs) at the time of drilling. Well permit# 169917 is the closest well to the Terrace Gas Plant (less than 0.5 miles) and boring logs for this well report a static water level of 104 fbgs at the time of completion. Well construction and test reports can be found at the Colorado Division of Water Resources Website.

There are no major surface water features in the vicinity of the plant. However, there are named springs and associated intermittent streams within approximately three miles of the plant. Gatehook Springs and associated intermittent stream is approximately 1 mile north east, Elizabeth Springs is approximately 0.5 miles west and De Moss springs is approximately 1.7 miles west.

### **3.2 Kern 43-33 Battery**

Three permitted groundwater wells exist within 0.6 miles and 1.3 miles of the Kern 43-33 Battery. Static water levels, locations, completion dates and distances to the Kern well are presented in Table 8. Boring logs for these wells report static water levels ranging from 40 feet to 137 fbgs at the time of drilling. Well permit# 6944-R is the closest well to the project area (0.6 miles) and boring logs for this well report a static water level of 40 fbgs. Well construction and test reports can be found at the Colorado Division of Water Resources Website.

According to the Soil Survey of Weld County, Colorado Northern Part, soil in the area of the Kern 43-33 battery consists of the Ascalon fine sandy loam, 0 to 6 percent slopes. The Ascalon fine sandy loam is characterized by calcareous loamy alluvium and moderate permeability (2.0 to 6.0 inches/hour). Salinity for the Ascalon fine sandy loam is typically less than 2.0 mmhos/cm. The most prominent surface water feature near the project area is Crow Creek which trends northwest-southeast, approximately 0.5 miles northwest of the battery, through the town of Hereford, Colorado. The closest surface water feature to the battery is an unmade tributary of Crow Creek, less than 0.5 miles north of the battery.

## 4.0 FIELD ACTIVITIES

Olsson conducted site investigation activities on May 17, 2012 which included advancing five test pits in Pit 1, two test pits in Pit 2, and two test pits in Pit 3. K&K Oilfield Services was contracted to perform the excavations using a backhoe. Soil samples were collected at approximate one-foot intervals and placed into Ziploc<sup>®</sup> bags and field screened for volatile organic vapors using a photo-ionization detector (PID). The test pits were advanced until the soil was visibly clean or until the maximum depth of the excavation equipment was reached. Bedrock was not encountered during this investigation. One soil sample from each test pit exhibiting the highest PID reading was placed in a laboratory-supplied sample container and stored on ice in a cooler for laboratory analysis.

Two site background samples were collected using a hand auger near each historic produced water pit location from areas of apparent native undisturbed soil. Additionally, one sample of the liquid in the bottom of the tinhorn at Pit 2 and one sample of the sludge in the northwest corner of Pit 3 was collected for laboratory analysis.

Groundwater was not encountered during advancement of the test pits. Sampling depths and associated PID field screening measurements at the three produced water pits are presented as Table 1.

### 4.1 Terrace Gas Plant

Pit 1 at Terrace Gas Plant is located on the western most edge of the plant and measures approximately 59 feet (north-south) by 52 feet (east-west). Test pits 1 through 5 were advanced in Pit 1. A schematic map showing sampling locations, sampling depth, analytical results and maximum PID measurements for Pit 1 is presented as Figure 2. Hydrocarbon staining or odor was not observed in test pit 1, test pit 2, test pit 3, or test pit 4. Test pit 5 was excavated immediately in front of a dump line into the pit from Terrace Gas Plant. Minor hydrocarbon staining was first observed between approximately 1 fbgs to 2 fbgs. Additional staining was observed between 4 fbgs and 4.5 fbgs in test pit 5. A maximum PID reading of 1040 ppm was recorded in the head space of a soil sample collected at approximately 2 fbgs and SS2 was collected from this interval. A PID reading of 275 ppm was observed at 7.5 fbgs and 13 ppm at 9 fbgs. Two background samples (BS1 and BS2) were collected 30 feet south of Pit 1.

Pit 2 is located 800 feet west of the Terrace Gas Plant and measures approximately 18 feet by 18 feet. An open-top culvert, or “tinhorn”, is located in the middle of the pit and is approximately 8 feet in diameter and 10 feet deep. Test pits 6 and 7 were advanced approximately two feet north and two feet south of the tinhorn. A schematic map showing sampling locations, sampling depth and maximum PID field screening measurements for Pit 2 is presented as Figure 3.

A slight petroleum odor was observed during the excavation of test pit 6. SS6 was collected from a depth of 7 feet where a maximum PID reading of 120 ppm was observed. During the excavation of test pit 7, hydrocarbon staining and odor were observed at 5 fbgs and continued until the excavator reached its maximum equipment depth of approximately 10 fbgs (due to the steel gate around Pit 2 limiting the downward motion of the backhoe arm). Soil sample SS7 was collected from 9.5 fbgs where a maximum PID field screening reading of 2400 ppm was observed. Hydrocarbon staining was observed at the bottom of the test pit 7 and therefore the total depth of impact has not been determined. Two site specific background soil samples (BS3 and BS4) were collected 50 feet east of Pit 2.

## **4.2 Kern 43-33 Battery**

Pit 3 is located within the northeast portion of the Kern 43-33 tank battery and measures approximately 64 feet (north-south) by 62 feet (east-west). Two test pits were advanced in Pit 3. A schematic map showing sampling locations, sampling depth, analytical results and maximum PID field screening measurements for Pit 3 is presented as Figure 4.

Within the northern portion of the pit, an approximate 1-foot thick layer of sludge remains. This material was moved to the sides and temporary berms were put in place using the excavator to keep the material from the center of the pit where test pit 8 was excavated. Test pit 8 was excavated to a depth of 6.0 fbgs and soil sample SS8 was collected from a depth of 2.0 fbgs where a maximum PID reading of 698 ppm was recorded. A slight hydrocarbon odor was observed during the excavation of test pit 8.

Test pit 9 was excavated in the center of the southern part of Pit 3 to a depth of 5.5 fbgs. SS9 was collected from a depth of 2 fbgs where a maximum PID reading of 91 ppm was observed. A slight hydrocarbon odor was observed during the excavation of test pit 8. Site specific background soil samples (BS5 and BS6) were collected approximately 30 feet to the west (BS5) and 30 feet to the south (BS6) of the southwest corner of the tank battery boundary.

## **5.0 LABORATORY ANALYTICAL RESULTS**

Soil samples were delivered by Olsson to Summit Scientific of Golden, Colorado using standard chain-of-custody protocol for analysis of benzene, toluene, ethylbenzene, and xylenes (BTEX) and gasoline range organics (GRO) by EPA Method 8260B, diesel range organics (DRO) by EPA Method 8015, poly-nuclear aromatic hydrocarbons (PAHs) by EPA Method 8270D-Selective Ion Monitoring (SIM), specific conductance (EC) by Standard Method SM 2510B, soluble nutrients and sodium absorption ratio (SAR) by EPA Method 6020, pH by EPA Method 9045B, total metals using EPA Methods 6020A, 7471B (mercury only), and hexavalent chromium by EPA Method 3060A. The analytical results for Pit 1 are presented in Table 2 and Table 3. The analytical results for Pit 2 are presented in Table 4 and Table 5, and the analytical

results for Pit 3 are presented in Table 6 and Table 7. A summary of the analytical results follows.

### **5.1 Terrace Gas Plant: Pit 1**

- BTEX, GRO and DRO were not detected at or above their respective laboratory reporting limits in soil samples SS1, SS2, SS3, and SS4. Total xylenes, GRO and DRO were reported at low concentrations in soil sample SS5 but below their respective Colorado Oil and Gas Conservation Commission (COGCC) cleanup levels;
- Arsenic was reported above the COGCC cleanup level for arsenic (0.39 mg/kg) in all five soil samples collected from Pit 1. Analysis of site specific background soil samples reported similar concentration of arsenic;
- The pH was reported above of the COGCC range of 6 to 9 for soil sample SS5 (9.4); and
- The remaining analytes for the soil samples collected from Pit 1 were reported below their respective COGCC cleanup levels.

### **5.2 Terrace Gas Plant: Pit 2**

- Benzene was reported above the COGCC cleanup level of 0.17 mg/kg for benzene for soil sample SS7 (5.9 mg/kg);
- Total xylenes were reported above the COGCC cleanup level of 175 mg/kg for xylene for soil sample SS7 (260 mg/kg);
- Total Petroleum Hydrocarbons (TPH), the sum of GRO plus DRO concentrations, were reported above the COGCC cleanup level of 500 mg/kg for TPH in soil samples SS6 (1851 mg/kg) and SS7 (106,000 mg/kg);
- Benzo (a) pyrene was reported slightly above the COGCC cleanup level of 0.022 mg/kg for benzo (a) pyrene in SS7 (0.028 mg/kg);
- Arsenic was reported above the cleanup level for arsenic (0.39 mg/kg) for both soil samples collected from Pit 2. Analysis of site specific background soil samples reported similar concentration of arsenic;
- For the sludge sample collected from inside the tinhorn, benzene was reported at 11 mg/kg, toluene was reported at 87 mg/kg, Ethylbenzene was reported at 140 mg/kg, xylene was reported at 670 mg/kg and GRO was reported at 110,000 mg/kg. All of the reported concentrations are above their respective COGCC cleanup levels; and
- The remaining analytes for the soil samples collected from Pit 2 were reported below their respective COGCC cleanup levels.

### 5.3 Kern 43-33 Battery: Pit 3

- TPH was reported above the COGCC cleanup level of 500 mg/kg for soil samples SS8 (9890 mg/kg) and SS9 (6500 mg/kg);
- The pH was reported above of the COGCC range of 6 to 9 for pH for soil sample SS8 at 9.5;
- SAR was reported above the COGCC cleanup level of less than 12 for soil sample SS8 (20.0);
- Arsenic was reported above the cleanup level for arsenic (0.39 mg/kg) for both soil samples (SS8 and SS9) collected from Pit 3. Analysis of site specific background soil samples reported similar concentration of arsenic;
- For the sample collected from sludge located within the pit, benzene was reported at 0.74 mg/kg and TPH was reported at 91,200 mg/kg. Both concentrations are above their respective COGCC cleanup levels; and
- The remaining analytes for the soil samples collected from Pit 3 were reported below their respective COGCC cleanup levels.

## 6.0 CONCLUSIONS

Arsenic was reported above the COGCC cleanup level for arsenic in all nine soil samples collected from the three produced water pits and all six site specific background samples. According to *Elements in North American Soils* (Dragun and Cheriki, 2005), arsenic concentrations in Colorado soil range from 1.3 mg/kg to 16 mg/kg with a deviation of 3 mg/kg. Based on these published arsenic values and site specific background sample results, the arsenic concentrations reported for samples collected from the pits at Terrace Gas Plant and the Kern 43-33 battery appear to be within the naturally-occurring Colorado arsenic concentration soil ranges.

Pit 1: The extent of impact appears to be limited to the area of test pit 5 / soil sample SS5 where the pH was reported above of the COGCC range of 6-9. Soil sample SS5 was collected at a depth of 2.0 fbgs from the interval with the highest PID reading. Staining was observed between 4.5 and 6.0 fbgs.

Pit 2: Field screening, field observations, and analytical results reported for SS6 and SS7 indicate soil is impacted between 7.0 fbgs and at minimum 9.5 fbgs. The backhoe excavation depth was limited to 10 fbgs due to an obstruction posed by the steel gate around the pit.



Hydrocarbon staining was still observed at 10 fbgs in test pit 7, thus the vertical extent of impact has not been determined for Pit 2. Benzene, total xylenes and GRO were reported above their respective COGCC cleanup levels for the sample collected from the liquid inside the tinhorn.

Pit 3: Based on analytical results and field observations, the vertical extent of impact appears to be limited to 2-3 fbgs. TPH (soil samples SS8 and SS9), pH and SAR (soil sample SS8) were reported above their respective COGCC cleanup levels in soil samples.

## **7.0 RECOMMENDATIONS**

Olsson recommends excavating soil from each of the three former produced water pits for disposal offsite at an approved regulated landfill or land farmed on site. The liquid in the tinhorn at Pit 2 and the sludge and water in Pit 3 should be removed for offsite disposal prior to excavation. Whiting may consider augmenting the soil at Pit 1 with manure or sawdust to lower the pH of the impacted soils if land farmed onsite.

## **8.0 REFERENCES**

Dragun and Cheriki, 2005, Elements in North American Soils, 2<sup>nd</sup> edition, pg.29, Amherst Scientific Publishers

COGCC Table 910-1 Rules 900 Series – Exploration and Production Waste Management

Crabb, James A., 1982, Soil Survey of Weld County northern part, United States Department of Agriculture, Soil Conservation Service and Forest Service, in cooperation with Colorado Agricultural Experiment Station

Dragun and Cheriki, 2005, Elements in North American Soils, 2<sup>nd</sup> edition, pg.29, Amherst Scientific Publishers

Scott, G.R., Map showing geology, structure, and oil and gas fields in the Sterling 1 degree x 2 degrees quadrangle, Colorado, Nebraska and Kansas (Sheet 1). Map I-1092. 1:250000. Miscellaneous Investigations Series. U.S. Geological Survey. 1978

## Tables

Terrace Gas Plant and  
Kern 43-33 Well and Battery  
Whiting Petroleum Corporation  
Samples collected May 17, 2012

<b>Table 1. Soil Sampling Depths and Observations.</b>			
Sample ID	Sampling Depth (ft)	PID Measurement (ppm)	Observations
<b>Terrace Gas Plant: Pit 1</b>			
SS1	1.0	58	No staining or odor observed
SS2	1.0	65	No staining or odor observed
SS3	1.0	3.2	No staining or odor observed
SS4	1.0	13.6	No staining or odor observed
SS5	2.0	1040	Staining between 4-5 fbgs. PID reading: 275ppm at 7.5 fbgs
<b>Terrace Gas Plant: Pit 2</b>			
SS6	7.0	120	No staining observed, very little hydrocarbon odor
SS7	9.5	2400	Staining observed, strong hydrocarbon odor at 10.0 fbgs <sup>1</sup>
<b>Kern 41-33 Battery: Pit 3</b>			
SS8	2.0	698	No staining observed, slight hydrocarbon odor
SS9	2.0	91	No staining observed, slight hydrocarbon odor

notes:

1- Due to the steel gate, 10 feet was the maxium equipment depth

ft- feet

ppm- parts per million

fbgs- feet below ground surface

Terrace Gas Plant  
Whiting Petroleum Corporation  
Samples collected May 17, 2012

<b>Table 2. Analytical Results for Pit 1: BTEX, TPH and PAHs.</b>							
<b>BTEX</b>							
Analyte	Units	COGCC CL	SS1	SS2	SS3	SS4	SS5
Benzene	mg/kg	<b>0.17</b>	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Toluene	"	<b>85</b>	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Ethylbenzene	"	<b>100</b>	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Xylenes (total)	"	<b>175</b>	< 0.0050	< 0.0050	< 0.0050	< 0.0050	2.0
<b>TPH</b>							
Analyte	Units	COGCC CL	SS1	SS2	SS3	SS4	SS5
GRO	mg/kg	<b>500</b>	< 0.50	< 0.50	< 0.50	< 0.50	38
DRO	"	<b>500</b>	< 50	< 50	< 50	< 50	58
TPH (GRO + DRO)	"	<b>500</b>	< 50	< 50	< 50	< 50	96
<b>PAHs</b>							
Analyte	Units	COGCC CL	SS1	SS2	SS3	SS4	SS5
Acenaphthene	mg/kg	<b>1000</b>	< 0.005	< 0.005	< 0.005	< 0.005	7.12
Acenaphthylene	"	<b>NA</b>	< 0.005	< 0.005	< 0.005	< 0.005	6.15
Anthracene	"	<b>1000</b>	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Benzo (a) anthracene	"	<b>0.22</b>	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Benzo (b) fluoranthene	"	<b>0.22</b>	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Benzo (k) fluoranthene	"	<b>2.2</b>	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Benzo (g,h,i) perylene	"	<b>NA</b>	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Benzo (a) pyrene	"	<b>0.022</b>	< 0.005	< 0.005	< 0.005	< 0.005	0.00898
Chrysene	"	<b>22</b>	< 0.005	< 0.005	< 0.005	< 0.005	9.08
Dibenz (a,h) anthracene	"	<b>0.022</b>	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Fluoranthene	"	<b>1000</b>	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Fluorene	"	<b>1000</b>	< 0.005	< 0.005	< 0.005	< 0.005	47.5
Indeno (1,2,3-cd) pyrene	"	<b>0.22</b>	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Naphthalene	"	<b>23</b>	< 0.005	< 0.005	< 0.005	< 0.005	0.0015
Phenanthrene	"	<b>NA</b>	< 0.005	< 0.005	< 0.005	< 0.005	61.1
Pyrene	"	<b>1000</b>	< 0.005	< 0.005	< 0.005	< 0.005	10.9

notes:

COGCC CL- Colorado Oil and Gas Conservation Commission Cleanup Level

SS1- Sample ID

mg/kg- milligrams per kilogram

NA- Not Applicable

NS- Not Sampled

< - analyte was not detected above reporting limit

" - same as above

BTEX- Benzene, Toluene, Ethylbenzene, Xylenes

GRO- Gasoline Range Organics

DRO- Diesel Range Organics

TPH- Total Petroleum Hydrocarbons

PAH- Polynuclear Aromatic Hydrocarbons

Terrace Gas Plant  
Whiting Petroleum Corporation  
Samples collected May 17, 2012

Table 3. Analytical Results for Pit 1: Metals and Physical Parameters									
Total Metals									
Analyte, Units and COGCC CL			Test Pit Samples					Background Samples	
Analyte	Units	COGCC CL	SS1	SS2	SS3	SS4	SS5	BS1	BS2
Arsenic	mg/kg	<b>0.39</b>	<b>3.27</b>	<b>2.54</b>	<b>2.94</b>	<b>2.46</b>	<b>2.47</b>	<b>2.47</b>	<b>2.13</b>
Barium	"	<b>15,000</b>	459	254	305	2.91	259	300	339
Cadmium	"	<b>70</b>	0.308	0.18	0.239	0.214	0.216	0.333	0.191
Total Chromium	"	<b>NA</b>	7.38	4.41	5.21	4.87	4.86	5.82	5.45
Chromium, Trivalent	"	<b>120,000</b>	6.38	3.14	4.21	3.87	2.47	< 10.0	< 10.0
Chromium, Hexavalent	"	<b>23</b>	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 10.0	< 10.0
Copper	"	<b>3100</b>	9.72	4.62	6.25	6.39	6.11	7.36	6.12
Lead	"	<b>400</b>	10.9	22.9	12.1	11.5	10.5	10.9	7.39
Nickel	"	<b>1600</b>	7.58	4.18	5.35	4.64	4.86	5.73	5.28
Selenium	"	<b>390</b>	0.196	0.155	0.197	0.138	0.13	0.258	0.21
Silver	"	<b>390</b>	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100
Zinc	"	<b>23,000</b>	46.6	21.3	25.7	23.4	28.3	32.1	27.8
Mercury	"	<b>23</b>	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.0500
Physical Parameters									
Analyte	Units	COGCC CL	SS1	SS2	SS3	SS4	SS5	BS1	BS2
EC	mmhos /cm	<b>&lt; 4</b>	0.611	0.375	0.44	0.332	1.12	0.442	0.325
pH	pH Units	<b>6-9</b>	8.7	8.8	8.7	8.7	<b>9.4</b>	8.2	8.5
Soluble Nutrients									
Analyte	Units	COGCC CL	SS1	SS2	SS3	SS4	SS5	BS1	BS2
Calcium	mg/kg	<b>NA</b>	1520	809	1840	740	638	349	630
Magnesium	"	<b>NA</b>	96.8	53.1	90.0	61.7	35.9	36.5	30.4
Sodium	"	<b>NA</b>	374	68.1	101	37.3	923	18.4	12.1
SAR	Units	<b>&lt; 12</b>	2.51	0.63	0.62	0.35	9.63	0.25	0.13

notes:

COGCC CL- Colorado Oil and Gas Conservation  
Commission Cleanup Level

SS1- Sample ID

mg/kg- milligrams per kilogram

NA- Not Applicable

NS- Not Sampled

< - analyte was not detected above reporting limit

" - same as above

**8.98** - reported concentration above COGCC Cleanup Level

EC- Specific Conductance / Electrical Conductivity

SAR- Sodium Absorption Ratio

mmhos/cm- millimhos per centimeter

\*based on published arsenic values for Colorado soils and site specific background sample results, the arsenic concentrations appear to be naturally occurring. Therefore, cleanup based on arsenic concentrations is not required

Terrace Gas Plant  
Whiting Petroleum Corporation  
Samples collected May 17, 2012

<b>Table 4. Analytical Results for Pit 2: BTEX, TPH and PAHs.</b>					
<b>BTEX</b>					
Analyte	Units	COGCC CL	SS6	SS7	tinhorn liquid
Benzene	mg/kg	<b>0.17</b>	< 0.0050	<b>5.9</b>	<b>11</b>
Toluene	"	<b>85</b>	< 0.0050	0.092	<b>87</b>
Ethylbenzene	"	<b>100</b>	< 0.0050	34	<b>140</b>
Xylenes (total)	"	<b>175</b>	< 0.0050	<b>260</b>	<b>670.0</b>
<b>TPH</b>					
Analyte	Units	COGCC CL	SS6	SS7	tinhorn
GRO	mg/kg	<b>500</b>	51	<b>7800</b>	<b>110,000</b>
DRO	"	<b>500</b>	<b>1800</b>	<b>2800</b>	NS
TPH (GRO + DRO)	"	<b>500</b>	<b>1851</b>	<b>106,000</b>	<b>≥ 110,000</b>
<b>PAHs</b>					
Analyte	Units	COGCC CL	SS6	SS7	tinhorn
Acenaphthene	mg/kg	<b>1000</b>	0.00549	0.0346	NS
Acenaphthylene	"	<b>NA</b>	0.00921	0.0	NS
Anthracene	"	<b>1000</b>	0.0283	< 0.005	NS
Benzo (a) anthracene	"	<b>0.22</b>	< 0.005	0.0291	NS
Benzo (b) fluoranthene	"	<b>0.22</b>	< 0.005	0.0279	NS
Benzo (k) fluoranthene	"	<b>2.2</b>	< 0.005	< 0.005	NS
Benzo (g,h,i) perylene	"	<b>NA</b>	< 0.005	< 0.005	NS
Benzo (a) pyrene	"	<b>0.022</b>	< 0.005	<b>0.028</b>	NS
Chrysene	"	<b>22</b>	0.0682	0.028	NS
Dibenz (a,h) anthracene	"	<b>0.022</b>	< 0.010	< 0.010	NS
Fluoranthene	"	<b>1000</b>	< 0.005	< 0.005	NS
Fluorene	"	<b>1000</b>	0.00925	0.276	NS
Indeno (1,2,3-cd) pyrene	"	<b>0.22</b>	< 0.010	< 0.010	NS
Naphthalene	"	<b>23</b>	< 0.005	3.43	NS
Phenanthrene	"	<b>NA</b>	0.0243	0.315	NS
Pyrene	"	<b>1000</b>	0.0456	0.0422	NS

notes:

COGCC CL- Colorado Oil and Gas Conservation Commission Cleanup Level

SS1- Sample ID

mg/kg- milligrams per kilogram

NA- Not Applicable

NS- Not Sampled

< - analyte was not detected above reporting limit

" - same as above

**8.98** - reported concentration above COGCC Cleanup Level

BTEX- Benzene, Toluene, Ethylbenzene, Xylenes

GRO- Gasoline Range Organics

DRO- Diesel Range Organics

TPH- Total Petroleum Hydrocarbons

PAH- Polynuclear Aromatic Hydrocarbons

Terrace Gas Plant  
Whiting Petroleum Corporation  
Samples collected May 17, 2012

<b>Table 5. Analytical Results for Pit 2: Metals and Physical Parameters.</b>						
<b>Total Metals</b>						
<b>Analyte, Units and COGCC CL</b>			<b>Test Pit Samples</b>		<b>Background Samples</b>	
<b>Analyte</b>	<b>Units</b>	<b>COGCC CL</b>	<b>SS6</b>	<b>SS7</b>	<b>BS3</b>	<b>BS4</b>
Arsenic	mg/kg	<b>0.39</b>	<b>1.79</b>	<b>1.68</b>	<b>1.91</b>	<b>2.00</b>
Barium	"	<b>15,000</b>	254	219	304	289
Cadmium	"	<b>70</b>	0.136	0.168	0.197	0.213
Total Chromium	"	<b>NA</b>	4.84	5.42	4.85	4.91
Chromium, Trivalent	"	<b>120,000</b>	3.84	4.42	< 10.0	< 10.0
Chromium, Hexavalent	"	<b>23</b>	< 1.0	< 1.0	< 10.0	< 10.0
Copper	"	<b>3100</b>	5.13	6.68	5.41	5.57
Lead	"	<b>400</b>	6.91	8.0	7.31	8.29
Nickel	"	<b>1600</b>	4.41	5.0	4.66	4.65
Selenium	"	<b>390</b>	0.122	< 0.100	0.182	0.206
Silver	"	<b>390</b>	< 0.100	< 0.100	< 0.100	< 0.100
Zinc	"	<b>23,000</b>	23.0	26.5	22.8	24.0
Mercury	"	<b>23</b>	< 0.0500	< 0.0500	< 0.0500	< 0.0500
<b>Physical Parameters</b>						
<b>Analyte</b>	<b>Units</b>	<b>COGCC CL</b>	<b>SS6</b>	<b>SS7</b>	<b>BS3</b>	<b>BS4</b>
EC	mmhos/cm	<b>&lt; 4</b>	1.07	0.865	0.322	0.345
pH	pH Units	<b>6-9</b>	8.0	8.4	8.4	8.4
<b>Soluble Nutrients</b>						
<b>Analyte</b>	<b>Units</b>	<b>COGCC CL</b>	<b>SS6</b>	<b>SS7</b>	<b>BS3</b>	<b>BS4</b>
Calcium	mg/kg	<b>NA</b>	< 2.50	522	488	359
Magnesium	"	<b>NA</b>	< 1.00	27.5	26.7	19.5
Sodium	"	<b>NA</b>	< 5.00	29.2	6.92	5.72
SAR	Units	<b>&lt; 12</b>	0	0.34	0.0800	0.0800

notes:

COGCC CL- Colorado Oil and Gas  
Conservation Commission Maximum  
Cleanup Level

SS1- Sample ID

mg/kg- milligrams per kilogram

NA- Not Applicable

NS- Not Sampled

< - analyte was not detected  
above reporting limit

" - same as above

**8.98** - reported concentration  
above cleanup level

EC- Specific Conductance / Electrical  
Conductivity

SAR- Sodium Absorption Ratio

mmhos/cm- millimhos per centimeter

\*based on published arsenic values for  
Colorado soils and site specific background  
sample results, the arsenic concentrations  
appear to be naturally occurring. Therefore,  
cleanup based on arsenic concentrations is not  
required

Kern 43-33 Well and Battery  
Whiting Petroleum Corporation  
Samples collected May 17, 2012

<b>Table 6. Analytical Results for Pit 3: BTEX, TPH and PAHs.</b>					
<b>BTEX</b>					
Analyte	Units	COGCC CL	SS8	SS9	Sludge
Benzene	mg/kg	<b>0.17</b>	< 0.0050	< 0.0050	<b>0.74</b>
Toluene	"	<b>85</b>	< 0.0050	< 0.0050	0.73
Ethylbenzene	"	<b>100</b>	< 0.0050	< 0.0050	2.5
Xylenes (total)	"	<b>175</b>	0.063	< 0.0050	19
<b>TPH</b>					
Analyte	Units	COGCC CL	SS8	SS9	Sludge
GRO	"	<b>500</b>	490	<b>1400</b>	<b>3,200</b>
DRO	mg/kg	<b>500</b>	<b>9400</b>	<b>5100</b>	<b>73,000</b>
ORO	"	<b>500</b>	NS	NS	<b>15,000</b>
TPH (GRO+DRO+ORO)	"	<b>500</b>	<b>9890</b>	<b>6,500</b>	<b>91,200</b>
<b>PAHs</b>					
Analyte	Units	COGCC CL	SS8	SS9	Sludge
Acenaphthene	mg/kg	<b>1000</b>	0.0366	0.0086	NS
Acenaphthylene	"	<b>NA</b>	0.194	< 0.005	NS
Anthracene	"	<b>1000</b>	0.275	0.0167	NS
Benzo (a) anthracene	"	<b>0.22</b>	0.0807	0.0293	NS
Benzo (b) flouranthene	"	<b>0.22</b>	< 0.005	0.0119	NS
Benzo (k) fluoranthene	"	<b>2.2</b>	< 0.005	0.0156	NS
Benzo (g,h,i) perylene	"	<b>NA</b>	< 0.005	< 0.005	NS
Benzo (a) pyrene	"	<b>0.022</b>	0.00541	< 0.005	NS
Chrysene	"	<b>22</b>	0.344	0.3	NS
Dibenz (a,h) anthracene	"	<b>0.022</b>	< 0.010	< 0.010	NS
Fluoranthene	"	<b>1000</b>	0.0439	0.0192	NS
Fluorene	"	<b>1000</b>	1.01	0.0156	NS
Indeno (1,2,3-cd) pyrene	"	<b>0.22</b>	< 0.010	< 0.010	NS
Naphthalene	"	<b>23</b>	1.59	0.00674	NS
Phenanthrene	"	<b>NA</b>	4.03	0.0273	NS
Pyrene	"	<b>1000</b>	0.78	0.366	NS

notes:

COGCC CL- Colorado Oil and Gas Conservation Commission Cleanup Level

SS1- Sample ID

mg/kg- milligrams per kilogram

NA- Not Applicable

NS- Not Sampled

< - analyte was not detected above reporting limit

" - same as above

**8.98** - reported concentration above maximum cleanup level

BTEX- Benzene, Toluene, Ethylbenzene, Xylenes

GRO- Gasoline Range Organics

DRO- Diesel Range Organics

TPH- Total Petroleum Hydrocarbons

PAH- Polynuclear Aromatic Hydrocarbons



Kern 43-33 Well and Battery  
Whiting Petroleum Corporation  
Samples collected May 17, 2012

Table 7. Analytical Results for Pit 3: Metals and Physical Parameters						
Total Metals						
Analyte, Units and COGCC CL			Test Pit Samples		Background Samples	
Analyte	Units	COGCC CL	SS8	SS9	BS5	BS6
Arsenic	mg/kg	<b>0.39</b>	<b>1.28</b>	<b>0.591</b>	<b>2.03</b>	<b>1.99</b>
Barium	"	<b>15,000</b>	107	109	101	85.0
Cadmium	"	<b>70</b>	< 0.0892	< 0.0895	0.131	0.116
Total Chromium	"	<b>NA</b>	3.42	3.57	6.23	6.15
Chromium, Trivalent	"	<b>120,000</b>	2.42	2.57	< 10.0	< 10.0
Chromium, Hexavalent	"	<b>23</b>	< 1.0	< 1.0	< 10.0	< 10.0
Copper	"	<b>3100</b>	2.30	2.10	4.31	4.00
Lead	"	<b>400</b>	2.76	2.58	6.38	6.14
Nickel	"	<b>1600</b>	2.80	2.78	5.36	5.33
Selenium	"	<b>390</b>	< 0.0892	< 0.0895	0.155	0.153
Silver	"	<b>390</b>	< 0.0892	< 0.0895	< 0.0882	< 0.0886
Zinc	"	<b>23,000</b>	65.2	13.0	20.1	20.1
Mercury	"	<b>23</b>	< 0.0500	< 0.0500	< 0.0500	< 0.0500
Physical Parameters						
Analyte	Units	COGCC CL	SS8	SS9	BS5	BS6
SC	mmhos /cm	<b>&lt; 4</b>	1.44	0.324	0.252	0.0718
pH	pH Units	<b>6-9</b>	<b>9.5</b>	8.1	8.4	7.2
Soluble Nutrients						
Analyte	Units	COGCC CL	SS8	SS9	BS5	BS6
Calcium	mg/kg	<b>NA</b>	106	3.86	143	11.9
Magnesium	mg/kg	<b>NA</b>	14.7	6.47	16.8	8.44
Sodium	"	<b>NA</b>	828	116	< 5.0	< 5.0
SAR	Units	<b>&lt; 12</b>	<b>20.0</b>	8.38	0.0700	0.1900

notes:

COGCC CL- Colorado Oil and Gas  
Conservation Commission Maximum  
Cleanup Level

SS1- Sample ID

mg/kg- milligrams per kilogram

NA- Not Applicable

NS- Not Sampled

< - analyte was not detected  
above reporting limit

" - same as above

**8.98** - reported concentration above cleanup  
level

EC- Specific Conductance / Electrical Conductivity

SAR- Sodium Absorption Ratio

mmhos/cm- millimhos per centimeter

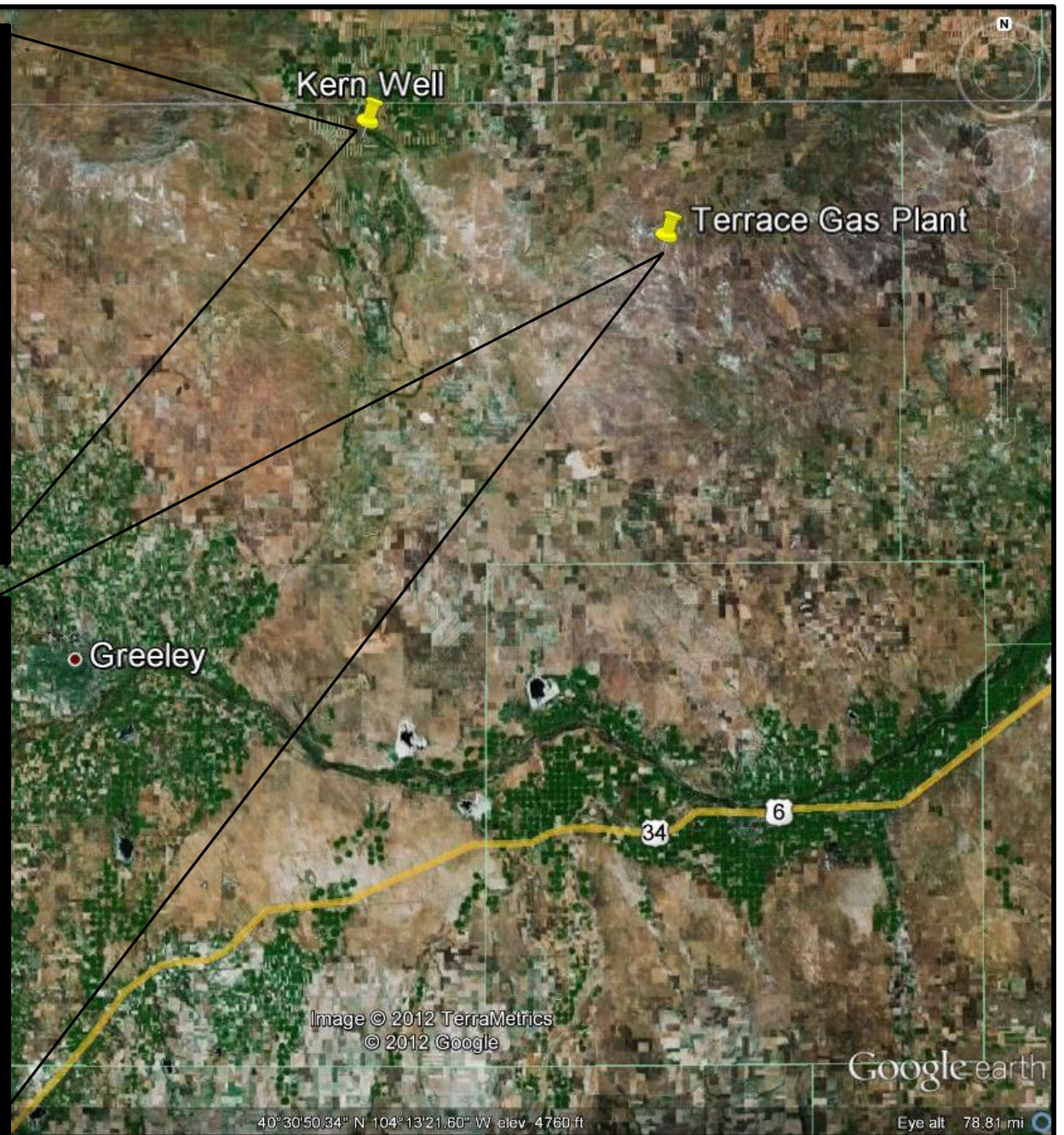
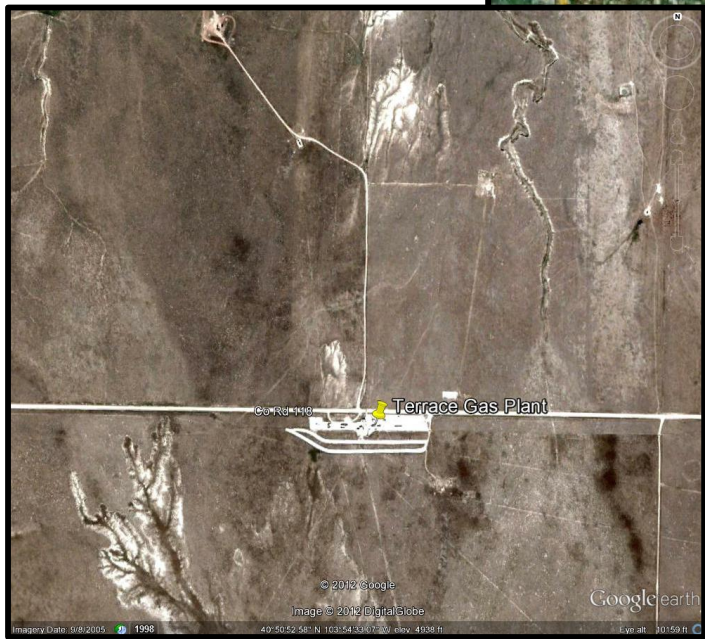
\*based on published arsenic values for Colorado  
soils and site specific background sample results,  
the arsenic concentrations appear to be naturally  
occurring. Therefore, cleanup based on arsenic  
concentrations is not required

**TABLE 8: Groundwater wells in the vicinity of Terrace Gas Plant and the Kern 43-33 Battery**

<b>Permit #</b>	<b>Static Water Level (feet)</b>	<b>Use</b>	<b>Approx. Distance from Site (miles)</b>	<b>Completion Date</b>	<b>Location</b>
<b>Terrace Gas Plant</b>					
169917	104	Domestic / Livestock	<0.5	7/2/1993	NE NE, Sec. 18 Twp. 10N Range 58W
11401	80	Livestock	2.7	11/1/1957	NW SE Sec. 10 Twp. 10N Range 58W
11399	90	Livestock	2.9	10/1/1958	SE SE Sec. 21 Twp. 10N Range 58W
<b>Kern 43-33 Battery</b>					
6944-R	40	Irrigation	0.6	4/25/1905	NE NE Sec. 34 Twp. 12N Range 62W
84241A	57	Livestock	0.7	6/13/1976	NE NW Sec. 3 Twp. 11N Range 62W
157438	137	Commercial	1.3	11/22/1989	NW SW Sec. 4 Twp. 11N Range 62W

## Figures





PROJECT  
NO: 012-0790

DRAWN BY: BB

DATE: 6-14-12

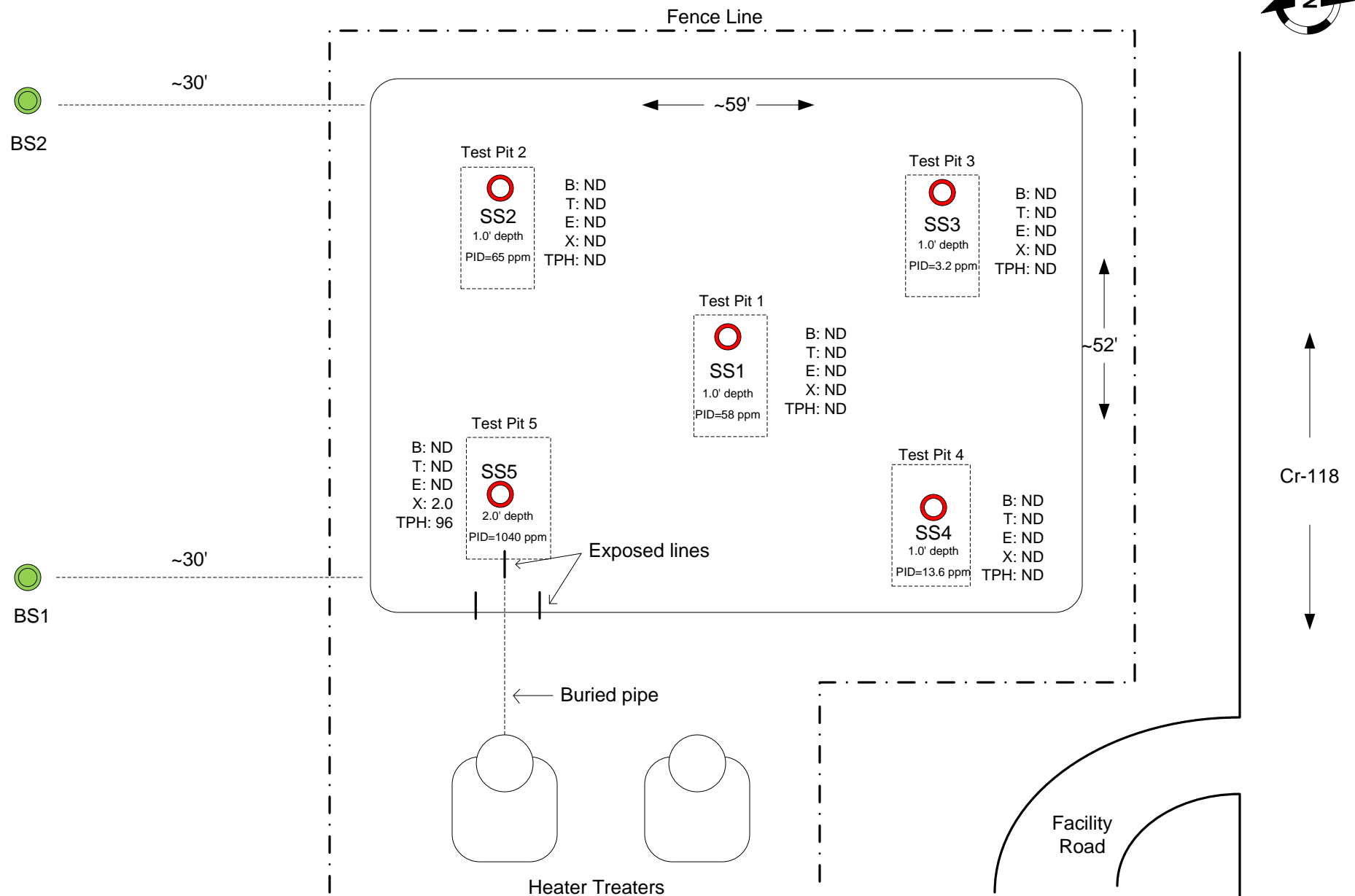
General Location Map of  
Terrace Gas Plant and Kern 43-33 Well  
Whiting Petroleum Corporation

**OLSSON**  
ASSOCIATES

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

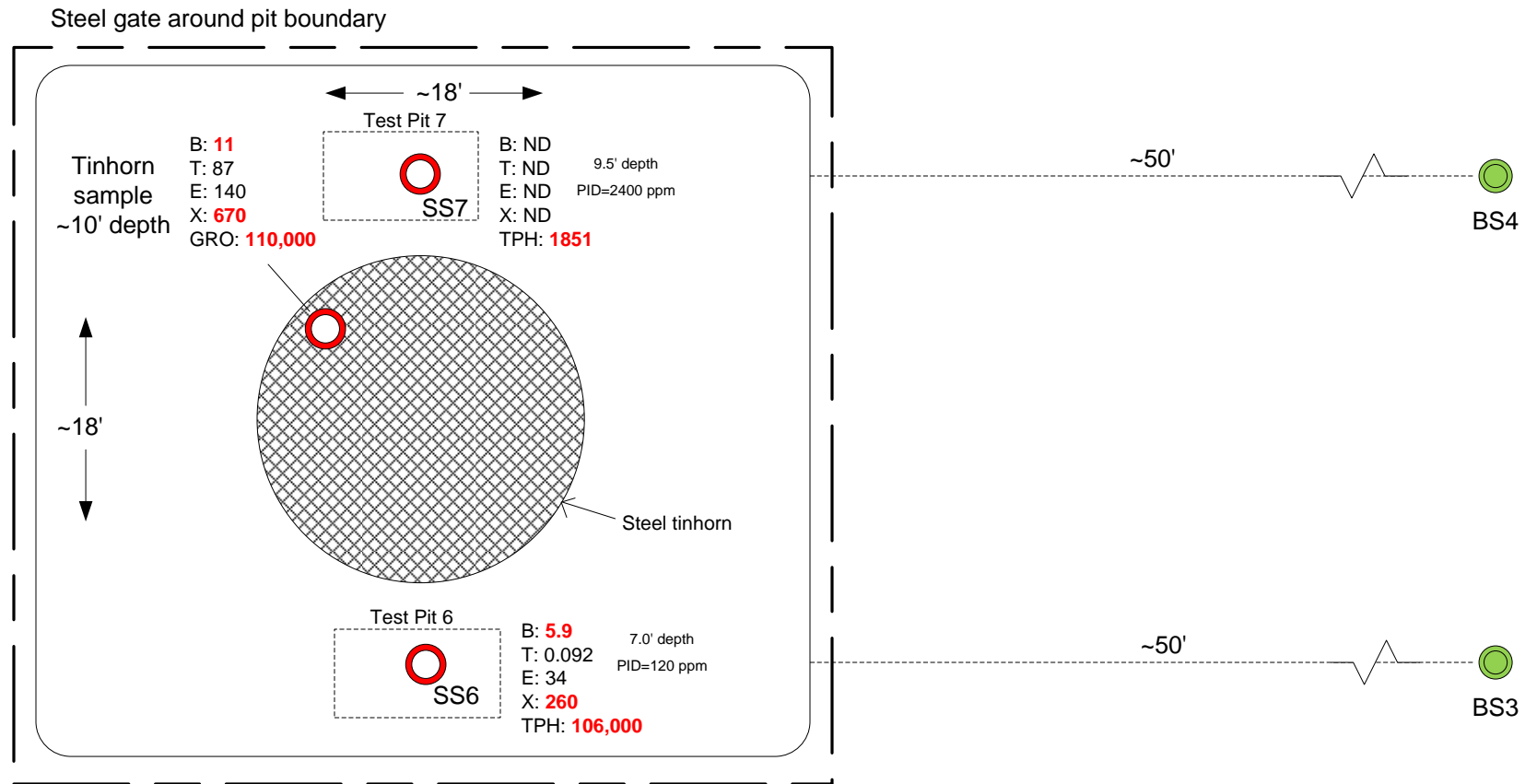
FIGURE 1





PROJECT NO: 012-0790	Sampling Locations for Pit 1 Terrace Gas Plant Whiting Petroleum Corporation	 4690 TABLE MOUNTAIN DRIVE, SUITE 200 GOLDEN, CO 80403 TEL 303.237.2072 FAX 303.237.2659	LEGEND		FIGURE 2
DRAWN BY: BB			 Approx. Soil sampling location	B: Benzene T: Toluene E: Ethylbenzene X: Total xylenes TPH: Total Petroleum Hydrocarbons ND: Non-detect	
DATE: 6-14-12			 Approx. Background soil sampling location	*Analytical values are reported in mg/kg	

← CR-118 →



PROJECT NO: 012-0790

DRAWN BY: BB

DATE: 6-14-12

Soil and Tinhorn Sampling Locations for Pit 2  
Terrace Gas Plant  
Whiting Petroleum Corporation



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

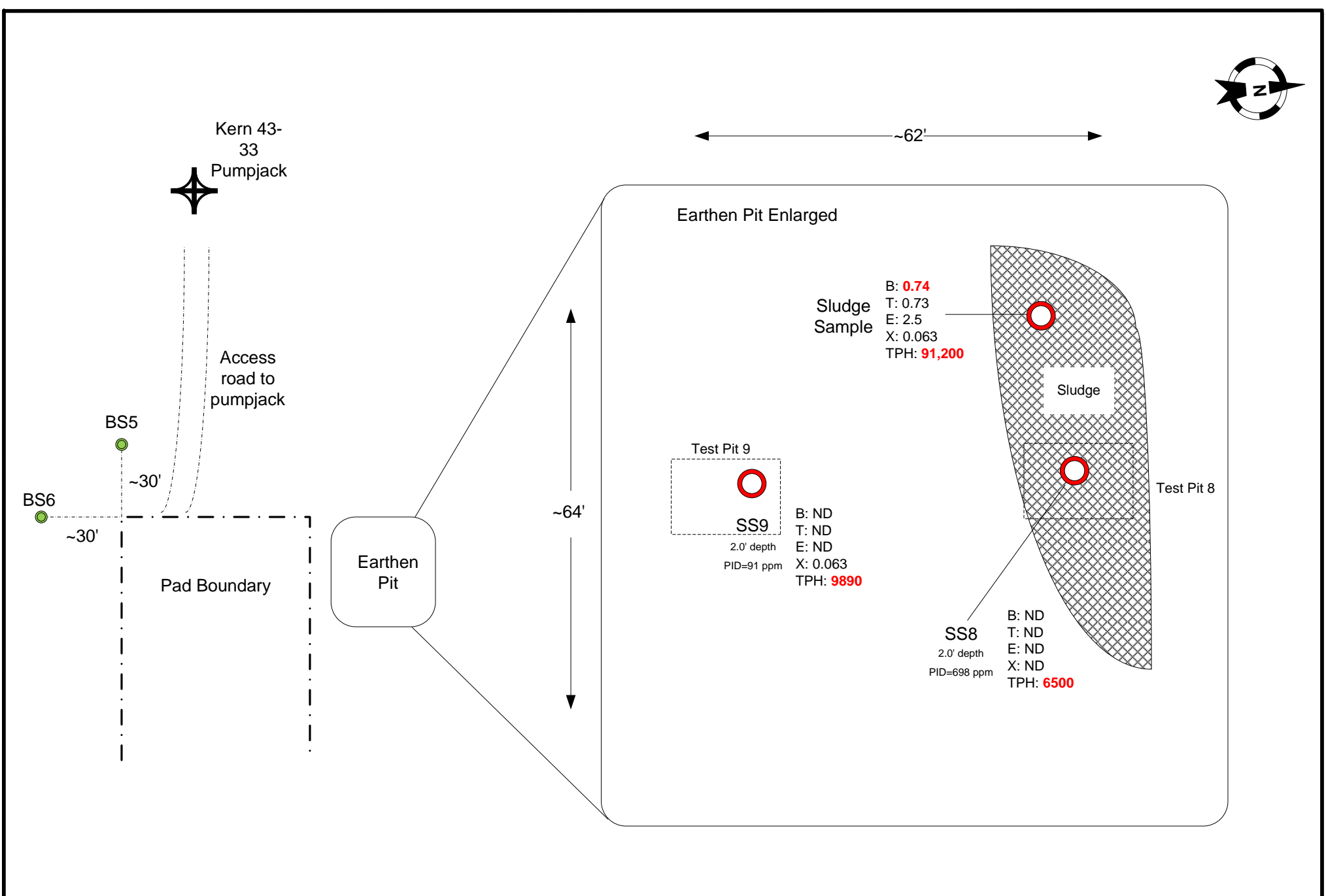
LEGEND

- Soil sampling location
- Background soil sampling location

\*Analytical values are reported in mg/kg

B: Benzene  
T: Toluene  
E: Ethylbenzene  
X: Total xylenes  
TPH: Total Petroleum Hydrocarbons  
ND: Non-detect  
**5.9**: Above COGCC cleanup level

FIGURE 3



PROJECT NO: 012-0790	Soil Sampling Locations for Pit 3 Kern 43-33 Battery Whiting Petroleum Corporation	 4690 TABLE MOUNTAIN DRIVE, SUITE 200 GOLDEN, CO 80403 TEL 303.237.2072 FAX 303.237.2659	LEGEND <div> <span style="color: red;">●</span> Soil sampling location           <span style="margin-left: 20px;">B: Benzene</span> </div> <div> <span style="color: green;">●</span> Background soil sampling location           <span style="margin-left: 20px;">T: Toluene</span> </div> <div> <span style="color: blue;">●</span> <span style="margin-left: 20px;">E: Ethylbenzene</span> </div> <div> <span style="color: magenta;">●</span> <span style="margin-left: 20px;">X: Total xylenes</span> </div> <div> <span style="color: cyan;">●</span> <span style="margin-left: 20px;">TPH: Total Petroleum Hydrocarbons</span> </div> <div> <span style="color: black;">●</span> <span style="margin-left: 20px;">ND: Non-detect</span> </div> <div> <span style="color: red;">●</span> <span style="margin-left: 20px;">5.9: Above COGCC cleanup level</span> </div>		FIGURE 4
DRAWN BY: BB					
DATE: 6-14-12					

## **Appendix A**

### **Analytical Reports**



# Summit Scientific

---

741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

June 13, 2012

James Hix

Olsson Associates

4690 Table Mountain Drive, Suite 200

Golden, CO 80403

RE: Whiting Pit Closures-Pit 1/Terrace Plant

Enclosed are the results of analyses for samples received by Summit Scientific on 05/18/12 09:30. 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' or 'Shrewsbury', written in a cursive style.

Ben Shrewsbury

President / Laboratory Director



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

**Reported:**  
06/13/12 10:42

### ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SS1	R205130-01	Soil	05/17/12 09:42	05/18/12 09:30
SS2	R205130-02	Soil	05/17/12 10:13	05/18/12 09:30
SS3	R205130-03	Soil	05/17/12 10:41	05/18/12 09:30
SS4	R205130-04	Soil	05/17/12 11:15	05/18/12 09:30
SS5	R205130-05	Soil	05/17/12 12:00	05/18/12 09:30
BS1	R205130-06	Soil	05/17/12 12:15	05/18/12 09:30
BS2	R205130-07	Soil	05/17/12 12:20	05/18/12 09:30

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant

Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

R205130

Summit Scientific

S<sub>2</sub>

741 Corporate Circle Suite 1 • Golden, Colorado 80401  
303-277-9310 • 303-277-9331 Fax

Page 1 of 1

Client: Olsson Associates  
Address: 4690 Table Mountain Drive, Suite 200  
City/State/Zip: Golden, CO 80403  
Phone: 303-277-2072  
Fax: 303-277-2659  
Project Name: Whiting pit closures - Pit 1 / Terrace plant  
Project Number:  
Project Manager: James Hix  
E-Mail:  
City/State/Zip: Golden, CO 80403  
Phone: 303-277-2072  
Fax: 303-277-2659  
Project Name: Whiting pit closures - Pit 1 / Terrace plant  
Project Number:  
Project Manager: James Hix  
E-Mail:

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)			
SS1	5/17	9:42	3											
SS2	5/17	10:13	3											
SS3	5/17	10:41	3											
SS4	5/17	11:15	3											
SS5	5/17	12:00	3											
B51	5/17	12:15	2											
B52	5/17	12:20	2											
Requisitioned by: [Signature] Date Time: 5-17-12 9:31														Notes:
Requisitioned by: [Signature] Date Time: 5-17-12														
Requisitioned by: [Signature] Date Time: 5-17-12 4:40														

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**SS1**  
**R205130-01 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **05/17/12 09:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	2051809	05/18/12	05/19/12	8015 Full Carbon Chain	

Date Sampled: **05/17/12 09:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: <i>o</i> -Terphenyl		104 %	80-124		"	"	"	"	

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

Date Sampled: **05/17/12 09:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0050	mg/kg	1	2051808	05/18/12	05/19/12	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: **05/17/12 09:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		112 %	67.4-143		"	"	"	"	
Surrogate: Toluene-d8		95.8 %	77.3-114		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		103 %	78.4-125		"	"	"	"	

**Semivolatile Organic Compounds by EPA Method 8270D SIM**

Date Sampled: **05/17/12 09:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Nitrobenzene-d5	10.0		ug/kg	1	2052109	05/21/12	05/25/12	EPA 8270D SIM	

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant

Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**SS1**  
**R205130-01 (Soil)**

**Summit Scientific**

**Semivolatile Organic Compounds by EPA Method 8270D SIM**

Terphenyl-d14	9.86	ug/kg	1	2052109	05/21/12	05/25/12	EPA 8270D SIM	
2-Fluorobiphenyl	5.03	"	"	"	"	"	"	S-GC
2,4,6-Tribromophenol	20.0	"	"	"	"	"	"	
Acenaphthene	ND	5.00	"	"	"	"	"	
Acenaphthylene	ND	5.00	"	"	"	"	"	
Anthracene	ND	5.00	"	"	"	"	"	
Benzo (a) anthracene	ND	5.00	"	"	"	"	"	
Benzo (b) fluoranthene	ND	5.00	"	"	"	"	"	
Benzo (k) fluoranthene	ND	5.00	"	"	"	"	"	
Benzo (g,h,i) perylene	ND	5.00	"	"	"	"	"	
Benzo (a) pyrene	ND	5.00	"	"	"	"	"	
Chrysene	ND	5.00	"	"	"	"	"	
Dibenz (a,h) anthracene	ND	10.0	"	"	"	"	"	
Fluoranthene	ND	5.00	"	"	"	"	"	
Fluorene	ND	5.00	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	10.0	"	"	"	"	"	
Naphthalene	ND	5.00	"	"	"	"	"	
Phenanthrene	ND	5.00	"	"	"	"	"	
Pyrene	ND	5.00	"	"	"	"	"	

**Calculated Analytes**

Date Sampled: **05/17/12 09:42**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Chromium+3 Calculated	6.38	1.00	mg/kg	1	2052310	05/23/12	05/23/12	Calculation	

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

Date Sampled: **05/17/12 09:42**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Arsenic	3.27	0.100	mg/kg	1	2051803	05/18/12	05/22/12	EPA 6020A	
Barium	459	0.100	"	"	"	"	"	"	
Cadmium	0.308	0.100	"	"	"	"	"	"	
Chromium	7.38	0.100	"	"	"	"	"	"	
Copper	9.72	0.500	"	"	"	"	"	"	

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant

Project Number: [none]  
Project Manager: James Hix

**Reported:**  
06/13/12 10:42

**SS1**  
**R205130-01 (Soil)**

**Summit Scientific**

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

<b>Lead</b>	<b>10.9</b>	0.100	mg/kg	1	2051803	05/18/12	05/22/12	EPA 6020A
<b>Nickel</b>	<b>7.58</b>	0.200	"	"	"	"	05/24/12	"
<b>Selenium</b>	<b>0.196</b>	0.100	"	"	"	"	05/22/12	"
Silver	ND	0.100	"	"	"	"	"	"
<b>Zinc</b>	<b>46.6</b>	5.00	"	"	"	"	05/24/12	"

**Total Mercury by EPA Method 7471/7470**

Date Sampled: **05/17/12 09:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Mercury	ND	0.0500	mg/kg	1	2051804	05/18/12	05/22/12	EPA 7471B	

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

Date Sampled: **05/17/12 09:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Specific Conductance (EC)</b>	<b>0.611</b>	0.00100	mmhos/cm	1	2052307	05/23/12	05/24/12	SM 2510B	

Date Sampled: **05/17/12 09:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>pH</b>	<b>8.7</b>		pH Units	"	2052306	05/23/12	05/24/12	EPA 9045B	

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

Date Sampled: **05/17/12 09:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Calcium</b>	<b>1520</b>	2.50	mg/kg	1	2051801	05/18/12	05/21/12	EPA 6020/USDA60 6(2, 3A)	
<b>Magnesium</b>	<b>96.8</b>	1.00	"	"	"	"	"	"	
<b>Sodium</b>	<b>374</b>	5.00	"	"	"	"	"	"	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

**Reported:**  
06/13/12 10:42

**SS1**  
**R205130-01 (Soil)**

**Summit Scientific**

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

Date Sampled: **05/17/12 09:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	2.51		units	1	2052308	05/23/12	05/23/12	EPA 6020/USDA6 0 6(2, 3A)	

**Accutest Laboratories - 6010 Hexavalent Chromium, Soil (3060A Mod Digest)**

Date Sampled: **05/17/12 09:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	1	mg/kg	1	2052310	05/23/12	05/23/12	3060A/7196 A	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**SS2**  
**R205130-02 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **05/17/12 10:13**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	2051809	05/18/12	05/19/12	8015 Full Carbon Chain	

Date Sampled: **05/17/12 10:13**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: <i>o</i> -Terphenyl		101 %	80-124		"	"	"	"	

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

Date Sampled: **05/17/12 10:13**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0050	mg/kg	1	2051808	05/18/12	05/19/12	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: **05/17/12 10:13**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		112 %	67.4-143		"	"	"	"	
Surrogate: Toluene-d8		98.8 %	77.3-114		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		100 %	78.4-125		"	"	"	"	

**Semivolatile Organic Compounds by EPA Method 8270D SIM**

Date Sampled: **05/17/12 10:13**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
2-Fluorobiphenyl	5.73		ug/kg	1	2052109	05/21/12	05/25/12	EPA 8270D SIM	

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.





Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant

Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**SS2**  
**R205130-02 (Soil)**

**Summit Scientific**

**Semivolatile Organic Compounds by EPA Method 8270D SIM**

<b>2,4,6-Tribromophenol</b>	<b>15.6</b>		ug/kg	1	2052109	05/21/12	05/25/12	EPA 8270D SIM
<b>Nitrobenzene-d5</b>	<b>5.02</b>		"	"	"	"	"	"
<b>Terphenyl-dl4</b>	<b>7.31</b>		"	"	"	"	"	"
Acenaphthene	ND	5.00	"	"	"	"	"	"
Acenaphthylene	ND	5.00	"	"	"	"	"	"
Anthracene	ND	5.00	"	"	"	"	"	"
Benzo (a) anthracene	ND	5.00	"	"	"	"	"	"
Benzo (b) fluoranthene	ND	5.00	"	"	"	"	"	"
Benzo (k) fluoranthene	ND	5.00	"	"	"	"	"	"
Benzo (g,h,i) perylene	ND	5.00	"	"	"	"	"	"
Benzo (a) pyrene	ND	5.00	"	"	"	"	"	"
Chrysene	ND	5.00	"	"	"	"	"	"
Dibenz (a,h) anthracene	ND	10.0	"	"	"	"	"	"
Fluoranthene	ND	5.00	"	"	"	"	"	"
Fluorene	ND	5.00	"	"	"	"	"	"
Indeno (1,2,3-cd) pyrene	ND	10.0	"	"	"	"	"	"
Naphthalene	ND	5.00	"	"	"	"	"	"
Phenanthrene	ND	5.00	"	"	"	"	"	"
Pyrene	ND	5.00	"	"	"	"	"	"

**Calculated Analytes**

Date Sampled: **05/17/12 10:13**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
<b>Chromium+3 Calculated</b>	<b>3.41</b>	1.00	mg/kg	1	2052310	05/23/12	05/23/12	Calculation	

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

Date Sampled: **05/17/12 10:13**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
<b>Arsenic</b>	<b>2.54</b>	0.100	mg/kg	1	2051803	05/18/12	05/22/12	EPA 6020A	
<b>Barium</b>	<b>254</b>	0.100	"	"	"	"	"	"	
<b>Cadmium</b>	<b>0.180</b>	0.100	"	"	"	"	"	"	
<b>Chromium</b>	<b>4.41</b>	0.100	"	"	"	"	"	"	
<b>Copper</b>	<b>4.62</b>	0.500	"	"	"	"	"	"	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**SS2**  
**R205130-02 (Soil)**

**Summit Scientific**

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

Analyte	Result	Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Lead	22.9	0.100	mg/kg	1	2051803	05/18/12	05/22/12	EPA 6020A	
Nickel	4.18	0.200	"	"	"	"	"	"	
Selenium	0.155	0.100	"	"	"	"	"	"	
Silver	ND	0.100	"	"	"	"	"	"	
Zinc	21.3	5.00	"	"	"	"	"	"	

**Total Mercury by EPA Method 7471/7470**

Date Sampled: **05/17/12 10:13**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Mercury	ND	0.0500	mg/kg	1	2051804	05/18/12	05/22/12	EPA 7471B	

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

Date Sampled: **05/17/12 10:13**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	0.375	0.00100	mmhos/cm	1	2052307	05/23/12	05/24/12	SM 2510B	

Date Sampled: **05/17/12 10:13**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	8.8		pH Units	"	2052306	05/23/12	05/24/12	EPA 9045B	

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

Date Sampled: **05/17/12 10:13**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	809	2.50	mg/kg	1	2051801	05/18/12	05/21/12	EPA 6020/USDA60 6(2, 3A)	
Magnesium	53.1	1.00	"	"	"	"	"	"	
Sodium	68.1	5.00	"	"	"	"	"	"	

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**SS2**  
**R205130-02 (Soil)**

**Summit Scientific**

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

Date Sampled: **05/17/12 10:13**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	0.630		units	1	2052308	05/23/12	05/23/12	EPA 6020/USDA6 0 6(2, 3A)	

**Accutest Laboratories - 6010 Hexavalent Chromium, Soil (3060A Mod Digest)**

Date Sampled: **05/17/12 10:13**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	1	mg/kg	1	2052310	05/23/12	05/23/12	3060A/7196 A	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**SS3**  
**R205130-03 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **05/17/12 10:41**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	2051809	05/18/12	05/19/12	8015 Full Carbon Chain	

Date Sampled: **05/17/12 10:41**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: <i>o</i> -Terphenyl		97.6 %	80-124		"	"	"	"	

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

Date Sampled: **05/17/12 10:41**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0050	mg/kg	1	2051808	05/18/12	05/19/12	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: **05/17/12 10:41**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		114 %	67.4-143		"	"	"	"	
Surrogate: Toluene-d8		96.4 %	77.3-114		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		105 %	78.4-125		"	"	"	"	

**Semivolatile Organic Compounds by EPA Method 8270D SIM**

Date Sampled: **05/17/12 10:41**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Terphenyl-d14	10.1		ug/kg	1	2052109	05/21/12	05/25/12	EPA 8270D SIM	

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant

Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**SS3**  
**R205130-03 (Soil)**

**Summit Scientific**

**Semivolatile Organic Compounds by EPA Method 8270D SIM**

Nitrobenzene-d5	10.0	ug/kg	1	2052109	05/21/12	05/25/12	EPA 8270D SIM
2,4,6-Tribromophenol	20.0	"	"	"	"	"	"
2-Fluorobiphenyl	8.93	"	"	"	"	"	"
Acenaphthene	ND	5.00	"	"	"	"	"
Acenaphthylene	ND	5.00	"	"	"	"	"
Anthracene	ND	5.00	"	"	"	"	"
Benzo (a) anthracene	ND	5.00	"	"	"	"	"
Benzo (b) fluoranthene	ND	5.00	"	"	"	"	"
Benzo (k) fluoranthene	ND	5.00	"	"	"	"	"
Benzo (g,h,i) perylene	ND	5.00	"	"	"	"	"
Benzo (a) pyrene	ND	5.00	"	"	"	"	"
Chrysene	ND	5.00	"	"	"	"	"
Dibenz (a,h) anthracene	ND	10.0	"	"	"	"	"
Fluoranthene	ND	5.00	"	"	"	"	"
Fluorene	ND	5.00	"	"	"	"	"
Indeno (1,2,3-cd) pyrene	ND	10.0	"	"	"	"	"
Naphthalene	ND	5.00	"	"	"	"	"
Phenanthrene	ND	5.00	"	"	"	"	"
Pyrene	ND	5.00	"	"	"	"	"

**Calculated Analytes**

Date Sampled: **05/17/12 10:41**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Chromium+3 Calculated	4.21	1.00	mg/kg	1	2052310	05/23/12	05/23/12	Calculation	

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

Date Sampled: **05/17/12 10:41**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Arsenic	2.94	0.100	mg/kg	1	2051803	05/18/12	05/22/12	EPA 6020A	
Barium	305	0.100	"	"	"	"	"	"	
Cadmium	0.239	0.100	"	"	"	"	"	"	
Chromium	5.21	0.100	"	"	"	"	"	"	
Copper	6.25	0.500	"	"	"	"	"	"	

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**SS3**  
**R205130-03 (Soil)**

**Summit Scientific**

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

Lead	12.1	0.100	mg/kg	1	2051803	05/18/12	05/22/12	EPA 6020A	
Nickel	5.35	0.200	"	"	"	"	"	"	
Selenium	0.197	0.100	"	"	"	"	"	"	
Silver	ND	0.100	"	"	"	"	"	"	
Zinc	25.7	5.00	"	"	"	"	"	"	

**Total Mercury by EPA Method 7471/7470**

Date Sampled: **05/17/12 10:41**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Mercury	ND	0.0500	mg/kg	1	2051804	05/18/12	05/22/12	EPA 7471B	

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

Date Sampled: **05/17/12 10:41**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	0.440	0.00100	mmhos/cm	1	2052307	05/23/12	05/24/12	SM 2510B	

Date Sampled: **05/17/12 10:41**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	8.7		pH Units	"	2052306	05/23/12	05/24/12	EPA 9045B	

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

Date Sampled: **05/17/12 10:41**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	1840	2.50	mg/kg	1	2051801	05/18/12	05/21/12	EPA 6020/USDA60 6(2, 3A)	
Magnesium	90.0	1.00	"	"	"	"	"	"	
Sodium	101	5.00	"	"	"	"	"	"	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**SS3**  
**R205130-03 (Soil)**

**Summit Scientific**

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

Date Sampled: **05/17/12 10:41**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	0.620		units	1	2052308	05/23/12	05/23/12	EPA 6020/USDA6 0 6(2, 3A)	

**Accutest Laboratories - 6010 Hexavalent Chromium, Soil (3060A Mod Digest)**

Date Sampled: **05/17/12 10:41**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	1	mg/kg	1	2052310	05/23/12	05/23/12	3060A/7196 A	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**SS4**  
**R205130-04 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **05/17/12 11:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	2051809	05/18/12	05/19/12	8015 Full Carbon Chain	

Date Sampled: **05/17/12 11:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: <i>o</i> -Terphenyl		99.3 %	80-124		"	"	"	"	

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

Date Sampled: **05/17/12 11:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0050	mg/kg	1	2051808	05/18/12	05/19/12	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: **05/17/12 11:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		116 %	67.4-143		"	"	"	"	
Surrogate: Toluene-d8		103 %	77.3-114		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		101 %	78.4-125		"	"	"	"	

**Semivolatile Organic Compounds by EPA Method 8270D SIM**

Date Sampled: **05/17/12 11:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Nitrobenzene-d5	8.67		ug/kg	1	2052109	05/21/12	05/25/12	EPA 8270D SIM	

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.





Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant

Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**SS4**  
**R205130-04 (Soil)**

**Summit Scientific**

**Semivolatile Organic Compounds by EPA Method 8270D SIM**

Terphenyl-d14	12.8	ug/kg	1	2052109	05/21/12	05/25/12	EPA 8270D SIM
2-Fluorobiphenyl	8.41	"	"	"	"	"	"
2,4,6-Tribromophenol	22.3	"	"	"	"	"	"
Acenaphthene	ND	5.00	"	"	"	"	"
Acenaphthylene	ND	5.00	"	"	"	"	"
Anthracene	ND	5.00	"	"	"	"	"
Benzo (a) anthracene	ND	5.00	"	"	"	"	"
Benzo (b) fluoranthene	ND	5.00	"	"	"	"	"
Benzo (k) fluoranthene	ND	5.00	"	"	"	"	"
Benzo (g,h,i) perylene	ND	5.00	"	"	"	"	"
Benzo (a) pyrene	ND	5.00	"	"	"	"	"
Chrysene	ND	5.00	"	"	"	"	"
Dibenz (a,h) anthracene	ND	10.0	"	"	"	"	"
Fluoranthene	ND	5.00	"	"	"	"	"
Fluorene	ND	5.00	"	"	"	"	"
Indeno (1,2,3-cd) pyrene	ND	10.0	"	"	"	"	"
Naphthalene	ND	5.00	"	"	"	"	"
Phenanthrene	ND	5.00	"	"	"	"	"
Pyrene	ND	5.00	"	"	"	"	"

**Calculated Analytes**

Date Sampled: **05/17/12 11:15**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Chromium+3 Calculated	3.87	1.00	mg/kg	1	2052310	05/23/12	05/23/12	Calculation	

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

Date Sampled: **05/17/12 11:15**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Arsenic	2.46	0.100	mg/kg	1	2051803	05/18/12	05/22/12	EPA 6020A	
Barium	291	0.100	"	"	"	"	"	"	
Cadmium	0.214	0.100	"	"	"	"	"	"	
Chromium	4.87	0.100	"	"	"	"	"	"	
Copper	6.39	0.500	"	"	"	"	"	"	

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant

Project Number: [none]  
Project Manager: James Hix

**Reported:**  
06/13/12 10:42

**SS4**  
**R205130-04 (Soil)**

**Summit Scientific**

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

<b>Lead</b>	<b>11.5</b>	0.100	mg/kg	1	2051803	05/18/12	05/22/12	EPA 6020A	
<b>Nickel</b>	<b>4.64</b>	0.200	"	"	"	"	"	"	
<b>Selenium</b>	<b>0.138</b>	0.100	"	"	"	"	"	"	
Silver	ND	0.100	"	"	"	"	"	"	
<b>Zinc</b>	<b>23.4</b>	5.00	"	"	"	"	"	"	

**Total Mercury by EPA Method 7471/7470**

Date Sampled: **05/17/12 11:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Mercury	ND	0.0500	mg/kg	1	2051804	05/18/12	05/22/12	EPA 7471B	

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

Date Sampled: **05/17/12 11:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Specific Conductance (EC)</b>	<b>0.332</b>	0.00100	mmhos/cm	1	2052307	05/23/12	05/24/12	SM 2510B	

Date Sampled: **05/17/12 11:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>pH</b>	<b>8.7</b>		pH Units	"	2052306	05/23/12	05/24/12	EPA 9045B	

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

Date Sampled: **05/17/12 11:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Calcium</b>	<b>740</b>	2.50	mg/kg	1	2051801	05/18/12	05/21/12	EPA 6020/USDA60 6(2, 3A)	
<b>Magnesium</b>	<b>61.7</b>	1.00	"	"	"	"	"	"	
<b>Sodium</b>	<b>37.3</b>	5.00	"	"	"	"	"	"	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**SS4**  
**R205130-04 (Soil)**

**Summit Scientific**

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

Date Sampled: **05/17/12 11:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	0.350		units	1	2052308	05/23/12	05/23/12	EPA 6020/USDA6 0 6(2, 3A)	

**Accutest Laboratories - 6010 Hexavalent Chromium, Soil (3060A Mod Digest)**

Date Sampled: **05/17/12 11:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	1	mg/kg	1	2052310	05/23/12	05/23/12	3060A/7196 A	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**SS5**  
**R205130-05 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **05/17/12 12:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	58	50	mg/kg	1	2051809	05/18/12	05/19/12	8015 Full Carbon Chain	

Date Sampled: **05/17/12 12:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: o-Terphenyl		99.5 %	80-124		"	"	"	"	

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

Date Sampled: **05/17/12 12:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0050	mg/kg	1	2051808	05/18/12	05/19/12	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	2.0	0.0050	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	38	0.50	"	"	"	"	"	"	

Date Sampled: **05/17/12 12:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		104 %	67.4-143		"	"	"	"	
Surrogate: Toluene-d8		160 %	77.3-114		"	"	"	"	S-02
Surrogate: 4-Bromofluorobenzene		146 %	78.4-125		"	"	"	"	S-02

**Semivolatile Organic Compounds by EPA Method 8270D SIM**

Date Sampled: **05/17/12 12:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
2-Fluorobiphenyl	8.57		ug/kg	1	2052109	05/21/12	05/25/12	EPA 8270D SIM	

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant

Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**SS5**  
**R205130-05 (Soil)**

**Summit Scientific**

**Semivolatile Organic Compounds by EPA Method 8270D SIM**

<b>2,4,6-Tribromophenol</b>	<b>17.7</b>		ug/kg	1	2052109	05/21/12	05/25/12	EPA 8270D SIM
<b>Nitrobenzene-d5</b>	<b>13.8</b>		"	"	"	"	"	"
<b>Terphenyl-dl4</b>	<b>13.4</b>		"	"	"	"	"	"
<b>Acenaphthene</b>	<b>7.12</b>	5.00	"	"	"	"	"	"
<b>Acenaphthylene</b>	<b>6.15</b>	5.00	"	"	"	"	"	"
<b>Anthracene</b>	<b>ND</b>	5.00	"	"	"	"	"	"
<b>Benzo (a) anthracene</b>	<b>ND</b>	5.00	"	"	"	"	"	"
<b>Benzo (b) fluoranthene</b>	<b>ND</b>	5.00	"	"	"	"	"	"
<b>Benzo (k) fluoranthene</b>	<b>ND</b>	5.00	"	"	"	"	"	"
<b>Benzo (g,h,i) perylene</b>	<b>ND</b>	5.00	"	"	"	"	"	"
<b>Benzo (a) pyrene</b>	<b>8.98</b>	5.00	"	"	"	"	"	"
<b>Chrysene</b>	<b>9.08</b>	5.00	"	"	"	"	"	"
<b>Dibenz (a,h) anthracene</b>	<b>ND</b>	10.0	"	"	"	"	"	"
<b>Fluoranthene</b>	<b>ND</b>	5.00	"	"	"	"	"	"
<b>Fluorene</b>	<b>47.5</b>	5.00	"	"	"	"	"	"
<b>Indeno (1,2,3-cd) pyrene</b>	<b>ND</b>	10.0	"	"	"	"	"	"
<b>Naphthalene</b>	<b>150</b>	50.0	"	10	"	"	"	"
<b>Phenanthrene</b>	<b>61.1</b>	5.00	"	1	"	"	"	"
<b>Pyrene</b>	<b>10.9</b>	5.00	"	"	"	"	"	"

**Calculated Analytes**

Date Sampled: **05/17/12 12:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Chromium+3 Calculated</b>	<b>3.86</b>	1.00	mg/kg	1	2052310	05/23/12	05/23/12	Calculation	

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

Date Sampled: **05/17/12 12:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Arsenic</b>	<b>2.47</b>	0.100	mg/kg	1	2051803	05/18/12	05/22/12	EPA 6020A	
<b>Barium</b>	<b>259</b>	0.100	"	"	"	"	"	"	
<b>Cadmium</b>	<b>0.216</b>	0.100	"	"	"	"	"	"	
<b>Chromium</b>	<b>4.86</b>	0.100	"	"	"	"	"	"	
<b>Copper</b>	<b>6.11</b>	0.500	"	"	"	"	"	"	

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant

Project Number: [none]  
Project Manager: James Hix

**Reported:**  
06/13/12 10:42

**SS5**  
**R205130-05 (Soil)**

**Summit Scientific**

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

<b>Lead</b>	<b>10.5</b>	0.100	mg/kg	1	2051803	05/18/12	05/22/12	EPA 6020A	
<b>Nickel</b>	<b>4.86</b>	0.200	"	"	"	"	"	"	
<b>Selenium</b>	<b>0.130</b>	0.100	"	"	"	"	"	"	
Silver	ND	0.100	"	"	"	"	"	"	
<b>Zinc</b>	<b>28.3</b>	5.00	"	"	"	"	"	"	

**Total Mercury by EPA Method 7471/7470**

Date Sampled: **05/17/12 12:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Mercury	ND	0.0500	mg/kg	1	2051804	05/18/12	05/22/12	EPA 7471B	

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

Date Sampled: **05/17/12 12:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Specific Conductance (EC)</b>	<b>1.12</b>	0.00100	mmhos/cm	1	2052307	05/23/12	05/24/12	SM 2510B	

Date Sampled: **05/17/12 12:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>pH</b>	<b>9.4</b>		pH Units	"	2052306	05/23/12	05/24/12	EPA 9045B	

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

Date Sampled: **05/17/12 12:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Calcium</b>	<b>638</b>	2.50	mg/kg	1	2051801	05/18/12	05/21/12	EPA 6020/USDA60 6(2, 3A)	
<b>Magnesium</b>	<b>35.9</b>	1.00	"	"	"	"	"	"	
<b>Sodium</b>	<b>923</b>	5.00	"	"	"	"	"	"	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**SS5**  
**R205130-05 (Soil)**

**Summit Scientific**

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

Date Sampled: **05/17/12 12:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	9.63		units	1	2052308	05/23/12	05/23/12	EPA 6020/USDA6 0 6(2, 3A)	

**Accutest Laboratories - 6010 Hexavalent Chromium, Soil (3060A Mod Digest)**

Date Sampled: **05/17/12 12:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	1	mg/kg	1	2052310	05/23/12	05/23/12	3060A/7196 A	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant

Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**BS1**  
**R205130-06 (Soil)**

**Summit Scientific**

**Calculated Analytes**

Date Sampled: **05/17/12 12:15**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Chromium+3 Calculated	ND	10.0	mg/kg	1	2052310	05/23/12	05/23/12	Calculation	R-01

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

Date Sampled: **05/17/12 12:15**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Arsenic	2.47	0.100	mg/kg	1	2051803	05/18/12	05/22/12	EPA 6020A	
Barium	300	0.100	"	"	"	"	"	"	
Cadmium	0.333	0.100	"	"	"	"	"	"	
Chromium	5.82	0.100	"	"	"	"	"	"	
Copper	7.36	0.500	"	"	"	"	"	"	
Lead	10.9	0.100	"	"	"	"	"	"	
Nickel	5.73	0.200	"	"	"	"	"	"	
Selenium	0.258	0.100	"	"	"	"	"	"	
Silver	ND	0.100	"	"	"	"	"	"	
Zinc	32.1	5.00	"	"	"	"	"	"	

**Total Mercury by EPA Method 7471/7470**

Date Sampled: **05/17/12 12:15**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Mercury	ND	0.0500	mg/kg	1	2051804	05/18/12	05/22/12	EPA 7471B	

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

Date Sampled: **05/17/12 12:15**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Specific Conductance (EC)	0.442	0.00100	mmhos/cm	1	2052307	05/23/12	05/24/12	SM 2510B	

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.*





Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant

Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**BS1**  
**R205130-06 (Soil)**

**Summit Scientific**

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

Date Sampled: **05/17/12 12:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>pH</b>	<b>8.2</b>		pH Units	1	2052306	05/23/12	05/24/12	EPA 9045B	

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

Date Sampled: **05/17/12 12:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Calcium</b>	<b>349</b>	2.50	mg/kg	1	2051801	05/18/12	05/21/12	EPA 6020/USDA6 0 6(2, 3A)	
<b>Magnesium</b>	<b>36.5</b>	1.00	"	"	"	"	"	"	
<b>Sodium</b>	<b>18.4</b>	5.00	"	"	"	"	"	"	

Date Sampled: **05/17/12 12:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Sodium Adsorption Ratio</b>	<b>0.250</b>		units	"	2052308	05/23/12	05/23/12	"	

**Accutest Laboratories - 6010 Hexavalent Chromium, Soil (3060A Mod Digest)**

Date Sampled: **05/17/12 12:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	10	mg/kg	1	2052310	05/23/12	05/23/12	3060A/7196 A	R-01

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant

Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**BS2**  
**R205130-07 (Soil)**

**Summit Scientific**

**Calculated Analytes**

Date Sampled: **05/17/12 12:20**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium+3 Calculated	ND	10.0	mg/kg	1	2052310	05/23/12	05/23/12	Calculation	R-01

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

Date Sampled: **05/17/12 12:20**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Arsenic	2.13	0.100	mg/kg	1	2051803	05/18/12	05/22/12	EPA 6020A	
Barium	339	0.100	"	"	"	"	"	"	
Cadmium	0.191	0.100	"	"	"	"	"	"	
Chromium	5.45	0.100	"	"	"	"	"	"	
Copper	6.12	0.500	"	"	"	"	"	"	
Lead	7.39	0.100	"	"	"	"	"	"	
Nickel	5.28	0.200	"	"	"	"	"	"	
Selenium	0.210	0.100	"	"	"	"	"	"	
Silver	ND	0.100	"	"	"	"	"	"	
Zinc	27.8	5.00	"	"	"	"	"	"	

**Total Mercury by EPA Method 7471/7470**

Date Sampled: **05/17/12 12:20**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Mercury	ND	0.0500	mg/kg	1	2051804	05/18/12	05/22/12	EPA 7471B	

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

Date Sampled: **05/17/12 12:20**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	0.325	0.00100	mmhos/cm	1	2052307	05/23/12	05/24/12	SM 2510B	

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**BS2**  
**R205130-07 (Soil)**

**Summit Scientific**

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

Date Sampled: **05/17/12 12:20**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>pH</b>	<b>8.5</b>		pH Units	1	2052306	05/23/12	05/24/12	EPA 9045B	

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

Date Sampled: **05/17/12 12:20**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Calcium</b>	<b>630</b>	2.50	mg/kg	1	2051801	05/18/12	05/21/12	EPA 6020/USDA6 0 6(2, 3A)	
<b>Magnesium</b>	<b>30.4</b>	1.00	"	"	"	"	"	"	
<b>Sodium</b>	<b>12.1</b>	5.00	"	"	"	"	"	"	

Date Sampled: **05/17/12 12:20**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Sodium Adsorption Ratio</b>	<b>0.130</b>		units	"	2052308	05/23/12	05/23/12	"	

**Accutest Laboratories - 6010 Hexavalent Chromium, Soil (3060A Mod Digest)**

Date Sampled: **05/17/12 12:20**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	10	mg/kg	1	2052310	05/23/12	05/23/12	3060A/7196 A	R-01

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

**Reported:**  
06/13/12 10:42

**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 2051809 - EPA 3550A**

**Blank (2051809-BLK1)**

Prepared & Analyzed: 05/18/12

C10-C28 (DRO)	ND	50	mg/kg
---------------	----	----	-------

**LCS (2051809-BS1)**

Prepared & Analyzed: 05/18/12

C10-C28 (DRO)	499	50	mg/kg	501	99.6	81.4-129
---------------	-----	----	-------	-----	------	----------

**LCS Dup (2051809-BSD1)**

Prepared & Analyzed: 05/18/12

C10-C28 (DRO)	515	50	mg/kg	501	103	81.4-129	3.18	9.26
---------------	-----	----	-------	-----	-----	----------	------	------

**Matrix Spike (2051809-MS1)**

**Source: R205138-01**

Prepared & Analyzed: 05/18/12

C10-C28 (DRO)	577	50	mg/kg	501	32.7	109	77.8-133
---------------	-----	----	-------	-----	------	-----	----------

**Matrix Spike Dup (2051809-MSD1)**

**Source: R205138-01**

Prepared: 05/18/12 Analyzed: 05/19/12

C10-C28 (DRO)	563	50	mg/kg	501	32.7	106	77.8-133	2.38	8.48
---------------	-----	----	-------	-----	------	-----	----------	------	------

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**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 2051808 - EPA 5030 Soil MS**

**Blank (2051808-BLK1)**

Prepared & Analyzed: 05/18/12

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	0.0424		"	0.0397	107	67.4-143				
Surrogate: Toluene-d8	0.0415		"	0.0400	104	77.3-114				
Surrogate: 4-Bromofluorobenzene	0.0390		"	0.0400	97.5	78.4-125				

**LCS (2051808-BS1)**

Prepared & Analyzed: 05/18/12

Benzene	0.0812	0.0050	mg/kg	0.100	81.2	61-139				
Toluene	0.0876	0.0050	"	0.100	87.6	64-132				
Ethylbenzene	0.106	0.0050	"	0.100	106	68.7-135				
m,p-Xylene	0.196	0.010	"	0.200	98.0	70.4-129				
o-Xylene	0.102	0.0050	"	0.100	102	66.9-126				
Surrogate: 1,2-Dichloroethane-d4	0.0402		"	0.0397	101	67.4-143				
Surrogate: Toluene-d8	0.0384		"	0.0400	95.9	77.3-114				
Surrogate: 4-Bromofluorobenzene	0.0393		"	0.0400	98.3	78.4-125				

**LCS Dup (2051808-BSD1)**

Prepared & Analyzed: 05/18/12

Benzene	0.0877	0.0050	mg/kg	0.100	87.7	61-139	7.68	11.1		
Toluene	0.0964	0.0050	"	0.100	96.4	64-132	9.55	10.9		
Ethylbenzene	0.109	0.0050	"	0.100	109	68.7-135	2.43	20		
m,p-Xylene	0.202	0.010	"	0.200	101	70.4-129	2.92	20		
o-Xylene	0.105	0.0050	"	0.100	105	66.9-126	2.79	20		
Surrogate: 1,2-Dichloroethane-d4	0.0445		"	0.0397	112	67.4-143				
Surrogate: Toluene-d8	0.0421		"	0.0400	105	77.3-114				
Surrogate: 4-Bromofluorobenzene	0.0394		"	0.0400	98.4	78.4-125				

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**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 2051808 - EPA 5030 Soil MS**

Matrix Spike (2051808-MS1)		Source: R205138-01			Prepared & Analyzed: 05/18/12					
Benzene	0.0821	0.0050	mg/kg	0.100	ND	82.1	42.9-137			
Toluene	0.0958	0.0050	"	0.100	ND	95.8	42.6-130			
Ethylbenzene	0.108	0.0050	"	0.100	ND	108	39-133			
m,p-Xylene	0.199	0.010	"	0.200	ND	99.7	34.7-134			
o-Xylene	0.105	0.0050	"	0.100	ND	105	41.3-126			
Surrogate: 1,2-Dichloroethane-d4	0.0458		"	0.0397		115	67.4-143			
Surrogate: Toluene-d8	0.0418		"	0.0400		105	77.3-114			
Surrogate: 4-Bromofluorobenzene	0.0392		"	0.0400		98.1	78.4-125			
Matrix Spike Dup (2051808-MSD1)		Source: R205138-01			Prepared & Analyzed: 05/18/12					
Benzene	0.0826	0.0050	mg/kg	0.100	ND	82.6	42.9-137	0.619	17.9	
Toluene	0.0955	0.0050	"	0.100	ND	95.5	42.6-130	0.282	11.9	
Ethylbenzene	0.107	0.0050	"	0.100	ND	107	39-133	1.11	20	
m,p-Xylene	0.199	0.010	"	0.200	ND	99.6	34.7-134	0.151	20	
o-Xylene	0.104	0.0050	"	0.100	ND	104	41.3-126	0.916	20	
Surrogate: 1,2-Dichloroethane-d4	0.0470		"	0.0397		118	67.4-143			
Surrogate: Toluene-d8	0.0411		"	0.0400		103	77.3-114			
Surrogate: 4-Bromofluorobenzene	0.0395		"	0.0400		98.7	78.4-125			

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**Semivolatile Organic Compounds by EPA Method 8270D SIM - Quality Control**  
**Summit Scientific**

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

**Batch 2052109 - EPA 3550A**

**Blank (2052109-BLK1)**

Prepared: 05/21/12 Analyzed: 05/24/12

2,4,6-Tribromophenol	23.9		ug/kg	16.7	144	44.5-144
2-Fluorobiphenyl	15.6		"	16.6	94.0	31.2-131
Nitrobenzene-d5	15.6		"	16.7	93.7	21.8-138
Terphenyl-dl4	16.4		"	16.4	99.7	41.7-139
Acenaphthene	ND	5.00	"			
Acenaphthylene	ND	5.00	"			
Anthracene	ND	5.00	"			
Benzo (a) anthracene	ND	5.00	"			
Benzo (b) fluoranthene	ND	5.00	"			
Benzo (k) fluoranthene	ND	5.00	"			
Benzo (g,h,i) perylene	ND	5.00	"			
Benzo (a) pyrene	ND	5.00	"			
Chrysene	ND	5.00	"			
Dibenz (a,h) anthracene	ND	10.0	"			
Fluoranthene	ND	5.00	"			
Fluorene	ND	5.00	"			
Indeno (1,2,3-cd) pyrene	ND	10.0	"			
Naphthalene	ND	5.00	"			
Phenanthrene	ND	5.00	"			
Pyrene	ND	5.00	"			

**LCS (2052109-BS1)**

Prepared: 05/21/12 Analyzed: 05/29/12

Nitrobenzene-d5	15.6		ug/kg	16.7	93.6	21.8-138
Terphenyl-dl4	15.2		"	16.4	92.9	41.7-139
2-Fluorobiphenyl	15.0		"	16.6	90.1	31.2-131
2,4,6-Tribromophenol	20.0		"	16.7	120	44.5-144
Acenaphthene	29.0	5.00	"	33.3	87.1	30-120
Acenaphthylene	29.6	5.00	"	33.3	88.8	30-120
Anthracene	28.4	5.00	"	33.3	85.1	30-120
Benzo (a) anthracene	30.0	5.00	"	33.3	90.1	30-120
Benzo (b) fluoranthene	29.9	5.00	"	33.3	89.6	30-120
Benzo (k) fluoranthene	30.2	5.00	"	33.3	90.6	30-120
Benzo (g,h,i) perylene	31.9	5.00	"	33.3	95.8	30-120
Benzo (a) pyrene	30.5	5.00	"	33.3	91.5	30-120
Chrysene	28.0	5.00	"	33.3	84.1	30-120
Dibenz (a,h) anthracene	32.1	10.0	"	33.3	96.3	30-120
Fluoranthene	29.4	5.00	"	33.3	88.2	30-120
Fluorene	29.6	5.00	"	33.3	88.8	30-120

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**Semivolatile Organic Compounds by EPA Method 8270D SIM - Quality Control**  
**Summit Scientific**

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

**Batch 2052109 - EPA 3550A**

**LCS (2052109-BS1)**

Prepared: 05/21/12 Analyzed: 05/29/12

Indeno (1,2,3-cd) pyrene	29.0	10.0	ug/kg	33.3	87.0	30-120
Naphthalene	28.5	5.00	"	33.3	85.6	30-120
Phenanthrene	28.2	5.00	"	33.3	84.7	30-120
Pyrene	29.2	5.00	"	33.3	87.7	30-120

**LCS Dup (2052109-BSD1)**

Prepared: 05/21/12 Analyzed: 05/29/12

2-Fluorobiphenyl	15.1		ug/kg	16.6	90.7	31.2-131	0.662	
Nitrobenzene-d5	16.0		"	16.7	96.3	21.8-138	2.84	
Terphenyl-dl4	15.2		"	16.4	92.4	41.7-139	0.581	
2,4,6-Tribromophenol	22.6		"	16.7	136	44.5-144	12.1	
Acenaphthene	30.3	5.00	"	33.3	91.0	30-120	4.40	30
Acenaphthylene	29.6	5.00	"	33.3	88.8	30-120	0.0383	30
Anthracene	30.1	5.00	"	33.3	90.2	30-120	5.74	30
Benzo (a) anthracene	31.4	5.00	"	33.3	94.2	30-120	4.51	30
Benzo (b) fluoranthene	32.5	5.00	"	33.3	97.6	30-120	8.57	30
Benzo (k) fluoranthene	33.5	5.00	"	33.3	100	30-120	10.3	30
Benzo (g,h,i) perylene	28.8	5.00	"	33.3	86.5	30-120	10.2	30
Benzo (a) pyrene	30.7	5.00	"	33.3	92.1	30-120	0.654	30
Chrysene	27.9	5.00	"	33.3	83.6	30-120	0.575	30
Dibenz (a,h) anthracene	28.9	10.0	"	33.3	86.7	30-120	10.5	30
Fluoranthene	30.6	5.00	"	33.3	91.9	30-120	4.07	30
Fluorene	30.0	5.00	"	33.3	90.1	30-120	1.48	30
Indeno (1,2,3-cd) pyrene	29.5	10.0	"	33.3	88.4	30-120	1.60	30
Naphthalene	29.3	5.00	"	33.3	88.0	30-120	2.67	30
Phenanthrene	29.9	5.00	"	33.3	89.6	30-120	5.59	30
Pyrene	30.7	5.00	"	33.3	92.2	30-120	5.03	30

**Matrix Spike (2052109-MS1)**

Source: R205130-01

Prepared: 05/21/12 Analyzed: 05/25/12

2,4,6-Tribromophenol	31.8		ug/kg	16.7	20.0	71.1	44.5-144
Nitrobenzene-d5	14.2		"	16.7	10.0	24.8	21.8-138
2-Fluorobiphenyl	13.9		"	16.6	5.03	53.6	31.2-131
Terphenyl-dl4	13.9		"	16.4	9.86	24.8	41.7-139
Acenaphthene	27.3	5.00	"	33.3	ND	81.8	30-120
Acenaphthylene	28.2	5.00	"	33.3	ND	84.5	30-120
Anthracene	27.4	5.00	"	33.3	ND	82.3	30-120
Benzo (a) anthracene	28.6	5.00	"	33.3	ND	85.9	30-120
Benzo (b) fluoranthene	31.7	5.00	"	33.3	ND	95.1	30-120
Benzo (k) fluoranthene	33.0	5.00	"	33.3	ND	98.9	30-120
Benzo (g,h,i) perylene	20.0	5.00	"	33.3	ND	60.0	30-120

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.*





Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**Semivolatile Organic Compounds by EPA Method 8270D SIM - Quality Control**  
**Summit Scientific**

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

**Batch 2052109 - EPA 3550A**

Matrix Spike (2052109-MS1)	Source: R205130-01			Prepared: 05/21/12		Analyzed: 05/25/12	
Benzo (a) pyrene	28.8	5.00	ug/kg	33.3	ND	86.4	30-120
Chrysene	27.7	5.00	"	33.3	1.28	79.3	30-120
Dibenz (a,h) anthracene	20.3	10.0	"	33.3	ND	61.0	30-120
Fluoranthene	29.5	5.00	"	33.3	ND	88.4	30-120
Fluorene	27.2	5.00	"	33.3	ND	81.7	30-120
Indeno (1,2,3-cd) pyrene	24.4	10.0	"	33.3	ND	73.1	30-120
Naphthalene	26.8	5.00	"	33.3	ND	80.3	30-120
Phenanthrene	27.2	5.00	"	33.3	0.636	79.8	30-120
Pyrene	30.1	5.00	"	33.3	ND	90.3	30-120

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**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 2051803 - EPA 1311**

**Blank (2051803-BLK1)**

Prepared: 05/18/12 Analyzed: 05/22/12

Arsenic	ND	0.100	mg/kg
Barium	ND	0.100	"
Cadmium	ND	0.100	"
Chromium	ND	0.100	"
Copper	ND	0.500	"
Lead	ND	0.100	"
Nickel	ND	0.200	"
Selenium	ND	0.100	"
Silver	ND	0.100	"
Zinc	ND	5.00	"

**LCS (2051803-BS1)**

Prepared: 05/18/12 Analyzed: 05/22/12

Arsenic	2.59	0.100	mg/kg	2.54	102	80-120
Barium	252	0.100	"	225	112	80-120
Cadmium	1.10	0.100	"	1.02	109	80-120
Chromium	10.7	0.100	"	10.0	107	80-120
Copper	18.6	0.500	"	20.0	92.7	80-120
Lead	74.4	0.100	"	75.0	99.2	80-120
Nickel	16.8	0.200	"	15.1	111	80-120
Selenium	1.10	0.100	"	1.15	95.9	80-120
Silver	0.181	0.100	"	0.200	90.3	80-120
Zinc	79.9	5.00	"	75.0	107	80-120

**LCS Dup (2051803-BSD1)**

Prepared: 05/18/12 Analyzed: 05/22/12

Arsenic	2.72	0.100	mg/kg	2.54	107	80-120	4.99	20
Barium	252	0.100	"	225	112	80-120	0.0343	20
Cadmium	1.16	0.100	"	1.02	115	80-120	5.50	20
Chromium	10.7	0.100	"	10.0	107	80-120	0.370	20
Copper	19.1	0.500	"	20.0	95.2	80-120	2.62	20
Lead	73.1	0.100	"	75.0	97.4	80-120	1.84	20
Nickel	15.0	0.200	"	15.1	99.5	80-120	11.2	20
Selenium	1.09	0.100	"	1.15	95.0	80-120	0.859	20
Silver	0.223	0.100	"	0.200	112	80-120	21.2	20
Zinc	81.8	5.00	"	75.0	109	80-120	2.31	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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**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 2051803 - EPA 1311**

Matrix Spike (2051803-MS1)		Source: R205130-01			Prepared: 05/18/12		Analyzed: 05/22/12			
Arsenic	5.52	0.100	mg/kg	2.47	3.27	91.2	75-125			
Barium	1360	0.100	"	219	459	413	75-125			QM-07
Cadmium	1.39	0.100	"	0.986	0.308	109	75-125			
Chromium	15.9	0.100	"	9.77	7.38	87.1	75-125			
Copper	25.4	0.500	"	19.5	9.72	80.4	75-125			
Lead	78.1	0.100	"	72.9	10.9	92.2	75-125			
Nickel	20.6	0.200	"	14.7	7.58	88.4	75-125			
Selenium	1.14	0.100	"	1.12	0.196	84.9	75-125			
Silver	0.195	0.100	"	0.194	0.0232	88.3	75-125			
Zinc	115	5.00	"	72.9	46.6	94.0	75-125			

Matrix Spike Dup (2051803-MSD1)		Source: R205130-01			Prepared: 05/18/12		Analyzed: 05/22/12			
Arsenic	5.48	0.100	mg/kg	2.54	3.27	87.2	75-125	0.660	25	
Barium	818	0.100	"	225	459	160	75-125	49.9	25	QM-07
Cadmium	1.42	0.100	"	1.01	0.308	110	75-125	2.32	25	
Chromium	16.2	0.100	"	10.0	7.38	87.5	75-125	1.83	25	
Copper	25.6	0.500	"	20.0	9.72	79.3	75-125	0.913	25	
Lead	82.2	0.100	"	75.0	10.9	95.2	75-125	5.19	25	
Nickel	21.0	0.200	"	15.1	7.58	89.1	75-125	2.28	25	
Selenium	1.18	0.100	"	1.15	0.196	85.2	75-125	2.73	25	
Silver	0.209	0.100	"	0.200	0.0232	92.7	75-125	6.82	25	
Zinc	115	5.00	"	75.0	46.6	91.6	75-125	0.169	25	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

**Total Mercury by EPA Method 7471/7470 - Quality Control**  
**Summit Scientific**

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

**Batch 2051804 - EPA 7471A**

<b>Blank (2051804-BLK1)</b>				Prepared: 05/18/12 Analyzed: 05/22/12						
Mercury	ND	0.0500	mg/kg							
<b>LCS (2051804-BS1)</b>				Prepared: 05/18/12 Analyzed: 05/22/12						
Mercury	0.409	0.0500	mg/kg	0.400		102	80-120			
<b>LCS Dup (2051804-BSD1)</b>				Prepared: 05/18/12 Analyzed: 05/22/12						
Mercury	0.415	0.0500	mg/kg	0.400		104	80-120	1.55	20	
<b>Matrix Spike (2051804-MS1)</b>				<b>Source: R205130-01</b>		Prepared: 05/18/12 Analyzed: 05/22/12				
Mercury	0.386	0.0500	mg/kg	0.361	0.0172	102	75-125			
<b>Matrix Spike Dup (2051804-MSD1)</b>				<b>Source: R205130-01</b>		Prepared: 05/18/12 Analyzed: 05/22/12				
Mercury	0.390	0.0500	mg/kg	0.370	0.0172	101	75-125	1.15	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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

**Reported:**  
06/13/12 10:42

**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 2052306 - General Preparation**

**Duplicate (2052306-DUP1)**      **Source: R205130-01**      Prepared: 05/23/12      Analyzed: 05/24/12

pH	8.7		pH Units		8.7			0.461	20	
----	-----	--	----------	--	-----	--	--	-------	----	--

**Batch 2052307 - General Preparation**

**Duplicate (2052307-DUP1)**      **Source: R205130-01**      Prepared: 05/23/12      Analyzed: 05/24/12

Specific Conductance (EC)	0.634	0.00100	mmhos/cm		0.611			3.77	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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:42

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

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

**Batch 2051801 - General Preparation**

**Blank (2051801-BLK1)**

Prepared: 05/18/12 Analyzed: 05/21/12

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

**LCS (2051801-BS1)**

Prepared: 05/18/12 Analyzed: 05/21/12

Calcium	388	2.50	mg/kg	400	96.9	70-130
Magnesium	203	1.00	"	200	101	70-130
Sodium	795	5.00	"	800	99.4	70-130

**LCS Dup (2051801-BSD1)**

Prepared: 05/18/12 Analyzed: 05/21/12

Calcium	411	2.50	mg/kg	400	103	70-130	5.81	25
Magnesium	203	1.00	"	200	102	70-130	0.175	25
Sodium	805	5.00	"	800	101	70-130	1.19	25

**Matrix Spike (2051801-MS1)**

Source: R205130-01

Prepared: 05/18/12 Analyzed: 05/21/12

Calcium	1790	2.50	mg/kg	460	1520	58.7	70-130		QM-07
Magnesium	322	1.00	"	230	96.8	97.9	70-130		
Sodium	1280	5.00	"	920	374	98.9	70-130		

**Matrix Spike Dup (2051801-MSD1)**

Source: R205130-01

Prepared: 05/18/12 Analyzed: 05/21/12

Calcium	1770	2.50	mg/kg	451	1520	54.1	70-130	1.44	25	QM-07
Magnesium	309	1.00	"	226	96.8	93.9	70-130	4.19	25	
Sodium	1210	5.00	"	903	374	92.9	70-130	5.66	25	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 1/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

**Reported:**  
06/13/12 10:42

### Notes and Definitions

S-GC Surrogate recovery outside of control limits. The data was accepted based on valid recovery of the remaining surrogate.

S-02 The surrogate recovery for this sample cannot be accurately quantified due to interference from coeluting organic compounds present in the sample extract.

R-01 The Reporting Limit for this analyte has been raised to account for matrix interference.

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

---

741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

June 13, 2012

James Hix

Olsson Associates

4690 Table Mountain Drive, Suite 200

Golden, CO 80403

RE: Whiting Pit Closures-Pit 2/Terrace Plant

Enclosed are the results of analyses for samples received by Summit Scientific on 05/18/12 09:30. 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' or 'Shrewsbury', written in a cursive style.

Ben Shrewsbury

President / Laboratory Director





Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

**Reported:**  
06/13/12 10:46

### ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SS6	R205131-01	Soil	05/17/12 13:14	05/18/12 09:30
SS7	R205131-02	Soil	05/17/12 14:00	05/18/12 09:30
BS3	R205131-03	Soil	05/17/12 14:10	05/18/12 09:30
BS4	R205131-04	Soil	05/17/12 14:15	05/18/12 09:30
Tin Horn	R205131-05	Water	05/17/12 14:24	05/18/12 09:30

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.*





Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:46

**SS6**  
**R205131-01 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **05/17/12 13:14**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>C10-C28 (DRO)</b>	<b>1800</b>	50	mg/kg	1	2051809	05/18/12	05/19/12	8015 Full Carbon Chain	

Date Sampled: **05/17/12 13:14**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: o-Terphenyl</i>		101 %	80-124		"	"	"	"	

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

Date Sampled: **05/17/12 13:14**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0050	mg/kg	1	2051808	05/18/12	05/19/12	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
<b>Gasoline Range Hydrocarbons</b>	<b>51</b>	5.0	"	10	"	"	"	"	

Date Sampled: **05/17/12 13:14**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		104 %	67.4-143		"	"	"	"	
<i>Surrogate: Toluene-d8</i>		95.0 %	77.3-114		"	"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>		117 %	78.4-125		"	"	"	"	

**Semivolatile Organic Compounds by EPA Method 8270D SIM**

Date Sampled: **05/17/12 13:14**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Terphenyl-d14</b>	<b>25.7</b>		ug/kg	1	2052109	05/21/12	05/25/12	EPA 8270D SIM	S-02

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant

Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:46

**SS6**  
**R205131-01 (Soil)**

**Summit Scientific**

**Semivolatile Organic Compounds by EPA Method 8270D SIM**

Nitrobenzene-d5	17.0	ug/kg	1	2052109	05/21/12	05/25/12	EPA 8270D SIM	
2,4,6-Tribromophenol	30.8	"	"	"	"	"	"	S-02
2-Fluorobiphenyl	8.62	"	"	"	"	"	"	
Acenaphthene	5.49	5.00	"	"	"	"	"	
Acenaphthylene	9.21	5.00	"	"	"	"	"	
Anthracene	28.3	5.00	"	"	"	"	"	
Benzo (a) anthracene	ND	5.00	"	"	"	"	"	
Benzo (b) fluoranthene	ND	5.00	"	"	"	"	"	
Benzo (k) fluoranthene	ND	5.00	"	"	"	"	"	
Benzo (g,h,i) perylene	ND	5.00	"	"	"	"	"	
Benzo (a) pyrene	ND	5.00	"	"	"	"	"	
Chrysene	68.2	5.00	"	"	"	"	"	
Dibenz (a,h) anthracene	ND	10.0	"	"	"	"	"	
Fluoranthene	ND	5.00	"	"	"	"	"	
Fluorene	9.25	5.00	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	10.0	"	"	"	"	"	
Naphthalene	ND	5.00	"	"	"	"	"	
Phenanthrene	24.3	5.00	"	"	"	"	"	
Pyrene	45.6	5.00	"	"	"	"	"	

**Calculated Analytes**

Date Sampled: 05/17/12 13:14

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium+3 Calculated	3.84	1.00	mg/kg	1	2052310	05/23/12	05/23/12	Calculation	

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

Date Sampled: 05/17/12 13:14

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Arsenic	1.79	0.100	mg/kg	1	2051803	05/18/12	05/22/12	EPA 6020A	
Barium	254	0.100	"	"	"	"	"	"	
Cadmium	0.136	0.100	"	"	"	"	"	"	
Chromium	4.84	0.100	"	"	"	"	"	"	
Copper	5.13	0.500	"	"	"	"	"	"	

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant

Project Number: [none]  
Project Manager: James Hix

**Reported:**  
06/13/12 10:46

**SS6**  
**R205131-01 (Soil)**

**Summit Scientific**

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

<b>Lead</b>	<b>6.91</b>	0.100	mg/kg	1	2051803	05/18/12	05/22/12	EPA 6020A
<b>Nickel</b>	<b>4.41</b>	0.100	"	"	"	"	"	"
<b>Selenium</b>	<b>0.122</b>	0.100	"	"	"	"	"	"
Silver	ND	0.100	"	"	"	"	"	"
<b>Zinc</b>	<b>23.0</b>	5.00	"	"	"	"	"	"

**Total Mercury by EPA Method 7471/7470**

Date Sampled: **05/17/12 13:14**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Mercury	ND	0.0500	mg/kg	1	2051804	05/18/12	05/22/12	EPA 7471B	

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

Date Sampled: **05/17/12 13:14**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Specific Conductance (EC)</b>	<b>1.07</b>	0.00100	mmhos/cm	1	2052307	05/23/12	05/24/12	SM 2510B	

Date Sampled: **05/17/12 13:14**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>pH</b>	<b>8.0</b>		pH Units	"	2052306	05/23/12	05/24/12	EPA 9045B	

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

Date Sampled: **05/17/12 13:14**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	ND	2.50	mg/kg	1	2051801	05/18/12	05/21/12	EPA 6020/USDA60 6(2, 3A)	
Magnesium	ND	1.00	"	"	"	"	"	"	
Sodium	ND	5.00	"	"	"	"	"	"	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:46

**SS6**  
**R205131-01 (Soil)**

**Summit Scientific**

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

Date Sampled: **05/17/12 13:14**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	0.00		units	1	2052308	05/23/12	05/23/12	EPA 6020/USDA6 0 6(2, 3A)	

**Accutest Laboratories - 6010 Hexavalent Chromium, Soil (3060A Mod Digest)**

Date Sampled: **05/17/12 13:14**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	1	mg/kg	1	2052310	05/23/12	05/23/12	3060A/7196 A	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:46

**SS7**  
**R205131-02 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **05/17/12 14:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	2800	50	mg/kg	1	2051809	05/18/12	05/19/12	8015 Full Carbon Chain	

Date Sampled: **05/17/12 14:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: o-Terphenyl		104 %	80-124		"	"	"	"	

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

Date Sampled: **05/17/12 14:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	5.9	0.050	mg/kg	10	2051808	05/18/12	05/19/12	EPA 8260B	
Toluene	0.092	0.0050	"	1	"	"	05/19/12	"	
Ethylbenzene	34	1.0	"	200	"	"	05/19/12	"	
Xylenes (total)	260	1.0	"	"	"	"	05/19/12	"	
Gasoline Range Hydrocarbons	7800	100	"	"	"	"	"	"	

Date Sampled: **05/17/12 14:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		91.7 %	67.4-143		"	"	"	"	
Surrogate: Toluene-d8		101 %	77.3-114		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		92.4 %	78.4-125		"	"	"	"	

**Semivolatile Organic Compounds by EPA Method 8270D SIM**

Date Sampled: **05/17/12 14:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
2-Fluorobiphenyl	10.1		ug/kg	1	2052109	05/21/12	05/25/12	EPA 8270D SIM	

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant

Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:46

**SS7**  
**R205131-02 (Soil)**

**Summit Scientific**

**Semivolatile Organic Compounds by EPA Method 8270D SIM**

2,4,6-Tribromophenol	21.7	ug/kg	1	2052109	05/21/12	05/25/12	EPA 8270D SIM
Terphenyl-dl4	14.4	"	"	"	"	"	"
Nitrobenzene-d5	17.3	"	"	"	"	"	"
Acenaphthene	34.6	5.00	"	"	"	"	"
Acenaphthylene	25.0	5.00	"	"	"	"	"
Anthracene	ND	5.00	"	"	"	"	"
Benzo (a) anthracene	29.1	5.00	"	"	"	"	"
Benzo (b) fluoranthene	27.9	5.00	"	"	"	"	"
Benzo (k) fluoranthene	ND	5.00	"	"	"	"	"
Benzo (g,h,i) perylene	ND	5.00	"	"	"	"	"
Benzo (a) pyrene	28.0	5.00	"	"	"	"	"
Chrysene	28.0	5.00	"	"	"	"	"
Dibenz (a,h) anthracene	ND	10.0	"	"	"	"	"
Fluoranthene	ND	5.00	"	"	"	"	"
Fluorene	276	5.00	"	"	"	"	"
Indeno (1,2,3-cd) pyrene	ND	10.0	"	"	"	"	"
Naphthalene	3430	5.00	"	"	"	"	"
Phenanthrene	315	5.00	"	"	"	"	"
Pyrene	42.2	5.00	"	"	"	"	"

**Calculated Analytes**

Date Sampled: **05/17/12 14:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium+3 Calculated	4.42	1.00	mg/kg	1	2052310	05/23/12	05/23/12	Calculation	

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

Date Sampled: **05/17/12 14:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Arsenic	1.68	0.100	mg/kg	1	2051803	05/18/12	05/22/12	EPA 6020A	
Barium	219	0.100	"	"	"	"	"	"	
Cadmium	0.168	0.100	"	"	"	"	"	"	
Chromium	5.42	0.100	"	"	"	"	"	"	
Copper	6.68	0.500	"	"	"	"	"	"	

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.





Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant

Project Number: [none]  
Project Manager: James Hix

**Reported:**  
06/13/12 10:46

**SS7**  
**R205131-02 (Soil)**

**Summit Scientific**

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

<b>Lead</b>	<b>8.00</b>	0.100	mg/kg	1	2051803	05/18/12	05/22/12	EPA 6020A	
<b>Nickel</b>	<b>5.00</b>	0.100	"	"	"	"	"	"	
Selenium	ND	0.100	"	"	"	"	"	"	
Silver	ND	0.100	"	"	"	"	"	"	
<b>Zinc</b>	<b>26.5</b>	5.00	"	"	"	"	"	"	

**Total Mercury by EPA Method 7471/7470**

Date Sampled: **05/17/12 14:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Mercury	ND	0.0500	mg/kg	1	2051804	05/18/12	05/22/12	EPA 7471B	

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

Date Sampled: **05/17/12 14:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Specific Conductance (EC)</b>	<b>0.865</b>	0.00100	mmhos/cm	1	2052307	05/23/12	05/24/12	SM 2510B	

Date Sampled: **05/17/12 14:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>pH</b>	<b>8.4</b>		pH Units	"	2052306	05/23/12	05/24/12	EPA 9045B	

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

Date Sampled: **05/17/12 14:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Calcium</b>	<b>522</b>	2.50	mg/kg	1	2051801	05/18/12	05/21/12	EPA 6020/USDA60 6(2, 3A)	
<b>Magnesium</b>	<b>27.5</b>	1.00	"	"	"	"	"	"	
<b>Sodium</b>	<b>29.2</b>	5.00	"	"	"	"	"	"	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:46

**SS7**  
**R205131-02 (Soil)**

**Summit Scientific**

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

Date Sampled: **05/17/12 14:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	0.340		units	1	2052308	05/23/12	05/23/12	EPA 6020/USDA6 0 6(2, 3A)	

**Accutest Laboratories - 6010 Hexavalent Chromium, Soil (3060A Mod Digest)**

Date Sampled: **05/17/12 14:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	1	mg/kg	1	2052310	05/23/12	05/23/12	3060A/7196 A	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant

Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:46

**BS3**  
**R205131-03 (Soil)**

**Summit Scientific**

**Calculated Analytes**

Date Sampled: **05/17/12 14:10**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Chromium+3 Calculated	ND	10.0	mg/kg	1	2052310	05/23/12	05/23/12	Calculation	R-01

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

Date Sampled: **05/17/12 14:10**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Arsenic	1.91	0.100	mg/kg	1	2051803	05/18/12	05/22/12	EPA 6020A	
Barium	304	0.100	"	"	"	"	"	"	
Cadmium	0.197	0.100	"	"	"	"	"	"	
Chromium	4.85	0.100	"	"	"	"	"	"	
Copper	5.41	0.500	"	"	"	"	"	"	
Lead	7.31	0.100	"	"	"	"	"	"	
Nickel	4.66	0.100	"	"	"	"	"	"	
Selenium	0.182	0.100	"	"	"	"	"	"	
Silver	ND	0.100	"	"	"	"	"	"	
Zinc	22.8	5.00	"	"	"	"	"	"	

**Total Mercury by EPA Method 7471/7470**

Date Sampled: **05/17/12 14:10**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Mercury	ND	0.0500	mg/kg	1	2051804	05/18/12	05/22/12	EPA 7471B	

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

Date Sampled: **05/17/12 14:10**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Specific Conductance (EC)	0.322	0.00100	mmhos/cm	1	2052307	05/23/12	05/24/12	SM 2510B	

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:46

**BS3**  
**R205131-03 (Soil)**

**Summit Scientific**

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

Date Sampled: **05/17/12 14:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	8.4		pH Units	1	2052306	05/23/12	05/24/12	EPA 9045B	

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

Date Sampled: **05/17/12 14:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	488	2.50	mg/kg	1	2051801	05/18/12	05/21/12	EPA 6020/USDA6 0 6(2, 3A)	
Magnesium	26.7	1.00	"	"	"	"	"	"	
Sodium	6.92	5.00	"	"	"	"	"	"	

Date Sampled: **05/17/12 14:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	0.0800		units	"	2052308	05/23/12	05/23/12	"	

**Accutest Laboratories - 6010 Hexavalent Chromium, Soil (3060A Mod Digest)**

Date Sampled: **05/17/12 14:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	10	mg/kg	1	2052310	05/23/12	05/23/12	3060A/7196 A	R-01

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant

Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:46

**BS4**  
**R205131-04 (Soil)**

**Summit Scientific**

**Calculated Analytes**

Date Sampled: **05/17/12 14:15**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Chromium+3 Calculated	ND	10.0	mg/kg	1	2052310	05/23/12	05/23/12	Calculation	R-01

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

Date Sampled: **05/17/12 14:15**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Arsenic	2.00	0.100	mg/kg	1	2051803	05/18/12	05/22/12	EPA 6020A	
Barium	289	0.100	"	"	"	"	"	"	
Cadmium	0.213	0.100	"	"	"	"	"	"	
Chromium	4.91	0.100	"	"	"	"	"	"	
Copper	5.57	0.500	"	"	"	"	"	"	
Lead	8.29	0.100	"	"	"	"	"	"	
Nickel	4.65	0.100	"	"	"	"	"	"	
Selenium	0.206	0.100	"	"	"	"	"	"	
Silver	ND	0.100	"	"	"	"	"	"	
Zinc	24.0	5.00	"	"	"	"	"	"	

**Total Mercury by EPA Method 7471/7470**

Date Sampled: **05/17/12 14:15**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Mercury	ND	0.0500	mg/kg	1	2051804	05/18/12	05/22/12	EPA 7471B	

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

Date Sampled: **05/17/12 14:15**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Specific Conductance (EC)	0.345	0.00100	mmhos/cm	1	2052307	05/23/12	05/24/12	SM 2510B	

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:46

**BS4**  
**R205131-04 (Soil)**

**Summit Scientific**

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

Date Sampled: **05/17/12 14:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	8.4		pH Units	1	2052306	05/23/12	05/24/12	EPA 9045B	

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

Date Sampled: **05/17/12 14:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	359	2.50	mg/kg	1	2051801	05/18/12	05/21/12	EPA 6020/USDA60 6(2, 3A)	
Magnesium	19.5	1.00	"	"	"	"	"	"	
Sodium	5.72	5.00	"	"	"	"	"	"	

Date Sampled: **05/17/12 14:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	0.0800		units	"	2052308	05/23/12	05/23/12	"	

**Accutest Laboratories - 6010 Hexavalent Chromium, Soil (3060A Mod Digest)**

Date Sampled: **05/17/12 14:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	10	mg/kg	1	2052310	05/23/12	05/23/12	3060A/7196 A	R-01

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:46

**Tin Horn**  
**R205131-05 (Water)**

**Summit Scientific**

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

Date Sampled: 05/17/12 14:24

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Benzene</b>	<b>11000</b>	1000	ug/l	1000	2052206	05/22/12	05/24/12	EPA 8260B	
<b>Toluene</b>	<b>87000</b>	1000	"	"	"	"	"	"	
<b>Ethylbenzene</b>	<b>140000</b>	1000	"	"	"	"	"	"	
<b>Xylenes (total)</b>	<b>670000</b>	1000	"	"	"	"	"	"	
<b>Gasoline Range Hydrocarbons</b>	<b>110000000</b>	5000000	"	10000	"	"	"	"	

Date Sampled: 05/17/12 14:24

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		121 %	57.9-139		"	"	"	"	
<i>Surrogate: Toluene-d8</i>		115 %	83.1-115		"	"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>		261 %	80.8-120		"	"	"	"	S-02

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

**Reported:**  
06/13/12 10:46

**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 2051809 - EPA 3550A**

**Blank (2051809-BLK1)**

Prepared & Analyzed: 05/18/12

C10-C28 (DRO) ND 50 mg/kg

**LCS (2051809-BS1)**

Prepared & Analyzed: 05/18/12

C10-C28 (DRO) 499 50 mg/kg 501 99.6 81.4-129

**LCS Dup (2051809-BSD1)**

Prepared & Analyzed: 05/18/12

C10-C28 (DRO) 515 50 mg/kg 501 103 81.4-129 3.18 9.26

**Matrix Spike (2051809-MS1)**

**Source: R205138-01**

Prepared & Analyzed: 05/18/12

C10-C28 (DRO) 577 50 mg/kg 501 32.7 109 77.8-133

**Matrix Spike Dup (2051809-MSD1)**

**Source: R205138-01**

Prepared: 05/18/12 Analyzed: 05/19/12

C10-C28 (DRO) 563 50 mg/kg 501 32.7 106 77.8-133 2.38 8.48

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.*





Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:46

**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 2051808 - EPA 5030 Soil MS**

**Blank (2051808-BLK1)**

Prepared & Analyzed: 05/18/12

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	0.0424		"	0.0397	107	67.4-143				
Surrogate: Toluene-d8	0.0415		"	0.0400	104	77.3-114				
Surrogate: 4-Bromofluorobenzene	0.0390		"	0.0400	97.5	78.4-125				

**LCS (2051808-BS1)**

Prepared & Analyzed: 05/18/12

Benzene	0.0812	0.0050	mg/kg	0.100	81.2	61-139				
Toluene	0.0876	0.0050	"	0.100	87.6	64-132				
Ethylbenzene	0.106	0.0050	"	0.100	106	68.7-135				
m,p-Xylene	0.196	0.010	"	0.200	98.0	70.4-129				
o-Xylene	0.102	0.0050	"	0.100	102	66.9-126				
Surrogate: 1,2-Dichloroethane-d4	0.0402		"	0.0397	101	67.4-143				
Surrogate: Toluene-d8	0.0384		"	0.0400	95.9	77.3-114				
Surrogate: 4-Bromofluorobenzene	0.0393		"	0.0400	98.3	78.4-125				

**LCS Dup (2051808-BSD1)**

Prepared & Analyzed: 05/18/12

Benzene	0.0877	0.0050	mg/kg	0.100	87.7	61-139	7.68	11.1		
Toluene	0.0964	0.0050	"	0.100	96.4	64-132	9.55	10.9		
Ethylbenzene	0.109	0.0050	"	0.100	109	68.7-135	2.43	20		
m,p-Xylene	0.202	0.010	"	0.200	101	70.4-129	2.92	20		
o-Xylene	0.105	0.0050	"	0.100	105	66.9-126	2.79	20		
Surrogate: 1,2-Dichloroethane-d4	0.0445		"	0.0397	112	67.4-143				
Surrogate: Toluene-d8	0.0421		"	0.0400	105	77.3-114				
Surrogate: 4-Bromofluorobenzene	0.0394		"	0.0400	98.4	78.4-125				

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:46

**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 2051808 - EPA 5030 Soil MS**

Matrix Spike (2051808-MS1)		Source: R205138-01			Prepared & Analyzed: 05/18/12					
Benzene	0.0821	0.0050	mg/kg	0.100	ND	82.1	42.9-137			
Toluene	0.0958	0.0050	"	0.100	ND	95.8	42.6-130			
Ethylbenzene	0.108	0.0050	"	0.100	ND	108	39-133			
m,p-Xylene	0.199	0.010	"	0.200	ND	99.7	34.7-134			
o-Xylene	0.105	0.0050	"	0.100	ND	105	41.3-126			
Surrogate: 1,2-Dichloroethane-d4	0.0458		"	0.0397		115	67.4-143			
Surrogate: Toluene-d8	0.0418		"	0.0400		105	77.3-114			
Surrogate: 4-Bromofluorobenzene	0.0392		"	0.0400		98.1	78.4-125			

Matrix Spike Dup (2051808-MSD1)		Source: R205138-01			Prepared & Analyzed: 05/18/12					
Benzene	0.0826	0.0050	mg/kg	0.100	ND	82.6	42.9-137	0.619	17.9	
Toluene	0.0955	0.0050	"	0.100	ND	95.5	42.6-130	0.282	11.9	
Ethylbenzene	0.107	0.0050	"	0.100	ND	107	39-133	1.11	20	
m,p-Xylene	0.199	0.010	"	0.200	ND	99.6	34.7-134	0.151	20	
o-Xylene	0.104	0.0050	"	0.100	ND	104	41.3-126	0.916	20	
Surrogate: 1,2-Dichloroethane-d4	0.0470		"	0.0397		118	67.4-143			
Surrogate: Toluene-d8	0.0411		"	0.0400		103	77.3-114			
Surrogate: 4-Bromofluorobenzene	0.0395		"	0.0400		98.7	78.4-125			

**Batch 2052206 - EPA 5030 Water MS**

Blank (2052206-BLK1)		Prepared: 05/22/12 Analyzed: 05/23/12								
Benzene	ND	1.0	ug/l							
Toluene	ND	1.0	"							
Ethylbenzene	ND	1.0	"							
Xylenes (total)	ND	1.0	"							
Gasoline Range Hydrocarbons	ND	500	"							
Surrogate: 1,2-Dichloroethane-d4	9.44		"	13.2		71.3	57.9-139			
Surrogate: Toluene-d8	12.6		"	13.3		94.7	83.1-115			
Surrogate: 4-Bromofluorobenzene	12.4		"	13.3		93.4	80.8-120			

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:46

**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 2052206 - EPA 5030 Water MS**

**LCS (2052206-BS1)**

Prepared: 05/22/12 Analyzed: 05/23/12

Benzene	19.6	1.0	ug/l	26.7		73.7	60.1-131			
Toluene	17.8	1.0	"	26.7		66.7	65.9-127			
Ethylbenzene	26.8	1.0	"	26.7		101	65.1-129			
m,p-Xylene	55.3	2.0	"	53.3		104	66.8-127			
o-Xylene	24.1	1.0	"	26.7		90.3	61.2-120			
Surrogate: 1,2-Dichloroethane-d4	9.52		"	13.2		71.9	57.9-139			
Surrogate: Toluene-d8	13.0		"	13.3		97.4	83.1-115			
Surrogate: 4-Bromofluorobenzene	12.6		"	13.3		94.9	80.8-120			

**LCS Dup (2052206-BSD1)**

Prepared: 05/22/12 Analyzed: 05/23/12

Benzene	20.2	1.0	ug/l	26.7		75.9	60.1-131	2.96	10.9	
Toluene	18.0	1.0	"	26.7		67.3	65.9-127	0.895	11.3	
Ethylbenzene	27.5	1.0	"	26.7		103	65.1-129	2.28	20	
m,p-Xylene	56.5	2.0	"	53.3		106	66.8-127	2.11	20	
o-Xylene	24.6	1.0	"	26.7		92.2	61.2-120	2.06	20	
Surrogate: 1,2-Dichloroethane-d4	9.59		"	13.2		72.5	57.9-139			
Surrogate: Toluene-d8	14.0		"	13.3		105	83.1-115			
Surrogate: 4-Bromofluorobenzene	12.4		"	13.3		92.6	80.8-120			

**Matrix Spike (2052206-MS1)**

Source: R205133-04

Prepared: 05/22/12 Analyzed: 05/23/12

Benzene	21.7	1.0	ug/l	26.7	ND	81.3	52.7-130			
Toluene	24.7	1.0	"	26.7	ND	92.8	57-127			
Ethylbenzene	27.8	1.0	"	26.7	ND	104	59.2-127			
m,p-Xylene	58.0	2.0	"	53.3	ND	109	53.2-132			
o-Xylene	24.8	1.0	"	26.7	ND	93.0	56.3-117			
Surrogate: 1,2-Dichloroethane-d4	10.4		"	13.2		78.8	57.9-139			
Surrogate: Toluene-d8	13.4		"	13.3		100	83.1-115			
Surrogate: 4-Bromofluorobenzene	12.8		"	13.3		96.4	80.8-120			

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:46

**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 2052206 - EPA 5030 Water MS**

Matrix Spike Dup (2052206-MSD1)		Source: R205133-04			Prepared: 05/22/12		Analyzed: 05/23/12			
Benzene	21.9	1.0	ug/l	26.7	ND	82.1	52.7-130	0.964	19.3	
Toluene	24.2	1.0	"	26.7	ND	90.9	57-127	2.00	18.7	
Ethylbenzene	26.8	1.0	"	26.7	ND	100	59.2-127	3.84	20	
m,p-Xylene	55.1	2.0	"	53.3	ND	103	53.2-132	5.15	20	
o-Xylene	23.5	1.0	"	26.7	ND	88.1	56.3-117	5.47	20	
Surrogate: 1,2-Dichloroethane-d4	10.9		"	13.2		82.6	57.9-139			
Surrogate: Toluene-d8	13.5		"	13.3		101	83.1-115			
Surrogate: 4-Bromofluorobenzene	12.4		"	13.3		92.7	80.8-120			

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:46

**Semivolatile Organic Compounds by EPA Method 8270D SIM - Quality Control**  
**Summit Scientific**

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

**Batch 2052109 - EPA 3550A**

**Blank (2052109-BLK1)**

Prepared: 05/21/12 Analyzed: 05/24/12

Nitrobenzene-d5	15.6		ug/kg	16.7		93.7	21.8-138			
2-Fluorobiphenyl	15.6		"	16.6		94.0	31.2-131			
2,4,6-Tribromophenol	23.9		"	16.7		144	44.5-144			
Terphenyl-dl4	16.4		"	16.4		99.7	41.7-139			
Acenaphthene	ND	5.00	"							
Acenaphthylene	ND	5.00	"							
Anthracene	ND	5.00	"							
Benzo (a) anthracene	ND	5.00	"							
Benzo (b) fluoranthene	ND	5.00	"							
Benzo (k) fluoranthene	ND	5.00	"							
Benzo (g,h,i) perylene	ND	5.00	"							
Benzo (a) pyrene	ND	5.00	"							
Chrysene	ND	5.00	"							
Dibenz (a,h) anthracene	ND	10.0	"							
Fluoranthene	ND	5.00	"							
Fluorene	ND	5.00	"							
Indeno (1,2,3-cd) pyrene	ND	10.0	"							
Naphthalene	ND	5.00	"							
Phenanthrene	ND	5.00	"							
Pyrene	ND	5.00	"							

**LCS (2052109-BS1)**

Prepared: 05/21/12 Analyzed: 05/29/12

Terphenyl-dl4	15.2		ug/kg	16.4		92.9	41.7-139			
Nitrobenzene-d5	15.6		"	16.7		93.6	21.8-138			
2-Fluorobiphenyl	15.0		"	16.6		90.1	31.2-131			
2,4,6-Tribromophenol	20.0		"	16.7		120	44.5-144			
Acenaphthene	29.0	5.00	"	33.3		87.1	30-120			
Acenaphthylene	29.6	5.00	"	33.3		88.8	30-120			
Anthracene	28.4	5.00	"	33.3		85.1	30-120			
Benzo (a) anthracene	30.0	5.00	"	33.3		90.1	30-120			
Benzo (b) fluoranthene	29.9	5.00	"	33.3		89.6	30-120			
Benzo (k) fluoranthene	30.2	5.00	"	33.3		90.6	30-120			
Benzo (g,h,i) perylene	31.9	5.00	"	33.3		95.8	30-120			
Benzo (a) pyrene	30.5	5.00	"	33.3		91.5	30-120			
Chrysene	28.0	5.00	"	33.3		84.1	30-120			
Dibenz (a,h) anthracene	32.1	10.0	"	33.3		96.3	30-120			
Fluoranthene	29.4	5.00	"	33.3		88.2	30-120			
Fluorene	29.6	5.00	"	33.3		88.8	30-120			

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:46

**Semivolatile Organic Compounds by EPA Method 8270D SIM - Quality Control**  
**Summit Scientific**

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

**Batch 2052109 - EPA 3550A**

**LCS (2052109-BS1)**

Prepared: 05/21/12 Analyzed: 05/29/12

Indeno (1,2,3-cd) pyrene	29.0	10.0	ug/kg	33.3		87.0	30-120			
Naphthalene	28.5	5.00	"	33.3		85.6	30-120			
Phenanthrene	28.2	5.00	"	33.3		84.7	30-120			
Pyrene	29.2	5.00	"	33.3		87.7	30-120			

**LCS Dup (2052109-BSD1)**

Prepared: 05/21/12 Analyzed: 05/29/12

Nitrobenzene-d5	16.0		ug/kg	16.7		96.3	21.8-138	2.84		
Terphenyl-dl4	15.2		"	16.4		92.4	41.7-139	0.581		
2-Fluorobiphenyl	15.1		"	16.6		90.7	31.2-131	0.662		
2,4,6-Tribromophenol	22.6		"	16.7		136	44.5-144	12.1		
Acenaphthene	30.3	5.00	"	33.3		91.0	30-120	4.40	30	
Acenaphthylene	29.6	5.00	"	33.3		88.8	30-120	0.0383	30	
Anthracene	30.1	5.00	"	33.3		90.2	30-120	5.74	30	
Benzo (a) anthracene	31.4	5.00	"	33.3		94.2	30-120	4.51	30	
Benzo (b) fluoranthene	32.5	5.00	"	33.3		97.6	30-120	8.57	30	
Benzo (k) fluoranthene	33.5	5.00	"	33.3		100	30-120	10.3	30	
Benzo (g,h,i) perylene	28.8	5.00	"	33.3		86.5	30-120	10.2	30	
Benzo (a) pyrene	30.7	5.00	"	33.3		92.1	30-120	0.654	30	
Chrysene	27.9	5.00	"	33.3		83.6	30-120	0.575	30	
Dibenz (a,h) anthracene	28.9	10.0	"	33.3		86.7	30-120	10.5	30	
Fluoranthene	30.6	5.00	"	33.3		91.9	30-120	4.07	30	
Fluorene	30.0	5.00	"	33.3		90.1	30-120	1.48	30	
Indeno (1,2,3-cd) pyrene	29.5	10.0	"	33.3		88.4	30-120	1.60	30	
Naphthalene	29.3	5.00	"	33.3		88.0	30-120	2.67	30	
Phenanthrene	29.9	5.00	"	33.3		89.6	30-120	5.59	30	
Pyrene	30.7	5.00	"	33.3		92.2	30-120	5.03	30	

**Matrix Spike (2052109-MS1)**

Source: R205130-01

Prepared: 05/21/12 Analyzed: 05/25/12

Nitrobenzene-d5	14.2		ug/kg	16.7	10.0	24.8	21.8-138			
Terphenyl-dl4	13.9		"	16.4	9.86	24.8	41.7-139			
2-Fluorobiphenyl	13.9		"	16.6	5.03	53.6	31.2-131			
2,4,6-Tribromophenol	31.8		"	16.7	20.0	71.1	44.5-144			
Acenaphthene	27.3	5.00	"	33.3	ND	81.8	30-120			
Acenaphthylene	28.2	5.00	"	33.3	ND	84.5	30-120			
Anthracene	27.4	5.00	"	33.3	ND	82.3	30-120			
Benzo (a) anthracene	28.6	5.00	"	33.3	ND	85.9	30-120			
Benzo (b) fluoranthene	31.7	5.00	"	33.3	ND	95.1	30-120			
Benzo (k) fluoranthene	33.0	5.00	"	33.3	ND	98.9	30-120			
Benzo (g,h,i) perylene	20.0	5.00	"	33.3	ND	60.0	30-120			

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

**Reported:**  
06/13/12 10:46

**Semivolatile Organic Compounds by EPA Method 8270D SIM - Quality Control**  
**Summit Scientific**

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

**Batch 2052109 - EPA 3550A**

<b>Matrix Spike (2052109-MS1)</b>	<b>Source: R205130-01</b>			Prepared: 05/21/12		Analyzed: 05/25/12	
Benzo (a) pyrene	28.8	5.00	ug/kg	33.3	ND	86.4	30-120
Chrysene	27.7	5.00	"	33.3	1.28	79.3	30-120
Dibenz (a,h) anthracene	20.3	10.0	"	33.3	ND	61.0	30-120
Fluoranthene	29.5	5.00	"	33.3	ND	88.4	30-120
Fluorene	27.2	5.00	"	33.3	ND	81.7	30-120
Indeno (1,2,3-cd) pyrene	24.4	10.0	"	33.3	ND	73.1	30-120
Naphthalene	26.8	5.00	"	33.3	ND	80.3	30-120
Phenanthrene	27.2	5.00	"	33.3	0.636	79.8	30-120
Pyrene	30.1	5.00	"	33.3	ND	90.3	30-120

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

**Reported:**  
06/13/12 10:46

**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 2051803 - EPA 1311**

**Blank (2051803-BLK1)**

Prepared: 05/18/12 Analyzed: 05/22/12

Arsenic	ND	0.100	mg/kg
Barium	ND	0.100	"
Cadmium	ND	0.100	"
Chromium	ND	0.100	"
Copper	ND	0.500	"
Lead	ND	0.100	"
Nickel	ND	0.200	"
Selenium	ND	0.100	"
Silver	ND	0.100	"
Zinc	ND	5.00	"

**LCS (2051803-BS1)**

Prepared: 05/18/12 Analyzed: 05/22/12

Arsenic	2.59	0.100	mg/kg	2.54	102	80-120
Barium	252	0.100	"	225	112	80-120
Cadmium	1.10	0.100	"	1.02	109	80-120
Chromium	10.7	0.100	"	10.0	107	80-120
Copper	18.6	0.500	"	20.0	92.7	80-120
Lead	74.4	0.100	"	75.0	99.2	80-120
Nickel	16.8	0.200	"	15.1	111	80-120
Selenium	1.10	0.100	"	1.15	95.9	80-120
Silver	0.181	0.100	"	0.200	90.3	80-120
Zinc	79.9	5.00	"	75.0	107	80-120

**LCS Dup (2051803-BS1)**

Prepared: 05/18/12 Analyzed: 05/22/12

Arsenic	2.72	0.100	mg/kg	2.54	107	80-120	4.99	20
Barium	252	0.100	"	225	112	80-120	0.0343	20
Cadmium	1.16	0.100	"	1.02	115	80-120	5.50	20
Chromium	10.7	0.100	"	10.0	107	80-120	0.370	20
Copper	19.1	0.500	"	20.0	95.2	80-120	2.62	20
Lead	73.1	0.100	"	75.0	97.4	80-120	1.84	20
Nickel	15.0	0.200	"	15.1	99.5	80-120	11.2	20
Selenium	1.09	0.100	"	1.15	95.0	80-120	0.859	20
Silver	0.223	0.100	"	0.200	112	80-120	21.2	20
Zinc	81.8	5.00	"	75.0	109	80-120	2.31	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.*





Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

**Reported:**  
06/13/12 10:46

**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 2051803 - EPA 1311**

Matrix Spike (2051803-MS1)		Source: R205130-01			Prepared: 05/18/12		Analyzed: 05/22/12			
Arsenic	5.52	0.100	mg/kg	2.47	3.27	91.2	75-125			
Barium	1360	0.100	"	219	459	413	75-125			QM-07
Cadmium	1.39	0.100	"	0.986	0.308	109	75-125			
Chromium	15.9	0.100	"	9.77	7.38	87.1	75-125			
Copper	25.4	0.500	"	19.5	9.72	80.4	75-125			
Lead	78.1	0.100	"	72.9	10.9	92.2	75-125			
Nickel	20.6	0.200	"	14.7	7.58	88.4	75-125			
Selenium	1.14	0.100	"	1.12	0.196	84.9	75-125			
Silver	0.195	0.100	"	0.194	0.0232	88.3	75-125			
Zinc	115	5.00	"	72.9	46.6	94.0	75-125			

Matrix Spike Dup (2051803-MSD1)		Source: R205130-01			Prepared: 05/18/12		Analyzed: 05/22/12			
Arsenic	5.48	0.100	mg/kg	2.54	3.27	87.2	75-125	0.660	25	
Barium	818	0.100	"	225	459	160	75-125	49.9	25	QM-07
Cadmium	1.42	0.100	"	1.01	0.308	110	75-125	2.32	25	
Chromium	16.2	0.100	"	10.0	7.38	87.5	75-125	1.83	25	
Copper	25.6	0.500	"	20.0	9.72	79.3	75-125	0.913	25	
Lead	82.2	0.100	"	75.0	10.9	95.2	75-125	5.19	25	
Nickel	21.0	0.200	"	15.1	7.58	89.1	75-125	2.28	25	
Selenium	1.18	0.100	"	1.15	0.196	85.2	75-125	2.73	25	
Silver	0.209	0.100	"	0.200	0.0232	92.7	75-125	6.82	25	
Zinc	115	5.00	"	75.0	46.6	91.6	75-125	0.169	25	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

**Reported:**  
06/13/12 10:46

**Total Mercury by EPA Method 7471/7470 - Quality Control**  
**Summit Scientific**

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

**Batch 2051804 - EPA 7471A**

<b>Blank (2051804-BLK1)</b>				Prepared: 05/18/12 Analyzed: 05/22/12							
Mercury	ND	0.0500	mg/kg								
<b>LCS (2051804-BS1)</b>				Prepared: 05/18/12 Analyzed: 05/22/12							
Mercury	0.409	0.0500	mg/kg	0.400		102	80-120				
<b>LCS Dup (2051804-BSD1)</b>				Prepared: 05/18/12 Analyzed: 05/22/12							
Mercury	0.415	0.0500	mg/kg	0.400		104	80-120	1.55	20		
<b>Matrix Spike (2051804-MS1)</b>				<b>Source: R205130-01</b>		Prepared: 05/18/12 Analyzed: 05/22/12					
Mercury	0.386	0.0500	mg/kg	0.361	0.0172	102	75-125				
<b>Matrix Spike Dup (2051804-MSD1)</b>				<b>Source: R205130-01</b>		Prepared: 05/18/12 Analyzed: 05/22/12					
Mercury	0.390	0.0500	mg/kg	0.370	0.0172	101	75-125	1.15	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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

**Reported:**  
06/13/12 10:46

**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 2052306 - General Preparation**

<b>Duplicate (2052306-DUP1)</b>		<b>Source: R205130-01</b>		Prepared: 05/23/12   Analyzed: 05/24/12	
pH	8.7	pH Units	8.7	0.461	20

**Batch 2052307 - General Preparation**

<b>Duplicate (2052307-DUP1)</b>		<b>Source: R205130-01</b>		Prepared: 05/23/12		Analyzed: 05/24/12	
Specific Conductance (EC)	0.634	0.00100	mmhos/cm	0.611		3.77	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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

Reported:  
06/13/12 10:46

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

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

**Batch 2051801 - General Preparation**

**Blank (2051801-BLK1)**

Prepared: 05/18/12 Analyzed: 05/21/12

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

**LCS (2051801-BS1)**

Prepared: 05/18/12 Analyzed: 05/21/12

Calcium	388	2.50	mg/kg	400		96.9	70-130			
Magnesium	203	1.00	"	200		101	70-130			
Sodium	795	5.00	"	800		99.4	70-130			

**LCS Dup (2051801-BSD1)**

Prepared: 05/18/12 Analyzed: 05/21/12

Calcium	411	2.50	mg/kg	400		103	70-130	5.81	25	
Magnesium	203	1.00	"	200		102	70-130	0.175	25	
Sodium	805	5.00	"	800		101	70-130	1.19	25	

**Matrix Spike (2051801-MS1)**

Source: R205130-01

Prepared: 05/18/12 Analyzed: 05/21/12

Calcium	1790	2.50	mg/kg	460	1520	58.7	70-130			QM-07
Magnesium	322	1.00	"	230	96.8	97.9	70-130			
Sodium	1280	5.00	"	920	374	98.9	70-130			

**Matrix Spike Dup (2051801-MSD1)**

Source: R205130-01

Prepared: 05/18/12 Analyzed: 05/21/12

Calcium	1770	2.50	mg/kg	451	1520	54.1	70-130	1.44	25	QM-07
Magnesium	309	1.00	"	226	96.8	93.9	70-130	4.19	25	
Sodium	1210	5.00	"	903	374	92.9	70-130	5.66	25	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 2/Terrace Plant  
Project Number: [none]  
Project Manager: James Hix

**Reported:**  
06/13/12 10:46

### Notes and Definitions

S-02      The surrogate recovery for this sample cannot be accurately quantified due to interference from coeluting organic compounds present in the sample extract.

R-01      The Reporting Limit for this analyte has been raised to account for matrix interference.

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

---

741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

May 29, 2012

James Hix

Olsson Associates

4690 Table Mountain Drive, Suite 200

Golden, CO 80403

RE: Whiting Pit Closures-Pit 3/Kern Well

Enclosed are the results of analyses for samples received by Summit Scientific on 05/18/12 09:30. 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' or 'Shrewsbury', written in a cursive style.

Ben Shrewsbury

President / Laboratory Director



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well  
Project Number: [none]  
Project Manager: James Hix

**Reported:**  
05/29/12 18:02

### ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SS8	R205132-01	Soil	05/17/12 14:10	05/18/12 09:30
SS9	R205132-02	Soil	05/17/12 16:34	05/18/12 09:30
BS5	R205132-03	Soil	05/17/12 17:00	05/18/12 09:30
BS6	R205132-04	Soil	05/17/12 17:03	05/18/12 09:30
Sludge	R205132-05	Soil	05/17/12 16:05	05/18/12 09:30

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.*



Page 1 of 1

Sampler Name: Ben Bandy

[illegible]

[www.s2scientific.com](http://www.s2scientific.com)





Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well  
Project Number: [none]  
Project Manager: James Hix

Reported:  
05/29/12 18:02

**SS8**  
**R205132-01 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **05/17/12 14:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	9400	50	mg/kg	1	2052107	05/21/12	05/23/12	8015 Full Carbon Chain	

Date Sampled: **05/17/12 14:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: o-Terphenyl		210 %	80-124		"	"	"	"	S-02

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

Date Sampled: **05/17/12 14:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0050	mg/kg	1	2052106	05/21/12	05/24/12	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	0.063	0.0050	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	490	5.0	"	10	"	"	"	"	

Date Sampled: **05/17/12 14:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		119 %	67.4-143		"	"	"	"	
Surrogate: Toluene-d8		105 %	77.3-114		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		107 %	78.4-125		"	"	"	"	

**Semivolatile Organic Compounds by EPA Method 8270D SIM**

Date Sampled: **05/17/12 14:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Acenaphthene	36.6	5.00	ug/kg	1	2052109	05/21/12	05/25/12	EPA 8270D SIM	

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well

Project Number: [none]  
Project Manager: James Hix

Reported:  
05/29/12 18:02

**SS8**  
**R205132-01 (Soil)**

**Summit Scientific**

**Semivolatile Organic Compounds by EPA Method 8270D SIM**

Analyte	Result	Conc	Units	Dilution	Batch	Prepared	Analyzed	Method
Acenaphthylene	194	5.00	ug/kg	1	2052109	05/21/12	05/25/12	EPA 8270D SIM
Anthracene	275	5.00	"	"	"	"	"	"
Benzo (a) anthracene	80.7	5.00	"	"	"	"	"	"
Benzo (b) fluoranthene	ND	5.00	"	"	"	"	"	"
Benzo (k) fluoranthene	ND	5.00	"	"	"	"	"	"
Benzo (g,h,i) perylene	ND	5.00	"	"	"	"	"	"
Benzo (a) pyrene	5.41	5.00	"	"	"	"	"	"
Chrysene	344	5.00	"	"	"	"	"	"
Dibenz (a,h) anthracene	ND	10.0	"	"	"	"	"	"
Fluoranthene	43.9	5.00	"	"	"	"	"	"
Fluorene	1010	5.00	"	"	"	"	"	"
Indeno (1,2,3-cd) pyrene	ND	10.0	"	"	"	"	"	"
Naphthalene	1590	5.00	"	"	"	"	"	"
Phenanthrene	4030	5.00	"	"	"	"	"	"
Pyrene	780	5.00	"	"	"	"	"	"

Date Sampled: 05/17/12 14:10

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: Nitrobenzene-d5		72.0 %	21.8-138		"	"	"	"	
Surrogate: 2-Fluorobiphenyl		76.2 %	31.2-131		"	"	"	"	
Surrogate: 2,4,6-Tribromophenol		105 %	44.5-144		"	"	"	"	
Surrogate: Terphenyl-d14		122 %	41.7-139		"	"	"	"	

**Calculated Analytes**

Date Sampled: 05/17/12 14:10

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium+3 Calculated	2.42	1.00	mg/kg	1	2052310	05/23/12	05/23/12	Calculation	

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

Date Sampled: 05/17/12 14:10

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	-----------------	-------	----------	-------	----------	----------	--------	-------

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well

Project Number: [none]  
Project Manager: James Hix

Reported:  
05/29/12 18:02

**SS8**  
**R205132-01 (Soil)**

**Summit Scientific**

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

Arsenic	1.28	0.0892	mg/kg	1	2051803	05/18/12	05/22/12	EPA 6020A
Barium	107	0.0892	"	"	"	"	"	"
Cadmium	ND	0.0892	"	"	"	"	"	"
Chromium	3.42	0.0892	"	"	"	"	"	"
Copper	2.30	0.446	"	"	"	"	"	"
Lead	2.76	0.0892	"	"	"	"	"	"
Nickel	2.80	0.0892	"	"	"	"	"	"
Selenium	ND	0.0892	"	"	"	"	"	"
Silver	ND	0.0892	"	"	"	"	"	"
Zinc	65.2	4.46	"	"	"	"	"	"

**Total Mercury by EPA Method 7471/7470**

Date Sampled: **05/17/12 14:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Mercury	ND	0.0500	mg/kg	1	2051804	05/18/12	05/22/12	EPA 7471B	

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

Date Sampled: **05/17/12 14:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	1.44	0.00100	mmhos/cm	1	2052307	05/23/12	05/24/12	SM 2510B	

Date Sampled: **05/17/12 14:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	9.5		pH Units	"	2052306	05/23/12	05/24/12	EPA 9045B	

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

Date Sampled: **05/17/12 14:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	106	2.50	mg/kg	1	2051801	05/18/12	05/21/12	EPA 6020/USDA60 6(2, 3A)	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well  
Project Number: [none]  
Project Manager: James Hix

**Reported:**  
05/29/12 18:02

**SS8**  
**R205132-01 (Soil)**

**Summit Scientific**

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

<b>Magnesium</b>	<b>14.7</b>	1.00	mg/kg	1	2051801	05/18/12	05/21/12	EPA 6020/USDA6 0 6(2, 3A)
<b>Sodium</b>	<b>828</b>	5.00	"	"	"	"	"	"

Date Sampled: **05/17/12 14:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Sodium Adsorption Ratio</b>	<b>20.0</b>		units	"	2052308	05/23/12	05/23/12	"	

**Accutest Laboratories - 6010 Hexavalent Chromium, Soil (3060A Mod Digest)**

Date Sampled: **05/17/12 14:10**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	1	mg/kg	1	2052310	05/23/12	05/23/12	3060A/7196 A	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well  
Project Number: [none]  
Project Manager: James Hix

Reported:  
05/29/12 18:02

**SS9**  
**R205132-02 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **05/17/12 16:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	5100	50	mg/kg	1	2052107	05/21/12	05/23/12	8015 Full Carbon Chain	

Date Sampled: **05/17/12 16:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: o-Terphenyl		170 %	80-124		"	"	"	"	S-02

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

Date Sampled: **05/17/12 16:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0050	mg/kg	1	2052106	05/21/12	05/24/12	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	05/24/12	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	1400	50	"	100	"	"	05/24/12	"	

Date Sampled: **05/17/12 16:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		123 %	67.4-143		"	"	"	"	
Surrogate: Toluene-d8		99.7 %	77.3-114		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		115 %	78.4-125		"	"	"	"	

**Semivolatile Organic Compounds by EPA Method 8270D SIM**

Date Sampled: **05/17/12 16:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Acenaphthene	8.60	5.00	ug/kg	1	2052109	05/21/12	05/25/12	EPA 8270D SIM	

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well

Project Number: [none]  
Project Manager: James Hix

Reported:  
05/29/12 18:02

**SS9**  
**R205132-02 (Soil)**

**Summit Scientific**

**Semivolatile Organic Compounds by EPA Method 8270D SIM**

Analyte	Result	Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Acenaphthylene	ND	5.00	ug/kg	1	2052109	05/21/12	05/25/12	EPA 8270D SIM	
<b>Anthracene</b>	<b>16.7</b>	5.00	"	"	"	"	"	"	
<b>Benzo (a) anthracene</b>	<b>29.3</b>	5.00	"	"	"	"	"	"	
<b>Benzo (b) fluoranthene</b>	<b>11.9</b>	5.00	"	"	"	"	"	"	
<b>Benzo (k) fluoranthene</b>	<b>15.6</b>	5.00	"	"	"	"	"	"	
Benzo (g,h,i) perylene	ND	5.00	"	"	"	"	"	"	
Benzo (a) pyrene	ND	5.00	"	"	"	"	"	"	
<b>Chrysene</b>	<b>264</b>	5.00	"	"	"	"	"	"	
Dibenz (a,h) anthracene	ND	10.0	"	"	"	"	"	"	
<b>Fluoranthene</b>	<b>19.2</b>	5.00	"	"	"	"	"	"	
<b>Fluorene</b>	<b>15.6</b>	5.00	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	10.0	"	"	"	"	"	"	
<b>Naphthalene</b>	<b>6.74</b>	5.00	"	"	"	"	"	"	
<b>Phenanthrene</b>	<b>27.3</b>	5.00	"	"	"	"	"	"	
<b>Pyrene</b>	<b>366</b>	5.00	"	"	"	"	"	"	

Date Sampled: **05/17/12 16:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: Nitrobenzene-d5		109 %	21.8-138		"	"	"	"	
Surrogate: 2-Fluorobiphenyl		83.4 %	31.2-131		"	"	"	"	
Surrogate: 2,4,6-Tribromophenol		104 %	44.5-144		"	"	"	"	
Surrogate: Terphenyl-d14		136 %	41.7-139		"	"	"	"	

**Calculated Analytes**

Date Sampled: **05/17/12 16:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Chromium+3 Calculated</b>	<b>2.57</b>	1.00	mg/kg	1	2052310	05/23/12	05/23/12	Calculation	

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

Date Sampled: **05/17/12 16:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	-----------------	-------	----------	-------	----------	----------	--------	-------

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well

Project Number: [none]  
Project Manager: James Hix

Reported:  
05/29/12 18:02

**SS9**  
**R205132-02 (Soil)**

**Summit Scientific**

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

<b>Arsenic</b>	<b>0.591</b>	0.0895	mg/kg	1	2051803	05/18/12	05/22/12	EPA 6020A
<b>Barium</b>	<b>109</b>	0.0895	"	"	"	"	"	"
Cadmium	ND	0.0895	"	"	"	"	"	"
<b>Chromium</b>	<b>3.57</b>	0.0895	"	"	"	"	"	"
<b>Copper</b>	<b>2.10</b>	0.448	"	"	"	"	"	"
<b>Lead</b>	<b>2.58</b>	0.0895	"	"	"	"	"	"
<b>Nickel</b>	<b>2.78</b>	0.0895	"	"	"	"	"	"
Selenium	ND	0.0895	"	"	"	"	"	"
Silver	ND	0.0895	"	"	"	"	"	"
<b>Zinc</b>	<b>13.0</b>	4.48	"	"	"	"	"	"

**Total Mercury by EPA Method 7471/7470**

Date Sampled: **05/17/12 16:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Mercury	ND	0.0500	mg/kg	1	2051804	05/18/12	05/22/12	EPA 7471B	

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

Date Sampled: **05/17/12 16:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Specific Conductance (EC)</b>	<b>0.324</b>	0.00100	mmhos/cm	1	2052307	05/23/12	05/24/12	SM 2510B	

Date Sampled: **05/17/12 16:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>pH</b>	<b>8.1</b>		pH Units	"	2052306	05/23/12	05/24/12	EPA 9045B	

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

Date Sampled: **05/17/12 16:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Calcium</b>	<b>3.86</b>	2.50	mg/kg	1	2051801	05/18/12	05/21/12	EPA 6020/USDA60 6(2, 3A)	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well  
Project Number: [none]  
Project Manager: James Hix

Reported:  
05/29/12 18:02

**SS9**  
**R205132-02 (Soil)**

**Summit Scientific**

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

Magnesium	6.47	1.00	mg/kg	1	2051801	05/18/12	05/21/12	EPA 6020/USDA6 0 6(2, 3A)	
Sodium	116	5.00	"	"	"	"	"	"	

Date Sampled: **05/17/12 16:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	8.38		units	"	2052308	05/23/12	05/23/12	"	

**Accutest Laboratories - 6010 Hexavalent Chromium, Soil (3060A Mod Digest)**

Date Sampled: **05/17/12 16:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	1	mg/kg	1	2052310	05/23/12	05/23/12	3060A/7196 A	

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.*





Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well

Project Number: [none]  
Project Manager: James Hix

Reported:  
05/29/12 18:02

**BS5**  
**R205132-03 (Soil)**

**Summit Scientific**

**Calculated Analytes**

Date Sampled: **05/17/12 17:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium+3 Calculated	ND	10.0	mg/kg	1	2052310	05/23/12	05/23/12	Calculation	

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

Date Sampled: **05/17/12 17:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Arsenic	2.03	0.0882	mg/kg	1	2051803	05/18/12	05/22/12	EPA 6020A	
Barium	101	0.0882	"	"	"	"	"	"	
Cadmium	0.131	0.0882	"	"	"	"	"	"	
Chromium	6.23	0.0882	"	"	"	"	"	"	
Copper	4.31	0.441	"	"	"	"	"	"	
Lead	6.38	0.0882	"	"	"	"	"	"	
Nickel	5.36	0.0882	"	"	"	"	"	"	
Selenium	0.155	0.0882	"	"	"	"	"	"	
Silver	ND	0.0882	"	"	"	"	"	"	
Zinc	20.1	4.41	"	"	"	"	"	"	

**Total Mercury by EPA Method 7471/7470**

Date Sampled: **05/17/12 17:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Mercury	ND	0.0500	mg/kg	1	2051804	05/18/12	05/22/12	EPA 7471B	

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

Date Sampled: **05/17/12 17:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	0.252	0.00100	mmhos/cm	1	2052307	05/23/12	05/24/12	SM 2510B	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well

Project Number: [none]  
Project Manager: James Hix

Reported:  
05/29/12 18:02

**BS5**  
**R205132-03 (Soil)**

**Summit Scientific**

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

Date Sampled: **05/17/12 17:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	8.4		pH Units	1	2052306	05/23/12	05/24/12	EPA 9045B	

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

Date Sampled: **05/17/12 17:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	143	2.50	mg/kg	1	2051801	05/18/12	05/21/12	EPA 6020/USDA6 0 6(2, 3A)	
Magnesium	16.8	1.00	"	"	"	"	"	"	
Sodium	ND	5.00	"	"	"	"	"	"	

Date Sampled: **05/17/12 17:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	0.0700		units	"	2052308	05/23/12	05/23/12	"	

**Accutest Laboratories - 6010 Hexavalent Chromium, Soil (3060A Mod Digest)**

Date Sampled: **05/17/12 17:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	10	mg/kg	1	2052310	05/23/12	05/23/12	3060A/7196 A	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well  
Project Number: [none]  
Project Manager: James Hix

Reported:  
05/29/12 18:02

**BS6**  
**R205132-04 (Soil)**

**Summit Scientific**

**Calculated Analytes**

Date Sampled: **05/17/12 17:03**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium+3 Calculated	ND	10.0	mg/kg	1	2052310	05/23/12	05/23/12	Calculation	

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

Date Sampled: **05/17/12 17:03**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Arsenic	1.99	0.0886	mg/kg	1	2051803	05/18/12	05/22/12	EPA 6020A	
Barium	85.0	0.0886	"	"	"	"	"	"	
Cadmium	0.116	0.0886	"	"	"	"	"	"	
Chromium	6.15	0.0886	"	"	"	"	"	"	
Copper	4.00	0.443	"	"	"	"	"	"	
Lead	6.14	0.0886	"	"	"	"	"	"	
Nickel	5.33	0.0886	"	"	"	"	"	"	
Selenium	0.153	0.0886	"	"	"	"	"	"	
Silver	ND	0.0886	"	"	"	"	"	"	
Zinc	20.1	4.43	"	"	"	"	"	"	

**Total Mercury by EPA Method 7471/7470**

Date Sampled: **05/17/12 17:03**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Mercury	ND	0.0500	mg/kg	1	2051804	05/18/12	05/22/12	EPA 7471B	

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

Date Sampled: **05/17/12 17:03**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	0.0718	0.00100	mmhos/cm	1	2052307	05/23/12	05/24/12	SM 2510B	

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well  
Project Number: [none]  
Project Manager: James Hix

Reported:  
05/29/12 18:02

**BS6**  
**R205132-04 (Soil)**

**Summit Scientific**

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

Date Sampled: **05/17/12 17:03**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	7.2		pH Units	1	2052306	05/23/12	05/24/12	EPA 9045B	

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

Date Sampled: **05/17/12 17:03**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	11.9	2.50	mg/kg	1	2051801	05/18/12	05/21/12	EPA 6020/USDA6 0 6(2, 3A)	
Magnesium	8.44	1.00	"	"	"	"	"	"	
Sodium	ND	5.00	"	"	"	"	"	"	

Date Sampled: **05/17/12 17:03**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	0.190		units	"	2052308	05/23/12	05/23/12	"	

**Accutest Laboratories - 6010 Hexavalent Chromium, Soil (3060A Mod Digest)**

Date Sampled: **05/17/12 17:03**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chromium, Hexavalent	ND	10	mg/kg	1	2052310	05/23/12	05/23/12	3060A/7196 A	

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well

Project Number: [none]  
Project Manager: James Hix

Reported:  
05/29/12 18:02

**Sludge**  
**R205132-05 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **05/17/12 16:05**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>C10-C28 (TEPH-DRO)</b>	<b>73000</b>	1500	mg/kg	30	2052107	05/21/12	05/23/12	8015 Full Carbon Chain	
<b>C28-C36 (TEPH-ORO)</b>	<b>15000</b>	1500	"	"	"	"	"	"	

Date Sampled: **05/17/12 16:05**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: o-Terphenyl</i>		123 %	80-124		"	"	"	"	

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

Date Sampled: **05/17/12 16:05**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Benzene</b>	<b>0.74</b>	0.050	mg/kg	10	2052106	05/21/12	05/24/12	EPA 8260B	
<b>Toluene</b>	<b>0.73</b>	0.050	"	"	"	"	"	"	
<b>Ethylbenzene</b>	<b>2.5</b>	0.50	"	100	"	"	"	"	
<b>Xylenes (total)</b>	<b>19</b>	0.50	"	"	"	"	"	"	
<b>Gasoline Range Hydrocarbons</b>	<b>3200</b>	50	"	"	"	"	"	"	

Date Sampled: **05/17/12 16:05**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		119 %	67.4-143		"	"	"	"	
<i>Surrogate: Toluene-d8</i>		99.2 %	77.3-114		"	"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>		78.5 %	78.4-125		"	"	"	"	

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well  
Project Number: [none]  
Project Manager: James Hix

Reported:  
05/29/12 18:02

**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 2052107 - EPA 3550A**

**Blank (2052107-BLK1)**

Prepared: 05/21/12 Analyzed: 05/22/12

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

**LCS (2052107-BS1)**

Prepared: 05/21/12 Analyzed: 05/22/12

C10-C28 (DRO)	557	50	mg/kg	501	111	81.4-129
C10-C28 (TEPH-DRO)	557	50	"	501	111	85-129

**LCS Dup (2052107-BSD1)**

Prepared: 05/21/12 Analyzed: 05/22/12

C10-C28 (TEPH-DRO)	561	50	mg/kg	501	112	85-129	0.637	11.8
C10-C28 (DRO)	561	50	"	501	112	81.4-129	0.637	9.26

**Matrix Spike (2052107-MS1)**

Source: R205129-01

Prepared: 05/21/12 Analyzed: 05/22/12

C10-C28 (TEPH-DRO)	663	50	mg/kg	501	88.6	115	77.3-134
C10-C28 (DRO)	663	50	"	501	132	106	77.8-133

**Matrix Spike Dup (2052107-MSD1)**

Source: R205129-01

Prepared: 05/21/12 Analyzed: 05/22/12

C10-C28 (DRO)	695	50	mg/kg	501	132	112	77.8-133	4.81	8.48
C10-C28 (TEPH-DRO)	695	50	"	501	88.6	121	77.3-134	4.81	8.39

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well  
Project Number: [none]  
Project Manager: James Hix

Reported:  
05/29/12 18:02

**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 2052106 - EPA 5030 Soil MS**

**Blank (2052106-BLK1)**

Prepared & Analyzed: 05/21/12

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	0.0403		"	0.0397	101	67.4-143				
Surrogate: Toluene-d8	0.0404		"	0.0400	101	77.3-114				
Surrogate: 4-Bromofluorobenzene	0.0400		"	0.0400	100	78.4-125				

**LCS (2052106-BS1)**

Prepared: 05/21/12 Analyzed: 05/22/12

Benzene	0.0848	0.0050	mg/kg	0.100	84.8	61-139				
Toluene	0.0928	0.0050	"	0.100	92.8	64-132				
Ethylbenzene	0.107	0.0050	"	0.100	107	68.7-135				
m,p-Xylene	0.198	0.010	"	0.200	99.2	70.4-129				
o-Xylene	0.104	0.0050	"	0.100	104	66.9-126				
Surrogate: 1,2-Dichloroethane-d4	0.0413		"	0.0397	104	67.4-143				
Surrogate: Toluene-d8	0.0396		"	0.0400	99.1	77.3-114				
Surrogate: 4-Bromofluorobenzene	0.0385		"	0.0400	96.2	78.4-125				

**LCS Dup (2052106-BSD1)**

Prepared: 05/21/12 Analyzed: 05/22/12

Benzene	0.0802	0.0050	mg/kg	0.100	80.2	61-139	5.64	11.1		
Toluene	0.0913	0.0050	"	0.100	91.3	64-132	1.60	10.9		
Ethylbenzene	0.108	0.0050	"	0.100	108	68.7-135	0.615	20		
m,p-Xylene	0.199	0.010	"	0.200	99.7	70.4-129	0.543	20		
o-Xylene	0.105	0.0050	"	0.100	105	66.9-126	0.976	20		
Surrogate: 1,2-Dichloroethane-d4	0.0389		"	0.0397	98.1	67.4-143				
Surrogate: Toluene-d8	0.0397		"	0.0400	99.2	77.3-114				
Surrogate: 4-Bromofluorobenzene	0.0383		"	0.0400	95.8	78.4-125				

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well  
Project Number: [none]  
Project Manager: James Hix

Reported:  
05/29/12 18:02

**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 2052106 - EPA 5030 Soil MS**

Matrix Spike (2052106-MS1)		Source: R205129-01			Prepared: 05/21/12		Analyzed: 05/22/12			
Benzene	0.0794	0.0050	mg/kg	0.100	ND	79.4	42.9-137			
Toluene	0.0894	0.0050	"	0.100	ND	89.4	42.6-130			
Ethylbenzene	0.108	0.0050	"	0.100	ND	108	39-133			
m,p-Xylene	0.198	0.010	"	0.200	ND	99.0	34.7-134			
o-Xylene	0.106	0.0050	"	0.100	ND	106	41.3-126			
Surrogate: 1,2-Dichloroethane-d4	0.0432		"	0.0397		109	67.4-143			
Surrogate: Toluene-d8	0.0393		"	0.0400		98.2	77.3-114			
Surrogate: 4-Bromofluorobenzene	0.0392		"	0.0400		98.0	78.4-125			
Matrix Spike Dup (2052106-MSD1)		Source: R205129-01			Prepared: 05/21/12		Analyzed: 05/22/12			
Benzene	0.0822	0.0050	mg/kg	0.100	ND	82.2	42.9-137	3.53	17.9	
Toluene	0.0934	0.0050	"	0.100	ND	93.4	42.6-130	4.43	11.9	
Ethylbenzene	0.106	0.0050	"	0.100	ND	106	39-133	0.981	20	
m,p-Xylene	0.197	0.010	"	0.200	ND	98.4	34.7-134	0.578	20	
o-Xylene	0.104	0.0050	"	0.100	ND	104	41.3-126	0.971	20	
Surrogate: 1,2-Dichloroethane-d4	0.0457		"	0.0397		115	67.4-143			
Surrogate: Toluene-d8	0.0400		"	0.0400		100	77.3-114			
Surrogate: 4-Bromofluorobenzene	0.0385		"	0.0400		96.2	78.4-125			

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.





Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well  
Project Number: [none]  
Project Manager: James Hix

Reported:  
05/29/12 18:02

**Semivolatile Organic Compounds by EPA Method 8270D SIM - Quality Control**  
**Summit Scientific**

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

**Batch 2052109 - EPA 3550A**

**Blank (2052109-BLK1)**

Prepared: 05/21/12 Analyzed: 05/24/12

Acenaphthene	ND	5.00	ug/kg							
Acenaphthylene	ND	5.00	"							
Anthracene	ND	5.00	"							
Benzo (a) anthracene	ND	5.00	"							
Benzo (b) fluoranthene	ND	5.00	"							
Benzo (k) fluoranthene	ND	5.00	"							
Benzo (g,h,i) perylene	ND	5.00	"							
Benzo (a) pyrene	ND	5.00	"							
Chrysene	ND	5.00	"							
Dibenz (a,h) anthracene	ND	10.0	"							
Fluoranthene	ND	5.00	"							
Fluorene	ND	5.00	"							
Indeno (1,2,3-cd) pyrene	ND	10.0	"							
Naphthalene	ND	5.00	"							
Phenanthrene	ND	5.00	"							
Pyrene	ND	5.00	"							
Surrogate: Nitrobenzene-d5	15.6		"	16.7		93.7	21.8-138			
Surrogate: 2-Fluorobiphenyl	15.6		"	16.6		94.0	31.2-131			
Surrogate: 2,4,6-Tribromophenol	23.9		"	16.7		144	44.5-144			
Surrogate: Terphenyl-dl4	16.4		"	16.4		99.7	41.7-139			

**LCS (2052109-BS1)**

Prepared: 05/21/12 Analyzed: 05/29/12

Acenaphthene	29.0	5.00	ug/kg	33.3		87.1	30-120			
Acenaphthylene	29.6	5.00	"	33.3		88.8	30-120			
Anthracene	28.4	5.00	"	33.3		85.1	30-120			
Benzo (a) anthracene	30.0	5.00	"	33.3		90.1	30-120			
Benzo (b) fluoranthene	29.9	5.00	"	33.3		89.6	30-120			
Benzo (k) fluoranthene	30.2	5.00	"	33.3		90.6	30-120			
Benzo (g,h,i) perylene	31.9	5.00	"	33.3		95.8	30-120			
Benzo (a) pyrene	30.5	5.00	"	33.3		91.5	30-120			
Chrysene	28.0	5.00	"	33.3		84.1	30-120			
Dibenz (a,h) anthracene	32.1	10.0	"	33.3		96.3	30-120			
Fluoranthene	29.4	5.00	"	33.3		88.2	30-120			
Fluorene	29.6	5.00	"	33.3		88.8	30-120			
Indeno (1,2,3-cd) pyrene	29.0	10.0	"	33.3		87.0	30-120			
Naphthalene	28.5	5.00	"	33.3		85.6	30-120			
Phenanthrene	28.2	5.00	"	33.3		84.7	30-120			
Pyrene	29.2	5.00	"	33.3		87.7	30-120			

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well  
Project Number: [none]  
Project Manager: James Hix

Reported:  
05/29/12 18:02

**Semivolatile Organic Compounds by EPA Method 8270D SIM - Quality Control**  
**Summit Scientific**

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

**Batch 2052109 - EPA 3550A**

**LCS (2052109-BS1)**

Prepared: 05/21/12 Analyzed: 05/29/12

Surrogate: Nitrobenzene-d5	15.6		ug/kg	16.7		93.6	21.8-138		
Surrogate: 2-Fluorobiphenyl	15.0		"	16.6		90.1	31.2-131		
Surrogate: 2,4,6-Tribromophenol	20.0		"	16.7		120	44.5-144		
Surrogate: Terphenyl-d14	15.2		"	16.4		92.9	41.7-139		

**LCS Dup (2052109-BSD1)**

Prepared: 05/21/12 Analyzed: 05/29/12

Acenaphthene	30.3	5.00	ug/kg	33.3		91.0	30-120	4.40	30
Acenaphthylene	29.6	5.00	"	33.3		88.8	30-120	0.0383	30
Anthracene	30.1	5.00	"	33.3		90.2	30-120	5.74	30
Benzo (a) anthracene	31.4	5.00	"	33.3		94.2	30-120	4.51	30
Benzo (b) fluoranthene	32.5	5.00	"	33.3		97.6	30-120	8.57	30
Benzo (k) fluoranthene	33.5	5.00	"	33.3		100	30-120	10.3	30
Benzo (g,h,i) perylene	28.8	5.00	"	33.3		86.5	30-120	10.2	30
Benzo (a) pyrene	30.7	5.00	"	33.3		92.1	30-120	0.654	30
Chrysene	27.9	5.00	"	33.3		83.6	30-120	0.575	30
Dibenz (a,h) anthracene	28.9	10.0	"	33.3		86.7	30-120	10.5	30
Fluoranthene	30.6	5.00	"	33.3		91.9	30-120	4.07	30
Fluorene	30.0	5.00	"	33.3		90.1	30-120	1.48	30
Indeno (1,2,3-cd) pyrene	29.5	10.0	"	33.3		88.4	30-120	1.60	30
Naphthalene	29.3	5.00	"	33.3		88.0	30-120	2.67	30
Phenanthrene	29.9	5.00	"	33.3		89.6	30-120	5.59	30
Pyrene	30.7	5.00	"	33.3		92.2	30-120	5.03	30
Surrogate: Nitrobenzene-d5	16.0		"	16.7		96.3	21.8-138		
Surrogate: 2-Fluorobiphenyl	15.1		"	16.6		90.7	31.2-131		
Surrogate: 2,4,6-Tribromophenol	22.6		"	16.7		136	44.5-144		
Surrogate: Terphenyl-d14	15.2		"	16.4		92.4	41.7-139		

**Matrix Spike (2052109-MS1)**

Source: R205130-01

Prepared: 05/21/12 Analyzed: 05/25/12

Acenaphthene	27.3	5.00	ug/kg	33.3	ND	81.8	30-120		
Acenaphthylene	28.2	5.00	"	33.3	ND	84.5	30-120		
Anthracene	27.4	5.00	"	33.3	ND	82.3	30-120		
Benzo (a) anthracene	28.6	5.00	"	33.3	ND	85.9	30-120		
Benzo (b) fluoranthene	31.7	5.00	"	33.3	ND	95.1	30-120		
Benzo (k) fluoranthene	33.0	5.00	"	33.3	ND	98.9	30-120		
Benzo (g,h,i) perylene	20.0	5.00	"	33.3	ND	60.0	30-120		
Benzo (a) pyrene	28.8	5.00	"	33.3	ND	86.4	30-120		
Chrysene	27.7	5.00	"	33.3	1.28	79.3	30-120		
Dibenz (a,h) anthracene	20.3	10.0	"	33.3	ND	61.0	30-120		

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well  
Project Number: [none]  
Project Manager: James Hix

**Reported:**  
05/29/12 18:02

**Semivolatile Organic Compounds by EPA Method 8270D SIM - Quality Control**  
**Summit Scientific**

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

**Batch 2052109 - EPA 3550A**

<b>Matrix Spike (2052109-MS1)</b>	<b>Source: R205130-01</b>			Prepared: 05/21/12		Analyzed: 05/25/12	
Fluoranthene	29.5	5.00	ug/kg	33.3	ND	88.4	30-120
Fluorene	27.2	5.00	"	33.3	ND	81.7	30-120
Indeno (1,2,3-cd) pyrene	24.4	10.0	"	33.3	ND	73.1	30-120
Naphthalene	26.8	5.00	"	33.3	ND	80.3	30-120
Phenanthrene	27.2	5.00	"	33.3	0.636	79.8	30-120
Pyrene	30.1	5.00	"	33.3	ND	90.3	30-120
<i>Surrogate: Nitrobenzene-d5</i>	<i>14.2</i>		<i>"</i>	<i>16.7</i>		<i>84.9</i>	<i>21.8-138</i>
<i>Surrogate: 2-Fluorobiphenyl</i>	<i>13.9</i>		<i>"</i>	<i>16.6</i>		<i>83.9</i>	<i>31.2-131</i>
<i>Surrogate: 2,4,6-Tribromophenol</i>	<i>31.8</i>		<i>"</i>	<i>16.7</i>		<i>191</i>	<i>44.5-144</i>
<i>Surrogate: Terphenyl-d14</i>	<i>13.9</i>		<i>"</i>	<i>16.4</i>		<i>84.9</i>	<i>41.7-139</i>

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well  
Project Number: [none]  
Project Manager: James Hix

Reported:  
05/29/12 18:02

**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 2051803 - EPA 1311**

**Blank (2051803-BLK1)**

Prepared: 05/18/12 Analyzed: 05/22/12

Arsenic	ND	0.100	mg/kg
Barium	ND	0.100	"
Cadmium	ND	0.100	"
Chromium	ND	0.100	"
Copper	ND	0.500	"
Lead	ND	0.100	"
Nickel	ND	0.200	"
Selenium	ND	0.100	"
Silver	ND	0.100	"
Zinc	ND	5.00	"

**LCS (2051803-BS1)**

Prepared: 05/18/12 Analyzed: 05/22/12

Arsenic	2.59	0.100	mg/kg	2.54	102	80-120
Barium	252	0.100	"	225	112	80-120
Cadmium	1.10	0.100	"	1.02	109	80-120
Chromium	10.7	0.100	"	10.0	107	80-120
Copper	18.6	0.500	"	20.0	92.7	80-120
Lead	74.4	0.100	"	75.0	99.2	80-120
Nickel	16.8	0.200	"	15.1	111	80-120
Selenium	1.10	0.100	"	1.15	95.9	80-120
Silver	0.181	0.100	"	0.200	90.3	80-120
Zinc	79.9	5.00	"	75.0	107	80-120

**LCS Dup (2051803-BSD1)**

Prepared: 05/18/12 Analyzed: 05/22/12

Arsenic	2.72	0.100	mg/kg	2.54	107	80-120	4.99	20
Barium	252	0.100	"	225	112	80-120	0.0343	20
Cadmium	1.16	0.100	"	1.02	115	80-120	5.50	20
Chromium	10.7	0.100	"	10.0	107	80-120	0.370	20
Copper	19.1	0.500	"	20.0	95.2	80-120	2.62	20
Lead	73.1	0.100	"	75.0	97.4	80-120	1.84	20
Nickel	15.0	0.200	"	15.1	99.5	80-120	11.2	20
Selenium	1.09	0.100	"	1.15	95.0	80-120	0.859	20
Silver	0.223	0.100	"	0.200	112	80-120	21.2	20
Zinc	81.8	5.00	"	75.0	109	80-120	2.31	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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well  
Project Number: [none]  
Project Manager: James Hix

**Reported:**  
05/29/12 18:02

**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 2051803 - EPA 1311**

Matrix Spike (2051803-MS1)				Source: R205130-01		Prepared: 05/18/12		Analyzed: 05/22/12	
Arsenic	5.52	0.100	mg/kg	2.47	3.27	91.2	75-125		
Barium	1360	0.100	"	219	459	413	75-125		QM-07
Cadmium	1.39	0.100	"	0.986	0.308	109	75-125		
Chromium	15.9	0.100	"	9.77	7.38	87.1	75-125		
Copper	25.4	0.500	"	19.5	9.72	80.4	75-125		
Lead	78.1	0.100	"	72.9	10.9	92.2	75-125		
Nickel	20.6	0.200	"	14.7	7.58	88.4	75-125		
Selenium	1.14	0.100	"	1.12	0.196	84.9	75-125		
Silver	0.195	0.100	"	0.194	0.0232	88.3	75-125		
Zinc	115	5.00	"	72.9	46.6	94.0	75-125		

Matrix Spike Dup (2051803-MSD1)				Source: R205130-01		Prepared: 05/18/12		Analyzed: 05/22/12	
Arsenic	5.48	0.100	mg/kg	2.54	3.27	87.2	75-125	0.660	25
Barium	818	0.100	"	225	459	160	75-125	49.9	25
Cadmium	1.42	0.100	"	1.01	0.308	110	75-125	2.32	25
Chromium	16.2	0.100	"	10.0	7.38	87.5	75-125	1.83	25
Copper	25.6	0.500	"	20.0	9.72	79.3	75-125	0.913	25
Lead	82.2	0.100	"	75.0	10.9	95.2	75-125	5.19	25
Nickel	21.0	0.200	"	15.1	7.58	89.1	75-125	2.28	25
Selenium	1.18	0.100	"	1.15	0.196	85.2	75-125	2.73	25
Silver	0.209	0.100	"	0.200	0.0232	92.7	75-125	6.82	25
Zinc	115	5.00	"	75.0	46.6	91.6	75-125	0.169	25

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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well  
Project Number: [none]  
Project Manager: James Hix

Reported:  
05/29/12 18:02

**Total Mercury by EPA Method 7471/7470 - Quality Control**  
**Summit Scientific**

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

**Batch 2051804 - EPA 7471A**

<b>Blank (2051804-BLK1)</b>				Prepared: 05/18/12 Analyzed: 05/22/12							
Mercury	ND	0.0500	mg/kg								
<b>LCS (2051804-BS1)</b>				Prepared: 05/18/12 Analyzed: 05/22/12							
Mercury	0.409	0.0500	mg/kg	0.400		102	80-120				
<b>LCS Dup (2051804-BSD1)</b>				Prepared: 05/18/12 Analyzed: 05/22/12							
Mercury	0.415	0.0500	mg/kg	0.400		104	80-120	1.55	20		
<b>Matrix Spike (2051804-MS1)</b>				<b>Source: R205130-01</b>		Prepared: 05/18/12 Analyzed: 05/22/12					
Mercury	0.386	0.0500	mg/kg	0.361	0.0172	102	75-125				
<b>Matrix Spike Dup (2051804-MSD1)</b>				<b>Source: R205130-01</b>		Prepared: 05/18/12 Analyzed: 05/22/12					
Mercury	0.390	0.0500	mg/kg	0.370	0.0172	101	75-125	1.15	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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well  
Project Number: [none]  
Project Manager: James Hix

**Reported:**  
05/29/12 18:02

**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 2052306 - General Preparation**

**Duplicate (2052306-DUP1)**      **Source: R205130-01**      Prepared: 05/23/12      Analyzed: 05/24/12

pH	8.7		pH Units	8.7		0.461	20
----	-----	--	----------	-----	--	-------	----

**Batch 2052307 - General Preparation**

**Duplicate (2052307-DUP1)**      **Source: R205130-01**      Prepared: 05/23/12      Analyzed: 05/24/12

Specific Conductance (EC)	0.634	0.00100	mmhos/cm	0.611		3.77	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.*



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well  
Project Number: [none]  
Project Manager: James Hix

Reported:  
05/29/12 18:02

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

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

**Batch 2051801 - General Preparation**

**Blank (2051801-BLK1)**

Prepared: 05/18/12 Analyzed: 05/21/12

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

**LCS (2051801-BS1)**

Prepared: 05/18/12 Analyzed: 05/21/12

Calcium	388	2.50	mg/kg	400		96.9	70-130			
Magnesium	203	1.00	"	200		101	70-130			
Sodium	795	5.00	"	800		99.4	70-130			

**LCS Dup (2051801-BSD1)**

Prepared: 05/18/12 Analyzed: 05/21/12

Calcium	411	2.50	mg/kg	400		103	70-130	5.81	25	
Magnesium	203	1.00	"	200		102	70-130	0.175	25	
Sodium	805	5.00	"	800		101	70-130	1.19	25	

**Matrix Spike (2051801-MS1)**

Source: R205130-01

Prepared: 05/18/12 Analyzed: 05/21/12

Calcium	1790	2.50	mg/kg	460	1520	58.7	70-130			QM-07
Magnesium	322	1.00	"	230	96.8	97.9	70-130			
Sodium	1280	5.00	"	920	374	98.9	70-130			

**Matrix Spike Dup (2051801-MSD1)**

Source: R205130-01

Prepared: 05/18/12 Analyzed: 05/21/12

Calcium	1770	2.50	mg/kg	451	1520	54.1	70-130	1.44	25	QM-07
Magnesium	309	1.00	"	226	96.8	93.9	70-130	4.19	25	
Sodium	1210	5.00	"	903	374	92.9	70-130	5.66	25	

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.*





Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Whiting Pit Closures-Pit 3/Kern Well  
Project Number: [none]  
Project Manager: James Hix

**Reported:**  
05/29/12 18:02

### Notes and Definitions

S-02      The surrogate recovery for this sample cannot be accurately quantified due to interference from coeluting organic compounds present in the sample extract.

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

**Appendix B**  
**Photographic Log**

**Photographic Log**  
**Whiting Pit Closures – Terrace Gas Plant and Kern 43-33 Battery**

	<p style="text-align: right;"><b>PHOTO 1</b></p> <p><b>Subject:</b> Terrace Gas Plant Pit 1 Excavation of test pit 2</p> <p><b>View:</b> Northeast</p>
	<p style="text-align: right;"><b>PHOTO 2</b></p> <p><b>Subject:</b> Terrace Gas Plant – Pit 1, test pit 2. Total depth of test pit 2 – 5.5 feet below ground surface. No staining or hydrocarbon odor were observed</p> <p><b>View:</b> NA</p>



**Photographic Log**  
**Whiting Pit Closures – Terrace Gas Plant and Kern 43-33 Battery**



**PHOTO 3**

**Subject:** Terrace Gas Plant, Pit 1 showing excavation of test pit 3

**View:** West



**PHOTO 4**

**Subject:** Terrace Gas plant, Pit 1, total depth of test pit 3 – 4.5 feet below ground surface. No hydrocarbon odor or staining were observed in the excavation.

**View:** NA



**PHOTO 5**

**Subject:** Terrace Gas Plant, Pit 1, showing location of test pit 5 beneath the inlet pipe.

**View:** Northeast



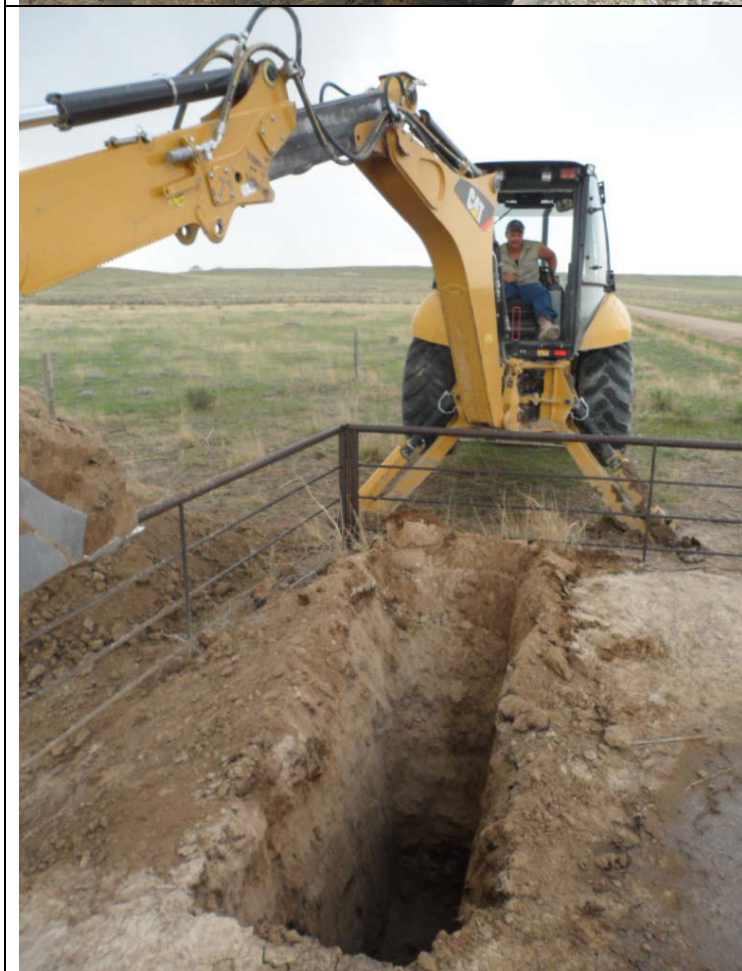
**Photographic Log**  
**Whiting Pit Closures – Terrace Gas Plant and Kern 43-33 Battery**



**PHOTO 6**

**Subject:** Terrace Gas Plant, Pit 1 photo showing total depth of test pit 5 – 9.0 feet below ground surface. Staining was seen at 2 feet and between 4.5-6 feet below ground surface.

**View:** NA



**PHOTO 7**

**Subject:** Terrace Gas Plant Tinhorn Pit 2 excavation of test pit 6 on the south side of the pit enclosure.

**View:** West

**Photographic Log**  
**Whiting Pit Closures – Terrace Gas Plant and Kern 43-33 Battery**



**PHOTO 8**

**Subject:** Terrace Gas Plant, Tinhorn, Pit 2 total depth of test pit 6 was 8 feet below ground surface. A soil sample was collected at 7 feet below ground surface. No staining was observed; however there was a slight odor detected.

**View:** NA



**PHOTO 9**

**Subject:** Terrace Gas Plant – Tin horn Pit 2. Photograph shows inside the tinhorn and oil water mixture.

**View:** NA



**PHOTO 10**

**Subject:** Terrace Gas Plant Tinhorn Pit 2 photograph shows excavation of test pit 7 on the north side of the tinhorn, closest to County Road 118.

**View:** West



**Photographic Log**  
**Whiting Pit Closures – Terrace Gas Plant and Kern 43-33 Battery**



**PHOTO 11**

**Subject:** Terrace Gas Plant tinhorn, Pit 2  
The total depth of test pit 7 was 10 feet below ground surface. However, the bottom of test pit still had significant staining.

**View:** NA



**PHOTO 12**

**Subject:** Terrace Gas Plant tinhorn, Pit 2  
photograph showing test pit 7 and hydrocarbon impacted soils

**View:** West



**PHOTO 13**

**Subject:** Kern 43-33 Pit 3 photograph  
showing water and sludge in the bottom  
of the pit.

**View:** Northwest



**Photographic Log**  
**Whiting Pit Closures – Terrace Gas Plant and Kern 43-33 Battery**



**PHOTO 14**

**Subject:** Kern 43-33 Pit 3 photograph showing excavation of test pit 8 and stained soils and sludge.

**View:** NA



**PHOTO 15**

**Subject:** Kern 43-33 Pit 3 photograph showing excavation of test pit 8. Sludge was moved to the sides of Pit 3. A soil sample was collected from 2 feet below ground surface. No staining, however a slight odor was detected at the total depth of the test pit.

**View:** Northwest