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BARR

June 12, 2015

Mr. Steve Schoff
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155

**Re: Additional Soil Characterization, Operable Unit 5**
**Joslyn Manufacturing & Supply Co. Site – Brooklyn Center, Minnesota**

Dear Mr. Schoff:

On behalf of Joslyn Manufacturing Company (Joslyn), this letter summarizes the implementation and results of a soil quality investigation conducted within Operable Unit 5 (OU5) at the above-referenced site in February 2015. The investigation fulfilled the Minnesota Pollution Control Agency's (MPCA) request that Joslyn further define the vertical extent and magnitude of concentrations of polychlorinated dibenzo-p-dioxins and furans (dioxins) in soils below the depths proposed for excavation as part of the recommended remedy for OU5.

The objectives and scope of this soil investigation were originally proposed to the MPCA in a May 27, 2014 work plan letter prepared by Barr Engineering Co. (Barr) and approved by you on July 24, 2014. An attempt to implement the investigation was made in fall 2014 using sediment core sampling techniques since saturated soil conditions at the site would not allow for access with a direct-push drilling rig. The sediment cores were unable to penetrate through the wood and other organic material present near the surface, therefore the work was suspended until winter.

## Investigation Activities

A total of six soil borings were advanced to 10 feet below existing ground surface (bgs) at the locations shown on Figure 1. Field activities were conducted in accordance with the May 2014 work plan letter and included the following activities:

- Six soil borings were advanced to the depth of 10 feet bgs.
- Four composite samples were prepared from soils collected from each boring. Soil from each designated sample interval was thoroughly mixed prior to containerization. A deviation from the work plan resulted in the collection of six composite samples from location B-1.
- The uppermost composite sample from each boring was submitted for immediate laboratory analysis for dioxins (expressed as TCDD-TEQ) and total organic carbon (TOC).
- The composite samples collected from the deeper intervals of each boring were held at the laboratory pending review of the data reported.

- Soil quality data for each interval analyzed were reviewed and discussed verbally with MPCA staff before decisions were made whether to analyze additional sample intervals at specific boring locations. Ultimately, all sample intervals collected were analyzed with the exception of B-1(3.5-5), B-1(5-6.5), B-3(9-10), and D-1(9-10). At boring B-1, the decision was made to skip the middle intervals and analyze the deepest interval. The relatively low concentrations reported for the third intervals analyzed at borings B-3 and D-1 precluded the need to analyze the final, deepest sample at those locations.

# Summary of Results

**Soil borings**

Soils observed in the soil borings were consistent with previous investigations. In general, black, fibrous peat overlies gray organic clay (Figure 2). Silty sand and silt was observed in the upland area (B-1 and D-1). The water table was present between 4-5 feet bgs at the upland area borings and also at E-4, which is located on the berm of the former railroad spur. The water table was present at the ground surface at the other borings, which are located within the wetland portion of OU5.

Soils were screened for odor, discoloration and sheen in the field. No odor, discoloration or sheen was observed in the soils retrieved from borings B-3, C-3, D-1, and F-3. At boring location B-1, no odor, discoloration, or sheen was observed in the upper 6.5 feet. In the saturated silty sand layer that extended from 6.5 to 10 feet bgs, however, the soil was discolored and presented a weathered petroleum odor. At boring location E-4, no odor, discoloration, or sheen was observed in the upper 8 feet of the soil profile, but a light weathered petroleum odor and discoloration was observed from 8 to 10 feet bgs. Boring logs are included as Attachment A.

**Analytical Results**

Soil samples were sent to ALS Environmental laboratory in Kelso, Washington and analyzed for dioxins (expressed as TCDD-TEQ) and total organic carbon (TOC). Analytical results are summarized in Tables 1 and 2 and laboratory reports are included in Attachment B.

TCDD-TEQ concentrations from the composite samples decreased with increasing depth. In the upper-most intervals sampled at each boring, TCDD-TEQ concentrations ranged from 834 to 17,800 ng/kg (parts per trillion). TCDD-TEQ concentrations from the deepest analyzed composite sample interval at each location ranged between 1.62 and 427 ng/kg. The exception was boring E-4, where the TCDD-TEQ concentration did not decline with depth. At location E-4, the dioxin concentrations reported for the upper three composite samples (3.5'-5', 5'-6.5', and 6.5'-9') ranged between 509 and 1,070 ng/kg, while the dioxin concentration reported for the deepest interval (9'-10'), where field screening results indicated the presence of contamination, was 3,450 ng/kg.

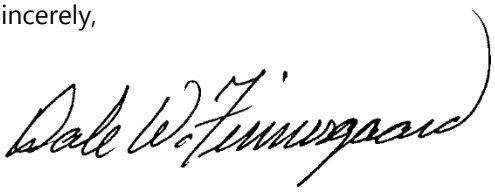
# Conclusions

Soil samples were collected from six locations in February 2015 to further define the vertical extent and magnitude of the concentration of dioxins in soils below the depths proposed for excavation as part of the recommended remedy for OU5. With the exception of location E-4, dioxin concentrations decreased by several orders of magnitude from the planned excavation depth to ten feet bgs in all borings. At three of the six locations (B-3, C-3 and F-3), TCDD-TEQ concentrations in the deepest interval analyzed fell below the Minnesota Tier 2 Industrial Soil Reference Value of 35 ng/kg.

The results of the additional soil characterization meet the MPCA's objective of refining our understanding of the vertical extent and magnitude of dioxin concentrations in OU5 soils. The remedial action objective for OU5 is the elimination of direct soil contact exposure pathways for both human and ecological receptors. All of the soil sampled in this investigation will be isolated by the remedy, eliminating both the human-health and ecological-risk pathways. Based upon the field and analytical data generated by this investigation, Joslyn concludes that no additional soil characterization activities are needed for OU5, and that the MPCA should continue moving forward with remedial action planning based upon the previously recommended remedial alternative (Remedial Alternative 8b, *Focused Feasibility Study – Revision 2, Operable Unit 5, West Area Soils, July 2013*).

We would appreciate an opportunity to review these latest findings with you and discuss your tentative schedule for moving forward with finalizing the Proposed Plan for the OU5 remedy and scheduling a public meeting for the same. If you have any questions regarding this investigation summary, please contact me or John Hunt.

Sincerely,



Dale W. Finnesgaard, P.E.

Vice President

Enclosure

cc: Carl Grabinski, Joslyn
Carlos Stern
Jim Payne

Table 1 – Soil Boring Matrix with TCDD-TEQ and TOC Results
Table 2 – Soil Analytical Data Summary
Figure 1 – Soil Sampling Locations
Figure 2 – Geologic Cross Section
Attachment A – Soil Boring Logs
Attachment B – Laboratory Analytical Reports

# Tables

Table 1

**Soil Boring Matrix with TCDD-TEQ and TOC Results**

Additional Soil Characterization, Operable Unit 5

Joslyn Manufacturing Supply Co.

Brooklyn Center, Minnesota

| Boring Location | Sample Date | Planned Excavation Depth | Boring Depth (feet, bgs) | Soil Sampling Results | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Sample Intervals | TCDD-TEQ** (ng/kg) | TOC (%) | ALS Lab Report # | Date Analyzed |
| B-1 | 2/2/2015 | 0* | 10 | 0.5 - 2 | **13,800** | 3.81 | K1501105 | 2/18/2015 |
| | | | | 2 - 3.5 | **3,950** | 2.47 | K1501100 | 3/18/2015 |
| | | | | 6.5 - 9 | **2,260** | 0.553 | K1501100 | 3/18/2015 |
| | | | | 9 - 10 | **427** | 0.124 | K1501100 | 3/18/2015 |
| B-3 | 2/2/2015 | 3.5 | 10 | 3.5 - 5 | **4,360** | 43.7 | K1501105 | 2/18/2015 |
| | | | | 5 - 6.5 | **2,000** | 42.2 | K1501100 | 3/18/2015 |
| | | | | 6.5 - 9 | **1.62** | 11.3 | K1503395 | 4/11/2015 |
| C-3 | 2/2/2015 | 3.5 | 10 | 3.5 - 5 | **7,940** | 39.4 | K1501105 | 2/20/2015 |
| | | | | 5 - 6.5 | **15,000** | 40.2 | K1501100 | 3/31/2015 |
| | | | | 6.5 - 9 | **1,790** | 32.2 | K1503395 | 4/11/2015 |
| | | | | 9 - 10 | **8.74** | 7.33 | K1504931 | 5/19/2015 |
| D-1 | 2/2/2015 | 0* | 10 | 0.5 - 2 | **17,800** | 1.33 | K1501105 | 2/18/2015 |
| | | | | 2 - 3.5 | **1,540** | 1.37 | K1501100 | 3/31/2015 |
| | | | | 3.5 - 9 | **51** | 14.3 | K1503395 | 4/11/2015 |
| E-4 | 2/2/2015 | 3.5 | 10 | 3.5 - 5 | **834** | 44.3 | K1501105 | 2/18/2015 |
| | | | | 5 - 6.5 | **1,070** | 31.9 | K1501100 | 3/31/2015 |
| | | | | 6.5 - 9 | **509** | 8.01 | K1501100 | 3/31/2015 |
| | | | | 9 - 10 | **3,450** | 3.91 | K1501100 | 3/31/2015 |
| F-3 | 2/2/2015 | 2.5 | 10 | 2.5 - 4 | **2,840** | 11 | K1501105 | 2/18/2015 |
| | | | | 4 - 5.5 | **1,950** | 17.9 | K1501100 | 3/31/2015 |
| | | | | 5.5 - 9 | **542** | 38.4 | K1503395 | 4/11/2015 |
| | | | | 9 - 10 | **3.14** | 11.8 | K1504931 | 5/19/2015 |

* locations B-1 and D-1 will be covered as part of the recommended alternative

** TCDD Equivalent, reporting limit at 0, TEF 2005 (estimated maximum possible concentration @ 1)

Table 2

**Soil Analytical Data Summary**

Additional Soil Characterization, Operable Unit 5

Joslyn Manufacturing Supply Co.

Brooklyn Center, Minnesota

| Parameter | Analysis Location | Proposed Minnesota Tier 2 Commercial/ Industrial SRVs | Minnesota Tier 2 Industrial Soil Reference Values | Location | B-1 | B-1 | B-1 | B-1 | B-3 | B-3 | B-3 | C-3 | C-3 | C-3 | C-3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Date | 2/02/2015 | 2/02/2015 | 2/02/2015 | 2/02/2015 | 2/02/2015 | 2/02/2015 | 2/02/2015 | 2/02/2015 | 2/02/2015 | 2/02/2015 | 2/02/2015 |
| | | | | Depth | 0.5 - 2 ft | 2 - 3.5 ft | 6.5 - 9 ft | 9 - 10 ft | 3.5 - 5 ft | 5 - 6.5 ft | 6.5 - 9 ft | 3.5 - 5 ft | 5 - 6.5 ft | 6.5 - 9 ft | 9 - 10 ft |
| | | | | Sample Type | N | N | N | N | N | N | N | N | N | N | N |
| **Effective Date** | | 10/01/2014 | 06/22/2009 | | | | | | | | | | | | |
| **Exceedance Key** | | **Bold** | Underline | | | | | | | | | | | | |
| General Parameters | | | | | | | | | | | | | | | |
| Carbon, total organic | Lab | | | | 3.81 % | 2.47 h % | 0.553 h % | 0.124 h % | 43.7 % | 42.2 h % | 11.3 h % | 39.4 % | 40.2 h % | 32.2 h % | 7.33 h % |
| Solids, total | Lab | | | | 80.5 % | 74.0 % | 82.3 % | 83.6 % | 22.1 % | 19.0 % | 27.6 % | 22.1 % | 17.5 % | 18.7 % | 35.5 % |
| Chlorinated Dioxins / Furans | | | | | | | | | | | | | | | |
| 2,3,7,8-Dioxin, tetra | Lab | **30 DI ng/kg** | Underline 35 DI ng/kg | | 5.88 ng/kg | 0.575 EMPC ng/kg | 0.247 EMPC ng/kg | < 0.307 ng/kg | < 0.572 ng/kg | 4.59 ng/kg | < 0.592 ng/kg | < 0.156 ng/kg | 2.04 EMPC ng/kg | < 2.50 ng/kg | **Underline 351 ng/kg** |
| 1,2,3,7,8-Dioxin, penta | Lab | | | | 149 ng/kg | 17.9 ng/kg | 5.77 ng/kg | < 0.773 ng/kg | 14.5 ng/kg | 41.4 ng/kg | < 0.755 ng/kg | 11.8 ng/kg | 104 ng/kg | 29.4 ng/kg | 1.11 EMPC ng/kg |
| 1,2,3,4,7,8-Dioxin, hexa | Lab | | | | 522 ng/kg | 96.4 ng/kg | 74.2 ng/kg | 6.51 ng/kg | 160 ng/kg | 194 ng/kg | < 0.454 ng/kg | 79.0 ng/kg | 501 ng/kg | 111 ng/kg | 8.76 ng/kg |
| 1,2,3,6,7,8-Dioxin, hexa | Lab | | | | 11900 ng/kg | 4510 EMPC ng/kg | 4620 ng/kg | 329 ng/kg | 3430 ng/kg | 1530 ng/kg | 2.37 EMPC ng/kg | 6270 ng/kg | 18500 ng/kg | 1280 ng/kg | 1.78 j ng/kg |
| 1,2,3,7,8,9-Dioxin, hexa | Lab | | | | 1070 ng/kg | 292 ng/kg | 497 ng/kg | 101 ng/kg | 306 ng/kg | 336 ng/kg | < 0.435 ng/kg | 385 ng/kg | 1100 ng/kg | 284 ng/kg | 0.268 EMPC ng/kg |
| 1,2,3,4,6,7,8-Dioxin, hepta | Lab | | | | 453000 ng/kg | 122000 * ng/kg | 99200 * ng/kg | 27700 * ng/kg | 192000 ng/kg | 94900 * ng/kg | 72.3 ng/kg | 290000 ng/kg | 382000 * ng/kg | 73200 ng/kg | < 0.224 ng/kg |
| Dioxin, octa | Lab | | | | 15000000 e ng/kg | 3050000 * ng/kg | 762000 * ng/kg | 289000 * ng/kg | 3730000 ng/kg | 1430000 * ng/kg | 828 ng/kg | 5390000 ng/kg | 4450000 * ng/kg | 725000 ng/kg | 3750 ng/kg |
| 2,3,7,8-Dibenzofuran, tetra | Lab | | | | 49.8 ng/kg | 41.3 ng/kg | 0.529 j ng/kg | < 0.280 ng/kg | < 0.622 ng/kg | < 0.910 ng/kg | < 1.64 ng/kg | 61.3 ng/kg | 327 ng/kg | 17.3 EMPC ng/kg | < 0.291 ng/kg |
| 1,2,3,7,8-Dibenzofuran, penta | Lab | | | | 316 ng/kg | 322 ng/kg | 2.39 EMPC ng/kg | < 1.07 ng/kg | 3.22 j ng/kg | 6.09 EMPC ng/kg | < 0.379 ng/kg | 411 ng/kg | 2350 ng/kg | 85.6 ng/kg | 0.700 j ng/kg |
| 2,3,4,7,8-Dibenzofuran, penta | Lab | | | | 702 ng/kg | 697 ng/kg | 10.9 ng/kg | < 1.07 ng/kg | 2.51 j ng/kg | 16.4 EMPC ng/kg | < 0.368 ng/kg | 3.39 j ng/kg | 4770 ng/kg | 200 ng/kg | 1.22 j ng/kg |
| 1,2,3,4,7,8-Dibenzofuran, hexa | Lab | | | | 4820 ng/kg | 2230 EMPC ng/kg | 1040 * ng/kg | 16.8 ng/kg | 443 * ng/kg | 299 * ng/kg | 1.09 EMPC ng/kg | 3630 ng/kg | 20500 ng/kg | 890 ng/kg | 4.90 j ng/kg |
| 1,2,3,6,7,8-Dibenzofuran, hexa | Lab | | | | 724 ng/kg | 643 ng/kg | 96.8 ng/kg | < 1.31 ng/kg | < 3.74 ng/kg | < 4.57 ng/kg | < 0.354 ng/kg | 741 ng/kg | 4370 ng/kg | 205 ng/kg | 1.45 j ng/kg |
| 1,2,3,7,8,9-Dibenzofuran, hexa | Lab | | | | 957 ng/kg | 1080 ng/kg | 98.4 ng/kg | < 1.44 ng/kg | < 4.35 ng/kg | < 5.28 ng/kg | < 0.471 ng/kg | 1400 ng/kg | 7660 ng/kg | 288 ng/kg | 1.71 j ng/kg |
| 2,3,4,6,7,8-Dibenzofuran, hexa | Lab | | | | 1390 ng/kg | 1210 ng/kg | 383 ng/kg | 9.31 ng/kg | 197 ng/kg | 133 ng/kg | < 0.372 ng/kg | 1230 ng/kg | 6410 ng/kg | 344 ng/kg | 2.34 j ng/kg |
| 1,2,3,4,6,7,8-Dibenzofuran, hepta | Lab | | | | 120000 ng/kg | 39600 ng/kg | 24100 ng/kg | 1330 ng/kg | 57800 ng/kg | 23700 ng/kg | 25.7 EMPC ng/kg | 141000 ng/kg | 171000 ng/kg | 35600 ng/kg | 101 ng/kg |
| 1,2,3,4,7,8,9-Dibenzofuran, hepta | Lab | | | | 8990 ng/kg | 3080 ng/kg | 1260 EMPC ng/kg | 63.0 ng/kg | 1800 ng/kg | 911 ng/kg | < 0.812 ng/kg | 5500 ng/kg | 16900 ng/kg | 1060 ng/kg | 5.89 j ng/kg |
| Dibenzofuran, octa | Lab | | | | 3160000 ng/kg | 479000 * ng/kg | 308000 * ng/kg | 9780 * ng/kg | 856000 ng/kg | 264000 * ng/kg | 153 ng/kg | 1850000 ng/kg | 1290000 * ng/kg | 147000 ng/kg | 571 ng/kg |
| TCDD Equivalent, reporting limit at 0, TEF 2005 (EMPC @ 1) | Barr Calc | **30 DI ng/kg** | Underline 35 DI ng/kg | | **Underline 13800 ng/kg** | **Underline 3950 a ng/kg** | **Underline 2260 a ng/kg** | **Underline 427 a ng/kg** | **Underline 4360 a ng/kg** | **Underline 2000 a ng/kg** | 1.62 a ng/kg | **Underline 7940 a ng/kg** | **Underline 15000 a ng/kg** | **Underline 1790 a ng/kg** | 8.74 a ng/kg |
| TCDD Equivalent, reporting limit at 0, TEF 2005 (EMPC @ 1/2) | Barr Calc | **30 DI ng/kg** | Underline 35 DI ng/kg | | **Underline 13800 ng/kg** | **Underline 3620 a ng/kg** | **Underline 2250 a ng/kg** | **Underline 427 a ng/kg** | **Underline 4360 a ng/kg** | **Underline 2000 a ng/kg** | 1.32 a ng/kg | **Underline 7940 a ng/kg** | **Underline 15000 a ng/kg** | **Underline 1790 a ng/kg** | 8.55 a ng/kg |
| TCDD Equivalent, reporting limit at 1, TEF 2005 (EMPC @ 1) | Barr Calc | **30 DI ng/kg** | Underline 35 DI ng/kg | | **Underline 13800 ng/kg** | **Underline 3950 a ng/kg** | **Underline 2260 a ng/kg** | **Underline 429 a ng/kg** | **Underline 4360 a ng/kg** | **Underline 2000 a ng/kg** | 3.47 a ng/kg | **Underline 7940 a ng/kg** | **Underline 15000 a ng/kg** | **Underline 1800 a ng/kg** | 8.99 a ng/kg |
| TCDD Equivalent, reporting limit at 1, TEF 2005 (EMPC @ 1/2) | Barr Calc | **30 DI ng/kg** | Underline 35 DI ng/kg | | **Underline 13800 ng/kg** | **Underline 3620 a ng/kg** | **Underline 2250 a ng/kg** | **Underline 429 a ng/kg** | **Underline 4360 a ng/kg** | **Underline 2000 a ng/kg** | 3.17 a ng/kg | **Underline 7940 a ng/kg** | **Underline 15000 a ng/kg** | **Underline 1800 a ng/kg** | 8.8 a ng/kg |
| TCDD Equivalent, reporting limit at 1/2, TEF 2005 (EMPC @ 1) | Barr Calc | **30 DI ng/kg** | Underline 35 DI ng/kg | | **Underline 13800 ng/kg** | **Underline 3950 a ng/kg** | **Underline 2260 a ng/kg** | **Underline 428 a ng/kg** | **Underline 4360 a ng/kg** | **Underline 2000 a ng/kg** | 2.55 a ng/kg | **Underline 7940 a ng/kg** | **Underline 15000 a ng/kg** | **Underline 1800 a ng/kg** | 8.86 a ng/kg |
| TCDD Equivalent, reporting limit at 1/2, TEF 2005 (EMPC@1/2) | Barr Calc | **30 DI ng/kg** | Underline 35 DI ng/kg | | **Underline 13800 ng/kg** | **Underline 3620 a ng/kg** | **Underline 2250 a ng/kg** | **Underline 428 a ng/kg** | **Underline 4360 a ng/kg** | **Underline 2000 a ng/kg** | 2.24 a ng/kg | **Underline 7940 a ng/kg** | **Underline 15000 a ng/kg** | **Underline 1790 a ng/kg** | 8.67 a ng/kg |
| Dioxin tetra, total | Lab | | | | 86.0 ng/kg | 17.6 ng/kg | 8.98 ng/kg | 2.15 ng/kg | 128 ng/kg | 120 ng/kg | < 0.592 ng/kg | 249 ng/kg | 291 ng/kg | 44.2 ng/kg | < 0.224 ng/kg |
| Dioxin penta, total | Lab | | | | 573 ng/kg | 143 ng/kg | 45.0 ng/kg | < 0.773 ng/kg | 1560 ng/kg | 930 ng/kg | < 0.755 ng/kg | 2940 ng/kg | 2850 ng/kg | 349 ng/kg | < 0.146 ng/kg |
| Dioxin, hexa, total | Lab | | | | 22000 ng/kg | 11700 ng/kg | 16900 ng/kg | 1900 ng/kg | 21500 ng/kg | 9830 ng/kg | 5.66 j ng/kg | 29100 ng/kg | 48200 ng/kg | 6230 ng/kg | 78.8 ng/kg |
| Dioxin, hepta, total | Lab | | | | 223000 ng/kg | 182000 ng/kg | 220000 ng/kg | 48900 ng/kg | 245000 ng/kg | 104000 ng/kg | 72.3 ng/kg | 322000 ng/kg | 651000 ng/kg | 80000 ng/kg | 934 ng/kg |
| Dibenzofuran, tetra, total | Lab | | | | 238 ng/kg | 122 ng/kg | 47.4 ng/kg | 1.06 ng/kg | 76.2 ng/kg | 48.3 ng/kg | < 1.64 ng/kg | 436 ng/kg | 1590 ng/kg | 60.6 ng/kg | < 0.291 ng/kg |
| Dibenzofuran, penta, total | Lab | | | | 4740 ng/kg | 3850 ng/kg | 192 ng/kg | 13.0 ng/kg | 857 ng/kg | 492 ng/kg | < 0.652 ng/kg | 6350 ng/kg | 27900 ng/kg | 1500 ng/kg | 7.88 ng/kg |
| Dibenzofuran, hexa, total | Lab | | | | 53900 ng/kg | 59700 ng/kg | 6760 ng/kg | 1020 ng/kg | 28600 ng/kg | 14500 ng/kg | 22.3 ng/kg | 94700 ng/kg | 116000 ng/kg | 20800 ng/kg | 117 ng/kg |
| Dibenzofuran, hepta, total | Lab | | | | 141000 ng/kg | 144000 ng/kg | 167000 ng/kg | 7430 ng/kg | 200000 ng/kg | 92900 ng/kg | 96.7 ng/kg | 292000 ng/kg | 212000 ng/kg | 94700 ng/kg | 552 ng/kg |

DI - Value represents a criteria for 2,3,7,8-TCDD or 2,3,7,8-TCDD equivalents.
EMPC - Estimated maximum possible concentration.
N - Sample Type: Normal
a - Estimated value, calculated using some or all values that are estimates.
e - Estimated value, exceeded the instrument calibration range.
j - Estimated detected value. The reported value is less than the stated laboratory quantitation limit but greater the laboratory method detection limit.
* - Estimated value, QA/QC criteria not met.

Table 2

**Soil Analytical Data Summary**

Additional Soil Characterization, Operable Unit 5

Joslyn Manufacturing Supply Co.

Brooklyn Center, Minnesota

| | | | Location | D-1 | D-1 | D-1 | E-4 | E-4 | E-4 | E-4 | F-3 | F-3 | F-3 | F-3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Date | 2/02/2015 | 2/02/2015 | 2/02/2015 | 2/02/2015 | 2/02/2015 | 2/02/2015 | 2/02/2015 | 2/02/2015 | 2/02/2015 | 2/02/2015 | 2/02/2015 |
| | | | Depth | 0.5 - 2 ft | 2 - 3.5 ft | 3.5 - 9 ft | 3.5 - 5 ft | 5 - 6.5 ft | 6.5 - 9 ft | 9 - 10 ft | 2.5 - 4 ft | 4 - 5.5 ft | 5.5 - 9 ft | 9 - 10 ft |
| | | | Sample Type | N | N | N | N | N | N | N | N | N | N | N |
| Parameter | Analysis Location | Proposed Minnesota Tier 2 Commercial/ Industrial SRVs | Minnesota Tier 2 Industrial Soil Reference Values | | | | | | | | | | | |
| **Effective Date** | | 10/01/2014 | 06/22/2009 | | | | | | | | | | | |
| **Exceedance Key** | | **Bold** | Underline | | | | | | | | | | | |
| General Parameters | | | | | | | | | | | | | | |
| Carbon, total organic | Lab | | | 1.33 % | 1.37 h % | 14.3 h % | 44.3 % | 31.9 h % | 8.01 h % | 3.91 h % | 11.0 % | 17.9 h % | 38.4 h % | 11.8 h % |
| Solids, total | Lab | | | 87.8 % | 84.2 % | 39.9 % | 22.0 % | 16.5 % | 32.9 % | 40.8 % | 31.3 % | 25.8 % | 13.4 % | 30.6 % |
| Chlorinated Dioxins / Furans | | | | | | | | | | | | | | |
| 2,3,7,8-Dioxin, tetra | Lab | **30 DI ng/kg** | Underline 35 DI ng/kg | 24.1 ng/kg | 1.88 EMPC ng/kg | < 0.824 ng/kg | 6.54 ng/kg | 3.80 EMPC ng/kg | **Underline 47.2 ng/kg** | < 1.47 ng/kg | 21.6 ng/kg | 26.5 ng/kg | 17.7 ng/kg | **Underline 62.7 ng/kg** |
| 1,2,3,7,8-Dioxin, penta | Lab | | | 521 ng/kg | 32.0 ng/kg | 1.72 EMPC ng/kg | 66.4 ng/kg | 55.3 ng/kg | 124 ng/kg | 35.9 EMPC ng/kg | 119 ng/kg | 190 ng/kg | 98.3 ng/kg | 0.826 EMPC ng/kg |
| 1,2,3,4,7,8-Dioxin, hexa | Lab | | | 1700 ng/kg | 171 ng/kg | 7.17 ng/kg | 164 ng/kg | 275 ng/kg | 31.6 ng/kg | 184 ng/kg | 538 ng/kg | 547 ng/kg | 265 ng/kg | 2.63 EMPC ng/kg |
| 1,2,3,6,7,8-Dioxin, hexa | Lab | | | 21400 ng/kg | 2180 ng/kg | 52.3 ng/kg | 634 ng/kg | 1050 ng/kg | 279 ng/kg | 2050 ng/kg | 2560 ng/kg | 2440 ng/kg | 480 ng/kg | 1.37 j ng/kg |
| 1,2,3,7,8,9-Dioxin, hexa | Lab | | | 4160 ng/kg | 359 ng/kg | 13.5 EMPC ng/kg | 487 ng/kg | 407 ng/kg | 54.1 ng/kg | 168 ng/kg | 995 ng/kg | 800 ng/kg | 301 ng/kg | 0.850 j ng/kg |
| 1,2,3,4,6,7,8-Dioxin, hepta | Lab | | | 650000 ng/kg | 52000 * ng/kg | 1860 ng/kg | 40500 ng/kg | 55100 * ng/kg | 22500 * ng/kg | 232000 * ng/kg | 122000 ng/kg | 72000 * ng/kg | 11500 ng/kg | < 0.298 ng/kg |
| Dioxin, octa | Lab | | | 5200000 ng/kg | 684000 * ng/kg | 25300 e ng/kg | 366000 ng/kg | 397000 * ng/kg | 134000 * ng/kg | 2220000 * ng/kg | 1450000 ng/kg | 602000 * ng/kg | 145000 ng/kg | 685 ng/kg |
| 2,3,7,8-Dibenzofuran, tetra | Lab | | | 201 ng/kg | 5.36 ng/kg | < 0.863 ng/kg | 6.36 ng/kg | < 2.91 ng/kg | 40.7 ng/kg | < 1.17 ng/kg | 27.0 ng/kg | 28.9 EMPC ng/kg | 18.6 EMPC ng/kg | < 0.312 ng/kg |
| 1,2,3,7,8-Dibenzofuran, penta | Lab | | | 950 ng/kg | 25.7 ng/kg | 3.03 EMPC ng/kg | 34.2 ng/kg | 34.1 ng/kg | 123 ng/kg | 1.66 EMPC ng/kg | 75.4 ng/kg | 88.3 ng/kg | 61.2 ng/kg | 1.01 EMPC ng/kg |
| 2,3,4,7,8-Dibenzofuran, penta | Lab | | | 3090 ng/kg | 138 ng/kg | 5.14 j ng/kg | 25.8 ng/kg | 75.2 ng/kg | 2.66 j ng/kg | < 3.02 ng/kg | 179 ng/kg | 237 ng/kg | 136 ng/kg | 0.732 j ng/kg |
| 1,2,3,4,7,8-Dibenzofuran, hexa | Lab | | | 16800 ng/kg | 1000 ng/kg | 41.6 ng/kg | 260 ng/kg | 316 ng/kg | 21.7 ng/kg | 170 * ng/kg | 720 * ng/kg | 847 ng/kg | 379 ng/kg | 1.53 j ng/kg |
| 1,2,3,6,7,8-Dibenzofuran, hexa | Lab | | | 3170 ng/kg | 195 ng/kg | 9.58 EMPC ng/kg | 72.5 ng/kg | 81.5 ng/kg | 72.7 ng/kg | 30.3 * ng/kg | 330 ng/kg | 290 ng/kg | 106 ng/kg | 0.844 EMPC ng/kg |
| 1,2,3,7,8,9-Dibenzofuran, hexa | Lab | | | 4190 ng/kg | 101 ng/kg | 10.5 ng/kg | 144 ng/kg | 85.2 * ng/kg | < 4.22 * ng/kg | < 31.5 ng/kg | 358 ng/kg | 258 * ng/kg | 164 ng/kg | 1.57 j ng/kg |
| 2,3,4,6,7,8-Dibenzofuran, hexa | Lab | | | 5320 ng/kg | 328 ng/kg | 13.5 ng/kg | 112 ng/kg | 141 ng/kg | 9.92 ng/kg | 64.8 ng/kg | 473 ng/kg | 186 EMPC ng/kg | 162 ng/kg | 1.08 j ng/kg |
| 1,2,3,4,6,7,8-Dibenzofuran, hepta | Lab | | | 151000 ng/kg | 22700 ng/kg | 547 ng/kg | 3730 ng/kg | 7290 ng/kg | 1350 ng/kg | 12400 j* ng/kg | 30700 ng/kg | 17800 ng/kg | 3150 ng/kg | 16.7 ng/kg |
| 1,2,3,4,7,8,9-Dibenzofuran, hepta | Lab | | | 15400 ng/kg | 2020 ng/kg | 38.0 ng/kg | 279 ng/kg | 422 ng/kg | 67.9 ng/kg | 533 * ng/kg | 1220 ng/kg | 1270 ng/kg | 298 ng/kg | 2.02 j ng/kg |
| Dibenzofuran, octa | Lab | | | 2800000 ng/kg | 180000 * ng/kg | 2750 ng/kg | 29900 ng/kg | 29300 EMPC* ng/kg | 9360 * ng/kg | 91700 * ng/kg | 228000 ng/kg | 91300 * ng/kg | 7960 ng/kg | 106 ng/kg |
| TCDD Equivalent, reporting limit at 0, TEF 2005 (EMPC @ 1) | Barr Calc | **30 DI ng/kg** | Underline 35 DI ng/kg | **Underline 17800 ng/kg** | **Underline 1540 a ng/kg** | **Underline 51 a ng/kg** | **Underline 834 ng/kg** | **Underline 1070 a ng/kg** | **Underline 509 a ng/kg** | **Underline 3450 a ng/kg** | **Underline 2840 a ng/kg** | **Underline 1950 a ng/kg** | **Underline 542 a ng/kg** | 3.14 a ng/kg |
| TCDD Equivalent, reporting limit at 0, TEF 2005 (EMPC @ 1/2) | Barr Calc | **30 DI ng/kg** | Underline 35 DI ng/kg | **Underline 17800 ng/kg** | **Underline 1540 a ng/kg** | **Underline 49 a ng/kg** | **Underline 834 ng/kg** | **Underline 1070 a ng/kg** | **Underline 509 a ng/kg** | **Underline 3430 a ng/kg** | **Underline 2840 a ng/kg** | **Underline 1940 a ng/kg** | **Underline 541 a ng/kg** | 2.91 a ng/kg |
| TCDD Equivalent, reporting limit at 1, TEF 2005 (EMPC @ 1) | Barr Calc | **30 DI ng/kg** | Underline 35 DI ng/kg | **Underline 17800 ng/kg** | **Underline 1540 a ng/kg** | **Underline 51.9 a ng/kg** | **Underline 834 ng/kg** | **Underline 1070 a ng/kg** | **Underline 509 a ng/kg** | **Underline 3450 a ng/kg** | **Underline 2840 a ng/kg** | **Underline 1950 a ng/kg** | **Underline 542 a ng/kg** | 3.47 a ng/kg |
| TCDD Equivalent, reporting limit at 1, TEF 2005 (EMPC @ 1/2) | Barr Calc | **30 DI ng/kg** | Underline 35 DI ng/kg | **Underline 17800 ng/kg** | **Underline 1540 a ng/kg** | **Underline 49.9 a ng/kg** | **Underline 834 ng/kg** | **Underline 1070 a ng/kg** | **Underline 509 a ng/kg** | **Underline 3430 a ng/kg** | **Underline 2840 a ng/kg** | **Underline 1940 a ng/kg** | **Underline 541 a ng/kg** | 3.24 a ng/kg |
| TCDD Equivalent, reporting limit at 1/2, TEF 2005 (EMPC @ 1) | Barr Calc | **30 DI ng/kg** | Underline 35 DI ng/kg | **Underline 17800 ng/kg** | **Underline 1540 a ng/kg** | **Underline 51.5 a ng/kg** | **Underline 834 ng/kg** | **Underline 1070 a ng/kg** | **Underline 509 a ng/kg** | **Underline 3450 a ng/kg** | **Underline 2840 a ng/kg** | **Underline 1950 a ng/kg** | **Underline 542 a ng/kg** | 3.3 a ng/kg |
| TCDD Equivalent, reporting limit at 1/2, TEF 2005 (EMPC@1/2) | Barr Calc | **30 DI ng/kg** | Underline 35 DI ng/kg | **Underline 17800 ng/kg** | **Underline 1540 a ng/kg** | **Underline 49.4 a ng/kg** | **Underline 834 ng/kg** | **Underline 1070 a ng/kg** | **Underline 509 a ng/kg** | **Underline 3430 a ng/kg** | **Underline 2840 a ng/kg** | **Underline 1940 a ng/kg** | **Underline 541 a ng/kg** | 3.07 a ng/kg |
| Dioxin tetra, total | Lab | | | 214 ng/kg | 43.2 ng/kg | < 0.824 ng/kg | 128 ng/kg | 66.7 ng/kg | 47.2 ng/kg | < 1.47 ng/kg | 1310 ng/kg | 1290 ng/kg | 690 ng/kg | < 0.298 ng/kg |
| Dioxin penta, total | Lab | | | 1500 ng/kg | 228 ng/kg | 2.41 j ng/kg | 794 ng/kg | 1050 ng/kg | 198 ng/kg | 470 ng/kg | 5720 ng/kg | 5160 ng/kg | 2090 ng/kg | 0.850 j ng/kg |
| Dioxin, hexa, total | Lab | | | 47600 ng/kg | 8650 ng/kg | 206 ng/kg | 14200 ng/kg | 26200 ng/kg | 6940 ng/kg | 164000 ng/kg | 28400 ng/kg | 31000 ng/kg | 7220 ng/kg | 4.27 j ng/kg |
| Dioxin, hepta, total | Lab | | | 162000 ng/kg | 116000 ng/kg | 3610 ng/kg | 116000 ng/kg | 253000 ng/kg | 88200 ng/kg | 810000 ng/kg | 174000 ng/kg | 186000 ng/kg | 28800 ng/kg | 120 ng/kg |
| Dibenzofuran, tetra, total | Lab | | | 826 ng/kg | 57.6 ng/kg | < 0.863 ng/kg | 59.8 ng/kg | 33.9 ng/kg | 41.1 ng/kg | 2.29 ng/kg | 524 ng/kg | 579 ng/kg | 151 ng/kg | < 0.312 ng/kg |
| Dibenzofuran, penta, total | Lab | | | 16600 ng/kg | 835 ng/kg | 49.2 ng/kg | 830 ng/kg | 520 ng/kg | 131 ng/kg | 21.8 ng/kg | 3360 ng/kg | 3780 ng/kg | 835 ng/kg | 0.732 j ng/kg |
| Dibenzofuran, hexa, total | Lab | | | 61500 ng/kg | 6370 ng/kg | 612 ng/kg | 5150 ng/kg | 8790 ng/kg | 1320 ng/kg | 10400 ng/kg | 26800 ng/kg | 33100 ng/kg | 6130 ng/kg | 19.5 ng/kg |
| Dibenzofuran, hepta, total | Lab | | | 148000 ng/kg | 32800 ng/kg | 2680 ng/kg | 19500 ng/kg | 34200 ng/kg | 7500 ng/kg | 59000 ng/kg | 104000 ng/kg | 94600 ng/kg | 13900 ng/kg | 97.6 ng/kg |

DI - Value represents a criteria for 2,3,7,8-TCDD or 2,3,7,8-TCDD equivalents.
EMPC - Estimated maximum possible concentration.
N - Sample Type: Normal
a - Estimated value, calculated using some or all values that are estimates.
e - Estimated value, exceeded the instrument calibration range.
j - Estimated detected value. The reported value is less than the stated laboratory quantitation limit
* - Estimated value, QA/QC criteria not met.

# Figures

FLOODPLAIN MITIGATION EXTENTS
WEST AREA
MIDDLE TWIN LAKE
FORMER ICE CHUTE
TWIN LAKE AVE N
SOUTHERN LOTS
BUILDING 1B POND
BUILDING 1A POND
LAKEVIEW AVE N
SOO LINE RR
WA-1
WA-2
WA-3
WA-4
WA-5
WA-6S
WA-6MID
WA-6N
WA-7
WA-8 (FORMER RAIL SPUR)
D-5 COMPOSITE
Y
Y'

## LEGEND

- LAKESHORE
- EXISTING CONTOUR
- TRACKS
- WEST AREA SUB-AREA
- EXISTING MONITORING WELL
- 1.0FT EXCAVATION
- 2.0FT EXCAVATION
- 2.5FT EXCAVATION
- 3.5FT EXCAVATION
- CROSS SECTION

## BUILDING 1

- SUBSURFACE SOIL SAMPLE LOCATION
- SURFACE SOIL SAMPLING LOCATION
- SEDIMENT SAMPLING LOCATION
- SURFACE WATER SUBSAMPLE COLLECTION LOCATION (7/1/02)
- SURFACE WATER SUBSAMPLE COLLECTION LOCATION (6/18/03)
- SURFACE WATER SUBSAMPLE COLLECTION LOCATION (7/17/03)
- SUBSAMPLE LOCATION (1998)
- SOIL SAMPLE LOCATION
- SOIL BORING (2015)

1 PLAN: SITE LAYOUT

0 100 200
SCALE IN FEET

| NO. | BY | CHK. | APP. | DATE | REVISION DESCRIPTION |
|---|---|---|---|---|---|

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.
SIGNATURE
PRINTED NAME
DATE REG. NO.

CLIENT
BID
CONSTRUCTION
RELEASED TO/FOR

A B C 0 1 2 3
DATE RELEASED

BARR
Corporate Headquarters: Minneapolis, Minnesota Ph: 1-800-632-2277
Project Office: BARR ENGINEERING CO. 4700 WEST 77TH STREET MINNEAPOLIS, MN. 55435-4803 Ph: 1-800-632-2277 Fax: (952) 832-2601 www.barr.com

| | |
|---|---|
| Scale | AS SHOWN |
| Date | 09/10/09 |
| Drawn | ATS |
| Checked | SS1 |
| Designed | |
| Approved | |

JOSLYN MANUFACTURING & SUPPLY CO.
BROOKLYN CENTER, MINNESOTA

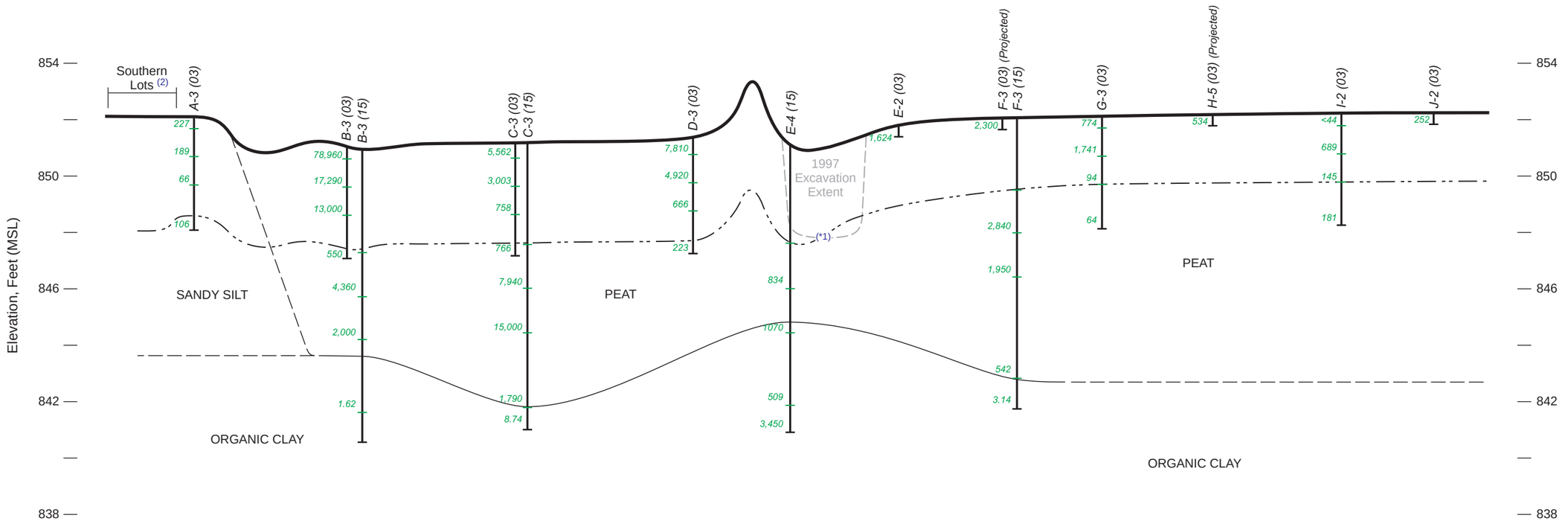
Additional Soil Characterization, Operable Unit 5

SOIL SAMPLING LOCATIONS

BARR PROJECT No. 23/27-110
CLIENT PROJECT No.
DWG. No. FIGURE 1
REV. No.

**Y**
SOUTH

**Y'**
NORTH




(*1) 3 composite samples from bottom of 1997 excavation analyzed for PCP:

WA-NE = <510 mg/kg
WA-CEN = <380 mg/kg
WA-SW = <160 mg/kg

(*2) 4 composite samples from 0 - 4' below ground surface collected in 2009 and analyzed Dioxin Furan:

T1 - Comp = 636 mg/kg
T2 - Comp = 367 mg/kg
T3 - Comp = 107 mg/kg
T4 - 1 = 183 mg/kg

0 — 100

Approximate Horizontal Scale in Feet
25X Vertical Exaggeration

Dioxin Furan Method — 106
4425 TCDD-Eq (ng/kg)

Sample Interval Top

Sample Interval Bottom

Excavation Limit

Figure 2

GEOLOGIC CROSS SECTION Y-Y'

P:\Mpls\23MN\27\23270110\Work Files\Graphics\Geologic Cross Section Y-Y' 2015.CDR RLG 06-02-15

# Attachment A

## Soil Boring Logs

Barr Engineering Company
4700 West 77th St. Suite 200
Minneapolis, MN 55435
Telephone: 952-832-2600

# LOG OF BORING B-1



Project:OU5 Soil Characterization
Project No.:23/27-0110
Location:Brooklyn Center, MN
Coordinates:
Datum:

Surface Elevation:
Drilling Method:Geoprobe
Sampling Method:
Completion Depth:10.0 ft

| Depth, feet | Sample Type & Recovery | Sample No. | USCS | Graphic Log | LITHOLOGIC DESCRIPTION | Elevation, feet |
|---|---|---|---|---|---|---|
| 0 | | 1 | PT | | 0-3': PEAT (PT): black; frozen from 0-1.5'. | |
| 5 | | 2 | ML | | 3-6.5': SILT (ML): gray; organic; interbedded with peat; moist to wet, wet at 4' bgs. | |
| | | | SM | | 6.5-10': SILTY SAND (SM): gray; wet; petroleum odor and some product staining observed. | |
| 10 | | | | | End of boring at 10' bgs, target depth reached. | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

Date Boring Started: 2/2/15
Date Boring Completed: 2/2/15
Logged By: ARP2
Drilling Contractor: Matrix
Drill Rig:

Remarks:

Additional data may have been collected in the field which is not included on this log.
Weather:

M:\GINT\PROJECTS\23270110\23270110 JOSLYN_OU5 SOIL CHARAC_020215.GPJ BARRLIBRARY.GLB ENVIRO LOG BARR TEMPLATE.GDT

Barr Engineering Company
4700 West 77th St. Suite 200
Minneapolis, MN 55435
Telephone: 952-832-2600

# LOG OF BORING B-3



Project:OU5 Soil Characterization
Project No.:23/27-0110
Location:Brooklyn Center, MN
Coordinates:
Datum:

Surface Elevation:
Drilling Method:Geoprobe
Sampling Method:
Completion Depth:10.0 ft

| Depth, feet | Sample Type & Recovery | Sample No. | USCS | Graphic Log | LITHOLOGIC DESCRIPTION | Elevation, feet |
|---|---|---|---|---|---|---|
| 0 | | 1 | PT | | 0-7': PEAT (PT): black; wet. | |
| 5 | | 2 | CL | | 7-10': LEAN CLAY (CL): light gray; organic; soft; wet. | |
| 10 | | | | | End of boring at 10' bgs, target depth reached. | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

Date Boring Started: 2/2/15
Date Boring Completed: 2/2/15
Logged By: ARP2
Drilling Contractor: Matrix
Drill Rig:

Remarks:

Additional data may have been collected in the field which is not included on this log.
Weather:

M:\GINT\PROJECTS\23270110\23270110 JOSLYN_OU5 SOIL CHARAC_020215.GPJ BARRLIBRARY.GLB ENVIRO LOG BARR TEMPLATE.GDT

Barr Engineering Company
4700 West 77th St. Suite 200
Minneapolis, MN 55435
Telephone: 952-832-2600

# LOG OF BORING C-3



Project:OU5 Soil Characterization
Project No.:23/27-0110
Location:Brooklyn Center, MN
Coordinates:
Datum:

Surface Elevation:
Drilling Method:Geoprobe
Sampling Method:
Completion Depth:10.0 ft

| Depth, feet | Sample Type & Recovery | Sample No. | USCS | Graphic Log | LITHOLOGIC DESCRIPTION | Elevation, feet |
|---|---|---|---|---|---|---|
| 0 | | 1 | PT | | 0-9': PEAT (PT): black; wet.<br>0-0.5': mostly wood. | |
| 5 | | 2 | | | | |
| 9 | | | CL | | 9-10': LEAN CLAY (CL): light gray; organic; soft; wet. | |
| 10 | | | | | End of boring at 10' bgs, target depth reached. | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

Date Boring Started: 2/2/15
Date Boring Completed: 2/2/15
Logged By: ARP2
Drilling Contractor: Matrix
Drill Rig:

Remarks:

Additional data may have been collected in the field which is not included on this log.
Weather:

M:\GINT\PROJECTS\23270110\23270110 JOSLYN_OU5 SOIL CHARAC_020215.GPJ BARRLIBRARY.GLB ENVIRO LOG BARR TEMPLATE.GDT

Barr Engineering Company
4700 West 77th St. Suite 200
Minneapolis, MN 55435
Telephone: 952-832-2600

# LOG OF BORING D-1



Project:OU5 Soil Characterization
Project No.:23/27-0110
Location:Brooklyn Center, MN
Coordinates:
Datum:

Surface Elevation:
Drilling Method:Geoprobe
Sampling Method:
Completion Depth:10.0 ft

| Depth, feet | Sample Type & Recovery | Sample No. | USCS | Graphic Log | LITHOLOGIC DESCRIPTION | Elevation, feet |
|---|---|---|---|---|---|---|
| 0 | | 1 | SM | | 0-4': SILTY SAND (SM): tan/orange/gray; mostly fine-grained sand; moist. | |
| 5 | | 2 | PT | | 4-7.5': PEAT (PT): black; fibrous; wet. | |
| | | | CL | | 7.5-10': LEAN CLAY (CL): light gray; organic; soft; wet. | |
| 10 | | | | | End of boring at 10' bgs, target depth reached. | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

Date Boring Started: 2/2/15
Date Boring Completed: 2/2/15
Logged By: ARP2
Drilling Contractor: Matrix
Drill Rig:

Remarks:

Additional data may have been collected in the field which is not included on this log.
Weather:

M:\GINT\PROJECTS\23270110\23270110 JOSLYN_OU5 SOIL CHARAC_020215.GPJ BARRLIBRARY.GLB ENVIRO LOG BARR TEMPLATE.GDT

Barr Engineering Company
4700 West 77th St. Suite 200
Minneapolis, MN 55435
Telephone: 952-832-2600

# LOG OF BORING E-4



Project:OU5 Soil Characterization
Project No.:23/27-0110
Location:Brooklyn Center, MN
Coordinates:
Datum:

Surface Elevation:
Drilling Method:Geoprobe
Sampling Method:
Completion Depth:10.0 ft

| Depth, feet | Sample Type & Recovery | Sample No. | USCS | Graphic Log | LITHOLOGIC DESCRIPTION | Elevation, feet |
|---|---|---|---|---|---|---|
| 0 | | | CL | | 0-2.5': SANDY CLAY (CL): gray; frozen. | |
| | | 1 | PT | | 2.5-6': PEAT (PT): black; fibrous; moist to wet, wet at 5' bgs. | |
| 5 | | | | | | |
| | | 2 | CL | | 6-10': LEAN CLAY (CL): light gray; organic; soft; wet.<br>8-10': slight petroleum odor and staining observed. | |
| 10 | | | | | End of boring at 10' bgs, target depth reached. | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

Date Boring Started: 2/2/15
Date Boring Completed: 2/2/15
Logged By: ARP2
Drilling Contractor: Matrix
Drill Rig:

Remarks:

Additional data may have been collected in the field which is not included on this log.
Weather:

M:\GINT\PROJECTS\23270110\23270110 JOSLYN_OU5 SOIL CHARAC_020215.GPJ BARRLIBRARY.GLB ENVIRO LOG BARR TEMPLATE.GDT

Barr Engineering Company
4700 West 77th St. Suite 200
Minneapolis, MN 55435
Telephone: 952-832-2600

# LOG OF BORING F-3



Project:OU5 Soil Characterization
Project No.:23/27-0110
Location:Brooklyn Center, MN
Coordinates:
Datum:

Surface Elevation:
Drilling Method:Geoprobe
Sampling Method:
Completion Depth:10.0 ft

| Depth, feet | Sample Type & Recovery | Sample No. | USCS | Graphic Log | LITHOLOGIC DESCRIPTION | Elevation, feet |
|---|---|---|---|---|---|---|
| 0 | | 1 | PT | | 0-9': PEAT (PT): black; fibrous; wet.<br>0-2': mostly wood and debris. | |
| 5 | | 2 | | | | |
| 10 | | | CL | | 9-10': LEAN CLAY (CL): gray; organic; soft; wet.<br>End of boring at 10' bgs, target depth reached. | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

Date Boring Started: 2/2/15
Date Boring Completed: 2/2/15
Logged By: ARP2
Drilling Contractor: Matrix
Drill Rig:

Remarks:

Additional data may have been collected in the field which is not included on this log.
Weather:

M:\GINT\PROJECTS\23270110\23270110 JOSLYN_OU5 SOIL CHARAC_020215.GPJ BARRLIBRARY.GLB ENVIRO LOG BARR TEMPLATE.GDT

# Attachment B

## Laboratory Analytical Reports

ALS Environmental
ALS Group USA, Corp.
1317 South 13th Avenue
Kelso, WA 98626
**T:** +1 360 577 7222
**F:** +1 360 636 1068
**www.alsglobal.com**

March 3, 2015

Analytical Report for Service Request No: K1501105
Revised Service Request No: K1501105.01

Terri Olson
Barr Engineering
4700 West 77th Street
Minneapolis, MN 55435

**RE: Joslyn OU5 2015 Soil/23270110**

Dear Terri:

Enclosed is the revised report for the samples submitted to our laboratory on February 04, 2015. For your reference, these analyses have been assigned our service request number K1501105.

Report revised to include the updated ALS-Houston's certification page.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

We apologize for any inconvenience this may have created.

Please call if you have any questions. My extension is 3363. You may also contact me via Email at Lisa.Domenighini@alsglobal.com.

Respectfully submitted,

**ALS Group USA Corp. dba ALS Environmental**

Lisa A Domenighini

Lisa Domenighini
Project Manager

LD/aj

## Acronyms

| | |
|---|---|
| ASTM | American Society for Testing and Materials |
| A2LA | American Association for Laboratory Accreditation |
| CARB | California Air Resources Board |
| CAS Number | Chemical Abstract Service registry Number |
| CFC | Chlorofluorocarbon |
| CFU | Colony-Forming Unit |
| DEC | Department of Environmental Conservation |
| DEQ | Department of Environmental Quality |
| DHS | Department of Health Services |
| DOE | Department of Ecology |
| DOH | Department of Health |
| EPA | U. S. Environmental Protection Agency |
| ELAP | Environmental Laboratory Accreditation Program |
| GC | Gas Chromatography |
| GC/MS | Gas Chromatography/Mass Spectrometry |
| LOD | Limit of Detection |
| LOQ | Limit of Quantitation |
| LUFT | Leaking Underground Fuel Tank |
| M | Modified |
| MCL | Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA. |
| MDL | Method Detection Limit |
| MPN | Most Probable Number |
| MRL | Method Reporting Limit |
| NA | Not Applicable |
| NC | Not Calculated |
| NCASI | National Council of the Paper Industry for Air and Stream Improvement |
| ND | Not Detected |
| NIOSH | National Institute for Occupational Safety and Health |
| PQL | Practical Quantitation Limit |
| RCRA | Resource Conservation and Recovery Act |
| SIM | Selected Ion Monitoring |
| TPH | Total Petroleum Hydrocarbons |
| tr | Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL. |

## Inorganic Data Qualifiers

| | |
|---|---|
| * | The result is an outlier. See case narrative. |
| # | The control limit criteria is not applicable. See case narrative. |
| B | The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards. |
| E | The result is an estimate amount because the value exceeded the instrument calibration range. |
| J | The result is an estimated value. |
| U | The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.<br>*DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution. |
| i | The MRL/MDL or LOQ/LOD is elevated due to a matrix interference. |
| X | See case narrative. |
| Q | See case narrative. One or more quality control criteria was outside the limits. |
| H | The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory. |

## Metals Data Qualifiers

| | |
|---|---|
| # | The control limit criteria is not applicable. See case narrative. |
| J | The result is an estimated value. |
| E | The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample. |
| M | The duplicate injection precision was not met. |
| N | The Matrix Spike sample recovery is not within control limits. See case narrative. |
| S | The reported value was determined by the Method of Standard Additions (MSA). |
| U | The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.<br>*DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution. |
| W | The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance. |
| i | The MRL/MDL or LOQ/LOD is elevated due to a matrix interference. |
| X | See case narrative. |
| + | The correlation coefficient for the MSA is less than 0.995. |
| Q | See case narrative. One or more quality control criteria was outside the limits. |

## Organic Data Qualifiers

| | |
|---|---|
| * | The result is an outlier. See case narrative. |
| # | The control limit criteria is not applicable. See case narrative. |
| A | A tentatively identified compound, a suspected aldol-condensation product. |
| B | The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards. |
| C | The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data. |
| D | The reported result is from a dilution. |
| E | The result is an estimated value. |
| J | The result is an estimated value. |
| N | The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed. |
| P | The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results. |
| U | The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.<br>*DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution. |
| i | The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference. |
| X | See case narrative. |
| Q | See case narrative. One or more quality control criteria was outside the limits. |

## Additional Petroleum Hydrocarbon Specific Qualifiers

| | |
|---|---|
| F | The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard. |
| L | The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard. |
| H | The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard. |
| O | The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard. |
| Y | The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard. |
| Z | The chromatographic fingerprint does not resemble a petroleum product. |

**ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso**
**State Certifications, Accreditations, and Licenses**

| Agency | Web Site | Number |
|---|---|---|
| Alaska DEC UST | http://dec.alaska.gov/applications/eh/ehllabreports/USTLabs.aspx | UST-040 |
| Arizona DHS | http://www.azdhs.gov/lab/license/env.htm | AZ0339 |
| Arkansas - DEQ | http://www.adeq.state.ar.us/techsvs/labcert.htm | 88-0637 |
| California DHS (ELAP) | http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx | 2795 |
| DOD ELAP | http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm | L14-51 |
| Florida DOH | http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm | E87412 |
| Hawaii DOH | Not available | - |
| Idaho DHW | http://www.healthandwelfare.idaho.gov/Health/Labs/CertificationDrinkingWaterLabs/tabid/1833/Default.aspx | - |
| ISO 17025 | http://www.pjlabs.com/ | L14-50 |
| Louisiana DEQ | http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx | 03016 |
| Maine DHS | Not available | WA01276 |
| Michigan DEQ | http://www.michigan.gov/deq/0,1607,7-135-3307_4131_4156---,00.html | 9949 |
| Minnesota DOH | http://www.health.state.mn.us/accreditation | 053-999-457 |
| Montana DPHHS | http://www.dphhs.mt.gov/publichealth/ | CERT0047 |
| Nevada DEP | http://ndep.nv.gov/bsdw/labservice.htm | WA01276 |
| New Jersey DEP | http://www.nj.gov/dep/oqa/ | WA005 |
| North Carolina DWQ | http://www.dwqlab.org/ | 605 |
| Oklahoma DEQ | http://www.deq.state.ok.us/CSDnew/labcert.htm | 9801 |
| Oregon – DEQ (NELAP) | http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx | WA100010 |
| South Carolina DHEC | http://www.scdhec.gov/environment/envserv/ | 61002 |
| Texas CEQ | http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html | T104704427 |
| Washington DOE | http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html | C544 |
| Wisconsin DNR | http://dnr.wi.gov/ | 998386840 |
| Wyoming (EPA Region 8) | http://www.epa.gov/region8/water/dwhome/wyomingdi.html | - |
| Kelso Laboratory Website | www.alsglobal.com | NA |

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.
Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

# Case Narrative

**ALS Environmental—Kelso Laboratory**
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

**ALS ENVIRONMENTAL**

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request No.:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/ 23270110 | **Date Received:** | 02/04/15 |
| **Sample Matrix:** | Soil | | |

**Case Narrative**

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix Spike (MS), and Matrix/Duplicate Matrix Spike (MS/DMS).

**Sample Receipt**

Six soil samples were received for analysis at ALS Environmental on 02/04/15. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4ºC upon receipt at the laboratory.

**General Chemistry Parameters**

No anomalies associated with the analysis of these samples were observed.

**Dioxins and Furans by EPA Method 8290**

The analysis for Dioxins and Furans was performed at ALS Houston, Texas Laboratory. The data for this analysis is included in the corresponding section of this report.

**Approved by** Lisa A Jomenighini

# Chain of Custody

**ALS Environmental—Kelso Laboratory**
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

K1501105

# Chain of Custody

BARR
4700 West 77th Street
Minneapolis, MN 55435-4803
(952) 832-2600

COC 1 of 1

Project Number: 23270110

Project Name: Joslyn OU5 2015 Soil

Sample Origination State MN (use two letter postal state abbreviation)

COC Number: № 43799

Project Manager: John Hunt

Project QC Contact: Terri Olson

Sampled by: Alex Puetz

Laboratory: ALS

| Location | Start Depth | Stop Depth | Depth Unit (m./ft. or in.) | Collection Date (mm/dd/yyyy) | Collection Time (hh:mm) | Matrix: Water | Matrix: Soil | Type: Grab | Type: Comp. | Type: QC | Number of Containers/Preservative — Water: VOCs (HCl) #1 | SVOCs (unpreserved) #2 | Dissolved Metals ($HNO_3$) | Total Metals ($HNO_3$) | General (unpreserved) #3 | Diesel Range Organics (HCl) | Nutrients ($H_2SO_4$) #4 | Soil: VOCs (tared MeOH) #1 | GRO, BTEX (tared MeOH) #1 | DRO (tared unpreserved) | Metals (unpreserved) | SVOCs (unpreserved) #2 | % Solids (plastic vial, unpres.) | Dioxins | TOC | Total Number Of Containers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. B-1 | 0.5 | 2 | ft | 02/02/2015 | 10:25 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 |
| 2. B-3 | 3.5 | 5 | | | 14:10 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 |
| 3. C-3 | 3.5 | 5 | | | 13:35 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 |
| 4. D-1 | 0.5 | 2 | | | 10:55 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 |
| 5. E-4 | 3.5 | 5 | | | 12:55 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 |
| 6. F-3 | 2.5 | 4 | | | 12:20 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 |
| 7. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10. | | | | | | | | | | | | | | | | | | | | | | | | | | |

Common Parameter/Container - Preservation Key

*#1 - Volatile Organics = BTEX, GRO, TPH, 8260 Full List*
*#2 - Semivolatile Organics = PAHs, PCP, Dioxins, 8270 Full List, Herbicide/Pesticide/PCBs*
*#3 - General = pH, Chloride, Fluoride, Alkalinity, TSS, TDS, TS, Sulfate*
*#4 - Nutrients = COD, TOC, Phenols, Ammonia Nitrogen, TKN*

| Relinquished By: | On Ice? | Date | Time | Received by: | Date | Time |
|---|---|---|---|---|---|---|
| [signature] | (Y) N | 02/02/15 | 16:15 | [signature] | 02/02/15 | 16:15 |
| [signature] | (Y) N | 02/03/15 | 14:12 | [signature] | 2/4/15 | 0940 |

Samples Shipped VIA: ☐ Air Freight ☐ Federal Express ☐ Sampler ☐ Other: _____

Air Bill Number:

Distribution: White-Original Accompanies Shipment to Lab; Yellow - Field Copy; Pink - Lab Coordinator

PC Lisa

## Cooler Receipt and Preservation Form

Client / Project: Barr Service Request *K15* 01105

Received: 2/4/15 Opened: 2/4/15 By: [illegible] Unloaded: 2/4/15 By: [illegible]

1. Samples were received via? *Mail* (*Fed Ex*) *UPS* *DHL* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) (*Cooler*) *Box* *Envelope* *Other* _____ *NA*
3. Were custody seals on coolers? NA (Y) N If yes, how many and where? one. front
   If present, were custody seals intact? (Y) N If present, were they signed and dated? (Y) N

| Raw Cooler Temp | Corrected Cooler Temp | Raw Temp Blank | Corrected Temp Blank | Corr. Factor | Thermometer ID | Cooler/COC ID NA | Tracking Number NA | Filed |
|---|---|---|---|---|---|---|---|---|
| 5.7 | 5.8 | 5.7 | 5.6 | +0.1 | 347 | 43799 | 6275 1644 7472 | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

4. Packing material: *Inserts* (*Baggies*) (*Bubble Wrap*) *Gel Packs* (*Wet Ice*) *Dry Ice* *Sleeves* _____
5. Were custody papers properly filled out (ink, signed, etc.)? NA (Y) N
6. Did all bottles arrive in good condition (unbroken)? *Indicate in the table below.* NA (Y) N
7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA (Y) N
8. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* NA (Y) N
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA (Y) N
10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* (NA) Y N
11. Were VOA vials received without headspace? *Indicate in the table below.* (NA) Y N
12. Was C12/Res negative? (NA) Y N

| Sample ID on Bottle | Sample ID on COC | Identified by: |
|---|---|---|
| | | |
| | | |
| | | |

| Sample ID | Bottle Count Bottle Type | Out of Temp | Head-space | Broke | pH | Reagent | Volume added | Reagent Lot Number | Initials | Time |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

*Notes, Discrepancies, & Resolutions:* _____

*Page* ____ *of* ____

# General Chemistry

**ALS Environmental—Kelso Laboratory**
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

**ALS Group USA, Corp.**
**dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/2/15 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/4/15 |
| **Analysis Method:** | 160.3 Modified | **Units:** | Percent |
| **Prep Method:** | None | **Basis:** | As Received |

**Solids, Total**

| Sample Name | Lab Code | Result | MRL | Dil. | Date Analyzed | Q |
|---|---|---|---|---|---|---|
| B-1 0.5-2' | K1501105-001 | **80.5** | - | 1 | 02/10/15 13:02 | |
| B-3 3.5-5' | K1501105-002 | **22.1** | - | 1 | 02/10/15 13:02 | |
| C-3 3.5-5' | K1501105-003 | **22.1** | - | 1 | 02/10/15 13:02 | |
| D-1 0.5-2' | K1501105-004 | **87.8** | - | 1 | 02/10/15 13:02 | |
| E-4 3.5-5' | K1501105-005 | **22.0** | - | 1 | 02/10/15 13:02 | |
| F-3 2.5-4' | K1501105-006 | **31.3** | - | 1 | 02/10/15 13:02 | |

**ALS Group USA, Corp.**

**dba ALS Environmental**

QA/QC Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 |
| | | **Date Analyzed:** | 02/10/15 |

## Replicate Sample Summary
## General Chemistry Parameters

| | | | |
|---|---|---|---|
| **Sample Name:** | B-1 0.5-2' | **Units:** | Percent |
| **Lab Code:** | K1501105-001 | **Basis:** | As Received |

| Analyte Name | Analysis Method | MRL | Sample Result | Duplicate Sample K1501105-001DUP Result | Average | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|
| Solids, Total | 160.3 Modified | - | 80.5 | 81.8 | 81.2 | 2 | 20 |

**Results flagged with an asterisk (*) indicate values outside control criteria.**

**Results flagged with a pound (#) indicate the control criteria is not applicable.**

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

**ALS Group USA, Corp.**
**dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/2/15 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/4/15 |
| **Analysis Method:** | ASTM D4129-05 Modified | **Units:** | Percent |
| **Prep Method:** | ALS SOP | **Basis:** | Dry, per Method |

## Carbon, Total Organic (TOC)

| Sample Name | Lab Code | Result | MRL | Dil. | Date Analyzed | Date Extracted | Q |
|---|---|---|---|---|---|---|---|
| B-1 0.5-2' | K1501105-001 | **3.81** | 0.050 | 1 | 02/17/15 14:30 | 2/17/15 | |
| B-3 3.5-5' | K1501105-002 | **43.7** | 0.050 | 1 | 02/17/15 14:30 | 2/17/15 | |
| C-3 3.5-5' | K1501105-003 | **39.4** | 0.050 | 1 | 02/17/15 14:30 | 2/17/15 | |
| D-1 0.5-2' | K1501105-004 | **1.33** | 0.050 | 1 | 02/17/15 14:30 | 2/17/15 | |
| E-4 3.5-5' | K1501105-005 | **44.3** | 0.050 | 1 | 02/17/15 14:30 | 2/17/15 | |
| F-3 2.5-4' | K1501105-006 | **11.0** | 0.050 | 1 | 02/17/15 14:30 | 2/17/15 | |
| Method Blank | K1501105-MB | ND U | 0.050 | 1 | 02/17/15 14:30 | 2/17/15 | |

**ALS Group USA, Corp.**

**dba ALS Environmental**

QA/QC Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 |
| | | **Date Analyzed:** | 02/17/15 |

## Replicate Sample Summary
## General Chemistry Parameters

| | | | |
|---|---|---|---|
| **Sample Name:** | B-1 0.5-2' | **Units:** | Percent |
| **Lab Code:** | K1501105-001 | **Basis:** | Dry, per Method |

| Analyte Name | Analysis Method | MRL | Sample Result | Duplicate Sample K1501105-001DUP Result | Average | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|
| Carbon, Total Organic (TOC) | ASTM D4129-05 Modified | 0.050 | 3.81 | 3.89 | 3.85 | 2 | 20 |

**Results flagged with an asterisk (*) indicate values outside control criteria.**

**Results flagged with a pound (#) indicate the control criteria is not applicable.**

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

**ALS Group USA, Corp.**
**dba ALS Environmental**

QA/QC Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 |
| | | **Date Analyzed:** | 02/17/15 |
| | | **Date Extracted:** | 02/17/15 |

**Duplicate Matrix Spike Summary**
**Carbon, Total Organic (TOC)**

| | | | |
|---|---|---|---|
| **Sample Name:** | B-1 0.5-2' | **Units:** | Percent |
| **Lab Code:** | K1501105-001 | **Basis:** | Dry, per Method |
| **Analysis Method:** | ASTM D4129-05 Modified | | |
| **Prep Method:** | ALS SOP | | |

| | | Matrix Spike K1501105-001MS | | | Duplicate Matrix Spike K1501105-001DMS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Analyte Name** | **Sample Result** | **Result** | **Spike Amount** | **% Rec** | **Result** | **Spike Amount** | **% Rec** | **% Rec Limits** | **RPD** | **RPD Limit** |
| Carbon, Total Organic (TOC) | 3.81 | 7.55 | 3.61 | 104 | 7.18 | 3.41 | 99 | 70-122 | 5 | 20 |

**Results flagged with an asterisk (*) indicate values outside control criteria.**

**Results flagged with a pound (#) indicate the control criteria is not applicable.**

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

**ALS Group USA, Corp.**
**dba ALS Environmental**

QA/QC Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Analyzed:** | 02/17/15 |
| **Sample Matrix:** | Soil | **Date Extracted:** | 02/17/15 |

**Lab Control Sample Summary**
**Carbon, Total Organic (TOC)**

| | | | |
|---|---|---|---|
| **Analysis Method:** | ASTM D4129-05 Modified | **Units:** | Percent |
| **Prep Method:** | ALS SOP | **Basis:** | Dry, per Method |
| | | **Analysis Lot:** | 433394 |

| Sample Name | Lab Code | Result | Spike Amount | % Rec | % Rec Limits |
|---|---|---|---|---|---|
| Lab Control Sample | K1501105-LCS | 0.524 | 0.543 | 96 | 72-122 |

# Subcontract Lab Results

**ALS Environmental—Kelso Laboratory**
1317 South 13th Avenue, Kelso, WA 98626
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**REVISED**
***8:39 am, Mar 03, 2015***

10450 Stancliff Rd., Suite 210
Houston, TX 77099
T: +1 713 266 1599
F: +1 713 266 1599
www.alsglobal.com

February 25, 2015 Service Request No: K1501105

Lisa Domenighini.

ALS Environmental
1317 South 13th Avenue
Kelso, WA 98626

**Laboratory Result for: Barr Engineering.**
Dear Lisa:

Enclosed are the results of the sample(s) submitted to our laboratory on February 06, 2015. For Your reference, these analyses have been assigned our service request number: **K1501105.**

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current TNI standards, where applicable, and considered in their entirety, and ALS Environmental is not responsible for use of less than the final complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report. In accordance to the TNI 2009 Standard, a statement on the estimated uncertainty of measurement of any quantitative analysis will be supplied upon request.

Please contact me if you have any questions. My direct line is 281-575-2279. You may also contact me via email at Arthi.Kodur@alsglobal.com

Respectfully submitted,

**ALS Group USA Corp., dba ALS Environmental**

Arthi Kodur
Project Manager

*For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com.*

# Certificate of Analysis

**ALS Environmental - Houston HRMS**
10450 Stancliff Rd, Suite 210, Houston TX 77099
Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

**ALS ENVIRONMENTAL**

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request No.:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Received:** | 2/6/15 |
| **Sample Matrix:** | Soil | | |

**ALS ENVIRONMENTAL NARRATIVE**

All analyses were performed in adherence to the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II. When appropriate to the method, method blank results have been reported with each analytical test.

**Sample Receipt**

Six soil samples were received for analysis at ALS Environmental on 2/6/15.

Please note the reporting forms are currently referencing the date ALS Environmental-Kelso received the samples (2/4/15) and not the date ALS Environmental-Houston received the samples (2/6/15).

The samples were received at 0°C in good condition and are consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4°C upon receipt at the laboratory.

**Data Validation Notes and Discussion**

**B flags – Method Blanks**

The Method Blank EQ1500104-01 contained low levels of various analytes below the Method Reporting Limit (MRL).

**MS/MSD**

EQ1500104: Laboratory Control Spike (LCS) sample was analyzed and reported in addition to an MS/MSD for this extraction batch. OCDD was outside the percent recovery for EQ1500104-02 (LCS). The batch precision (MS/DMS) measurements were determined on another order in the extraction batch. The MS/DMS results are not included in this report.

**2378-TCDF**

Samples analyzed on the DB-5MSUI column were analyzed under conditions were sufficient separation between 2,3,7,8-TCDF and its closest eluter was achieved. Confirmation of this result was not required.

**Y flags – Labeled Standards**

Quantification of the native 2,3,7,8-substituted analytes is based on isotopic dilution, which automatically corrects for variation in extraction efficiency and provides accurate values even with poor recovery. Samples that had recoveries of labeled standards outside the acceptance limits are qualified with 'Y' flags on the Labeled Compound summary pages. In all cases, the signal-to-noise ratios are greater than 10:1 and detection limit were below the Method Reporting Limit.

**Dilutions**

All samples in service request K1501105 had elevated levels of target analytes and required a dilution. The undiluted and diluted results were combined into one Total TEQ summary report for each sample. This reports a 'Total' result that includes the most appropriate concentration found for the associated target analyte.

**K flags**

EMPC - When the ion abundance ratios associated with a particular compound are outside the QC limits, samples are flagged with a 'K' flag. A 'K' flag indicates an estimated maximum possible concentration for the associated compound.

**Detection Limits**

Detection limits are calculated for each analyte in each sample by measuring the height of the noise level for each quantitation ion for the associated labeled standard. The concentration equivalent to 2.5 times the height of the noise is then calculated using the appropriate response factor and the weight of the sample. The calculated concentration equals the detection limit.

**The TEQ Summary results for each sample have been calculated by ALS ENVIRONMENTAL/Houston to include:**

- WHO-2005 TEFs, The 2005 World Health Organization Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds (M. Van den Berg et al., Toxicological Sciences 93(2):223-241, 2006)
- Non-detected compounds are not included in the 'Total'
- The 1:1 and associated dilution have been combined into one TEQ Summary report

**Client:** Barr Engineering Company **Service Request:**K1501105

**Project:** Joslyn OU5 2015 Soil/23270110

## SAMPLE CROSS-REFERENCE

| SAMPLE # | CLIENT SAMPLE ID | DATE | TIME |
|---|---|---|---|
| K1501105-001 | B-1 0.5-2' | 2/2/2015 | 1025 |
| K1501105-002 | B-3 3.5-5' | 2/2/2015 | 1410 |
| K1501105-003 | C-3 3.5-5' | 2/2/2015 | 1335 |
| K1501105-004 | D-1 0.5-2' | 2/2/2015 | 1055 |
| K1501105-005 | E-4 3.5-5' | 2/2/2015 | 1255 |
| K1501105-006 | F-3 2.5-4' | 2/2/2015 | 1220 |

# Service Request Summary

**Folder #:** **K1501105**
Client Name: Barr Engineering Company
Project Name: Joslyn OU5 2015 Soil
Project Number: 23270110

**Report To:** Terri Olson
Barr Engineering
4700 West 77th Street
Minneapolis, MN 55435
USA
Phone Number: 952-842-3578
Cell Number:
Fax Number:
E-mail: tolson@barr.com

Project Chemist: Lisa Domenighini
Originating Lab: KELSO
Logged By: SWOLF
Date Received: 02/04/15
Internal Due Date: 2/20/2015
QAP: LAB QAP
Qualifier Set: Lab Standard
Formset: Lab Standard
Merged?: Y
Report to MDL?: N, Y
P.O. Number:
EDD: BARR - EQUIS

12 4 oz-Glass Jar WM CLEAR Teflon Liner Unpreserved
**Location:** K-Delilah-28, EHRMS-WIC 6E
**Pressure Gas:**
**NPDES**

| | | | | KELSO | | HOUSTON |
|---|---|---|---|---|---|---|
| **Lab Samp No.** | **Client Samp No** | **Matrix** | **Collected** | TOC/ASTM D4129-05 Modified | TS/160.3 Modified | PCDD PCDF/8290 |
| K1501105-001 | B-1 0.5-2' | Soil | 02/02/15 1025 | II | II | II |
| K1501105-002 | B-3 3.5-5' | Soil | 02/02/15 1410 | II | II | II |
| K1501105-003 | C-3 3.5-5' | Soil | 02/02/15 1335 | II | II | II |
| K1501105-004 | D-1 0.5-2' | Soil | 02/02/15 1055 | II | II | II |
| K1501105-005 | E-4 3.5-5' | Soil | 02/02/15 1255 | II | II | II |
| K1501105-006 | F-3 2.5-4' | Soil | 02/02/15 1220 | II | II | II |

## Folder Comments:

Tier II except when requested otherwise.
Firm 3 week TAT

# Service Request Summary

**Folder #:** **K1501105**
Client Name: Barr Engineering Company
Project Name: Joslyn OU5 2015 Soil
Project Number: 23270110

**Report To:** Terri Olson
Barr Engineering
4700 West 77th Street
Minneapolis, MN 55435
USA
Phone Number: 952-842-3578
Cell Number:
Fax Number:
E-mail: tolson@barr.com

Project Chemist: Lisa Domenighini
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Date Received: 02/04/15
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QAP: LAB QAP
Qualifier Set: Lab Standard
Formset: Lab Standard
Merged?: Y
Report to MDL?: N, Y
P.O. Number:
EDD: BARR - EQUIS

12 4 oz-Glass Jar WM CLEAR Teflon Liner Unpreserved
**Location:** K-Delilah-28, EHRMS-WIC 6E
**Pressure Gas:**
**NPDES**

## Test Comments:

| Group | Test/Method | Samples | Comments |
|---|---|---|---|
| Semivoa GCMS | PCDD PCDF/8290 | 12 | Firm 3 week tat!due 2/25/15<br>full list |

# Data Qualifiers

## HRMS Qualifier Set

B Indicates the associated analyte was found in the method blank at >1/10th the reported value.

E Estimated value. The reported concentration is above the calibration range of the instrument.

H Sample extracted and/or analyzed out of suggested holding time.

J Estimated value. The reported concentration is below the MRL.

K The ion abundance ratio between the primary and secondary ions were outside of theoretical acceptance limits. Reported concentration is a conservative estimate, however EMPC correction was not applied.

P Chlorodiphenyl ether interference was present at the retention time of the target analyte. Reported result should be considered an estimate.

Q Monitored lock-mass indicates matrix-interference. Reported result is estimated.

S Signal saturated detector. Result reported from dilution.

U Compound was analyzed for, but was not detected (ND).

X See Case Narrative.

Y Isotopically Labeled Standard recovery outside of acceptance limits. In all cases, the signal-to-nois ratios are greater than 10:1, making the recoveries acceptable.

i The MDL/MRL have been elevated due to a matrix interference.

# ALS Laboratory Group

**Acronyms**

| | |
|---|---|
| Cal | Calibration |
| Conc | CONCentration |
| Dioxin(s) | Polychlorinated dibenzo-p-dioxin(s) |
| EDL | Estimated Detection Limit |
| EMPC | Estimated Maximum Possible Concentration |
| Flags | Data qualifiers |
| Furan(s) | Polychlorinated dibenzofuran(s) |
| g | Grams |
| ICAL | Initial CALibration |
| ID | IDentifier |
| Ions | Masses monitored for the analyte during data acquisition |
| L | Liter (s) |
| LCS | Laboratory Control Sample |
| DLCS | Duplicate Laboratory Control Sample |
| MB | Method Blank |
| MCL | Method Calibration Limit |
| MDL | Method Detection Limit |
| mL | Milliliters |
| MS | Matrix Spiked sample |
| DMS | Duplicate Matrix Spiked sample |
| NO | Number of peaks meeting all identification criteria |
| PCDD(s) | Polychlorinated dibenzo-p-dioxin(s) |
| PCDF(s) | Polychlorinated dibenzofuran(s) |
| ppb | Parts per billion |
| ppm | Parts per million |
| ppq | Parts per quadrillion |
| ppt | Parts per trillion |
| QA | Quality Assurance |
| QC | Quality Control |
| Ratio | Ratio of areas from monitored ions for an analyte |
| % Rec. | Percent recovery |
| RPD | Relative Percent Difference |
| RRF | Relative Response Factor |
| RT | Retention Time |
| SDG | Sample Delivery Group |
| S/N | Signal-to-noise ratio |
| TEF | Toxicity Equivalence Factor |
| TEQ | Toxicity Equivalence Quotient |

## State Certifications, Accreditations, and Licenses

| Agency | Number | Expire Date |
|---|---|---|
| American Association for Laboratory Accreditation | 2897.01 | 11/30/2015 |
| Arizona Department of Health Services | AZ0793 | 5/27/2015 |
| Arkansas Department of Environmental Quality | 14-038-0 | 6/16/2015 |
| California Department of Health Services | 2452 | 2/28/2015 |
| Florida Department of Health | E87611 | 6/30/2015 |
| Hawaii Department of Health | TX02694 | 6/30/2015 |
| Illinois Environmental Protection Agency | 200057 | 10/6/2015 |
| Louisiana Department of Health and Hospitals | TX2694 | 6/30/2015 |
| Maine Center for Disease Control and Prevention | 2014019 | 6/5/2016 |
| Maryland Department of the Environment | 343 | 6/30/2015 |
| Michigan Depratment of Environmental Quality | 9971 | 6/30/2015 |
| Minnesota Department of Health | TX02694 | 12/31/2015 |
| Nebraska Department of Health and Human Services | NE-OS-25-13 | 6/30/2015 |
| Nevada Department of Concervation and Natural Resources | TX014112013-2 | 7/31/2015 |
| New Jersey Department of Environmental Protection | NLC140001 | 6/30/2015 |
| New Mexico Environment Department | TX02694 | 6/30/2015 |
| New York Department of Health | 11707 | 4/1/2015 |
| Oklahoma Department of Environmental Quality | 2014-124 | 8/31/2015 |
| Oregon Environmental Laboratory Accreditation Program | TX200002 | 3/24/2015 |
| Pennsylvania Department of Environmental Protection | 68-03441 | 6/30/2015 |
| Tennessee Department of Environment and Concervation | 04016 | 6/30/2015 |
| Texas Commision on Environmental Quality | TX104704216-14-5 | 6/30/2015 |
| United States Department of Agriculture | P330-14-00067 | 2/21/2017 |
| Utah Department of Health Environmental Laboratory Certification | TX02694 | 7/31/2015 |
| Washington Department of Health | c819 | 11/14/2015 |
| West Virginia Department of Environmental Protection | 347 | 6/30/2015 |

# ALS ENVIRONMENTAL – Houston
## Data Processing/Form Production and Peer Review Signatures

SR# Unique ID: K1501105 | DB-5 | (DB-5MSUI) | DB-225 | SPB-Octyl

**First Level - Data Processing - to be filled by person generating the forms**

| Date: | Analyst: | Samples: |
|---|---|---|
| 02/20/15 | TC | -001, -002, -004, -005, -006 |

**Second Level - Data Review – to be filled by person doing peer review**

| Date: | Analyst: | Samples: |
|---|---|---|
| 02/23/15 | JC | 001, 002, 004, 005, 006 |

PEER REVIEW PAGE

# ALS ENVIRONMENTAL – Houston
## Data Processing/Form Production and Peer Review Signatures

SR# Unique ID: K1501105 | DB-5 | (DB-5MSUI) | DB-225 | SPB-Octyl

**First Level - Data Processing - to be filled by person generating the forms**

| Date: | Analyst: | Samples: |
|---|---|---|
| 02/24/15 | TC | -003, -001DL, -002DL, -003DL, -004DL, -005DL -006DL |

**Second Level - Data Review – to be filled by person doing peer review**

| Date: | Analyst: | Samples: |
|---|---|---|
| 02/24/15 | LKL | 003, 001DL, 002DL, 003DL, 004DL, 005DL, 006DL |

PEER REVIEW PAGE

# Chain of Custody

**ALS Environmental - Houston HRMS**
10450 Stancliff Rd, Suite 210, Houston TX 77099
Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

# Intra-Network Chain of Custody

1317 South 13th Avenue • Kelso, WA 98626 • 1-360-577-7222 • FAX 1-360-636-1068

ALS Contact: Lisa Domenighini

**Project Name:** Joslyn OU5 2015 Soil
**Project Number:** 23270110
**Project Manager:** Terri Olson
**Company:** Barr Engineering

| Lab Code | Client Sample ID | # of Cont. | Matrix | Sample Date | Sample Time | Date Received | Send To | PCDD PCDF 8290 |
|---|---|---|---|---|---|---|---|---|
| K1501105-001 | B-1 0.5-2' | 1 | Soil | 2/2/15 | 1025 | 2/4/15 | HOUSTON | II |
| K1501105-002 | B-3 3.5-5' | 1 | Soil | 2/2/15 | 1410 | 2/4/15 | HOUSTON | II |
| K1501105-003 | C-3 3.5-5' | 1 | Soil | 2/2/15 | 1335 | 2/4/15 | HOUSTON | II |
| K1501105-004 | D-1 0.5-2' | 1 | Soil | 2/2/15 | 1055 | 2/4/15 | HOUSTON | II |
| K1501105-005 | E-4 3.5-5' | 1 | Soil | 2/2/15 | 1255 | 2/4/15 | HOUSTON | II |
| K1501105-006 | F-3 2.5-4' | 1 | Soil | 2/2/15 | 1220 | 2/4/15 | HOUSTON | II |

**Folder Comments:**
Tier II except when requested otherwise.
Firm 3 week TAT

K1501105 5
Barr Engineering
Joslyn OU5 2015 Soil

**Special Instructions/Comments**
Please provide the electronic (PDF and EDD) report to the following e-mail address: ALKLS.Data@alsglobal.com.

pH Checked _____

**Turnaround Requirements**
____ **RUSH** (Surcharges Apply)
**PLEASE CIRCLE WORK DAYS**
1 2 3 4 5
__X__ **STANDARD**
Requested FAX Date: _____
Requested Report Date: 02/20/15

**Report Requirements**
___ I. Results Only
__X__ II. Results + QC Summaries
___ III. Results + QC and Calibration Summaries
___ IV. Data Validation Report with Raw Data
PQL/MDL/J N
EDD Y

**Invoice Information**
PO# K1501105
Bill to

Relinquished By: 2/5/15 Received By: 2/6/15 Airbill Number: _____

# Cooler Receipt Form

Project Chemist AK

Client/Project

Thermometer ID SM0

Date/Time Received: 2/6/15 Initials: AL Date/Time Logged in: 2/6/15 Initials AL

1. Method of delivery: ○ US Mail ✓ Fed Ex ○ UPS ○ DHL ○ Courier ○ Client
2. Samples received in: ✓ Cooler ○ Box ○ Envelope ○ Other
3. Were custody seals on coolers? ✓ Yes ○ No — If yes, how many and where? 1 seal
   Were they intact? ✓ Yes ○ No ○ N/A
   Were they signed and dated? ✓ Yes ○ No ○ N/A
4. Packing Material: ○ Inserts ○ Baggies ✓ Bubble Wrap ✓ Gel Packs ○ Wet Ice ○ Sleeves ○ Other
5. Foreign or Regulated Soil? ○ Yes ✓ No — Location of Sampling:

| Cooler Tracking Number | COC ID | Date Opened | Time Opened | Opened By | Temp. °C | Temp Blank? |
|---|---|---|---|---|---|---|
| 5478 9741 3409 | | 2/6/15 | 927 | AL | 0/0 | ☐ |
| | | | | | | ☐ |
| | | | | | | ☐ |
| | | | | | | ☐ |

6. Were custody papers properly filled out (ink, signed, dated, etc)? ✓ Yes ○ No
7. Did all bottles arrive in good condition (not broken, no signs of leakage)? ✓ Yes ○ No
8. Were all sample labels complete (i.e., sample ID, analysis, preservation, etc)? ✓ Yes ○ No
9. Were appropriate bottles/containers and volumes received for the requested tests? ✓ Yes ○ No
10. Did sample labels and tags agree with custody documents? ✓ Yes ○ No

Notes, Discrepancies, & Resolutions:

# of containers on COC: # of containers received:

Service request Label: K1501105 5

Barr Engineering
Joslyn OU6 2015 Soil

Effective 10/04/2013 ALS Environmental - Houston HRMS

10450 Stancliff Rd., Suite 210
Houston, TX 77099
**T:** +1 713 266 1599
**F:** +1 713 266 1599
**www.alsglobal.com**

# SAMPLE ACCEPTANCE POLICY

This policy outlines the criteria samples must meet to be accepted by ALS Environmental – Houston HRMS.

**Cooler Custody Seals (desirable, mandatory if specified in SAP):**

- ✓ Intact on outside of cooler, signed and dated

**Chain-of-Custody (COC) documentation (mandatory):**

The following is required on each COC:

- ✓ Sample ID, the location, date and time of collection, collector's name, preservation type, sample type, and any other special remarks concerning the sampleThe COC must be completed in ink.
- ✓ Signature and date of relinquishing party.

In the absence of a COC at sample receipt, the COC will be requested from the client.

**Sample Integrity (mandatory):**

Samples are inspected upon arrival to ensure that sample integrity was not compromised during transfer to the laboratory.

- ✓ Sample containers must arrive in good condition (not broken or leaking).
- ✓ Samples must be labeled appropriately, including Sample IDs, and requested test using durable labels and indelible ink.
- ✓ The correct type of sample bottle must be used for the method requested.
- ✓ An appropriate sample volume, or weight, must be received.
- ✓ Sample IDs and number of containers must reconcile with the COC.
- ✓ Samples must be received within the method defined holding time.

**Temperature Requirement (varies by sample matrix):**

- ✓ Aqueous and Non-aqueous samples must be shipped and stored cold, at 0 to 6ºC.
- ✓ Tissue samples must be shipped and stored frozen, at -20 to -10ºC.
- ✓ Air samples are shipped and stored cold, at 0 to 6ºC
- ✓ The sample temperature must be recorded on the COC

All cooler inspections are documented on the Cooler Receipt Form (CRF). A separate CRF is completed for each service request. Any samples not meeting the above criteria are noted on the CRF and the Project Manager notified. The Project Manager must resolve any sample integrity issues with the client prior to proceeding with the analysis. Such resolutions are documented in writing and filed with the project folder. Data associated with samples received outside of this acceptance policy will be qualified on the case narrative of the final report

# Preparation Information Benchsheets

**ALS Environmental - Houston HRMS**
10450 Stancliff Rd., Suite 210, Houston, TX 77099
Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

# *Preparation Information Benchsheet*

**Prep Run#:** 228939 **Prep WorkFlow:** OrgExtDioxS(30) **Status:** Prepped
**Team:** Semivoa GCMS/WMCDONOUGH **Prep Method:** Method **Prep Date/Time:** 2/10/15 07:45 AM

| # | Lab Code | Client ID | B# | Method /Test | pH | Matrix | Amt. Ext. | Sample Description |
|---|---|---|---|---|---|---|---|---|
| 1 | E1500124-001 | 010MBDA-TP33 | .01 | 8290/PCDD PCDF | | Soil | 10.069g | Damp, Brown Soil (w/ rocks) |
| 2 | E1500124-002 | 010MBDA-TP34 | .01 | 8290/PCDD PCDF | | Soil | 10.344g | Damp, Brown Soil (w/ rocks) |
| 3 | E1500124-003 | 010MBDA-TP35 | .01 | 8290/PCDD PCDF | | Soil | 10.408g | Damp, Brown Soil (w/ rocks) |
| 4 | E1500124-004 | 010MBDA-TP37 | .01 | 8290/PCDD PCDF | | Soil | 10.071g | Damp, Brown Soil (w/ rocks) |
| 5 | E1500124-005 | 010MBDA-TP38 | .01 | 8290/PCDD PCDF | | Soil | 10.295g | Wet, Brown Mud (w/ rocks) |
| 6 | E1500124-006 | 010MBDA-TP39 | .01 | 8290/PCDD PCDF | | Soil | 10.315g | Damp, Brown Soil (w/ rocks) |
| 7 | E1500124-007 | 010MBDA-TP41 | .01 | 8290/PCDD PCDF | | Soil | 10.534g | Damp, Brown Soil (w/ rocks) |
| 8 | E1500124-008 | 010MBDA-TP42 | .01 | 8290/PCDD PCDF | | Soil | 10.304g | Damp, Brown Soil (w/ rocks) |
| 9 | E1500124-009 | 010MBDA-TP43 | .01 | 8290/PCDD PCDF | | Soil | 10.091g | Damp, Brown Soil (w/ rocks) |
| 10 | EQ1500104-01 | MB | | 8290/PCDD PCDF | | Solid | 10.239g | |
| 11 | EQ1500104-02 | LCS | | 8290/PCDD PCDF | | Solid | 10.517g | |
| 12 | EQ1500104-03 | 010MBDA-TP33 MS | .01 | 8290/PCDD PCDF | | Solid | 10.163g | |
| 13 | EQ1500104-04 | 010MBDA-TP33 DMS | .01 | 8290/PCDD PCDF | | Solid | 10.048g | |
| 14 | K1501105-001 | B-1 0.5-2' | .02 | 8290/PCDD PCDF | | Soil | 10.295g | Damp, Dark Brown Soil |
| 15 | K1501105-002 | B-3 3.5-5' | .02 | 8290/PCDD PCDF | | Soil | 10.089g | Damp, Dark Brown Soil |
| 16 | K1501105-003 | C-3 3.5-5' | .02 | 8290/PCDD PCDF | | Soil | 10.127g | Damp, Dark Brown Soil |
| 17 | K1501105-004 | D-1 0.5-2' | .02 | 8290/PCDD PCDF | | Soil | 10.233g | Damp, Dark Brown Soil |
| 18 | K1501105-005 | E-4 3.5-5' | .02 | 8290/PCDD PCDF | | Soil | 10.318g | Damp, Dark Brown Soil |
| 19 | K1501105-006 | F-3 2.5-4' | .02 | 8290/PCDD PCDF | | Soil | 10.171g | Damp, Dark Brown Soil |

# *Preparation Information Benchsheet*

**Prep Run#:** 228939 **Prep WorkFlow:** OrgExtDioxS(30) **Status:** Prepped
**Team:** Semivoa GCMS/WMCDONOUGH **Prep Method:** Method **Prep Date/Time:** 2/10/15 07:45 AM

**Spiking Solutions**

| Name: | 1613B Matrix Working Standard | Inventory ID | 78598 | Logbook Ref: | 2-20 ng/ml 78598 WM 2/6/15 | Expires On: | 02/06/2016 |
|---|---|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| EQ1500104-02 | 100.00µL | EQ1500104-03 | 100.00µL | EQ1500104-04 | 100.00µL |

| Name: | 1613B Labeled Working Standard | Inventory ID | 78659 | Logbook Ref: | 2-4 ng/ml 78659 WM 2/10/15 | Expires On: | 02/10/2016 |
|---|---|---|---|---|---|---|---|

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| E1500124-001 | 1,000.00µL | E1500124-002 | 1,000.00µL | E1500124-003 | 1,000.00µL | E1500124-004 | 1,000.00µL | E1500124-005 | 1,000.00µL | E1500124-006 | 1,000.00µL |
| E1500124-007 | 1,000.00µL | E1500124-008 | 1,000.00µL | E1500124-009 | 1,000.00µL | EQ1500104-01 | 1,000.00µL | EQ1500104-02 | 1,000.00µL | EQ1500104-03 | 1,000.00µL |
| EQ1500104-04 | 1,000.00µL | K1501105-001 | 1,000.00µL | K1501105-002 | 1,000.00µL | K1501105-003 | 1,000.00µL | K1501105-004 | 1,000.00µL | K1501105-005 | 1,000.00µL |
| K1501105-006 | 1,000.00µL | | | | | | | | | | |

| Name: | 8290/1613B Cleanup Working Standard | Inventory ID | 78669 | Logbook Ref: | 78669 LM 2/10/15 8ng/mL | Expires On: | 02/10/2016 |
|---|---|---|---|---|---|---|---|

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| E1500124-001 | 100.00µL | E1500124-002 | 100.00µL | E1500124-003 | 100.00µL | E1500124-004 | 100.00µL | E1500124-005 | 100.00µL | E1500124-006 | 100.00µL |
| E1500124-007 | 100.00µL | E1500124-008 | 100.00µL | E1500124-009 | 100.00µL | EQ1500104-01 | 100.00µL | EQ1500104-02 | 100.00µL | EQ1500104-03 | 100.00µL |
| EQ1500104-04 | 100.00µL | K1501105-001 | 100.00µL | K1501105-002 | 100.00µL | K1501105-003 | 100.00µL | K1501105-004 | 100.00µL | K1501105-005 | 100.00µL |
| K1501105-006 | 100.00µL | | | | | | | | | | |

**Preparation Materials**

| | | | | | |
|---|---|---|---|---|---|
| Carbon, High Purity | AL 01/14/15 (78050) | Ethyl Acetate 99.9% Minimum EtOAc | LM 09/23/14 (75019) | Glass Wool | AL 10/22/14 (75977) |
| Sulfuric Acid Reagent Grade H2SO4 | LM 10/27/14 (76083) | Hexanes 95% | LM 2/9/15 (78641) | Dichloromethane (Methylene Chloride) 99.9% MeCl2 | LM12/15/14 (77367) |
| Sodium Chloride Reagent Grade NaCl | C2-65-5 (38670) | Sodium Hydroxide Reagent Grade NaOH | LM 09/02/14 (74232) | Sodium Sulfate Anhydrous Reagent Grade Na2SO4 | LM 11/25/14 (76864) |
| Tridecane (n-Tridecane) | LM 2/2/15 (78444) | Silica Gel Reagent Grade | LM 2/2/15 (78445) | Toluene 99.9% Minimum | AL 01/30/15 (78396) |

**Preparation Steps**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Step: | Extraction | Step: | Acid Clean | Step: | Silica Gel Clean | Step: | Final Volume |
| Started: | 2/10/15 07:45 | Started: | 2/13/15 11:00 | Started: | 2/14/15 11:05 | Started: | 2/17/15 09:00 |
| Finished: | 2/12/15 04:15 | Finished: | 2/13/15 11:20 | Finished: | 2/14/15 12:35 | Finished: | 2/17/15 09:40 |
| By: | WMCDONOUGH | By: | CDIAZ | By: | CDIAZ | By: | CDIAZ |
| Comments | | Comments | | Comments | | Comments | |

Comments: _____

Reviewed By: rp Date: 2-21-20015

# *Preparation Information Benchsheet*

**Prep Run#:** 228939
**Team:** Semivoa GCMS/WMCDONOUGH

**Prep WorkFlow:** OrgExtDioxS(30)
**Prep Method:** Method

**Status:** Prepped
**Prep Date/Time:** 2/10/15 07:45 AM

Chain of Custody

| | | | | |
|---|---|---|---|---|
| Relinquished By: | | Date: | | Extracts Examined |
| Received By: | | Date: | | Yes No |

# Analytical Results

**ALS Environmental - Houston HRMS**
10450 Stancliff Rd., Suite 210, Houston, TX 77099
Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 10:25 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-1 0.5-2' | **Units:** | ng/Kg |
| **Lab Code:** | K1501105-001 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 02/18/15 17:55 |
| **Prep Method:** | Method | **Date Extracted:** | 2/10/15 |
| **Sample Amount:** | 10.295g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P176385 | **Blank File Name:** | P176384 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P176382 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | 5.88 | | 0.0558 | 0.603 | 0.68 | 1.001 | 1 |
| 1,2,3,7,8-PeCDD | 149 | | 0.0931 | 3.02 | 1.56 | 1.000 | 1 |
| 1,2,3,4,7,8-HxCDD | 522 | | 1.42 | 3.02 | 1.24 | 1.001 | 1 |
| 1,2,3,6,7,8-HxCDD | 11900 | | 46.2 | 302 | 1.29 | 1.000 | 100 |
| 1,2,3,7,8,9-HxCDD | 1070 | | 1.33 | 3.02 | 1.25 | 1.007 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 453000 | | 432 | 432 | 1.05 | 1.000 | 100 |
| OCDD | 15000000 | **E** | 445 | 603 | 0.89 | 1.000 | 100 |
| 2,3,7,8-TCDF | 49.8 | | 0.0551 | 0.603 | 0.76 | 1.001 | 1 |
| 1,2,3,7,8-PeCDF | 316 | | 0.228 | 3.02 | 1.57 | 1.001 | 1 |
| 2,3,4,7,8-PeCDF | 702 | | 0.222 | 3.02 | 1.58 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDF | 4820 | | 399 | 399 | 1.21 | 1.000 | 100 |
| 1,2,3,6,7,8-HxCDF | 724 | | 51.8 | 51.8 | 1.25 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDF | 957 | | 49.3 | 49.3 | 1.25 | 1.000 | 1 |
| 2,3,4,6,7,8-HxCDF | 1390 | | 52.2 | 52.2 | 1.25 | 1.000 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 120000 | | 369 | 369 | 1.04 | 1.000 | 100 |
| 1,2,3,4,7,8,9-HpCDF | 8990 | | 497 | 497 | 1.02 | 1.000 | 100 |
| OCDF | 3160000 | | 337 | 603 | 0.89 | 1.005 | 100 |
| Total Tetra-Dioxins | 86.0 | | 0.0558 | 0.603 | 0.81 | | 1 |
| Total Penta-Dioxins | 573 | | 0.0931 | 3.02 | 1.59 | | 1 |
| Total Hexa-Dioxins | 22000 | | 1.39 | 3.02 | 1.25 | | 1 |
| Total Hepta-Dioxins | 223000 | | 0.838 | 3.02 | 1.02 | | 1 |
| Total Tetra-Furans | 238 | | 0.0551 | 0.603 | 0.79 | | 1 |
| Total Penta-Furans | 4740 | | 0.0233 | 3.02 | 1.57 | | 1 |
| Total Hexa-Furans | 53900 | | 51.4 | 51.4 | 1.25 | | 1 |
| Total Hepta-Furans | 141000 | | 109 | 109 | 1.03 | | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 10:25 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-1 0.5-2' | **Units:** | Percent |
| **Lab Code:** | K1501105-001 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 02/18/15 17:55 |
| **Prep Method:** | Method | **Date Extracted:** | 2/10/15 |
| **Sample Amount:** | 10.295g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P176385 | **Blank File Name:** | P176384 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P176382 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1676.071 | 84 | | 40-135 | 0.80 | 1.018 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1779.064 | 89 | | 40-135 | 1.59 | 1.168 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1353.660 | 68 | | 40-135 | 1.26 | 0.991 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1255.947 | 63 | | 40-135 | 1.27 | 0.993 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 728.024 | 36 | **Y** | 40-135 | 1.10 | 1.065 |
| 13C-OCDD | 4000 | 345.184 | 9 | **K** | 40-135 | 1.17 | 1.142 |
| 13C-2,3,7,8-TCDF | 2000 | 1694.943 | 85 | | 40-135 | 0.78 | 0.993 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1748.991 | 87 | | 40-135 | 1.59 | 1.129 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1785.046 | 89 | | 40-135 | 1.60 | 1.159 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1386.532 | 69 | | 40-135 | 0.53 | 0.972 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1281.245 | 64 | | 40-135 | 0.53 | 0.975 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1521.775 | 76 | | 40-135 | 0.53 | 1.008 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1385.013 | 69 | | 40-135 | 0.53 | 0.988 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 721.469 | 36 | **Y** | 40-135 | 0.48 | 1.040 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1115.065 | 56 | | 40-135 | 0.44 | 1.078 |
| 37Cl-2,3,7,8-TCDD | 800 | 754.783 | 94 | | 40-135 | NA | 1.019 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 10:25 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-1 0.5-2' | **Units:** | ng/Kg |
| **Lab Code:** | K1501105-001 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

**Analysis Method:** 8290
**Prep Method:** Method

**Toxicity Equivalency Quotient**

| Analyte Name | Result | DL | MRL | Dilution Factor | TEF | TEF - Adjusted Concentration |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | **5.88** | 0.0558 | 0.603 | 1 | 1 | 5.88 |
| 1,2,3,7,8-PeCDD | **149** | 0.0931 | 3.02 | 1 | 1 | 149 |
| 1,2,3,4,7,8-HxCDD | **522** | 1.42 | 3.02 | 1 | 0.1 | 52.2 |
| 1,2,3,6,7,8-HxCDD | **11900** | 46.2 | 302 | 100 | 0.1 | 1190 |
| 1,2,3,7,8,9-HxCDD | **1070** | 1.33 | 3.02 | 1 | 0.1 | 107 |
| 1,2,3,4,6,7,8-HpCDD | **453000** | 432 | 432 | 100 | 0.01 | 4530 |
| OCDD | **15000000** | 445 | 603 | 100 | 0.0003 | 4500 |
| 2,3,7,8-TCDF | **49.8** | 0.0551 | 0.603 | 1 | 0.1 | 4.98 |
| 1,2,3,7,8-PeCDF | **316** | 0.228 | 3.02 | 1 | 0.03 | 9.48 |
| 2,3,4,7,8-PeCDF | **702** | 0.222 | 3.02 | 1 | 0.3 | 211 |
| 1,2,3,4,7,8-HxCDF | **4820** | 399 | 399 | 100 | 0.1 | 482 |
| 1,2,3,6,7,8-HxCDF | **724** | 51.8 | 51.8 | 1 | 0.1 | 72.4 |
| 1,2,3,7,8,9-HxCDF | **957** | 49.3 | 49.3 | 1 | 0.1 | 95.7 |
| 2,3,4,6,7,8-HxCDF | **1390** | 52.2 | 52.2 | 1 | 0.1 | 139 |
| 1,2,3,4,6,7,8-HpCDF | **120000** | 369 | 369 | 100 | 0.01 | 1200 |
| 1,2,3,4,7,8,9-HpCDF | **8990** | 497 | 497 | 100 | 0.01 | 89.9 |
| OCDF | **3160000** | 337 | 603 | 100 | 0.0003 | 948 |
| | | Total TEQ | | | | 13800 |

2005 WHO TEFs, ND = 0

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 14:10 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-3 3.5-5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501105-002 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 02/18/15 18:42 |
| **Prep Method:** | Method | **Date Extracted:** | 2/10/15 |
| **Sample Amount:** | 10.089g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P176386 | **Blank File Name:** | P176384 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P176382 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | ND | U | 0.572 | 2.24 | | | 1 |
| 1,2,3,7,8-PeCDD | 14.5 | | 2.74 | 11.2 | 1.47 | 1.000 | 1 |
| 1,2,3,4,7,8-HxCDD | 160 | | 6.57 | 11.2 | 1.24 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 3430 | | 6.77 | 11.2 | 1.26 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 306 | | 6.21 | 11.2 | 1.32 | 1.006 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 192000 | | 673 | 1120 | 1.04 | 1.001 | 100 |
| OCDD | 3730000 | | 901 | 2240 | 0.89 | 1.000 | 100 |
| 2,3,7,8-TCDF | ND | U | 0.622 | 2.24 | | | 1 |
| 1,2,3,7,8-PeCDF | 3.22**J** | | 1.17 | 11.2 | 1.52 | 1.001 | 1 |
| 2,3,4,7,8-PeCDF | 2.51**J** | | 1.11 | 11.2 | 1.43 | 1.000 | 1 |
| 1,2,3,4,7,8-HxCDF | 443**P** | | 3.73 | 11.2 | 1.29 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDF | ND | U | 3.74 | 11.2 | | | 1 |
| 1,2,3,7,8,9-HxCDF | ND | U | 4.35 | 11.2 | | | 1 |
| 2,3,4,6,7,8-HxCDF | 197 | | 3.95 | 11.2 | 1.23 | 1.000 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 57800 | | 1230 | 1230 | 1.03 | 1.000 | 100 |
| 1,2,3,4,7,8,9-HpCDF | 1800 | | 74.7 | 74.7 | 1.04 | 1.000 | 1 |
| OCDF | 856000 | | 655 | 2240 | 0.90 | 1.005 | 100 |
| Total Tetra-Dioxins | 128 | | 0.572 | 2.24 | 0.77 | | 1 |
| Total Penta-Dioxins | 1560 | | 2.74 | 11.2 | 1.56 | | 1 |
| Total Hexa-Dioxins | 21500 | | 6.51 | 11.2 | 1.25 | | 1 |
| Total Hepta-Dioxins | 245000 | | 84.1 | 84.1 | 1.04 | | 1 |
| Total Tetra-Furans | 76.2 | | 0.622 | 2.24 | 0.76 | | 1 |
| Total Penta-Furans | 857 | | 0.510 | 11.2 | 1.56 | | 1 |
| Total Hexa-Furans | 28600 | | 3.93 | 11.2 | 1.24 | | 1 |
| Total Hepta-Furans | 200000 | | 76.5 | 76.5 | 1.04 | | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 14:10 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-3 3.5-5' | **Units:** | Percent |
| **Lab Code:** | K1501105-002 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 02/18/15 18:42 |
| **Prep Method:** | Method | **Date Extracted:** | 2/10/15 |
| **Sample Amount:** | 10.089g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P176386 | **Blank File Name:** | P176384 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P176382 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1343.224 | 67 | | 40-135 | 0.78 | 1.018 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1491.451 | 75 | | 40-135 | 1.58 | 1.168 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1198.163 | 60 | | 40-135 | 1.36 | 0.992 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1076.861 | 54 | | 40-135 | 1.20 | 0.994 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 767.980 | 38 | **Y** | 40-135 | 1.06 | 1.066 |
| 13C-OCDD | 4000 | 616.023 | 15 | **Y** | 40-135 | 0.94 | 1.143 |
| 13C-2,3,7,8-TCDF | 2000 | 1326.508 | 66 | | 40-135 | 0.79 | 0.993 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1417.286 | 71 | | 40-135 | 1.58 | 1.129 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1477.008 | 74 | | 40-135 | 1.58 | 1.159 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1199.429 | 60 | | 40-135 | 0.53 | 0.973 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1106.657 | 55 | | 40-135 | 0.53 | 0.976 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1253.470 | 63 | | 40-135 | 0.53 | 1.008 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1162.422 | 58 | | 40-135 | 0.52 | 0.988 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 579.892 | 29 | **Y** | 40-135 | 0.45 | 1.041 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 942.595 | 47 | | 40-135 | 0.45 | 1.079 |
| 37Cl-2,3,7,8-TCDD | 800 | 647.153 | 81 | | 40-135 | NA | 1.019 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 14:10 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-3 3.5-5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501105-002 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

**Analysis Method:** 8290
**Prep Method:** Method

**Toxicity Equivalency Quotient**

| Analyte Name | Result | DL | MRL | Dilution Factor | TEF | TEF - Adjusted Concentration |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | ND | 0.572 | 2.24 | 1 | 1 | |
| 1,2,3,7,8-PeCDD | **14.5** | 2.74 | 11.2 | 1 | 1 | 14.5 |
| 1,2,3,4,7,8-HxCDD | **160** | 6.57 | 11.2 | 1 | 0.1 | 16.0 |
| 1,2,3,6,7,8-HxCDD | **3430** | 6.77 | 11.2 | 1 | 0.1 | 343 |
| 1,2,3,7,8,9-HxCDD | **306** | 6.21 | 11.2 | 1 | 0.1 | 30.6 |
| 1,2,3,4,6,7,8-HpCDD | **192000** | 673 | 1120 | 100 | 0.01 | 1920 |
| OCDD | **3730000** | 901 | 2240 | 100 | 0.0003 | 1120 |
| 2,3,7,8-TCDF | ND | 0.622 | 2.24 | 1 | 0.1 | |
| 1,2,3,7,8-PeCDF | **3.22** | 1.17 | 11.2 | 1 | 0.03 | 0.0966 |
| 2,3,4,7,8-PeCDF | **2.51** | 1.11 | 11.2 | 1 | 0.3 | 0.753 |
| 1,2,3,4,7,8-HxCDF | **443** | 3.73 | 11.2 | 1 | 0.1 | 44.3 |
| 1,2,3,6,7,8-HxCDF | ND | 3.74 | 11.2 | 1 | 0.1 | |
| 1,2,3,7,8,9-HxCDF | ND | 4.35 | 11.2 | 1 | 0.1 | |
| 2,3,4,6,7,8-HxCDF | **197** | 3.95 | 11.2 | 1 | 0.1 | 19.7 |
| 1,2,3,4,6,7,8-HpCDF | **57800** | 1230 | 1230 | 100 | 0.01 | 578 |
| 1,2,3,4,7,8,9-HpCDF | **1800** | 74.7 | 74.7 | 1 | 0.01 | 18.0 |
| OCDF | **856000** | 655 | 2240 | 100 | 0.0003 | 257 |
| | | Total TEQ | | | | 4360 |

2005 WHO TEFs, ND = 0

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:35 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | C-3 3.5-5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501105-003 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 02/20/15 21:45 |
| **Prep Method:** | Method | **Date Extracted:** | 2/10/15 |
| **Sample Amount:** | 10.127g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P176444 | **Blank File Name:** | P176384 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P176440 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | ND | U | 0.156 | 2.23 | | | 1 |
| 1,2,3,7,8-PeCDD | 11.8 | | 0.337 | 11.2 | 1.54 | 1.000 | 1 |
| 1,2,3,4,7,8-HxCDD | 79.0 | | 10.2 | 11.2 | 1.30 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 6270 | | 10.7 | 11.2 | 1.24 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 385 | | 9.68 | 11.2 | 1.25 | 1.006 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 290000 | | 700 | 1120 | 1.04 | 1.000 | 100 |
| OCDD | 5390000 | | 972 | 2230 | 0.90 | 1.000 | 100 |
| | | | | | | | |
| 2,3,7,8-TCDF | 61.3 | | 0.180 | 2.23 | 0.75 | 1.000 | 1 |
| 1,2,3,7,8-PeCDF | 411 | | 0.644 | 11.2 | 1.60 | 1.000 | 1 |
| 2,3,4,7,8-PeCDF | 3.39**J** | | 0.609 | 11.2 | 1.38 | 0.998 | 1 |
| 1,2,3,4,7,8-HxCDF | 3630 | | 47.4 | 47.4 | 1.25 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDF | 741 | | 46.1 | 46.1 | 1.16 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDF | 1400 | | 53.8 | 53.8 | 1.24 | 1.001 | 1 |
| 2,3,4,6,7,8-HxCDF | 1230 | | 47.3 | 47.3 | 1.25 | 1.001 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 141000 | | 1230 | 1230 | 1.03 | 1.000 | 100 |
| 1,2,3,4,7,8,9-HpCDF | 5500 | | 123 | 123 | 1.05 | 1.000 | 1 |
| OCDF | 1850000 | | 1840 | 2230 | 0.90 | 1.005 | 100 |
| | | | | | | | |
| Total Tetra-Dioxins | 249 | | 0.156 | 2.23 | 0.75 | | 1 |
| Total Penta-Dioxins | 2940 | | 0.337 | 11.2 | 1.56 | | 1 |
| Total Hexa-Dioxins | 29100 | | 10.2 | 11.2 | 1.25 | | 1 |
| Total Hepta-Dioxins | 322000 | | 42.2 | 42.2 | 1.04 | | 1 |
| | | | | | | | |
| Total Tetra-Furans | 436 | | 0.180 | 2.23 | 0.73 | | 1 |
| Total Penta-Furans | 6350 | | 0.0983 | 11.2 | 1.54 | | 1 |
| Total Hexa-Furans | 94700 | | 48.5 | 48.5 | 1.25 | | 1 |
| Total Hepta-Furans | 292000 | | 130 | 130 | 1.05 | | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:35 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | C-3 3.5-5' | **Units:** | Percent |
| **Lab Code:** | K1501105-003 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 02/20/15 21:45 |
| **Prep Method:** | Method | **Date Extracted:** | 2/10/15 |
| **Sample Amount:** | 10.127g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P176444 | **Blank File Name:** | P176384 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P176440 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1416.606 | 71 | | 40-135 | 0.78 | 1.018 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1516.605 | 76 | | 40-135 | 1.58 | 1.168 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1156.371 | 58 | | 40-135 | 1.25 | 0.992 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1048.200 | 52 | | 40-135 | 1.24 | 0.994 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 755.810 | 38 | **Y** | 40-135 | 1.09 | 1.066 |
| 13C-OCDD | 4000 | 469.100 | 12 | **Y** | 40-135 | 0.99 | 1.142 |
| 13C-2,3,7,8-TCDF | 2000 | 1358.231 | 68 | | 40-135 | 0.78 | 0.994 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1428.797 | 71 | | 40-135 | 1.57 | 1.130 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1480.006 | 74 | | 40-135 | 1.58 | 1.159 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1126.974 | 56 | | 40-135 | 0.52 | 0.972 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1036.210 | 52 | | 40-135 | 0.52 | 0.975 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1202.198 | 60 | | 40-135 | 0.52 | 1.008 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1098.444 | 55 | | 40-135 | 0.53 | 0.988 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 523.811 | 26 | **Y** | 40-135 | 0.47 | 1.040 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 895.408 | 45 | | 40-135 | 0.44 | 1.079 |
| 37Cl-2,3,7,8-TCDD | 800 | 646.424 | 81 | | 40-135 | NA | 1.019 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:35 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | C-3 3.5-5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501105-003 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

**Analysis Method:** 8290
**Prep Method:** Method

**Toxicity Equivalency Quotient**

| Analyte Name | Result | DL | MRL | Dilution Factor | TEF | TEF - Adjusted Concentration |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | ND | 0.156 | 2.23 | 1 | 1 | |
| 1,2,3,7,8-PeCDD | **11.8** | 0.337 | 11.2 | 1 | 1 | 11.8 |
| 1,2,3,4,7,8-HxCDD | **79.0** | 10.2 | 11.2 | 1 | 0.1 | 7.90 |
| 1,2,3,6,7,8-HxCDD | **6270** | 10.7 | 11.2 | 1 | 0.1 | 627 |
| 1,2,3,7,8,9-HxCDD | **385** | 9.68 | 11.2 | 1 | 0.1 | 38.5 |
| 1,2,3,4,6,7,8-HpCDD | **290000** | 700 | 1120 | 100 | 0.01 | 2900 |
| OCDD | **5390000** | 972 | 2230 | 100 | 0.0003 | 1620 |
| 2,3,7,8-TCDF | **61.3** | 0.180 | 2.23 | 1 | 0.1 | 6.13 |
| 1,2,3,7,8-PeCDF | **411** | 0.644 | 11.2 | 1 | 0.03 | 12.3 |
| 2,3,4,7,8-PeCDF | **3.39** | 0.609 | 11.2 | 1 | 0.3 | 1.02 |
| 1,2,3,4,7,8-HxCDF | **3630** | 47.4 | 47.4 | 1 | 0.1 | 363 |
| 1,2,3,6,7,8-HxCDF | **741** | 46.1 | 46.1 | 1 | 0.1 | 74.1 |
| 1,2,3,7,8,9-HxCDF | **1400** | 53.8 | 53.8 | 1 | 0.1 | 140 |
| 2,3,4,6,7,8-HxCDF | **1230** | 47.3 | 47.3 | 1 | 0.1 | 123 |
| 1,2,3,4,6,7,8-HpCDF | **141000** | 1230 | 1230 | 100 | 0.01 | 1410 |
| 1,2,3,4,7,8,9-HpCDF | **5500** | 123 | 123 | 1 | 0.01 | 55.0 |
| OCDF | **1850000** | 1840 | 2230 | 100 | 0.0003 | 555 |
| | | Total TEQ | | | | 7940 |

2005 WHO TEFs, ND = 0

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 10:55 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | D-1 0.5-2' | **Units:** | ng/Kg |
| **Lab Code:** | K1501105-004 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 02/18/15 20:18 |
| **Prep Method:** | Method | **Date Extracted:** | 2/10/15 |
| **Sample Amount:** | 10.233g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P176388 | **Blank File Name:** | P176384 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P176382 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | 24.1 | | 0.0839 | 0.557 | 0.75 | 1.001 | 1 |
| 1,2,3,7,8-PeCDD | 521 | | 0.456 | 2.78 | 1.55 | 1.000 | 1 |
| 1,2,3,4,7,8-HxCDD | 1700 | | 1.49 | 2.78 | 1.24 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 21400 | | 70.3 | 278 | 1.24 | 1.000 | 100 |
| 1,2,3,7,8,9-HxCDD | 4160 | | 61.8 | 278 | 1.23 | 1.007 | 100 |
| 1,2,3,4,6,7,8-HpCDD | 650000 | | 409 | 409 | 1.04 | 1.000 | 100 |
| OCDD | 5200000 | | 469 | 557 | 0.89 | 1.000 | 100 |
| 2,3,7,8-TCDF | 201 | | 0.116 | 0.557 | 0.78 | 1.001 | 1 |
| 1,2,3,7,8-PeCDF | 950 | | 0.408 | 2.78 | 1.56 | 1.001 | 1 |
| 2,3,4,7,8-PeCDF | 3090 | | 24.2 | 278 | 1.53 | 1.001 | 100 |
| 1,2,3,4,7,8-HxCDF | 16800 | | 167 | 278 | 1.24 | 1.000 | 100 |
| 1,2,3,6,7,8-HxCDF | 3170 | | 149 | 278 | 1.21 | 1.000 | 100 |
| 1,2,3,7,8,9-HxCDF | 4190 | | 179 | 278 | 1.31 | 1.001 | 100 |
| 2,3,4,6,7,8-HxCDF | 5320 | | 147 | 278 | 1.16 | 1.000 | 100 |
| 1,2,3,4,6,7,8-HpCDF | 151000 | | 453 | 453 | 1.04 | 1.000 | 100 |
| 1,2,3,4,7,8,9-HpCDF | 15400 | | 603 | 603 | 1.10 | 1.000 | 100 |
| OCDF | 2800000 | | 1160 | 1160 | 0.89 | 1.005 | 100 |
| Total Tetra-Dioxins | 214 | | 0.0839 | 0.557 | 0.75 | | 1 |
| Total Penta-Dioxins | 1500 | | 0.456 | 2.78 | 1.55 | | 1 |
| Total Hexa-Dioxins | 47600 | | 1.36 | 2.78 | 1.25 | | 1 |
| Total Hepta-Dioxins | 162000 | | 91.2 | 91.2 | 1.01 | | 1 |
| Total Tetra-Furans | 826 | | 0.116 | 0.557 | 0.78 | | 1 |
| Total Penta-Furans | 16600 | | 0.145 | 2.78 | 1.56 | | 1 |
| Total Hexa-Furans | 61500 | | 39.9 | 39.9 | 1.25 | | 1 |
| Total Hepta-Furans | 148000 | | 110 | 110 | 1.02 | | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 10:55 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | D-1 0.5-2' | **Units:** | Percent |
| **Lab Code:** | K1501105-004 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 02/18/15 20:18 |
| **Prep Method:** | Method | **Date Extracted:** | 2/10/15 |
| **Sample Amount:** | 10.233g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P176388 | **Blank File Name:** | P176384 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P176382 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1797.560 | 90 | | 40-135 | 0.78 | 1.018 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1977.423 | 99 | | 40-135 | 1.57 | 1.167 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1240.860 | 62 | | 40-135 | 1.27 | 0.991 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1261.341 | 63 | | 40-135 | 1.26 | 0.993 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 610.585 | 31 | **Y** | 40-135 | 1.12 | 1.062 |
| 13C-OCDD | 4000 | 287.621 | 7 | **K** | 40-135 | 1.43 | 1.139 |
| 13C-2,3,7,8-TCDF | 2000 | 1820.001 | 91 | | 40-135 | 0.78 | 0.994 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1929.160 | 96 | | 40-135 | 1.59 | 1.128 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1886.098 | 94 | | 40-135 | 1.60 | 1.158 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1301.064 | 65 | | 40-135 | 0.53 | 0.970 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1313.997 | 66 | | 40-135 | 0.53 | 0.973 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 860.230 | 43 | | 40-135 | 0.54 | 1.007 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1145.014 | 57 | | 40-135 | 0.53 | 0.987 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 720.735 | 36 | **Y** | 40-135 | 0.50 | 1.037 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1135.576 | 57 | | 40-135 | 0.45 | 1.074 |
| 37Cl-2,3,7,8-TCDD | 800 | 845.073 | 106 | | 40-135 | NA | 1.019 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 10:55 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | D-1 0.5-2' | **Units:** | ng/Kg |
| **Lab Code:** | K1501105-004 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

**Analysis Method:** 8290
**Prep Method:** Method

**Toxicity Equivalency Quotient**

| Analyte Name | Result | DL | MRL | Dilution Factor | TEF | TEF - Adjusted Concentration |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | **24.1** | 0.0839 | 0.557 | 1 | 1 | 24.1 |
| 1,2,3,7,8-PeCDD | **521** | 0.456 | 2.78 | 1 | 1 | 521 |
| 1,2,3,4,7,8-HxCDD | **1700** | 1.49 | 2.78 | 1 | 0.1 | 170 |
| 1,2,3,6,7,8-HxCDD | **21400** | 70.3 | 278 | 100 | 0.1 | 2140 |
| 1,2,3,7,8,9-HxCDD | **4160** | 61.8 | 278 | 100 | 0.1 | 416 |
| 1,2,3,4,6,7,8-HpCDD | **650000** | 409 | 409 | 100 | 0.01 | 6500 |
| OCDD | **5200000** | 469 | 557 | 100 | 0.0003 | 1560 |
| 2,3,7,8-TCDF | **201** | 0.116 | 0.557 | 1 | 0.1 | 20.1 |
| 1,2,3,7,8-PeCDF | **950** | 0.408 | 2.78 | 1 | 0.03 | 28.5 |
| 2,3,4,7,8-PeCDF | **3090** | 24.2 | 278 | 100 | 0.3 | 927 |
| 1,2,3,4,7,8-HxCDF | **16800** | 167 | 278 | 100 | 0.1 | 1680 |
| 1,2,3,6,7,8-HxCDF | **3170** | 149 | 278 | 100 | 0.1 | 317 |
| 1,2,3,7,8,9-HxCDF | **4190** | 179 | 278 | 100 | 0.1 | 419 |
| 2,3,4,6,7,8-HxCDF | **5320** | 147 | 278 | 100 | 0.1 | 532 |
| 1,2,3,4,6,7,8-HpCDF | **151000** | 453 | 453 | 100 | 0.01 | 1510 |
| 1,2,3,4,7,8,9-HpCDF | **15400** | 603 | 603 | 100 | 0.01 | 154 |
| OCDF | **2800000** | 1160 | 1160 | 100 | 0.0003 | 840 |
| | | Total TEQ | | | | 17800 |

2005 WHO TEFs, ND = 0

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 12:55 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | E-4 3.5-5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501105-005 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 02/18/15 21:07 |
| **Prep Method:** | Method | **Date Extracted:** | 2/10/15 |
| **Sample Amount:** | 10.318g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P176389 | **Blank File Name:** | P176384 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P176382 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | 6.54 | | 0.684 | 2.20 | 0.75 | 1.001 | 1 |
| 1,2,3,7,8-PeCDD | 66.4 | | 1.96 | 11.0 | 1.59 | 1.000 | 1 |
| 1,2,3,4,7,8-HxCDD | 164 | | 7.08 | 11.0 | 1.24 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 634 | | 8.01 | 11.0 | 1.26 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 487 | | 7.01 | 11.0 | 1.23 | 1.005 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 40500 | | 105 | 110 | 1.05 | 1.000 | 10 |
| OCDD | 366000 | | 20.7 | 220 | 0.89 | 1.000 | 10 |
| | | | | | | | |
| 2,3,7,8-TCDF | 6.36 | | 0.914 | 2.20 | 0.85 | 1.001 | 1 |
| 1,2,3,7,8-PeCDF | 34.2 | | 2.20 | 11.0 | 1.61 | 1.001 | 1 |
| 2,3,4,7,8-PeCDF | 25.8 | | 2.21 | 11.0 | 1.47 | 1.000 | 1 |
| 1,2,3,4,7,8-HxCDF | 260 | | 7.43 | 11.0 | 1.27 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDF | 72.5 | | 7.26 | 11.0 | 1.21 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDF | 144 | | 7.31 | 11.0 | 1.26 | 1.000 | 1 |
| 2,3,4,6,7,8-HxCDF | 112 | | 7.66 | 11.0 | 1.25 | 1.000 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 3730 | | 15.6 | 15.6 | 1.04 | 1.000 | 1 |
| 1,2,3,4,7,8,9-HpCDF | 279 | | 15.2 | 15.2 | 1.03 | 1.000 | 1 |
| OCDF | 29900 | | 40.0 | 220 | 0.89 | 1.005 | 10 |
| | | | | | | | |
| Total Tetra-Dioxins | 128 | | 0.684 | 2.20 | 0.66 | | 1 |
| Total Penta-Dioxins | 794 | | 1.96 | 11.0 | 1.57 | | 1 |
| Total Hexa-Dioxins | 14200 | | 7.35 | 11.0 | 1.25 | | 1 |
| Total Hepta-Dioxins | 116000 | | 50.7 | 50.7 | 1.04 | | 1 |
| | | | | | | | |
| Total Tetra-Furans | 59.8 | | 0.914 | 2.20 | 0.70 | | 1 |
| Total Penta-Furans | 830 | | 1.10 | 11.0 | 1.56 | | 1 |
| Total Hexa-Furans | 5150 | | 7.42 | 11.0 | 1.19 | | 1 |
| Total Hepta-Furans | 19500 | | 15.3 | 15.3 | 1.04 | | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 12:55 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | E-4 3.5-5' | **Units:** | Percent |
| **Lab Code:** | K1501105-005 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 02/18/15 21:07 |
| **Prep Method:** | Method | **Date Extracted:** | 2/10/15 |
| **Sample Amount:** | 10.318g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P176389 | **Blank File Name:** | P176384 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P176382 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1674.524 | 84 | | 40-135 | 0.79 | 1.018 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1732.418 | 87 | | 40-135 | 1.57 | 1.168 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1408.160 | 70 | | 40-135 | 1.32 | 0.990 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1168.232 | 58 | | 40-135 | 1.20 | 0.993 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1023.980 | 51 | | 40-135 | 1.06 | 1.063 |
| 13C-OCDD | 4000 | 1396.740 | 35 | **Y** | 40-135 | 0.92 | 1.139 |
| 13C-2,3,7,8-TCDF | 2000 | 1617.154 | 81 | | 40-135 | 0.78 | 0.993 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1683.906 | 84 | | 40-135 | 1.58 | 1.129 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1701.088 | 85 | | 40-135 | 1.60 | 1.159 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1331.321 | 67 | | 40-135 | 0.53 | 0.971 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1235.106 | 62 | | 40-135 | 0.53 | 0.974 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1353.509 | 68 | | 40-135 | 0.53 | 1.008 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1323.166 | 66 | | 40-135 | 0.53 | 0.987 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 698.958 | 35 | **Y** | 40-135 | 0.45 | 1.038 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1033.131 | 52 | | 40-135 | 0.45 | 1.076 |
| 37Cl-2,3,7,8-TCDD | 800 | 762.687 | 95 | | 40-135 | NA | 1.019 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 12:55 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | E-4 3.5-5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501105-005 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

**Analysis Method:** 8290
**Prep Method:** Method

**Toxicity Equivalency Quotient**

| Analyte Name | Result | DL | MRL | Dilution Factor | TEF | TEF - Adjusted Concentration |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | **6.54** | 0.684 | 2.20 | 1 | 1 | 6.54 |
| 1,2,3,7,8-PeCDD | **66.4** | 1.96 | 11.0 | 1 | 1 | 66.4 |
| 1,2,3,4,7,8-HxCDD | **164** | 7.08 | 11.0 | 1 | 0.1 | 16.4 |
| 1,2,3,6,7,8-HxCDD | **634** | 8.01 | 11.0 | 1 | 0.1 | 63.4 |
| 1,2,3,7,8,9-HxCDD | **487** | 7.01 | 11.0 | 1 | 0.1 | 48.7 |
| 1,2,3,4,6,7,8-HpCDD | **40500** | 105 | 110 | 10 | 0.01 | 405 |
| OCDD | **366000** | 20.7 | 220 | 10 | 0.0003 | 110 |
| 2,3,7,8-TCDF | **6.36** | 0.914 | 2.20 | 1 | 0.1 | 0.636 |
| 1,2,3,7,8-PeCDF | **34.2** | 2.20 | 11.0 | 1 | 0.03 | 1.03 |
| 2,3,4,7,8-PeCDF | **25.8** | 2.21 | 11.0 | 1 | 0.3 | 7.74 |
| 1,2,3,4,7,8-HxCDF | **260** | 7.43 | 11.0 | 1 | 0.1 | 26.0 |
| 1,2,3,6,7,8-HxCDF | **72.5** | 7.26 | 11.0 | 1 | 0.1 | 7.25 |
| 1,2,3,7,8,9-HxCDF | **144** | 7.31 | 11.0 | 1 | 0.1 | 14.4 |
| 2,3,4,6,7,8-HxCDF | **112** | 7.66 | 11.0 | 1 | 0.1 | 11.2 |
| 1,2,3,4,6,7,8-HpCDF | **3730** | 15.6 | 15.6 | 1 | 0.01 | 37.3 |
| 1,2,3,4,7,8,9-HpCDF | **279** | 15.2 | 15.2 | 1 | 0.01 | 2.79 |
| OCDF | **29900** | 40.0 | 220 | 10 | 0.0003 | 8.97 |
| | | Total TEQ | | | | 834 |

2005 WHO TEFs, ND = 0

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 12:20 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | F-3 2.5-4' | **Units:** | ng/Kg |
| **Lab Code:** | K1501105-006 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 02/18/15 21:55 |
| **Prep Method:** | Method | **Date Extracted:** | 2/10/15 |
| **Sample Amount:** | 10.171g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P176390 | **Blank File Name:** | P176384 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P176382 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | 21.6 | | 0.424 | 1.57 | 0.77 | 1.001 | 1 |
| 1,2,3,7,8-PeCDD | 119 | | 5.15 | 7.85 | 1.50 | 1.000 | 1 |
| 1,2,3,4,7,8-HxCDD | 538 | | 7.98 | 7.98 | 1.36 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 2560 | | 9.15 | 9.15 | 1.21 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 995 | | 7.95 | 7.95 | 1.25 | 1.008 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 122000 | | 208 | 785 | 1.05 | 1.000 | 100 |
| OCDD | 1450000 | | 233 | 1570 | 0.88 | 1.000 | 100 |
| | | | | | | | |
| 2,3,7,8-TCDF | 27.0 | | 0.388 | 1.57 | 0.76 | 1.001 | 1 |
| 1,2,3,7,8-PeCDF | 75.4 | | 6.58 | 7.85 | 1.56 | 1.001 | 1 |
| 2,3,4,7,8-PeCDF | 179 | | 6.66 | 7.85 | 1.59 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDF | 720 | **P** | 7.41 | 7.85 | 1.25 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDF | 330 | | 7.57 | 7.85 | 1.24 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDF | 358 | | 8.10 | 8.10 | 1.26 | 1.000 | 1 |
| 2,3,4,6,7,8-HxCDF | 473 | | 8.25 | 8.25 | 1.24 | 1.000 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 30700 | | 311 | 785 | 1.03 | 1.000 | 100 |
| 1,2,3,4,7,8,9-HpCDF | 1220 | | 12.3 | 12.3 | 1.05 | 1.000 | 1 |
| OCDF | 228000 | | 197 | 1570 | 0.90 | 1.005 | 100 |
| | | | | | | | |
| Total Tetra-Dioxins | 1310 | | 0.424 | 1.57 | 0.77 | | 1 |
| Total Penta-Dioxins | 5720 | | 5.15 | 7.85 | 1.55 | | 1 |
| Total Hexa-Dioxins | 28400 | | 8.34 | 8.34 | 1.25 | | 1 |
| Total Hepta-Dioxins | 174000 | | 43.6 | 43.6 | 1.04 | | 1 |
| | | | | | | | |
| Total Tetra-Furans | 524 | | 0.388 | 1.57 | 0.73 | | 1 |
| Total Penta-Furans | 3360 | | 0.584 | 7.85 | 1.56 | | 1 |
| Total Hexa-Furans | 26800 | | 7.82 | 7.85 | 1.22 | | 1 |
| Total Hepta-Furans | 104000 | | 12.5 | 12.5 | 1.04 | | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 12:20 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | F-3 2.5-4' | **Units:** | Percent |
| **Lab Code:** | K1501105-006 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 02/18/15 21:55 |
| **Prep Method:** | Method | **Date Extracted:** | 2/10/15 |
| **Sample Amount:** | 10.171g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P176390 | **Blank File Name:** | P176384 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P176382 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1643.515 | 82 | | 40-135 | 0.78 | 1.018 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1690.259 | 85 | | 40-135 | 1.57 | 1.168 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1363.474 | 68 | | 40-135 | 1.24 | 0.990 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1141.167 | 57 | | 40-135 | 1.25 | 0.993 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 898.316 | 45 | | 40-135 | 1.03 | 1.063 |
| 13C-OCDD | 4000 | 1082.687 | 27 | **Y** | 40-135 | 0.95 | 1.139 |
| 13C-2,3,7,8-TCDF | 2000 | 1640.436 | 82 | | 40-135 | 0.79 | 0.993 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1665.039 | 83 | | 40-135 | 1.59 | 1.129 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1652.941 | 83 | | 40-135 | 1.59 | 1.159 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1359.163 | 68 | | 40-135 | 0.52 | 0.971 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1230.484 | 62 | | 40-135 | 0.53 | 0.973 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1258.137 | 63 | | 40-135 | 0.54 | 1.008 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1315.966 | 66 | | 40-135 | 0.52 | 0.987 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 705.563 | 35 | **Y** | 40-135 | 0.45 | 1.038 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 999.176 | 50 | | 40-135 | 0.45 | 1.076 |
| 37Cl-2,3,7,8-TCDD | 800 | 814.981 | 102 | | 40-135 | NA | 1.019 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 12:20 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | F-3 2.5-4' | **Units:** | ng/Kg |
| **Lab Code:** | K1501105-006 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

**Analysis Method:** 8290
**Prep Method:** Method

**Toxicity Equivalency Quotient**

| Analyte Name | Result | DL | MRL | Dilution Factor | TEF | TEF - Adjusted Concentration |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | **21.6** | 0.424 | 1.57 | 1 | 1 | 21.6 |
| 1,2,3,7,8-PeCDD | **119** | 5.15 | 7.85 | 1 | 1 | 119 |
| 1,2,3,4,7,8-HxCDD | **538** | 7.98 | 7.98 | 1 | 0.1 | 53.8 |
| 1,2,3,6,7,8-HxCDD | **2560** | 9.15 | 9.15 | 1 | 0.1 | 256 |
| 1,2,3,7,8,9-HxCDD | **995** | 7.95 | 7.95 | 1 | 0.1 | 99.5 |
| 1,2,3,4,6,7,8-HpCDD | **122000** | 208 | 785 | 100 | 0.01 | 1220 |
| OCDD | **1450000** | 233 | 1570 | 100 | 0.0003 | 435 |
| 2,3,7,8-TCDF | **27.0** | 0.388 | 1.57 | 1 | 0.1 | 2.70 |
| 1,2,3,7,8-PeCDF | **75.4** | 6.58 | 7.85 | 1 | 0.03 | 2.26 |
| 2,3,4,7,8-PeCDF | **179** | 6.66 | 7.85 | 1 | 0.3 | 53.7 |
| 1,2,3,4,7,8-HxCDF | **720** | 7.41 | 7.85 | 1 | 0.1 | 72.0 |
| 1,2,3,6,7,8-HxCDF | **330** | 7.57 | 7.85 | 1 | 0.1 | 33.0 |
| 1,2,3,7,8,9-HxCDF | **358** | 8.10 | 8.10 | 1 | 0.1 | 35.8 |
| 2,3,4,6,7,8-HxCDF | **473** | 8.25 | 8.25 | 1 | 0.1 | 47.3 |
| 1,2,3,4,6,7,8-HpCDF | **30700** | 311 | 785 | 100 | 0.01 | 307 |
| 1,2,3,4,7,8,9-HpCDF | **1220** | 12.3 | 12.3 | 1 | 0.01 | 12.2 |
| OCDF | **228000** | 197 | 1570 | 100 | 0.0003 | 68.4 |
| | | Total TEQ | | | | 2840 |

2005 WHO TEFs, ND = 0

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Method Blank | **Units:** | ng/Kg |
| **Lab Code:** | EQ1500104-01 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 02/18/15 17:07 |
| **Prep Method:** | Method | **Date Extracted:** | 2/10/15 |
| **Sample Amount:** | 10.239g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P176384 | **Blank File Name:** | P176384 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P176382 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | ND | U | 0.0411 | 0.488 | | | 1 |
| 1,2,3,7,8-PeCDD | ND | U | 0.0487 | 2.44 | | | 1 |
| 1,2,3,4,7,8-HxCDD | ND | U | 0.0329 | 2.44 | | | 1 |
| 1,2,3,6,7,8-HxCDD | 0.0830**JK** | | 0.0333 | 2.44 | 0.66 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 0.0900**JK** | | 0.0308 | 2.44 | 2.82 | 1.006 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 0.213**J** | | 0.0251 | 2.44 | 1.13 | 1.000 | 1 |
| OCDD | 0.559**JK** | | 0.0711 | 4.88 | 0.66 | 1.001 | 1 |
| | | | | | | | |
| 2,3,7,8-TCDF | ND | U | 0.0583 | 0.488 | | | 1 |
| 1,2,3,7,8-PeCDF | 0.0932**J** | | 0.0358 | 2.44 | 1.52 | 1.001 | 1 |
| 2,3,4,7,8-PeCDF | ND | U | 0.0355 | 2.44 | | | 1 |
| 1,2,3,4,7,8-HxCDF | 0.104**JK** | | 0.0168 | 2.44 | 0.86 | 1.001 | 1 |
| 1,2,3,6,7,8-HxCDF | 0.0970**JK** | | 0.0167 | 2.44 | 0.85 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDF | 0.105**JK** | | 0.0196 | 2.44 | 3.23 | 1.000 | 1 |
| 2,3,4,6,7,8-HxCDF | 0.0774**JK** | | 0.0176 | 2.44 | 0.85 | 1.000 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 0.357**J** | | 0.0289 | 2.44 | 0.94 | 1.000 | 1 |
| 1,2,3,4,7,8,9-HpCDF | 0.116**J** | | 0.0341 | 2.44 | 1.17 | 1.000 | 1 |
| OCDF | 0.275**J** | | 0.0821 | 4.88 | 0.83 | 1.006 | 1 |
| | | | | | | | |
| Total Tetra-Dioxins | ND | U | 0.0411 | 0.488 | | | 1 |
| Total Penta-Dioxins | ND | U | 0.0487 | 2.44 | | | 1 |
| Total Hexa-Dioxins | ND | U | 0.0323 | 2.44 | | | 1 |
| Total Hepta-Dioxins | 0.213**J** | | 0.0251 | 2.44 | 1.13 | | 1 |
| | | | | | | | |
| Total Tetra-Furans | ND | U | 0.0583 | 0.488 | | | 1 |
| Total Penta-Furans | 0.217**J** | | 0.0329 | 2.44 | | | 1 |
| Total Hexa-Furans | ND | U | 0.0176 | 2.44 | | | 1 |
| Total Hepta-Furans | 0.473**J** | | 0.0313 | 2.44 | 0.94 | | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Method Blank | **Units:** | Percent |
| **Lab Code:** | EQ1500104-01 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 02/18/15 17:07 |
| **Prep Method:** | Method | **Date Extracted:** | 2/10/15 |
| **Sample Amount:** | 10.239g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P176384 | **Blank File Name:** | P176384 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P176382 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1470.565 | 74 | | 40-135 | 0.77 | 1.018 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1651.803 | 83 | | 40-135 | 1.58 | 1.168 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1391.008 | 70 | | 40-135 | 1.27 | 0.992 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1319.772 | 66 | | 40-135 | 1.28 | 0.994 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1217.226 | 61 | | 40-135 | 1.05 | 1.065 |
| 13C-OCDD | 4000 | 1894.281 | 47 | | 40-135 | 0.90 | 1.141 |
| 13C-2,3,7,8-TCDF | 2000 | 1435.470 | 72 | | 40-135 | 0.79 | 0.994 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1644.192 | 82 | | 40-135 | 1.59 | 1.129 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1623.282 | 81 | | 40-135 | 1.58 | 1.159 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1389.477 | 69 | | 40-135 | 0.53 | 0.973 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1324.523 | 66 | | 40-135 | 0.53 | 0.976 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1517.006 | 76 | | 40-135 | 0.52 | 1.008 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1345.471 | 67 | | 40-135 | 0.53 | 0.988 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 1039.450 | 52 | | 40-135 | 0.45 | 1.040 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1237.382 | 62 | | 40-135 | 0.44 | 1.079 |
| 37Cl-2,3,7,8-TCDD | 800 | 650.940 | 81 | | 40-135 | NA | 1.019 |

# Accuracy & Precision

**ALS Environmental - Houston HRMS**
10450 Stancliff Rd., Suite 210, Houston TX 77099
Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

**ALS Group USA, Corp.**
**dba ALS Environmental**

QA/QC Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Analyzed:** | 02/18/15 |
| **Sample Matrix:** | Soil | **Date Extracted:** | 02/10/15 |

## Lab Control Sample Summary
## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Units:** | ng/Kg |
| **Prep Method:** | Method | **Basis:** | Dry |
| | | **Analysis Lot:** | 433767 |

**Lab Control Sample**
**EQ1500104-02**

| Analyte Name | Result | Spike Amount | % Rec | % Rec Limits |
|---|---|---|---|---|
| 1,2,3,4,6,7,8-HpCDD | 99.5 | 95.1 | 105 | 70-130 |
| 1,2,3,4,7,8-HxCDD | 95.0 | 95.1 | 100 | 70-130 |
| 1,2,3,6,7,8-HxCDD | 96.2 | 95.1 | 101 | 70-130 |
| 1,2,3,7,8,9-HxCDD | 91.9 | 95.1 | 97 | 70-130 |
| 1,2,3,7,8-PeCDD | 94.7 | 95.1 | 100 | 70-130 |
| 2,3,7,8-TCDD | 18.0 | 19.0 | 94 | 70-130 |
| OCDD | 259 | 190 | 136 * | 70-130 |
| | | | | |
| 1,2,3,4,6,7,8-HpCDF | 85.2 | 95.1 | 90 | 70-130 |
| 1,2,3,4,7,8,9-HpCDF | 83.5 | 95.1 | 88 | 70-130 |
| 1,2,3,4,7,8-HxCDF | 86.6 | 95.1 | 91 | 70-130 |
| 1,2,3,6,7,8-HxCDF | 84.2 | 95.1 | 89 | 70-130 |
| 1,2,3,7,8,9-HxCDF | 85.1 | 95.1 | 89 | 70-130 |
| 1,2,3,7,8-PeCDF | 89.1 | 95.1 | 94 | 70-130 |
| 2,3,4,6,7,8-HxCDF | 85.5 | 95.1 | 90 | 70-130 |
| 2,3,4,7,8-PeCDF | 86.4 | 95.1 | 91 | 70-130 |
| 2,3,7,8-TCDF | 17.9 | 19.0 | 94 | 70-130 |
| OCDF | 200 | 190 | 105 | 70-130 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Lab Control Sample | **Units:** | ng/Kg |
| **Lab Code:** | EQ1500104-02 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 02/18/15 22:43 |
| **Prep Method:** | Method | **Date Extracted:** | 2/10/15 |
| **Sample Amount:** | 10.517g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P176391 | **Blank File Name:** | P176384 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P176382 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | 18.0 | | 0.113 | 0.475 | 0.79 | 1.001 | 1 |
| 1,2,3,7,8-PeCDD | 94.7 | | 0.406 | 2.38 | 1.54 | 1.000 | 1 |
| 1,2,3,4,7,8-HxCDD | 95.0 | | 1.35 | 2.38 | 1.27 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 96.2 | | 1.40 | 2.38 | 1.28 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 91.9 | | 1.28 | 2.38 | 1.20 | 1.006 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 99.5 | | 1.21 | 2.38 | 1.07 | 1.000 | 1 |
| OCDD | 259 | | 0.780 | 4.75 | 0.89 | 1.000 | 1 |
| 2,3,7,8-TCDF | 17.9 | | 0.0903 | 0.475 | 0.77 | 1.001 | 1 |
| 1,2,3,7,8-PeCDF | 89.1 | | 0.354 | 2.38 | 1.58 | 1.001 | 1 |
| 2,3,4,7,8-PeCDF | 86.4 | | 0.353 | 2.38 | 1.57 | 1.000 | 1 |
| 1,2,3,4,7,8-HxCDF | 86.6 | | 1.18 | 2.38 | 1.27 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDF | 84.2 | | 1.16 | 2.38 | 1.23 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDF | 85.1 | | 1.40 | 2.38 | 1.26 | 1.000 | 1 |
| 2,3,4,6,7,8-HxCDF | 85.5 | | 1.19 | 2.38 | 1.21 | 1.000 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 85.2 | | 1.97 | 2.38 | 1.03 | 1.000 | 1 |
| 1,2,3,4,7,8,9-HpCDF | 83.5 | | 2.22 | 2.38 | 1.05 | 1.000 | 1 |
| OCDF | 200 | | 1.04 | 4.75 | 0.90 | 1.005 | 1 |
| Total Tetra-Dioxins | 18.0 | | 0.113 | 0.475 | 0.79 | | 1 |
| Total Penta-Dioxins | 94.7 | | 0.406 | 2.38 | 1.54 | | 1 |
| Total Hexa-Dioxins | 283 | | 1.34 | 2.38 | 1.27 | | 1 |
| Total Hepta-Dioxins | 109 | | 1.21 | 2.38 | 1.06 | | 1 |
| Total Tetra-Furans | 18.4 | | 0.0903 | 0.475 | 0.77 | | 1 |
| Total Penta-Furans | 178 | | 0.116 | 2.38 | | | 1 |
| Total Hexa-Furans | 343 | | 1.23 | 2.38 | 1.08 | | 1 |
| Total Hepta-Furans | 179 | | 2.09 | 2.38 | 1.03 | | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501105 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Lab Control Sample | **Units:** | Percent |
| **Lab Code:** | EQ1500104-02 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 02/18/15 22:43 |
| **Prep Method:** | Method | **Date Extracted:** | 2/10/15 |
| **Sample Amount:** | 10.517g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P176391 | **Blank File Name:** | P176384 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P176382 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1521.470 | 76 | | 40-135 | 0.78 | 1.018 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1718.932 | 86 | | 40-135 | 1.59 | 1.168 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1490.778 | 75 | | 40-135 | 1.26 | 0.992 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1363.202 | 68 | | 40-135 | 1.26 | 0.994 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1189.668 | 59 | | 40-135 | 1.06 | 1.066 |
| 13C-OCDD | 4000 | 1747.448 | 44 | | 40-135 | 0.90 | 1.141 |
| 13C-2,3,7,8-TCDF | 2000 | 1454.795 | 73 | | 40-135 | 0.79 | 0.993 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1683.311 | 84 | | 40-135 | 1.60 | 1.129 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1653.526 | 83 | | 40-135 | 1.59 | 1.159 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1456.857 | 73 | | 40-135 | 0.53 | 0.973 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1366.594 | 68 | | 40-135 | 0.53 | 0.976 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1512.233 | 76 | | 40-135 | 0.53 | 1.008 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1429.006 | 71 | | 40-135 | 0.52 | 0.988 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 947.721 | 47 | | 40-135 | 0.45 | 1.040 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1212.061 | 61 | | 40-135 | 0.45 | 1.079 |
| 37Cl-2,3,7,8-TCDD | 800 | 697.882 | 87 | | 40-135 | NA | 1.019 |

ALS Environmental
ALS Group USA, Corp
1317 South 13th Avenue
Kelso, WA 98626
**T :** +1 360 577 7222
**F :** +1 360 636 1068
**www.alsglobal.com**

May 03, 2015

**Analytical Report for Service Request No:** K1501100
**Revised Service Request No:** K1501100.01

Terri Olson
Barr Engineering
4700 West 77th Street
Minneapolis, MN 55435

**RE: Joslyn OU5 2015 Soil / 23270110**

Dear Terri,

Enclosed is the revised report for the sample(s) submitted to our laboratory February 04, 2015 For your reference, these analyses have been assigned our service request number **K1501100.**

The dioxin report was revised due to a reporting error for the method blank. Please reference the enclosed Houston cover letter.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

We apologize for the inconvenience.

Please contact me if you have any questions. My extension is 3363. You may also contact me via email at Lisa.Domenighini@alsglobal.com.

Respectfully submitted,

**ALS Group USA, Corp. dba ALS Environmental**

Lisa A Domenighini

Lisa Domenighini
Project Manager



**REVISED**
***9:15 am, May 04, 2015***

## Acronyms

| | |
|---|---|
| ASTM | American Society for Testing and Materials |
| A2LA | American Association for Laboratory Accreditation |
| CARB | California Air Resources Board |
| CAS Number | Chemical Abstract Service registry Number |
| CFC | Chlorofluorocarbon |
| CFU | Colony-Forming Unit |
| DEC | Department of Environmental Conservation |
| DEQ | Department of Environmental Quality |
| DHS | Department of Health Services |
| DOE | Department of Ecology |
| DOH | Department of Health |
| EPA | U. S. Environmental Protection Agency |
| ELAP | Environmental Laboratory Accreditation Program |
| GC | Gas Chromatography |
| GC/MS | Gas Chromatography/Mass Spectrometry |
| LOD | Limit of Detection |
| LOQ | Limit of Quantitation |
| LUFT | Leaking Underground Fuel Tank |
| M | Modified |
| MCL | Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA. |
| MDL | Method Detection Limit |
| MPN | Most Probable Number |
| MRL | Method Reporting Limit |
| NA | Not Applicable |
| NC | Not Calculated |
| NCASI | National Council of the Paper Industry for Air and Stream Improvement |
| ND | Not Detected |
| NIOSH | National Institute for Occupational Safety and Health |
| PQL | Practical Quantitation Limit |
| RCRA | Resource Conservation and Recovery Act |
| SIM | Selected Ion Monitoring |
| TPH | Total Petroleum Hydrocarbons |
| tr | Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL. |

## Inorganic Data Qualifiers

| | |
|---|---|
| * | The result is an outlier. See case narrative. |
| # | The control limit criteria is not applicable. See case narrative. |
| B | The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards. |
| E | The result is an estimate amount because the value exceeded the instrument calibration range. |
| J | The result is an estimated value. |
| U | The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution. |
| i | The MRL/MDL or LOQ/LOD is elevated due to a matrix interference. |
| X | See case narrative. |
| Q | See case narrative. One or more quality control criteria was outside the limits. |
| H | The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory. |

## Metals Data Qualifiers

| | |
|---|---|
| # | The control limit criteria is not applicable. See case narrative. |
| J | The result is an estimated value. |
| E | The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample. |
| M | The duplicate injection precision was not met. |
| N | The Matrix Spike sample recovery is not within control limits. See case narrative. |
| S | The reported value was determined by the Method of Standard Additions (MSA). |
| U | The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution. |
| W | The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance. |
| i | The MRL/MDL or LOQ/LOD is elevated due to a matrix interference. |
| X | See case narrative. |
| + | The correlation coefficient for the MSA is less than 0.995. |
| Q | See case narrative. One or more quality control criteria was outside the limits. |

## Organic Data Qualifiers

| | |
|---|---|
| * | The result is an outlier. See case narrative. |
| # | The control limit criteria is not applicable. See case narrative. |
| A | A tentatively identified compound, a suspected aldol-condensation product. |
| B | The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards. |
| C | The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data. |
| D | The reported result is from a dilution. |
| E | The result is an estimated value. |
| J | The result is an estimated value. |
| N | The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed. |
| P | The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results. |
| U | The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution. |
| i | The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference. |
| X | See case narrative. |
| Q | See case narrative. One or more quality control criteria was outside the limits. |

## Additional Petroleum Hydrocarbon Specific Qualifiers

| | |
|---|---|
| F | The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard. |
| L | The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard. |
| H | The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard. |
| O | The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard. |
| Y | The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard. |
| Z | The chromatographic fingerprint does not resemble a petroleum product. |

**ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso**
**State Certifications, Accreditations, and Licenses**

| Agency | Web Site | Number |
|---|---|---|
| Alaska DEC UST | http://dec.alaska.gov/applications/eh/ehllabreports/USTLabs.aspx | UST-040 |
| Arizona DHS | http://www.azdhs.gov/lab/license/env.htm | AZ0339 |
| Arkansas - DEQ | http://www.adeq.state.ar.us/techsvs/labcert.htm | 88-0637 |
| California DHS (ELAP) | http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx | 2795 |
| DOD ELAP | http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm | L14-51 |
| Florida DOH | http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm | E87412 |
| Hawaii DOH | Not available | - |
| Idaho DHW | http://www.healthandwelfare.idaho.gov/Health/Labs/CertificationDrinkingWaterLabs/tabid/1833/Default.aspx | - |
| ISO 17025 | http://www.pjlabs.com/ | L14-50 |
| Louisiana DEQ | http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx | 03016 |
| Maine DHS | Not available | WA01276 |
| Michigan DEQ | http://www.michigan.gov/deq/0,1607,7-135-3307_4131_4156---,00.html | 9949 |
| Minnesota DOH | http://www.health.state.mn.us/accreditation | 053-999-457 |
| Montana DPHHS | http://www.dphhs.mt.gov/publichealth/ | CERT0047 |
| Nevada DEP | http://ndep.nv.gov/bsdw/labservice.htm | WA01276 |
| New Jersey DEP | http://www.nj.gov/dep/oqa/ | WA005 |
| North Carolina DWQ | http://www.dwqlab.org/ | 605 |
| Oklahoma DEQ | http://www.deq.state.ok.us/CSDnew/labcert.htm | 9801 |
| Oregon – DEQ (NELAP) | http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx | WA100010 |
| South Carolina DHEC | http://www.scdhec.gov/environment/envserv/ | 61002 |
| Texas CEQ | http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html | T104704427 |
| Washington DOE | http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html | C544 |
| Wisconsin DNR | http://dnr.wi.gov/ | 998386840 |
| Wyoming (EPA Region 8) | http://www.epa.gov/region8/water/dwhome/wyomingdi.html | - |
| Kelso Laboratory Website | www.alsglobal.com | NA |

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.
Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

# Case Narrative

**ALS Environmental—Kelso Laboratory**
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

**ALS ENVIRONMENTAL**

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request No.:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/ 23270110 | **Date Received:** | 02/04/15 |
| **Sample Matrix:** | Soil | | |

**Case Narrative**

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix Spike (MS), and Matrix/Duplicate Matrix Spike (MS/DMS).

**Sample Receipt**

Twenty soil samples were received for analysis at ALS Environmental on 02/04/15. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4ºC upon receipt at the laboratory.

**General Chemistry Parameters**

**Total Organic Carbon by ASTM D4129-05 Modified:**
All samples were received past holding time. The analysis was performed as soon as possible after receipt by the laboratory. The data was flagged to indicate the holding time violation.

No other anomalies associated with the analysis of these samples were observed.

**Dioxins and Furans by EPA Method 8290**

The analysis for Dioxins and Furans was performed at ALS Houston, Texas Laboratory. The data for this analysis is included in the corresponding section of this report.

Lisa A Jamenighini

**Approved by**_____

# Chain of Custody

**ALS Environmental—Kelso Laboratory**
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

K1201100

# Chain of Custody

BARR
4700 West 77th Street
Minneapolis, MN 55435-4803
(952) 832-2600

COC 1 of 2

Project Number: 23270110

Project Name: Joslyn OU5 2015 Soil

Sample Origination State MN (use two letter postal state abbreviation)

COC Number: № 43800

Project Manager: John Hunt

Project QC Contact: Terri Olson

Sampled by: Alex Puetz

Laboratory: ALS

| | Location | Start Depth | Stop Depth | Depth Unit (m./ft. or in.) | Collection Date (mm/dd/yyyy) | Collection Time (hh:mm) | Matrix: Water | Matrix: Soil | Type: Grab | Type: Comp. | Type: QC | Number of Containers/Preservative: Water: VOCs (HCl) #1 | SVOCs (unpreserved) #2 | Dissolved Metals ($HNO_3$) | Total Metals ($HNO_3$) | General (unpreserved) #3 | Diesel Range Organics (HCl) | Nutrients ($H_2SO_4$) #4 | Soil: VOCs (tared MeOH) #1 | GRO, BTEX (tared MeOH) #1 | DRO (tared unpreserved) | Metals (unpreserved) | SVOCs (unpreserved) #2 | % Solids (plastic vial, unpres.) | Dioxins | TOC | Total Number Of Containers | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | B-1 | 2 | 3.5 | ft | 02/02/2015 | 10:35 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 2. | B-1 | 3.5 | 5 | | | 11:40 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 3. | B-1 | 5 | 6.5 | | | 11:45 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 4. | B-1 | 6.5 | 9 | | | 11:50 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 5. | B-1 | 9 | 10 | | | 12:00 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | HOLD ALL SAMPLES |
| 6. | B-3 | 5 | 6.5 | | | 14:15 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 7. | B-3 | 6.5 | 9 | | | 14:20 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 8. | B-3 | 9 | 10 | | | 14:25 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 9. | C-3 | 5 | 6.5 | | | 13:40 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 10. | C-3 | 6.5 | 9 | | | 13:45 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |

Common Parameter/Container - Preservation Key

*#1 - Volatile Organics = BTEX, GRO, TPH, 8260 Full List*
*#2 - Semivolatile Organics = PAHs, PCP, Dioxins, 8270 Full List, Herbicide/Pesticide/PCBs*
*#3 - General = pH, Chloride, Fluoride, Alkalinity, TSS, TDS, TS, Sulfate*
*#4 - Nutrients = COD, TOC, Phenols, Ammonia Nitrogen, TKN*

| Relinquished By: | On Ice? | Date | Time | Received by: | Date | Time |
|---|---|---|---|---|---|---|
| [signature] | (Y) N | 02/02/15 | 16:15 | [signature] | 02/02/15 | 16:15 |
| [signature] | (Y) N | 02/03/15 | 14:12 | [signature] | 2/4/15 | 0940 |

Samples Shipped VIA: ☐ Air Freight ☐ Federal Express ☐ Sampler ☐ Other: _____

Air Bill Number:

Distribution: White-Original Accompanies Shipment to Lab; Yellow - Field Copy; Pink - Lab Coordinator

H:\RLG\STDFORMS\Chain Of Custody Form 2009 RLG Rev. 09\01\09

K1501110

# Chain of Custody

BARR
4700 West 77th Street
Minneapolis, MN 55435-4803
(952) 832-2600

COC 2 of 2

Project Number: 23270110

Project Name: Joslyn OUS 2015 Soil

Sample Origination State MN (use two letter postal state abbreviation)

COC Number: № 43801

Project Manager: John Hunt

Project QC Contact: Terri Olson

Sampled by: Alex Puetz

Laboratory: ALS

| | Location | Start Depth | Stop Depth | Depth Unit (m./ft. or in.) | Collection Date (mm/dd/yyyy) | Collection Time (hh:mm) | Matrix: Water | Matrix: Soil | Type: Grab | Type: Comp. | Type: QC | Water: VOCs (HCl) #1 | Water: SVOCs (unpreserved) #2 | Water: Dissolved Metals ($HNO_3$) | Water: Total Metals ($HNO_3$) | Water: General (unpreserved) #3 | Water: Diesel Range Organics (HCl) | Water: Nutrients ($H_2SO_4$) #4 | Soil: VOCs (tared MeOH) #1 | Soil: GRO, BTEX (tared MeOH) #1 | Soil: DRO (tared unpreserved) | Soil: Metals (unpreserved) | Soil: SVOCs (unpreserved) #2 | Soil: % Solids (plastic vial, unpres.) | Soil: Dioxins | Soil: TOC | Total Number Of Containers | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | C-3 | 9 | 10 | ft | 02/02/2015 | 13:50 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 2. | D-1 | 2 | 3.5 | | | 11:05 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 3. | D-1 | 3.5 | 9 | | | 11:10 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 4. | D-1 | 9 | 10 | | | 11:20 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 5. | E-4 | 5 | 6.5 | | | 13:00 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | – HOLD |
| 6. | E-4 | 6.5 | 9 | | | 13:05 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | ALL |
| 7. | E-4 | 9 | 10 | | | 13:10 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | SAMPLES |
| 8. | F-3 | 4 | 5.5 | | | 12:25 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 9. | F-3 | 5.5 | 9 | | | 12:30 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 10. | F-3 | 9 | 10 | | | 12:35 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |

Common Parameter/Container - Preservation Key

*#1 - Volatile Organics = BTEX, GRO, TPH, 8260 Full List*
*#2 - Semivolatile Organics = PAHs, PCP, Dioxins, 8270 Full List, Herbicide/Pesticide/PCBs*
*#3 - General = pH, Chloride, Fluoride, Alkalinity, TSS, TDS, TS, Sulfate*
*#4 - Nutrients = COD, TOC, Phenols, Ammonia Nitrogen, TKN*

| | On Ice? | Date | Time | | Date | Time |
|---|---|---|---|---|---|---|
| Relinquished By: Alex Puetz | (Y) N | 02/02/15 | 16:15 | Received by: Jeremy Hutton | 02/02/15 | 16:15 |
| Relinquished By: Jeremy Hutton | (Y) N | 02/03/15 | 14:12 | Received by: | 2/4/15 | 0946 |

Samples Shipped VIA: ☐ Air Freight ☐ Federal Express ☐ Sampler ☐ Other: _____

Air Bill Number:

Distribution: White-Original Accompanies Shipment to Lab; Yellow - Field Copy; Pink - Lab Coordinator

H:\GIS\TEQRMS\Chain Of Custody Form 2009 BLS Rev 09041...

PC lisa

## Cooler Receipt and Preservation Form

Client / Project: Barr Service Request *K15* 0110

Received: 2/4/15 Opened: 2/4/15 By: [illegible] Unloaded: 2/4/15 By: [illegible]

1. Samples were received via? *Mail* (*Fed Ex*) *UPS* *DHL* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) (*Cooler*) *Box* *Envelope* *Other* _____ *NA*
3. Were custody seals on coolers? NA (Y) N If yes, how many and where? one, front
   If present, were custody seals intact? (Y) N If present, were they signed and dated? (Y) N

| Raw Cooler Temp | Corrected Cooler Temp | Raw Temp Blank | Corrected Temp Blank | Corr. Factor | Thermometer ID | Cooler/COC ID (Note NA) | Tracking Number NA | Filed |
|---|---|---|---|---|---|---|---|---|
| 5.7 | 5.8 | 5.7 | 5.6 | +0.1 | 347 | 43799 | 6275 1644 7472 | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

4. Packing material: *Inserts* (*Baggies*) (*Bubble Wrap*) *Gel Packs* (*Wet Ice*) *Dry Ice* *Sleeves* _____
5. Were custody papers properly filled out (ink, signed, etc.)? NA (Y) N
6. Did all bottles arrive in good condition (unbroken)? *Indicate in the table below.* NA (Y) N
7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA (Y) N
8. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* NA (Y) N
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA (Y) N
10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* (NA) Y N
11. Were VOA vials received without headspace? *Indicate in the table below.* (NA) Y N
12. Was C12/Res negative? (NA) Y N

| Sample ID on Bottle | Sample ID on COC | Identified by: |
|---|---|---|
| | | |
| | | |
| | | |

| Sample ID | Bottle Count Bottle Type | Out of Temp | Head-space | Broke | pH | Reagent | Volume added | Reagent Lot Number | Initials | Time |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

*Notes, Discrepancies, & Resolutions:* _____

*Page* ____ *of* ____

# General Chemistry

**ALS Environmental—Kelso Laboratory**
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/2/15 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/4/15 |
| **Analysis Method:** | 160.3 Modified | **Units:** | Percent |
| **Prep Method:** | None | **Basis:** | As Received |

**Solids, Total**

| Sample Name | Lab Code | Result | MRL | Dil. | Date Analyzed | Q |
|---|---|---|---|---|---|---|
| B-1 2-3.5' | K1501100-001 | **74.0** | - | 1 | 03/13/15 09:17 | |
| B-1 6.5-9' | K1501100-004 | **82.3** | - | 1 | 03/13/15 09:17 | |
| B-1 9-10' | K1501100-005 | **83.6** | - | 1 | 03/13/15 09:17 | |
| B-3 5-6.5' | K1501100-006 | **19.0** | - | 1 | 03/13/15 09:17 | |
| C-3 5-6.5' | K1501100-009 | **17.5** | - | 1 | 03/13/15 09:17 | |
| D-1 2-3.5' | K1501100-012 | **84.2** | - | 1 | 03/13/15 09:17 | |
| E-4 5-6.5' | K1501100-015 | **16.5** | - | 1 | 03/13/15 09:17 | |
| E-4 6.5-9' | K1501100-016 | **32.9** | - | 1 | 03/13/15 09:17 | |
| E-4 9-10' | K1501100-017 | **40.8** | - | 1 | 03/13/15 09:17 | |
| F-3 4-5.5' | K1501100-018 | **25.8** | - | 1 | 03/13/15 09:17 | |

**ALS Group USA, Corp.**

**dba ALS Environmental**

QA/QC Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 |
| | | **Date Analyzed:** | 03/13/15 |

## Replicate Sample Summary
## General Chemistry Parameters

| | | | |
|---|---|---|---|
| **Sample Name:** | B-1 2-3.5' | **Units:** | Percent |
| **Lab Code:** | K1501100-001 | **Basis:** | As Received |

| Analyte Name | Analysis Method | MRL | Sample Result | Duplicate Sample K1501100-001DUP Result | Average | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|
| Solids, Total | 160.3 Modified | - | 74.0 | 74.4 | 74.2 | <1 | 20 |

**Results flagged with an asterisk (*) indicate values outside control criteria.**

**Results flagged with a pound (#) indicate the control criteria is not applicable.**

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/2/15 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/4/15 |
| **Analysis Method:** | ASTM D4129-05 Modified | **Units:** | Percent |
| **Prep Method:** | ALS SOP | **Basis:** | Dry, per Method |

## Carbon, Total Organic (TOC)

| Sample Name | Lab Code | Result | MRL | Dil. | Date Analyzed | Date Extracted | Q |
|---|---|---|---|---|---|---|---|
| B-1 2-3.5' | K1501100-001 | **2.47** | 0.050 | 1 | 03/27/15 18:20 | 3/26/15 | * |
| B-1 6.5-9' | K1501100-004 | **0.553** | 0.050 | 1 | 03/27/15 18:20 | 3/26/15 | * |
| B-1 9-10' | K1501100-005 | **0.124** | 0.050 | 1 | 03/27/15 18:20 | 3/26/15 | * |
| B-3 5-6.5' | K1501100-006 | **42.2** | 0.050 | 1 | 03/27/15 18:20 | 3/26/15 | * |
| C-3 5-6.5' | K1501100-009 | **40.2** | 0.050 | 1 | 03/27/15 18:20 | 3/26/15 | * |
| D-1 2-3.5' | K1501100-012 | **1.37** | 0.050 | 1 | 03/27/15 18:20 | 3/26/15 | * |
| E-4 5-6.5' | K1501100-015 | **31.9** | 0.050 | 1 | 03/27/15 18:20 | 3/26/15 | * |
| E-4 6.5-9' | K1501100-016 | **8.01** | 0.050 | 1 | 03/27/15 18:20 | 3/26/15 | * |
| E-4 9-10' | K1501100-017 | **3.91** | 0.050 | 1 | 03/27/15 18:20 | 3/26/15 | * |
| F-3 4-5.5' | K1501100-018 | **17.9** | 0.050 | 1 | 03/27/15 18:20 | 3/26/15 | * |
| Method Blank | K1501100-MB | ND U | 0.050 | 1 | 03/27/15 18:20 | 3/26/15 | |

**ALS Group USA, Corp.**

**dba ALS Environmental**

QA/QC Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 |
| | | **Date Analyzed:** | 03/27/15 |

## Replicate Sample Summary
## General Chemistry Parameters

| | | | |
|---|---|---|---|
| **Sample Name:** | B-1 2-3.5' | **Units:** | Percent |
| **Lab Code:** | K1501100-001 | **Basis:** | Dry, per Method |

| Analyte Name | Analysis Method | MRL | Sample Result | Duplicate Sample K1501100-001DUP Result | Average | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|
| Carbon, Total Organic (TOC) | ASTM D4129-05 Modified | 0.050 | 2.47 | 2.62 | 2.55 | 6 | 20 |

**Results flagged with an asterisk (*) indicate values outside control criteria.**

**Results flagged with a pound (#) indicate the control criteria is not applicable.**

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

**ALS Group USA, Corp.**
**dba ALS Environmental**

QA/QC Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 |
| | | **Date Analyzed:** | 03/27/15 |
| | | **Date Extracted:** | 03/26/15 |

**Duplicate Matrix Spike Summary**
**Carbon, Total Organic (TOC)**

| | | | |
|---|---|---|---|
| **Sample Name:** | B-1 2-3.5' | **Units:** | Percent |
| **Lab Code:** | K1501100-001 | **Basis:** | Dry, per Method |
| **Analysis Method:** | ASTM D4129-05 Modified | | |
| **Prep Method:** | ALS SOP | | |

| | | Matrix Spike K1501100-001MS | | | Duplicate Matrix Spike K1501100-001DMS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Analyte Name** | **Sample Result** | **Result** | **Spike Amount** | **% Rec** | **Result** | **Spike Amount** | **% Rec** | **% Rec Limits** | **RPD** | **RPD Limit** |
| Carbon, Total Organic (TOC) | 2.47 | 6.59 | 4.16 | 99 | 7.04 | 4.51 | 101 | 70-122 | 2 | 20 |

**Results flagged with an asterisk (*) indicate values outside control criteria.**

**Results flagged with a pound (#) indicate the control criteria is not applicable.**

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

**ALS Group USA, Corp.**
**dba ALS Environmental**

QA/QC Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Analyzed:** | 03/27/15 |
| **Sample Matrix:** | Soil | **Date Extracted:** | 03/26/15 |

**Lab Control Sample Summary**
**Carbon, Total Organic (TOC)**

| | | | |
|---|---|---|---|
| **Analysis Method:** | ASTM D4129-05 Modified | **Units:** | Percent |
| **Prep Method:** | ALS SOP | **Basis:** | Dry, per Method |
| | | **Analysis Lot:** | 438290 |

| Sample Name | Lab Code | Result | Spike Amount | % Rec | % Rec Limits |
|---|---|---|---|---|---|
| Lab Control Sample | K1501100-LCS | 0.504 | 0.543 | 93 | 72-122 |

# Subcontract Lab Results

**ALS Environmental—Kelso Laboratory**
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com



**REVISED**
***9:15 am, May 04, 2015***

April 30, 2015 Service Request No: K1501100

Lisa Domenighini.
ALS Environmental
1317 South 13th Avenue
Kelso, WA 98626
**Laboratory Results for: Barr Engineering**

Dear Lisa,

Enclosed is the amended report for samples submitted to our laboratory on March 11, 2015. For your reference, these analyses have been assigned our service request number **K1501100.**

This amended report has the correct Native Analyte Results page for EQ1500199-01MB. In the original report the value for 2,3,4,6,7,8-HxCDF is non-detect (ND), however the ion ratio was flagged as being out in the report which is incorrect. The issue was traced to the report assembly program, where the ion ratio outage was reported even though the result was a ND. The report assembly program was corrected and updated. Please replace Final_K1501100ak with the report enclosed.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current TNI standards, where applicable, and considered in their entirety, and ALS Environmental is not responsible for use of less than the final complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report. In accordance to the TNI 2009 Standard, a statement on the estimated uncertainty of measurement of any quantitative analysis will be supplied upon request.

Please contact me if you have any questions. My direct number is 281-575-2279.

Respectfully submitted,

Arthi Kodur
Project Manager

10450 Stancliff Rd., Suite 210
Houston, TX 77099
T: +1 713 266 1599
F: +1 713 266 1599
www.alsglobal.com

March 31, 2015 Service Request No: K1501100

Lisa Domenighini.

ALS Environmental
1317 South 13th Avenue
Kelso, WA 98626

**Laboratory Result for: Barr Engineering.**
Dear Lisa:

Enclosed are the results of the sample(s) submitted to our laboratory on March 11, 2015. For Your reference, these analyses have been assigned our service request number: **K1501100.**

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current TNI standards, where applicable, and considered in their entirety, and ALS Environmental is not responsible for use of less than the final complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report. In accordance to the TNI 2009 Standard, a statement on the estimated uncertainty of measurement of any quantitative analysis will be supplied upon request.

Please contact me if you have any questions. My direct line is 281-575-2279. You may also contact me via email at Arthi.Kodur@alsglobal.com

Respectfully submitted,

**ALS Group USA Corp., dba ALS Environmental**

Arthi Kodur
Project Manager

Page 1 of _____

*For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com.*

# Certificate of Analysis

**ALS Environmental - Houston HRMS**
10450 Stancliff Rd, Suite 210, Houston TX 77099
Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

**ALS ENVIRONMENTAL**

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request No.:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Received:** | 3/11/15 |
| **Sample Matrix:** | Soil | | |

**ALS ENVIRONMENTAL NARRATIVE**

All analyses were performed in adherence to the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II. When appropriate to the method, method blank results have been reported with each analytical test.

**Sample Receipt**

Ten soil samples were received for analysis at ALS Environmental on 3/11/15.

Please note the reporting forms are currently referencing the date ALS Environmental-Kelso received the samples (2/4/15 and not the date ALS Environmental-Houston received the samples (3/11/15).

The samples were received at 0°C in good condition and are consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4°C upon receipt at the laboratory.

**Data Validation Notes and Discussion**

**B flags – Method Blanks**

The Method Blank EQ1500199-01 contained low levels of 1234678-HpCDD, OCDD, 1234678-HpCDF and OCDF at or below the Method Reporting Limit (MRL).

The associated compounds in the samples are flagged with 'B' flags.

**MS/MSD**

EQ1500199: Laboratory Control Spike/Duplicate Laboratory Control Spike (LCS/DLCS) samples were analyzed and reported in lieu of an MS/MSD for this extraction batch. 1234678-HpCDD, OCDD and OCDF were outside the percent recoveries for EQ1500199-02 (LCS) and 03 (DLCS). The outages can be traced back to high level samples in the batch.

**2378-TCDF**

Samples analyzed on the DB-5MSUI column were analyzed under conditions were sufficient separation between 2,3,7,8-TCDF and its closest eluter was achieved. Confirmation of this result was not required.

**Y flags – Labeled Standards**

Quantification of the native 2,3,7,8-substituted analytes is based on isotopic dilution, which automatically corrects for variation in extraction efficiency and provides accurate values even with poor recovery. Samples that had recoveries of labeled standards outside the acceptance limits are qualified with 'Y' flags on the Labeled Compound summary pages. In all cases, the signal-to-noise ratios are greater than 10:1 and detection limit were below the Method Reporting Limit.

Sample K1501100-017 has labeled standard recovery above the percent recovery. This can be attributed to matrix interference in the sample.

**Dilutions**

All samples associated with service request K1501100 have elevated levels of target analytes and required a dilution. The undiluted and diluted results were combined into one Total TEQ summary report for each sample. This reports a 'Total' result that includes the most appropriate concentration found for the associated target analyte.

**K flags**

EMPC - When the ion abundance ratios associated with a particular compound are outside the QC limits, samples are flagged with a 'K' flag. A 'K' flag indicates an estimated maximum possible concentration for the associated compound.

**Detection Limits**

Detection limits are calculated for each analyte in each sample by measuring the height of the noise level for each quantitation ion for the associated labeled standard. The concentration equivalent to 2.5 times the height of the noise is then calculated using the appropriate response factor and the weight of the sample. The calculated concentration equals the detection limit.

**The TEQ Summary results for each sample have been calculated by ALS ENVIRONMENTAL/Houston to include:**

- WHO-2005 TEFs, The 2005 World Health Organization Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds (M. Van den Berg et al., Toxicological Sciences 93(2):223-241, 2006)
- Non-detected compounds are not included in the 'Total'
- The 1:1 and associated dilution have been combined into one TEQ Summary report

**Client:** Barr Engineering Company **Service Request:**K1501100
**Project:** Joslyn OU5 2015 Soil/23270110

## SAMPLE CROSS-REFERENCE

| SAMPLE # | CLIENT SAMPLE ID | DATE | TIME |
|---|---|---|---|
| K1501100-001 | B-1 2-3.5' | 2/2/2015 | 1035 |
| K1501100-002 | B-1 3.5-5' | 2/2/2015 | 1140 |
| K1501100-003 | B-1 5-6.5' | 2/2/2015 | 1145 |
| K1501100-004 | B-1 6.5-9' | 2/2/2015 | 1150 |
| K1501100-005 | B-1 9-10' | 2/2/2015 | 1200 |
| K1501100-006 | B-3 5-6.5' | 2/2/2015 | 1415 |
| K1501100-007 | B-3 6.5-9' | 2/2/2015 | 1420 |
| K1501100-008 | B-3 9-10' | 2/2/2015 | 1425 |
| K1501100-009 | C-3 5-6.5' | 2/2/2015 | 1340 |
| K1501100-010 | C-3 6.5-9' | 2/2/2015 | 1345 |
| K1501100-011 | C-3 9-10' | 2/2/2015 | 1350 |
| K1501100-012 | D-1 2-3.5' | 2/2/2015 | 1105 |
| K1501100-013 | D-1 3.5-9' | 2/2/2015 | 1110 |
| K1501100-014 | D-1 9-10' | 2/2/2015 | 1120 |
| K1501100-015 | E-4 5-6.5' | 2/2/2015 | 1300 |
| K1501100-016 | E-4 6.5-9' | 2/2/2015 | 1305 |
| K1501100-017 | E-4 9-10' | 2/2/2015 | 1310 |
| K1501100-018 | F-3 4-5.5' | 2/2/2015 | 1225 |
| K1501100-019 | F-3 5.5-9' | 2/2/2015 | 1230 |
| K1501100-020 | F-3 9-10' | 2/2/2015 | 1235 |

# Service Request Summary

**Folder #:** **K1501100**
Client Name: Barr Engineering Company
Project Name: Joslyn OU5 2015 Soil
Project Number: 23270110

**Report To:** Terri Olson
Barr Engineering
4700 West 77th Street
Minneapolis, MN 55435
USA
Phone Number: 952-842-3578
Cell Number:
Fax Number:
E-mail: tolson@barr.com

Project Chemist: Lisa Domenighini
Originating Lab: KELSO
Logged By: SWOLF
Date Received: 02/04/15
Internal Due Date: 3/27/2015
QAP: LAB QAP
Qualifier Set: Lab Standard
Formset: Lab Standard
Merged?: Y
Report to MDL?: N, Y
P.O. Number:
EDD: BARR - EQUIS

40 4 oz-Glass Jar WM CLEAR Teflon Liner Unpreserved
**Location:** K-Delilah-41, EHRMS-WIC 1C
**Pressure Gas:**
**NPDES**

| | | | | KELSO | | HOUSTON |
|---|---|---|---|---|---|---|
| **Lab Samp No.** | **Client Samp No** | **Matrix** | **Collected** | TOC/ASTM D4129-05 Modified | TS/160.3 Modified | PCDD PCDF/8290 |
| K1501100-001 | B-1 2-3.5' | Soil | 02/02/15 1035 | II | II | II |
| K1501100-002 | B-1 3.5-5' | Soil | 02/02/15 1140 | II | II | II |
| K1501100-003 | B-1 5-6.5' | Soil | 02/02/15 1145 | II | II | II |
| K1501100-004 | B-1 6.5-9' | Soil | 02/02/15 1150 | II | II | II |
| K1501100-005 | B-1 9-10' | Soil | 02/02/15 1200 | II | II | II |
| K1501100-006 | B-3 5-6.5' | Soil | 02/02/15 1415 | II | II | II |
| K1501100-007 | B-3 6.5-9' | Soil | 02/02/15 1420 | II | II | II |
| K1501100-008 | B-3 9-10' | Soil | 02/02/15 1425 | II | II | II |
| K1501100-009 | C-3 5-6.5' | Soil | 02/02/15 1340 | II | II | II |
| K1501100-010 | C-3 6.5-9' | Soil | 02/02/15 1345 | II | II | II |
| K1501100-011 | C-3 9-10' | Soil | 02/02/15 1350 | II | II | II |
| K1501100-012 | D-1 2-3.5' | Soil | 02/02/15 1105 | II | II | II |
| K1501100-013 | D-1 3.5-9' | Soil | 02/02/15 1110 | II | II | II |
| K1501100-014 | D-1 9-10' | Soil | 02/02/15 1120 | II | II | II |
| K1501100-015 | E-4 5-6.5' | Soil | 02/02/15 1300 | II | II | II |
| K1501100-016 | E-4 6.5-9' | Soil | 02/02/15 1305 | II | II | II |

# Service Request Summary

**Folder #:** **K1501100**
Client Name: Barr Engineering Company
Project Name: Joslyn OU5 2015 Soil
Project Number: 23270110

**Report To:** Terri Olson
Barr Engineering
4700 West 77th Street
Minneapolis, MN 55435
USA
Phone Number: 952-842-3578
Cell Number:
Fax Number:
E-mail: tolson@barr.com

Project Chemist: Lisa Domenighini
Originating Lab: KELSO
Logged By: SWOLF
Date Received: 02/04/15
Internal Due Date: 3/27/2015
QAP: LAB QAP
Qualifier Set: Lab Standard
Formset: Lab Standard
Merged?: Y
Report to MDL?: N, Y
P.O. Number:
EDD: BARR - EQUIS

40 4 oz-Glass Jar WM CLEAR Teflon Liner Unpreserved
**Location:** K-Delilah-41, EHRMS-WIC 1C
**Pressure Gas:**
**NPDES**

| | | | | KELSO | | HOUSTON |
|---|---|---|---|---|---|---|
| **Lab Samp No.** | **Client Samp No** | **Matrix** | **Collected** | TOC/ASTM D4129-05 Modified | TS/160.3 Modified | PCDD PCDF/8290 |
| K1501100-017 | E-4 9-10' | Soil | 02/02/15 1310 | II | II | II |
| K1501100-018 | F-3 4-5.5' | Soil | 02/02/15 1225 | II | II | II |
| K1501100-019 | F-3 5.5-9' | Soil | 02/02/15 1230 | II | II | II |
| K1501100-020 | F-3 9-10' | Soil | 02/02/15 1235 | II | II | II |

## Folder Comments:

Tier II except when requested otherwise. Add narrative note that Benzo(b)fluoranthene cannot be separated from Benzo(j)fluoranthene.
The .02 jar is designated for 8290 Houston.

3/6/15: Samples released from hold. LAD

# Service Request Summary

**Folder #:** **K1501100**
Client Name: Barr Engineering Company
Project Name: Joslyn OU5 2015 Soil
Project Number: 23270110

**Report To:** Terri Olson
Barr Engineering
4700 West 77th Street
Minneapolis, MN 55435
USA
Phone Number: 952-842-3578
Cell Number:
Fax Number:
E-mail: tolson@barr.com

Project Chemist: Lisa Domenighini
Originating Lab: KELSO
Logged By: SWOLF
Date Received: 02/04/15
Internal Due Date: 3/27/2015
QAP: LAB QAP
Qualifier Set: Lab Standard
Formset: Lab Standard
Merged?: Y
Report to MDL?: N, Y
P.O. Number:
EDD: BARR - EQUIS

40 4 oz-Glass Jar WM CLEAR Teflon Liner Unpreserved
**Location:** K-Delilah-41, EHRMS-WIC 1C
**Pressure Gas:**
**NPDES**

## Test Comments:

| Group | Test/Method | Samples | Comments |
|---|---|---|---|
| Semivoa GCMS | PCDD PCDF/8290 | 30 | rcvd samples on 3/11/15<br>full list (ak 3/11/15)<br>Samples are high level use 5 grams for sample weight (ak 3/12/15) |

# Data Qualifiers

## HRMS Qualifier Set

B Indicates the associated analyte was found in the method blank at >1/10th the reported value.

E Estimated value. The reported concentration is above the calibration range of the instrument.

H Sample extracted and/or analyzed out of suggested holding time.

J Estimated value. The reported concentration is below the MRL.

K The ion abundance ratio between the primary and secondary ions were outside of theoretical acceptance limits. Reported concentration is a conservative estimate, however EMPC correction was not applied.

P Chlorodiphenyl ether interference was present at the retention time of the target analyte. Reported result should be considered an estimate.

Q Monitored lock-mass indicates matrix-interference. Reported result is estimated.

S Signal saturated detector. Result reported from dilution.

U Compound was analyzed for, but was not detected (ND).

X See Case Narrative.

Y Isotopically Labeled Standard recovery outside of acceptance limits. In all cases, the signal-to-nois ratios are greater than 10:1, making the recoveries acceptable.

i The MDL/MRL have been elevated due to a matrix interference.

# ALS Laboratory Group

**Acronyms**

| | |
|---|---|
| Cal | Calibration |
| Conc | CONCentration |
| Dioxin(s) | Polychlorinated dibenzo-p-dioxin(s) |
| EDL | Estimated Detection Limit |
| EMPC | Estimated Maximum Possible Concentration |
| Flags | Data qualifiers |
| Furan(s) | Polychlorinated dibenzofuran(s) |
| g | Grams |
| ICAL | Initial CALibration |
| ID | IDentifier |
| Ions | Masses monitored for the analyte during data acquisition |
| L | Liter (s) |
| LCS | Laboratory Control Sample |
| DLCS | Duplicate Laboratory Control Sample |
| MB | Method Blank |
| MCL | Method Calibration Limit |
| MDL | Method Detection Limit |
| mL | Milliliters |
| MS | Matrix Spiked sample |
| DMS | Duplicate Matrix Spiked sample |
| NO | Number of peaks meeting all identification criteria |
| PCDD(s) | Polychlorinated dibenzo-p-dioxin(s) |
| PCDF(s) | Polychlorinated dibenzofuran(s) |
| ppb | Parts per billion |
| ppm | Parts per million |
| ppq | Parts per quadrillion |
| ppt | Parts per trillion |
| QA | Quality Assurance |
| QC | Quality Control |
| Ratio | Ratio of areas from monitored ions for an analyte |
| % Rec. | Percent recovery |
| RPD | Relative Percent Difference |
| RRF | Relative Response Factor |
| RT | Retention Time |
| SDG | Sample Delivery Group |
| S/N | Signal-to-noise ratio |
| TEF | Toxicity Equivalence Factor |
| TEQ | Toxicity Equivalence Quotient |

## State Certifications, Accreditations, and Licenses

| Agency | Number | Expire Date |
|---|---|---|
| American Association for Laboratory Accreditation | 2897.01 | 11/30/2015 |
| Arizona Department of Health Services | AZ0793 | 5/27/2015 |
| Arkansas Department of Environmental Quality | 14-038-0 | 6/16/2015 |
| Florida Department of Health | E87611 | 6/30/2015 |
| Hawaii Department of Health | TX02694 | 6/30/2015 |
| Illinois Environmental Protection Agency | 200057 | 10/6/2015 |
| Louisiana Department of Environmental Quality | 03048 | 6/30/2015 |
| Louisiana Department of Health and Hospitals | LA150026 | 12/31/2015 |
| Maine Center for Disease Control and Prevention | 2014019 | 6/5/2016 |
| Maryland Department of the Environment | 343 | 6/30/2015 |
| Michigan Depratment of Environmental Quality | 9971 | 6/30/2015 |
| Minnesota Department of Health | 840911 | 12/31/2015 |
| Nebraska Department of Health and Human Services | NE-OS-25-13 | 6/30/2015 |
| Nevada Department of Concervation and Natural Resources | TX014112013-2 | 7/31/2015 |
| New Jersey Department of Environmental Protection | NLC140001 | 6/30/2015 |
| New Mexico Environment Department | TX02694 | 6/30/2015 |
| New York Department of Health | 11707 | 4/1/2015 |
| Oklahoma Department of Environmental Quality | 2014 124 | 8/31/2015 |
| Oklahoma Department of Environmental Quality | 2014-124 | 8/31/2015 |
| Pennsylvania Department of Environmental Protection | 68-03441 | 6/30/2015 |
| Tennessee Department of Environment and Concervation | 04016 | 6/30/2015 |
| Texas Commision on Environmental Quality | TX104704216-14-5 | 6/30/2015 |
| United States Department of Agriculture | P330-14-00067 | 2/21/2017 |
| Utah Department of Health Environmental Laboratory Certification | TX02694 | 7/31/2015 |
| Washington Department of Health | c819 | 11/14/2015 |
| West Virginia Department of Environmental Protection | 347 | 6/30/2015 |

# ALS ENVIRONMENTAL – Houston
## Data Processing/Form Production and Peer Review Signatures

SR# Unique ID: K1501100 | DB-5 | DB-5MSUI | DB-225 | SPB-Octyl

**First Level - Data Processing - to be filled by person generating the forms**

| Date: | Analyst: | Samples: |
|---|---|---|
| 03/20/15 | JC | -001,-004,-005,-006 |

**Second Level - Data Review – to be filled by person doing peer review**

| Date: | Analyst: | Samples: |
|---|---|---|
| 03/23/15 | [illegible] | 001,004-006 |

PEER REVIEW PAGE

# ALS Environmental – Houston HRMS
## Data Processing/Form Production and Peer Review Signatures

SR# Unique ID: K150110O  DB-5  DB-5MSUI  SPB-Octyl

**First Level - Data Processing** - to be filled by person generating the forms

Date: 3/31/15  Analyst: cer  Samples: 16, 9, 12, 15, 18, 17

**Second Level - Data Review** – to be filled by person doing peer review

Date: 03/31/15  Analyst: JA  Samples: 009, 012, 015-018

# ALS ENVIRONMENTAL – Houston
## Data Processing/Form Production and Peer Review Signatures

SR# Unique ID: K1501100 | DB-5 | (DB-5MSUI) | DB-225 | SPB-Octyl

**First Level - Data Processing** - to be filled by person generating the forms

Date: 03/31/15 Analyst: [signature]

Samples: 001DL, 004DL, 005DL, 006DL, 009DL, 012DL, 015DL, 017DL, 018DL

**Second Level - Data Review** – to be filled by person doing peer review

Date: 03/31/15 Analyst: [signature]

Samples: 001DL, 004DL, 005DL, 006DL, 009DL, 012DL, 015DL, 017DL, 018DL

# ALS ENVIRONMENTAL – Houston
## Data Processing/Form Production and Peer Review Signatures

SR# Unique ID: K1501100 | DB-5 | (DB-5MSUI) | DB-225 | SPB-Octyl

**First Level - Data Processing** - to be filled by person generating the forms

| Date: | Analyst: | Samples: |
|---|---|---|
| 03/31/15 | JC | 016DL |

**Second Level - Data Review** – to be filled by person doing peer review

| Date: | Analyst: | Samples: |
|---|---|---|
| 03/31/15 | LKL | 016DL |

# Chain of Custody

**ALS Environmental - Houston HRMS**
10450 Stancliff Rd, Suite 210, Houston TX 77099
Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

# Intra-Network Chain of Custody

1317 South 13th Avenue • Kelso, WA 98626 • 1-360-577-7222 • FAX 1-360-636-1068

ALS Contact: Lisa Domenighini

**Project Name:** Joslyn OU5 2015 Soil
**Project Number:** 23270110
**Project Manager:** Terri Olson
**Company:** Barr Engineering

K1501100 5
Barr Engineering
Joslyn OU5 2015 Soil

| Lab Code | Client Sample ID | # of Cont. | Matrix | Sample Date | Sample Time | Date Received | Send To | PCDD PCDF 8290 |
|---|---|---|---|---|---|---|---|---|
| K1501100-001 | B-1 2-3.5' | 1 | Soil | 2/2/15 | 1035 | 2/4/15 | HOUSTON | II |
| K1501100-002 | B-1 3.5-5' | | Soil | 2/2/15 | 1140 | 2/4/15 | HOUSTON | II (H) |
| K1501100-003 | B-1 5-6.5' | | Soil | 2/2/15 | 1145 | 2/4/15 | HOUSTON | II (H) |
| K1501100-004 | B-1 6.5-9' | | Soil | 2/2/15 | 1150 | 2/4/15 | HOUSTON | II |
| K1501100-005 | B-1 9-10' | | Soil | 2/2/15 | 1200 | 2/4/15 | HOUSTON | II |
| K1501100-006 | B-3 5-6.5' | | Soil | 2/2/15 | 1415 | 2/4/15 | HOUSTON | II |
| K1501100-007 | B-3 6.5-9' | | Soil | 2/2/15 | 1420 | 2/4/15 | HOUSTON | II (H) |
| K1501100-008 | B-3 9-10' | | Soil | 2/2/15 | 1425 | 2/4/15 | HOUSTON | II (H) |
| K1501100-009 | C-3 5-6.5' | | Soil | 2/2/15 | 1340 | 2/4/15 | HOUSTON | II |
| K1501100-010 | C-3 6.5-9' | | Soil | 2/2/15 | 1345 | 2/4/15 | HOUSTON | II (H) |
| K1501100-011 | C-3 9-10' | | Soil | 2/2/15 | 1350 | 2/4/15 | HOUSTON | II (H) |
| K1501100-012 | D-1 2-3.5' | | Soil | 2/2/15 | 1105 | 2/4/15 | HOUSTON | II |

Samples could have high concentrations

**Special Instructions/Comments**
Please provide the electronic (PDF and EDD) report to the following e-mail address: ALKLS.Data@alsglobal.com.

pH Checked _____

**Turnaround Requirements**
____ **RUSH** (Surcharges Apply)
**PLEASE CIRCLE WORK DAYS**
X 1 2 3 4 5
____ **STANDARD**
Requested FAX Date: _____
Requested Report Date: 03/27/15

**Report Requirements**
____ I. Results Only
X II. Results + QC Summaries
____ III. Results + QC and Calibration Summaries
____ IV. Data Validation Report with Raw Data
PQL/MDL/J N
EDD Y

**Invoice Information**
PO# K1501100
Bill to

Relinquished By: [signature] 3/9/15 0932
Received By: [signature] 3/4/15 1100
Airbill Number: _____

# Intra-Network Chain of Custody

1317 South 13th Avenue • Kelso, WA 98626 • 1-360-577-7222 • FAX 1-360-636-1068

ALS Contact: Lisa Domenighini

**Project Name:** Joslyn OU5 2015 Soil
**Project Number:** 23270110
**Project Manager:** Terri Olson
**Company:** Barr Engineering

| Lab Code | Client Sample ID | # of Cont. | Matrix | Sample Date | Time | Date Received | Send To | PCDD PCDF 8290 |
|---|---|---|---|---|---|---|---|---|
| K1501100-013 | D-1 3.5-9' | 1 | Soil | 2/2/15 | 1110 | 2/4/15 | HOUSTON | II (H) |
| K1501100-014 | D-1 9-10' | 1 | Soil | 2/2/15 | 1120 | 2/4/15 | HOUSTON | II (H) |
| K1501100-015 | E-4 5-6.5' | 1 | Soil | 2/2/15 | 1300 | 2/4/15 | HOUSTON | II |
| K1501100-016 | E-4 6.5-9' | | Soil | 2/2/15 | 1305 | 2/4/15 | HOUSTON | II |
| K1501100-017 | E-4 9-10' | | Soil | 2/2/15 | 1310 | 2/4/15 | HOUSTON | II |
| K1501100-018 | F-3 4-5.5' | | Soil | 2/2/15 | 1225 | 2/4/15 | HOUSTON | II |
| K1501100-019 | F-3 5.5-9' | 1 | Soil | 2/2/15 | 1230 | 2/4/15 | HOUSTON | II (H) |
| K1501100-020 | F-3 9-10' | 1 | Soil | 2/2/15 | 1235 | 2/4/15 | HOUSTON | II (H) |

K1501100
Barr Engineering
Joslyn OU5 2015 Soil
5

**Folder Comments:**
Tier II except when requested otherwise. Add narrative note that Benzo(b)fluoranthene cannot be separated from Benzo(j)fluoranthene.
The .02 jar is designated for 8290 Houston.

3/6/15: Samples released from hold. LAD

**Special Instructions/Comments**
Please provide the electronic (PDF and EDD) report to the following e-mail address:
ALKLS.Data@alsglobal.com.

pH Checked _____

**Turnaround Requirements**
____**RUSH** (Surcharges Apply)
**PLEASE CIRCLE WORK DAYS**
1 2 3 4 5
____**STANDARD**
Requested FAX Date: _____
Requested Report Date: 03/27/15

**Report Requirements**
____ I. Results Only
____ II. Results + QC Summaries
____ III. Results + QC and Calibration Summaries
____ IV. Data Validation Report with Raw Data
PQL/MDL/J N
EDD Y

**Invoice Information**
PO# K1501100
Bill to

Relinquished By: [signature] 3/9/15 0932
Received By: [signature] 3/11/15 1110
Airbill Number: _____

# Cooler Receipt Form

ALS Environmental

Project Chemist AK

Client/Project Kelso - Barr Eng. Thermometer ID SMO

Date/Time Received: 3/11/15 1100 Initials: JLL Date/Time Logged in: 3/11/15 1215 Initials JLL

1. Method of delivery: ○ US Mail ✓ Fed Ex ○ UPS ○ DHL ○ Courier ○ Client

2. Samples received in: ✓ Cooler ○ Box ○ Envelope ○ Other _____

3. Were custody seals on coolers? ✓ Yes ○ No
   Were they intact? ✓ Yes ○ No ○ N/A
   Were they signed and dated? ✓ Yes ○ No ○ N/A
   If yes, how many and where? one front seal

4. Packing Material: ○ Inserts ○ Baggies ✓ Bubble Wrap ✓ Gel Packs ○ Wet Ice ○ Sleeves ○ Other _____

5. Foreign or Regulated Soil? ○ Yes ✓ No Location of Sampling: _____

| Cooler Tracking Number | COC ID | Date Opened | Time Opened | Opened By | Temp. °C | Temp Blank? |
|---|---|---|---|---|---|---|
| 5478 9742 2116 | | 3/11/15 | 1110 | JLL | 0 | ☐ |
| | | | | | | ☐ |
| | | | | | | ☐ |
| | | | | | | ☐ |

6. Were custody papers properly filled out (ink, signed, dated, etc)? ✓ Yes ○ No
7. Did all bottles arrive in good condition (not broken, no signs of leakage)? ✓ Yes ○ No
8. Were all sample labels complete (i.e., sample ID, analysis, preservation, etc)? ✓ Yes ○ No
9. Were appropriate bottles/containers and volumes received for the requested tests? ✓ Yes ○ No
10. Did sample labels and tags agree with custody documents? ✓ Yes ○ No

Notes, Discrepancies, & Resolutions:

Service request Label:

K1501100 5
Barr Engineering
Joslyn OU5 2015 Soil

10450 Stancliff Rd., Suite 210
Houston, TX 77099
**T:** +1 713 266 1599
**F:** +1 713 266 1599
**www.alsglobal.com**

# SAMPLE ACCEPTANCE POLICY

This policy outlines the criteria samples must meet to be accepted by ALS Environmental – Houston HRMS.

**Cooler Custody Seals (desirable, mandatory if specified in SAP):**

- ✓ Intact on outside of cooler, signed and dated

**Chain-of-Custody (COC) documentation (mandatory):**

The following is required on each COC:

- ✓ Sample ID, the location, date and time of collection, collector's name, preservation type, sample type, and any other special remarks concerning the sampleThe COC must be completed in ink.
- ✓ Signature and date of relinquishing party.

In the absence of a COC at sample receipt, the COC will be requested from the client.

**Sample Integrity (mandatory):**

Samples are inspected upon arrival to ensure that sample integrity was not compromised during transfer to the laboratory.

- ✓ Sample containers must arrive in good condition (not broken or leaking).
- ✓ Samples must be labeled appropriately, including Sample IDs, and requested test using durable labels and indelible ink.
- ✓ The correct type of sample bottle must be used for the method requested.
- ✓ An appropriate sample volume, or weight, must be received.
- ✓ Sample IDs and number of containers must reconcile with the COC.
- ✓ Samples must be received within the method defined holding time.

**Temperature Requirement (varies by sample matrix):**

- ✓ Aqueous and Non-aqueous samples must be shipped and stored cold, at 0 to 6ºC.
- ✓ Tissue samples must be shipped and stored frozen, at -20 to -10ºC.
- ✓ Air samples are shipped and stored cold, at 0 to 6ºC
- ✓ The sample temperature must be recorded on the COC

All cooler inspections are documented on the Cooler Receipt Form (CRF). A separate CRF is completed for each service request. Any samples not meeting the above criteria are noted on the CRF and the Project Manager notified. The Project Manager must resolve any sample integrity issues with the client prior to proceeding with the analysis. Such resolutions are documented in writing and filed with the project folder. Data associated with samples received outside of this acceptance policy will be qualified on the case narrative of the final report

# Preparation Information Benchsheets

**ALS Environmental - Houston HRMS**
10450 Stancliff Rd., Suite 210, Houston, TX 77099
Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

# *Preparation Information Benchsheet*

**Prep Run#:** 231253 **Prep WorkFlow:** OrgExtDioxS(30) **Status:** Prepped
**Team:** Semivoa GCMS/DEDWARDS **Prep Method:** Method **Prep Date/Time:** 3/16/15 07:35 AM

| # | Lab Code | Client ID | B# | Method /Test | pH | Matrix | Amt. Ext. | Sample Description |
|---|---|---|---|---|---|---|---|---|
| 1 | E1500230-001 | PRC-DU1-Comp | .01 | 8290/PCDD PCDF | | Sediment | 10.054g | Watery Green Sediment |
| 2 | E1500230-002 | PRC-DU2-Comp | .01 | 8290/PCDD PCDF | | Sediment | 10.208g | Watery Green Sediment |
| 3 | EQ1500199-01 | MB | | 8290/PCDD PCDF | | Solid | 10.277g | |
| 4 | EQ1500199-02 | LCS | | 8290/PCDD PCDF | | Solid | 10.494g | |
| 5 | EQ1500199-03 | DLCS | | 8290/PCDD PCDF | | Solid | 10.162g | |
| 6 | K1501100-001 | B-1 2-3.5' | .02 | 8290/PCDD PCDF | | Soil | 10.355g | Moist Brown Sediment Crumbles |
| 7 | K1501100-004 | B-1 6.5-9' | .02 | 8290/PCDD PCDF | | Soil | 10.148g | Moist Brown Sediment |
| 8 | K1501100-005 | B-1 9-10' | .02 | 8290/PCDD PCDF | | Soil | 10.073g | Moist Brown Sediment |
| 9 | K1501100-006 | B-3 5-6.5' | .02 | 8290/PCDD PCDF | | Soil | 10.164g | Black Soft Soil |
| 10 | K1501100-009 | C-3 5-6.5' | .02 | 8290/PCDD PCDF | | Soil | 10.373g | Black Soft Soil |
| 11 | K1501100-012 | D-1 2-3.5' | .02 | 8290/PCDD PCDF | | Soil | 10.006g | Brown Moist Sand |
| 12 | K1501100-015 | E-4 5-6.5' | .02 | 8290/PCDD PCDF | | Soil | 10.094g | Black Moist Sludge |
| 13 | K1501100-016 | E-4 6.5-9' | .02 | 8290/PCDD PCDF | | Soil | 10.272g | Brown Moist Crumbles Sediment |
| 14 | K1501100-017 | E-4 9-10' | .02 | 8290/PCDD PCDF | | Soil | 10.206g | Tannish Moist Mud |
| 15 | K1501100-018 | F-3 4-5.5' | .02 | 8290/PCDD PCDF | | Soil | 10.143g | Black Moist Mud |

**Spiking Solutions**

Name: 1613B Matrix Working Standard Inventory ID 79278 Logbook Ref: 2-20 ng/ml 79278 DE 3/4/15 Expires On: 03/04/2016

| | | | |
|---|---|---|---|
| EQ1500199-02 | 100.00µL | EQ1500199-03 | 100.00µL |

Name: 8290/1613B Cleanup Working Standard Inventory ID 79294 Logbook Ref: 79294 LM 3/5/15 8ng/mL Expires On: 03/05/2016

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| E1500230-001 | 100.00µL | E1500230-002 | 100.00µL | EQ1500199-01 | 100.00µL | EQ1500199-02 | 100.00µL | EQ1500199-03 | 100.00µL | K1501100-001 | 100.00µL |
| K1501100-004 | 100.00µL | K1501100-005 | 100.00µL | K1501100-006 | 100.00µL | K1501100-009 | 100.00µL | K1501100-012 | 100.00µL | K1501100-015 | 100.00µL |
| K1501100-016 | 100.00µL | K1501100-017 | 100.00µL | K1501100-018 | 100.00µL | | | | | | |

Name: 1613B Labeled Working Standard Inventory ID 79431 Logbook Ref: 2-4 ng/ml 79431 DE 3/12/15 Expires On: 08/19/2015

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| E1500230-001 | 1,000.00µL | E1500230-002 | 1,000.00µL | EQ1500199-01 | 1,000.00µL | EQ1500199-02 | 1,000.00µL | EQ1500199-03 | 1,000.00µL | K1501100-001 | 1,000.00µL |
| K1501100-004 | 1,000.00µL | K1501100-005 | 1,000.00µL | K1501100-006 | 1,000.00µL | K1501100-009 | 1,000.00µL | K1501100-012 | 1,000.00µL | K1501100-015 | 1,000.00µL |

Name: 1613B Labeled Working Standard Inventory ID 79546 Logbook Ref: 2-4 ng/ml 79546 DE 3/16/15 Expires On: 08/19/2015

| | | | | | |
|---|---|---|---|---|---|
| K1501100-016 | 1,000.00µL | K1501100-017 | 1,000.00µL | K1501100-018 | 1,000.00µL |

# *Preparation Information Benchsheet*

**Prep Run#:** 231253 **Prep WorkFlow:** OrgExtDioxS(30) **Status:** Prepped
**Team:** Semivoa GCMS/DEDWARDS **Prep Method:** Method **Prep Date/Time:** 3/16/15 07:35 AM

## Preparation Materials

| | | | | | |
|---|---|---|---|---|---|
| Carbon, High Purity | LM 3/4/15 (79266) | Ethyl Acetate 99.9% Minimum EtOAc | LM 2/27/15 (79153) | Glass Wool | AL 2/17/15 (78802) |
| Sulfuric Acid Reagent Grade H2SO4 | LM 3/4/15 (79265) | Hexanes 95% | LM 3/4/15 (79263) | Dichloromethane (Methylene Chloride) 99.9% MeCl2 | LM 2/20/15 (78906) |
| Sodium Chloride Reagent Grade NaCl | C2-65-5 (38670) | Sodium Hydroxide Reagent Grade NaOH | LM 09/02/14 (74232) | Sodium Sulfate Anhydrous Reagent Grade Na2SO4 | LM 11/25/14 (76864) |
| Tridecane (n-Tridecane) | AL 03/10/15 (79360) | Silica Gel Reagent Grade | AL 03/13/15 (79494) | Toluene 99.9% Minimum | LM 3/4/15 (79264) |

## Preparation Steps

| Step: | Extraction | Step: | Acid Clean | Step: | Silica Gel Clean | Step: | Final Volume |
|---|---|---|---|---|---|---|---|
| Started: | 3/16/15 07:35 | Started: | 3/17/15 06:15 | Started: | 3/17/15 08:15 | Started: | 3/17/15 17:50 |
| Finished: | 3/17/15 04:30 | Finished: | 3/17/15 06:45 | Finished: | 3/17/15 09:45 | Finished: | 3/17/15 18:20 |
| By: | DEDWARDS | By: | CDIAZ | By: | CDIAZ | By: | LMCCRINK |
| Comments | | Comments | | Comments | | Comments | |

Comments: _____

Reviewed By: ak Date: 3/18/15

Chain of Custody

Relinquished By: _____ Date: _____ Extracts Examined

Received By: _____ Date: _____ Yes No

# Analytical Results

**ALS Environmental - Houston HRMS**
10450 Stancliff Rd., Suite 210, Houston, TX 77099
Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 10:35 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-1 2-3.5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-001 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/18/15 18:09 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.355g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P234987 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P234981 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | 0.575 | **JK** | 0.173 | 0.653 | 0.48 | 1.001 | 1 |
| 1,2,3,7,8-PeCDD | 17.9 | | 0.159 | 3.26 | 1.67 | 1.000 | 1 |
| 1,2,3,4,7,8-HxCDD | 96.4 | | 0.396 | 3.26 | 1.25 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 4510 | **K** | 134 | 653 | 1.52 | 1.000 | 200 |
| 1,2,3,7,8,9-HxCDD | 292 | | 0.395 | 3.26 | 1.29 | 1.007 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 122000 | | 379 | 653 | 1.13 | 1.000 | 200 |
| OCDD | 3050000 | | 933 | 1310 | 0.88 | 1.000 | 200 |
| 2,3,7,8-TCDF | 41.3 | | 0.156 | 0.653 | 0.77 | 1.001 | 1 |
| 1,2,3,7,8-PeCDF | 322 | | 13.6 | 13.6 | 1.56 | 1.001 | 1 |
| 2,3,4,7,8-PeCDF | 697 | | 13.4 | 13.4 | 1.53 | 1.002 | 1 |
| 1,2,3,4,7,8-HxCDF | 2230 | **K** | 291 | 653 | 1.63 | 1.000 | 200 |
| 1,2,3,6,7,8-HxCDF | 643 | | 22.9 | 22.9 | 1.24 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDF | 1080 | | 25.8 | 25.8 | 1.24 | 1.000 | 1 |
| 2,3,4,6,7,8-HxCDF | 1210 | | 24.3 | 24.3 | 1.25 | 1.000 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 39600 | | 924 | 924 | 1.04 | 1.000 | 200 |
| 1,2,3,4,7,8,9-HpCDF | 3080 | | 1240 | 1240 | 1.16 | 1.000 | 200 |
| OCDF | 479000 | | 984 | 1310 | 0.85 | 1.005 | 200 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 10:35 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-1 2-3.5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-001 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/18/15 18:09 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.355g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P234987 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P234981 |

### Native Analyte Results

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | 17.6 | | 0.173 | 0.653 | 0.75 | | 1 |
| Total Penta-Dioxins | 143 | | 0.159 | 3.26 | 1.58 | | 1 |
| Total Hexa-Dioxins | 11700 | | 0.406 | 3.26 | 1.27 | | 1 |
| Total Hepta-Dioxins | 182000 | | 35.4 | 35.4 | 1.05 | | 1 |
| Total Tetra-Furans | 122 | | 0.156 | 0.653 | 0.79 | | 1 |
| Total Penta-Furans | 3850 | | 0.0673 | 3.26 | 1.56 | | 1 |
| Total Hexa-Furans | 59700 | | 24.4 | 24.4 | 1.23 | | 1 |
| Total Hepta-Furans | 144000 | | 236 | 236 | 1.02 | | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 10:35 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-1 2-3.5' | **Units:** | Percent |
| **Lab Code:** | K1501100-001 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/18/15 18:09 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.355g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P234987 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P234981 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1302.966 | 65 | | 40-135 | 0.76 | 1.022 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1560.537 | 78 | | 40-135 | 1.60 | 1.192 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1169.346 | 58 | | 40-135 | 1.30 | 0.991 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1069.459 | 53 | | 40-135 | 1.29 | 0.994 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 799.030 | 40 | | 40-135 | 1.07 | 1.067 |
| 13C-OCDD | 4000 | 588.902 | 15 | **KY** | 40-135 | 1.11 | 1.143 |
| 13C-2,3,7,8-TCDF | 2000 | 1349.027 | 67 | | 40-135 | 0.80 | 0.993 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1517.144 | 76 | | 40-135 | 1.61 | 1.149 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1600.035 | 80 | | 40-135 | 1.62 | 1.182 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1151.253 | 58 | | 40-135 | 0.52 | 0.971 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1143.502 | 57 | | 40-135 | 0.53 | 0.974 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1285.181 | 64 | | 40-135 | 0.53 | 1.009 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1213.189 | 61 | | 40-135 | 0.53 | 0.988 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 861.217 | 43 | | 40-135 | 0.45 | 1.043 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1209.566 | 60 | | 40-135 | 0.45 | 1.080 |
| 37Cl-2,3,7,8-TCDD | 800 | 604.207 | 76 | | 40-135 | NA | 1.022 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 10:35 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-1 2-3.5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-001 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

**Analysis Method:** 8290
**Prep Method:** Method

### Toxicity Equivalency Quotient

| Analyte Name | Result | DL | MRL | Dilution Factor | TEF | TEF - Adjusted Concentration |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | **0.575** | 0.173 | 0.653 | 1 | 1 | 0.575 |
| 1,2,3,7,8-PeCDD | **17.9** | 0.159 | 3.26 | 1 | 1 | 17.9 |
| 1,2,3,4,7,8-HxCDD | **96.4** | 0.396 | 3.26 | 1 | 0.1 | 9.64 |
| 1,2,3,6,7,8-HxCDD | **4510** | 134 | 653 | 200 | 0.1 | 451 |
| 1,2,3,7,8,9-HxCDD | **292** | 0.395 | 3.26 | 1 | 0.1 | 29.2 |
| 1,2,3,4,6,7,8-HpCDD | **122000** | 379 | 653 | 200 | 0.01 | 1220 |
| OCDD | **3050000** | 933 | 1310 | 200 | 0.0003 | 915 |
| 2,3,7,8-TCDF | **41.3** | 0.156 | 0.653 | 1 | 0.1 | 4.13 |
| 1,2,3,7,8-PeCDF | **322** | 13.6 | 13.6 | 1 | 0.03 | 9.66 |
| 2,3,4,7,8-PeCDF | **697** | 13.4 | 13.4 | 1 | 0.3 | 209 |
| 1,2,3,4,7,8-HxCDF | **2230** | 291 | 653 | 200 | 0.1 | 223 |
| 1,2,3,6,7,8-HxCDF | **643** | 22.9 | 22.9 | 1 | 0.1 | 64.3 |
| 1,2,3,7,8,9-HxCDF | **1080** | 25.8 | 25.8 | 1 | 0.1 | 108 |
| 2,3,4,6,7,8-HxCDF | **1210** | 24.3 | 24.3 | 1 | 0.1 | 121 |
| 1,2,3,4,6,7,8-HpCDF | **39600** | 924 | 924 | 200 | 0.01 | 396 |
| 1,2,3,4,7,8,9-HpCDF | **3080** | 1240 | 1240 | 200 | 0.01 | 30.8 |
| OCDF | **479000** | 984 | 1310 | 200 | 0.0003 | 144 |
| | | Total TEQ | | | | 3950 |

2005 WHO TEFs, ND = 0

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 11:50 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-1 6.5-9' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-004 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/18/15 18:57 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.148g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P234988 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P234981 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | 0.247 | **JK** | 0.175 | 0.599 | 0.92 | 1.000 | 1 |
| 1,2,3,7,8-PeCDD | 5.77 | | 0.267 | 2.99 | 1.57 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDD | 74.2 | | 1.16 | 2.99 | 1.21 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 4620 | | 30.2 | 299 | 1.17 | 1.000 | 100 |
| 1,2,3,7,8,9-HxCDD | 497 | | 1.41 | 2.99 | 1.25 | 1.006 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 99200 | | 162 | 299 | 1.01 | 1.000 | 100 |
| OCDD | 762000 | | 127 | 599 | 0.88 | 1.000 | 100 |
| 2,3,7,8-TCDF | 0.529 | **J** | 0.162 | 0.599 | 0.85 | 1.001 | 1 |
| 1,2,3,7,8-PeCDF | 2.39 | **JK** | 1.62 | 2.99 | 1.24 | 1.001 | 1 |
| 2,3,4,7,8-PeCDF | 10.9 | | 1.62 | 2.99 | 1.61 | 1.002 | 1 |
| 1,2,3,4,7,8-HxCDF | 1040 | **P** | 1.67 | 2.99 | 1.25 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDF | 96.8 | | 1.11 | 2.99 | 1.21 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDF | 98.4 | | 0.959 | 2.99 | 1.40 | 1.001 | 1 |
| 2,3,4,6,7,8-HxCDF | 383 | | 0.928 | 2.99 | 1.23 | 1.000 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 24100 | | 78.9 | 299 | 1.02 | 1.000 | 100 |
| 1,2,3,4,7,8,9-HpCDF | 1260 | **K** | 107 | 299 | 0.77 | 1.000 | 100 |
| OCDF | 308000 | | 118 | 599 | 0.86 | 1.005 | 100 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 11:50 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-1 6.5-9' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-004 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/18/15 18:57 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.148g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P234988 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P234981 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | 8.98 | | 0.175 | 0.599 | 0.83 | | 1 |
| Total Penta-Dioxins | 45.0 | | 0.267 | 2.99 | 1.53 | | 1 |
| Total Hexa-Dioxins | 16900 | | 1.45 | 2.99 | 1.26 | | 1 |
| Total Hepta-Dioxins | 220000 | | 92.8 | 92.8 | 1.03 | | 1 |
| Total Tetra-Furans | 47.4 | | 0.162 | 0.599 | 0.75 | | 1 |
| Total Penta-Furans | 192 | | 0.165 | 2.99 | 1.56 | | 1 |
| Total Hexa-Furans | 6760 | | 113 | 113 | 1.26 | | 1 |
| Total Hepta-Furans | 167000 | | 46.8 | 46.8 | 1.00 | | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 11:50 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-1 6.5-9' | **Units:** | Percent |
| **Lab Code:** | K1501100-004 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/18/15 18:57 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.148g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P234988 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P234981 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1579.361 | 79 | | 40-135 | 0.78 | 1.021 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1710.656 | 86 | | 40-135 | 1.63 | 1.189 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1359.296 | 68 | | 40-135 | 1.27 | 0.991 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 820.287 | 41 | | 40-135 | 1.30 | 0.994 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 910.520 | 46 | | 40-135 | 1.08 | 1.067 |
| 13C-OCDD | 4000 | 1392.404 | 35 | **KY** | 40-135 | 1.09 | 1.144 |
| 13C-2,3,7,8-TCDF | 2000 | 1568.699 | 78 | | 40-135 | 0.81 | 0.993 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1668.356 | 83 | | 40-135 | 1.62 | 1.146 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1748.033 | 87 | | 40-135 | 1.62 | 1.178 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 875.850 | 44 | | 40-135 | 0.52 | 0.970 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1215.985 | 61 | | 40-135 | 0.53 | 0.974 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1462.419 | 73 | | 40-135 | 0.53 | 1.008 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1330.908 | 67 | | 40-135 | 0.53 | 0.988 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 1036.620 | 52 | | 40-135 | 0.48 | 1.042 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1057.542 | 53 | | 40-135 | 0.44 | 1.079 |
| 37Cl-2,3,7,8-TCDD | 800 | 697.173 | 87 | | 40-135 | NA | 1.022 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 11:50 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-1 6.5-9' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-004 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

**Analysis Method:** 8290
**Prep Method:** Method

**Toxicity Equivalency Quotient**

| Analyte Name | Result | DL | MRL | Dilution Factor | TEF | TEF - Adjusted Concentration |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | **0.247** | 0.175 | 0.599 | 1 | 1 | 0.247 |
| 1,2,3,7,8-PeCDD | **5.77** | 0.267 | 2.99 | 1 | 1 | 5.77 |
| 1,2,3,4,7,8-HxCDD | **74.2** | 1.16 | 2.99 | 1 | 0.1 | 7.42 |
| 1,2,3,6,7,8-HxCDD | **4620** | 30.2 | 299 | 100 | 0.1 | 462 |
| 1,2,3,7,8,9-HxCDD | **497** | 1.41 | 2.99 | 1 | 0.1 | 49.7 |
| 1,2,3,4,6,7,8-HpCDD | **99200** | 162 | 299 | 100 | 0.01 | 992 |
| OCDD | **762000** | 127 | 599 | 100 | 0.0003 | 229 |
| 2,3,7,8-TCDF | **0.529** | 0.162 | 0.599 | 1 | 0.1 | 0.0529 |
| 1,2,3,7,8-PeCDF | **2.39** | 1.62 | 2.99 | 1 | 0.03 | 0.0717 |
| 2,3,4,7,8-PeCDF | **10.9** | 1.62 | 2.99 | 1 | 0.3 | 3.27 |
| 1,2,3,4,7,8-HxCDF | **1040** | 1.67 | 2.99 | 1 | 0.1 | 104 |
| 1,2,3,6,7,8-HxCDF | **96.8** | 1.11 | 2.99 | 1 | 0.1 | 9.68 |
| 1,2,3,7,8,9-HxCDF | **98.4** | 0.959 | 2.99 | 1 | 0.1 | 9.84 |
| 2,3,4,6,7,8-HxCDF | **383** | 0.928 | 2.99 | 1 | 0.1 | 38.3 |
| 1,2,3,4,6,7,8-HpCDF | **24100** | 78.9 | 299 | 100 | 0.01 | 241 |
| 1,2,3,4,7,8,9-HpCDF | **1260** | 107 | 299 | 100 | 0.01 | 12.6 |
| OCDF | **308000** | 118 | 599 | 100 | 0.0003 | 92.4 |
| | | Total TEQ | | | | 2260 |

2005 WHO TEFs, ND = 0

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 12:00 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-1 9-10' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-005 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/18/15 19:45 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.073g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P234989 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P234981 |

### Native Analyte Results

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | ND | U | 0.307 | 0.594 | | | 1 |
| 1,2,3,7,8-PeCDD | ND | U | 0.773 | 2.97 | | | 1 |
| 1,2,3,4,7,8-HxCDD | 6.51 | | 3.40 | 3.40 | 1.20 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 329 | | 3.49 | 3.49 | 1.29 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 101 | | 3.30 | 3.30 | 1.27 | 1.007 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 27700 | | 69.9 | 148 | 1.04 | 1.000 | 50 |
| OCDD | 289000 | | 86.4 | 297 | 0.87 | 1.000 | 50 |
| 2,3,7,8-TCDF | ND | U | 0.280 | 0.594 | | | 1 |
| 1,2,3,7,8-PeCDF | ND | U | 1.07 | 2.97 | | | 1 |
| 2,3,4,7,8-PeCDF | ND | U | 1.07 | 2.97 | | | 1 |
| 1,2,3,4,7,8-HxCDF | 16.8 | | 1.46 | 2.97 | 1.22 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDF | ND | U | 1.31 | 2.97 | | | 1 |
| 1,2,3,7,8,9-HxCDF | ND | U | 1.44 | 2.97 | | | 1 |
| 2,3,4,6,7,8-HxCDF | 9.31 | | 1.43 | 2.97 | 1.21 | 1.000 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 1330 | | 25.2 | 25.2 | 1.02 | 1.000 | 1 |
| 1,2,3,4,7,8,9-HpCDF | 63.0 | | 25.8 | 25.8 | 1.02 | 1.000 | 1 |
| OCDF | 9780 | | 232 | 297 | 0.89 | 1.005 | 50 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 12:00 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-1 9-10' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-005 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/18/15 19:45 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.073g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P234989 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P234981 |

### Native Analyte Results

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | 2.15 | | 0.307 | 0.594 | 0.66 | | 1 |
| Total Penta-Dioxins | ND | U | 0.773 | 2.97 | | | 1 |
| Total Hexa-Dioxins | 1900 | | 3.40 | 3.40 | 1.27 | | 1 |
| Total Hepta-Dioxins | 48900 | | 15.2 | 15.2 | 1.06 | | 1 |
| Total Tetra-Furans | 1.06 | | 0.280 | 0.594 | 0.74 | | 1 |
| Total Penta-Furans | 13.0 | | 0.330 | 2.97 | 1.53 | | 1 |
| Total Hexa-Furans | 1020 | | 5.73 | 5.73 | 1.25 | | 1 |
| Total Hepta-Furans | 7430 | | 25.4 | 25.4 | 1.02 | | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 12:00 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-1 9-10' | **Units:** | Percent |
| **Lab Code:** | K1501100-005 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/18/15 19:45 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.073g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P234989 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P234981 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1155.129 | 58 | | 40-135 | 0.77 | 1.022 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1343.801 | 67 | | 40-135 | 1.61 | 1.192 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1078.917 | 54 | | 40-135 | 1.30 | 0.991 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 927.811 | 46 | | 40-135 | 1.26 | 0.993 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 832.971 | 42 | | 40-135 | 1.09 | 1.066 |
| 13C-OCDD | 4000 | 1021.020 | 26 | **Y** | 40-135 | 0.93 | 1.140 |
| 13C-2,3,7,8-TCDF | 2000 | 1230.318 | 62 | | 40-135 | 0.81 | 0.993 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1315.909 | 66 | | 40-135 | 1.64 | 1.149 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1339.975 | 67 | | 40-135 | 1.62 | 1.182 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 997.259 | 50 | | 40-135 | 0.53 | 0.970 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1017.538 | 51 | | 40-135 | 0.53 | 0.973 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1162.607 | 58 | | 40-135 | 0.53 | 1.008 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1061.535 | 53 | | 40-135 | 0.53 | 0.988 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 823.457 | 41 | | 40-135 | 0.44 | 1.042 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1106.433 | 55 | | 40-135 | 0.45 | 1.079 |
| 37Cl-2,3,7,8-TCDD | 800 | 560.717 | 70 | | 40-135 | NA | 1.023 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 12:00 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-1 9-10' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-005 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

**Analysis Method:** 8290
**Prep Method:** Method

### Toxicity Equivalency Quotient

| Analyte Name | Result | DL | MRL | Dilution Factor | TEF | TEF - Adjusted Concentration |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | ND | 0.307 | 0.594 | 1 | 1 | |
| 1,2,3,7,8-PeCDD | ND | 0.773 | 2.97 | 1 | 1 | |
| 1,2,3,4,7,8-HxCDD | **6.51** | 3.40 | 3.40 | 1 | 0.1 | 0.651 |
| 1,2,3,6,7,8-HxCDD | **329** | 3.49 | 3.49 | 1 | 0.1 | 32.9 |
| 1,2,3,7,8,9-HxCDD | **101** | 3.30 | 3.30 | 1 | 0.1 | 10.1 |
| 1,2,3,4,6,7,8-HpCDD | **27700** | 69.9 | 148 | 50 | 0.01 | 277 |
| OCDD | **289000** | 86.4 | 297 | 50 | 0.0003 | 86.7 |
| 2,3,7,8-TCDF | ND | 0.280 | 0.594 | 1 | 0.1 | |
| 1,2,3,7,8-PeCDF | ND | 1.07 | 2.97 | 1 | 0.03 | |
| 2,3,4,7,8-PeCDF | ND | 1.07 | 2.97 | 1 | 0.3 | |
| 1,2,3,4,7,8-HxCDF | **16.8** | 1.46 | 2.97 | 1 | 0.1 | 1.68 |
| 1,2,3,6,7,8-HxCDF | ND | 1.31 | 2.97 | 1 | 0.1 | |
| 1,2,3,7,8,9-HxCDF | ND | 1.44 | 2.97 | 1 | 0.1 | |
| 2,3,4,6,7,8-HxCDF | **9.31** | 1.43 | 2.97 | 1 | 0.1 | 0.931 |
| 1,2,3,4,6,7,8-HpCDF | **1330** | 25.2 | 25.2 | 1 | 0.01 | 13.3 |
| 1,2,3,4,7,8,9-HpCDF | **63.0** | 25.8 | 25.8 | 1 | 0.01 | 0.630 |
| OCDF | **9780** | 232 | 297 | 50 | 0.0003 | 2.93 |
| | | Total TEQ | | | | 427 |

2005 WHO TEFs, ND = 0

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 14:15 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-3 5-6.5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-006 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/18/15 20:34 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.164g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P234990 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P234981 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | 4.59 | | 0.993 | 2.59 | 0.73 | 1.000 | 1 |
| 1,2,3,7,8-PeCDD | 41.4 | | 4.01 | 12.9 | 1.68 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDD | 194 | | 27.8 | 27.8 | 1.25 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 1530 | | 29.4 | 29.4 | 1.26 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 336 | | 27.4 | 27.4 | 1.20 | 1.007 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 94900 | | 367 | 647 | 1.14 | 1.000 | 50 |
| OCDD | 1430000 | | 217 | 1290 | 0.89 | 1.000 | 50 |
| 2,3,7,8-TCDF | ND | U | 0.910 | 2.59 | | | 1 |
| 1,2,3,7,8-PeCDF | 6.09**JK** | | 3.55 | 12.9 | 1.89 | 1.001 | 1 |
| 2,3,4,7,8-PeCDF | 16.4**K** | | 3.48 | 12.9 | 1.31 | 1.002 | 1 |
| 1,2,3,4,7,8-HxCDF | 299**P** | | 4.77 | 12.9 | 1.16 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDF | ND | U | 4.57 | 12.9 | | | 1 |
| 1,2,3,7,8,9-HxCDF | ND | U | 5.28 | 12.9 | | | 1 |
| 2,3,4,6,7,8-HxCDF | 133 | | 4.61 | 12.9 | 1.27 | 1.001 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 23700 | | 375 | 647 | 0.95 | 1.000 | 50 |
| 1,2,3,4,7,8,9-HpCDF | 911 | | 193 | 193 | 1.02 | 1.000 | 1 |
| OCDF | 264000 | | 283 | 1290 | 0.89 | 1.005 | 50 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 14:15 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-3 5-6.5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-006 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/18/15 20:34 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.164g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P234990 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P234981 |

### Native Analyte Results

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | 120 | | 0.993 | 2.59 | 0.72 | | 1 |
| Total Penta-Dioxins | 930 | | 4.01 | 12.9 | 1.57 | | 1 |
| Total Hexa-Dioxins | 9830 | | 28.2 | 28.2 | 1.27 | | 1 |
| Total Hepta-Dioxins | 104000 | | 32.9 | 32.9 | 1.06 | | 1 |
| Total Tetra-Furans | 48.3 | | 0.910 | 2.59 | 0.82 | | 1 |
| Total Penta-Furans | 492 | | 1.86 | 12.9 | 1.58 | | 1 |
| Total Hexa-Furans | 14500 | | 48.9 | 48.9 | 1.26 | | 1 |
| Total Hepta-Furans | 92900 | | 182 | 182 | 1.03 | | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 14:15 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-3 5-6.5' | **Units:** | Percent |
| **Lab Code:** | K1501100-006 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/18/15 20:34 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.164g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P234990 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P234981 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1455.519 | 73 | | 40-135 | 0.78 | 1.022 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1702.421 | 85 | | 40-135 | 1.63 | 1.192 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1212.939 | 61 | | 40-135 | 1.35 | 0.991 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1110.451 | 56 | | 40-135 | 1.26 | 0.994 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1018.766 | 51 | | 40-135 | 1.06 | 1.067 |
| 13C-OCDD | 4000 | 1409.102 | 35 | **Y** | 40-135 | 0.95 | 1.141 |
| | | | | | | | |
| 13C-2,3,7,8-TCDF | 2000 | 1458.868 | 73 | | 40-135 | 0.81 | 0.993 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1641.294 | 82 | | 40-135 | 1.61 | 1.149 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1720.349 | 86 | | 40-135 | 1.62 | 1.182 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1187.748 | 59 | | 40-135 | 0.53 | 0.971 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1142.453 | 57 | | 40-135 | 0.52 | 0.974 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1273.306 | 64 | | 40-135 | 0.53 | 1.009 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1238.425 | 62 | | 40-135 | 0.53 | 0.988 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 1012.805 | 51 | | 40-135 | 0.45 | 1.042 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1269.955 | 63 | | 40-135 | 0.45 | 1.080 |
| | | | | | | | |
| 37Cl-2,3,7,8-TCDD | 800 | 704.025 | 88 | | 40-135 | NA | 1.022 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 14:15 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-3 5-6.5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-006 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

**Analysis Method:** 8290
**Prep Method:** Method

**Toxicity Equivalency Quotient**

| Analyte Name | Result | DL | MRL | Dilution Factor | TEF | TEF - Adjusted Concentration |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | **4.59** | 0.993 | 2.59 | 1 | 1 | 4.59 |
| 1,2,3,7,8-PeCDD | **41.4** | 4.01 | 12.9 | 1 | 1 | 41.4 |
| 1,2,3,4,7,8-HxCDD | **194** | 27.8 | 27.8 | 1 | 0.1 | 19.4 |
| 1,2,3,6,7,8-HxCDD | **1530** | 29.4 | 29.4 | 1 | 0.1 | 153 |
| 1,2,3,7,8,9-HxCDD | **336** | 27.4 | 27.4 | 1 | 0.1 | 33.6 |
| 1,2,3,4,6,7,8-HpCDD | **94900** | 367 | 647 | 50 | 0.01 | 949 |
| OCDD | **1430000** | 217 | 1290 | 50 | 0.0003 | 429 |
| 2,3,7,8-TCDF | ND | 0.910 | 2.59 | 1 | 0.1 | |
| 1,2,3,7,8-PeCDF | **6.09** | 3.55 | 12.9 | 1 | 0.03 | 0.183 |
| 2,3,4,7,8-PeCDF | **16.4** | 3.48 | 12.9 | 1 | 0.3 | 4.92 |
| 1,2,3,4,7,8-HxCDF | **299** | 4.77 | 12.9 | 1 | 0.1 | 29.9 |
| 1,2,3,6,7,8-HxCDF | ND | 4.57 | 12.9 | 1 | 0.1 | |
| 1,2,3,7,8,9-HxCDF | ND | 5.28 | 12.9 | 1 | 0.1 | |
| 2,3,4,6,7,8-HxCDF | **133** | 4.61 | 12.9 | 1 | 0.1 | 13.3 |
| 1,2,3,4,6,7,8-HpCDF | **23700** | 375 | 647 | 50 | 0.01 | 237 |
| 1,2,3,4,7,8,9-HpCDF | **911** | 193 | 193 | 1 | 0.01 | 9.11 |
| OCDF | **264000** | 283 | 1290 | 50 | 0.0003 | 79.2 |
| | | Total TEQ | | | | 2000 |

2005 WHO TEFs, ND = 0

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:40 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | C-3 5-6.5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-009 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/31/15 01:22 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.373g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235308 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235303 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | 2.04 | **JK** | 1.41 | 2.75 | 0.63 | 1.002 | 1 |
| 1,2,3,7,8-PeCDD | 104 | | 5.18 | 13.8 | 1.46 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDD | 501 | | 10.2 | 13.8 | 1.21 | 1.001 | 1 |
| 1,2,3,6,7,8-HxCDD | 18500 | | 1580 | 13800 | 1.25 | 1.000 | 1000 |
| 1,2,3,7,8,9-HxCDD | 1100 | | 9.50 | 13.8 | 1.27 | 1.007 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 382000 | | 2170 | 13800 | 1.04 | 1.000 | 1000 |
| OCDD | 4450000 | | 3440 | 27500 | 0.87 | 1.000 | 1000 |
| | | | | | | | |
| 2,3,7,8-TCDF | 327 | | 0.993 | 2.75 | 0.77 | 1.000 | 1 |
| 1,2,3,7,8-PeCDF | 2350 | | 18.2 | 18.2 | 1.55 | 1.000 | 1 |
| 2,3,4,7,8-PeCDF | 4770 | | 18.1 | 18.1 | 1.56 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDF | 20500 | | 1810 | 13800 | 1.16 | 1.000 | 1000 |
| 1,2,3,6,7,8-HxCDF | 4370 | | 40.4 | 40.4 | 1.21 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDF | 7660 | | 41.4 | 41.4 | 1.23 | 1.001 | 1 |
| 2,3,4,6,7,8-HxCDF | 6410 | | 42.6 | 42.6 | 1.23 | 1.000 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 171000 | | 2240 | 13800 | 1.00 | 1.000 | 1000 |
| 1,2,3,4,7,8,9-HpCDF | 16900 | | 2930 | 13800 | 1.02 | 1.000 | 1000 |
| OCDF | 1290000 | | 9340 | 27500 | 0.91 | 1.005 | 1000 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:40 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | C-3 5-6.5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-009 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/31/15 01:22 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.373g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235308 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235303 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | 291 | | 1.41 | 2.75 | 0.78 | | 1 |
| Total Penta-Dioxins | 2850 | | 5.18 | 13.8 | 1.61 | | 1 |
| Total Hexa-Dioxins | 48200 | | 9.78 | 13.8 | 1.27 | | 1 |
| Total Hepta-Dioxins | 651000 | | 147 | 147 | 1.05 | | 1 |
| Total Tetra-Furans | 1590 | | 0.993 | 2.75 | 0.74 | | 1 |
| Total Penta-Furans | 27900 | | 0.615 | 13.8 | 1.57 | | 1 |
| Total Hexa-Furans | 116000 | | 41.4 | 41.4 | 1.23 | | 1 |
| Total Hepta-Furans | 212000 | | 87.9 | 87.9 | 1.03 | | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:40 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | C-3 5-6.5' | **Units:** | Percent |
| **Lab Code:** | K1501100-009 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/31/15 01:22 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.373g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235308 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235303 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1624.133 | 81 | | 40-135 | 0.77 | 1.023 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1764.872 | 88 | | 40-135 | 1.60 | 1.198 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1383.623 | 69 | | 40-135 | 1.34 | 0.990 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1389.870 | 69 | | 40-135 | 1.30 | 0.993 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1245.596 | 62 | | 40-135 | 1.07 | 1.067 |
| 13C-OCDD | 4000 | 1189.436 | 30 | **KY** | 40-135 | 1.03 | 1.142 |
| | | | | | | | |
| 13C-2,3,7,8-TCDF | 2000 | 1659.535 | 83 | | 40-135 | 0.80 | 0.993 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1720.218 | 86 | | 40-135 | 1.64 | 1.154 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1747.664 | 87 | | 40-135 | 1.64 | 1.188 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1410.426 | 71 | | 40-135 | 0.53 | 0.970 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1309.683 | 65 | | 40-135 | 0.54 | 0.973 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1499.453 | 75 | | 40-135 | 0.53 | 1.008 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1380.432 | 69 | | 40-135 | 0.52 | 0.987 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 1436.512 | 72 | | 40-135 | 0.45 | 1.043 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1473.776 | 74 | | 40-135 | 0.45 | 1.079 |
| | | | | | | | |
| 37Cl-2,3,7,8-TCDD | 800 | 712.714 | 89 | | 40-135 | NA | 1.024 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:40 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | C-3 5-6.5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-009 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

**Analysis Method:** 8290
**Prep Method:** Method

**Toxicity Equivalency Quotient**

| Analyte Name | Result | DL | MRL | Dilution Factor | TEF | TEF - Adjusted Concentration |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | **2.04** | 1.41 | 2.75 | 1 | 1 | 2.04 |
| 1,2,3,7,8-PeCDD | **104** | 5.18 | 13.8 | 1 | 1 | 104 |
| 1,2,3,4,7,8-HxCDD | **501** | 10.2 | 13.8 | 1 | 0.1 | 50.1 |
| 1,2,3,6,7,8-HxCDD | **18500** | 1580 | 13800 | 1000 | 0.1 | 1850 |
| 1,2,3,7,8,9-HxCDD | **1100** | 9.50 | 13.8 | 1 | 0.1 | 110 |
| 1,2,3,4,6,7,8-HpCDD | **382000** | 2170 | 13800 | 1000 | 0.01 | 3820 |
| OCDD | **4450000** | 3440 | 27500 | 1000 | 0.0003 | 1340 |
| 2,3,7,8-TCDF | **327** | 0.993 | 2.75 | 1 | 0.1 | 32.7 |
| 1,2,3,7,8-PeCDF | **2350** | 18.2 | 18.2 | 1 | 0.03 | 70.5 |
| 2,3,4,7,8-PeCDF | **4770** | 18.1 | 18.1 | 1 | 0.3 | 1430 |
| 1,2,3,4,7,8-HxCDF | **20500** | 1810 | 13800 | 1000 | 0.1 | 2050 |
| 1,2,3,6,7,8-HxCDF | **4370** | 40.4 | 40.4 | 1 | 0.1 | 437 |
| 1,2,3,7,8,9-HxCDF | **7660** | 41.4 | 41.4 | 1 | 0.1 | 766 |
| 2,3,4,6,7,8-HxCDF | **6410** | 42.6 | 42.6 | 1 | 0.1 | 641 |
| 1,2,3,4,6,7,8-HpCDF | **171000** | 2240 | 13800 | 1000 | 0.01 | 1710 |
| 1,2,3,4,7,8,9-HpCDF | **16900** | 2930 | 13800 | 1000 | 0.01 | 169 |
| OCDF | **1290000** | 9340 | 27500 | 1000 | 0.0003 | 387 |
| | | Total TEQ | | | | 15000 |

2005 WHO TEFs, ND = 0

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 11:05 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | D-1 2-3.5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-012 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/31/15 02:10 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.006g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235309 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235303 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | 1.88 | **K** | 0.289 | 0.593 | 0.64 | 1.001 | 1 |
| 1,2,3,7,8-PeCDD | 32.0 | | 0.566 | 2.97 | 1.58 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDD | 171 | | 1.94 | 2.97 | 1.23 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 2180 | | 2.04 | 2.97 | 1.26 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 359 | | 1.91 | 2.97 | 1.31 | 1.008 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 52000 | | 690 | 2970 | 1.08 | 1.000 | 1000 |
| OCDD | 684000 | | 661 | 5930 | 0.88 | 1.000 | 1000 |
| 2,3,7,8-TCDF | 5.36 | | 0.511 | 0.593 | 0.72 | 1.001 | 1 |
| 1,2,3,7,8-PeCDF | 25.7 | | 4.06 | 4.06 | 1.59 | 1.000 | 1 |
| 2,3,4,7,8-PeCDF | 138 | | 4.13 | 4.13 | 1.55 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDF | 1000 | | 31.7 | 31.7 | 1.21 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDF | 195 | | 31.7 | 31.7 | 1.19 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDF | 101 | | 38.0 | 38.0 | 1.28 | 1.000 | 1 |
| 2,3,4,6,7,8-HxCDF | 328 | | 34.9 | 34.9 | 1.27 | 1.000 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 22700 | | 302 | 2970 | 1.11 | 1.000 | 1000 |
| 1,2,3,4,7,8,9-HpCDF | 2020 | | 11.1 | 11.1 | 1.04 | 1.000 | 1 |
| OCDF | 180000 | | 960 | 5930 | 0.84 | 1.005 | 1000 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 11:05 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | D-1 2-3.5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-012 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/31/15 02:10 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.006g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235309 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235303 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | 43.2 | | 0.289 | 0.593 | 0.73 | | 1 |
| Total Penta-Dioxins | 228 | | 0.566 | 2.97 | 1.64 | | 1 |
| Total Hexa-Dioxins | 8650 | | 1.96 | 2.97 | 1.26 | | 1 |
| Total Hepta-Dioxins | 116000 | | 41.5 | 41.5 | 1.06 | | 1 |
| Total Tetra-Furans | 57.6 | | 0.511 | 0.593 | 0.77 | | 1 |
| Total Penta-Furans | 835 | | 0.302 | 2.97 | 1.62 | | 1 |
| Total Hexa-Furans | 6370 | | 33.7 | 33.7 | 1.23 | | 1 |
| Total Hepta-Furans | 32800 | | 10.5 | 10.5 | 1.04 | | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 11:05 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | D-1 2-3.5' | **Units:** | Percent |
| **Lab Code:** | K1501100-012 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/31/15 02:10 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.006g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235309 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235303 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1582.231 | 79 | | 40-135 | 0.77 | 1.023 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1923.341 | 96 | | 40-135 | 1.64 | 1.198 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1443.161 | 72 | | 40-135 | 1.31 | 0.990 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1314.350 | 66 | | 40-135 | 1.29 | 0.993 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1524.101 | 76 | | 40-135 | 1.01 | 1.064 |
| 13C-OCDD | 4000 | 2008.429 | 50 | | 40-135 | 0.99 | 1.138 |
| 13C-2,3,7,8-TCDF | 2000 | 1566.419 | 78 | | 40-135 | 0.80 | 0.993 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1906.971 | 95 | | 40-135 | 1.63 | 1.154 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1934.127 | 97 | | 40-135 | 1.63 | 1.188 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1449.428 | 72 | | 40-135 | 0.52 | 0.968 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1342.441 | 67 | | 40-135 | 0.52 | 0.971 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1026.328 | 51 | | 40-135 | 0.50 | 1.007 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1476.336 | 74 | | 40-135 | 0.53 | 0.986 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 1352.791 | 68 | | 40-135 | 0.43 | 1.040 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1582.332 | 79 | | 40-135 | 0.44 | 1.076 |
| 37Cl-2,3,7,8-TCDD | 800 | 692.202 | 87 | | 40-135 | NA | 1.024 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 11:05 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | D-1 2-3.5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-012 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

**Analysis Method:** 8290
**Prep Method:** Method

### Toxicity Equivalency Quotient

| Analyte Name | Result | DL | MRL | Dilution Factor | TEF | TEF - Adjusted Concentration |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | **1.88** | 0.289 | 0.593 | 1 | 1 | 1.88 |
| 1,2,3,7,8-PeCDD | **32.0** | 0.566 | 2.97 | 1 | 1 | 32.0 |
| 1,2,3,4,7,8-HxCDD | **171** | 1.94 | 2.97 | 1 | 0.1 | 17.1 |
| 1,2,3,6,7,8-HxCDD | **2180** | 2.04 | 2.97 | 1 | 0.1 | 218 |
| 1,2,3,7,8,9-HxCDD | **359** | 1.91 | 2.97 | 1 | 0.1 | 35.9 |
| 1,2,3,4,6,7,8-HpCDD | **52000** | 690 | 2970 | 1000 | 0.01 | 520 |
| OCDD | **684000** | 661 | 5930 | 1000 | 0.0003 | 205 |
| 2,3,7,8-TCDF | **5.36** | 0.511 | 0.593 | 1 | 0.1 | 0.536 |
| 1,2,3,7,8-PeCDF | **25.7** | 4.06 | 4.06 | 1 | 0.03 | 0.771 |
| 2,3,4,7,8-PeCDF | **138** | 4.13 | 4.13 | 1 | 0.3 | 41.4 |
| 1,2,3,4,7,8-HxCDF | **1000** | 31.7 | 31.7 | 1 | 0.1 | 100 |
| 1,2,3,6,7,8-HxCDF | **195** | 31.7 | 31.7 | 1 | 0.1 | 19.5 |
| 1,2,3,7,8,9-HxCDF | **101** | 38.0 | 38.0 | 1 | 0.1 | 10.1 |
| 2,3,4,6,7,8-HxCDF | **328** | 34.9 | 34.9 | 1 | 0.1 | 32.8 |
| 1,2,3,4,6,7,8-HpCDF | **22700** | 302 | 2970 | 1000 | 0.01 | 227 |
| 1,2,3,4,7,8,9-HpCDF | **2020** | 11.1 | 11.1 | 1 | 0.01 | 20.2 |
| OCDF | **180000** | 960 | 5930 | 1000 | 0.0003 | 54.0 |
| | | Total TEQ | | | | 1540 |

2005 WHO TEFs, ND = 0

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:00 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | E-4 5-6.5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-015 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/31/15 02:58 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.094g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235310 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235303 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | 3.80**K** | | 2.11 | 3.00 | 1.25 | 1.001 | 1 |
| 1,2,3,7,8-PeCDD | 55.3 | | 4.24 | 15.0 | 1.46 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDD | 275 | | 14.7 | 15.0 | 1.27 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 1050 | | 15.1 | 15.1 | 1.21 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 407 | | 14.3 | 15.0 | 1.35 | 1.007 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 55100 | | 1890 | 15000 | 0.94 | 1.001 | 1000 |
| OCDD | 397000 | | 5390 | 30000 | 0.80 | 1.000 | 1000 |
| 2,3,7,8-TCDF | ND | U | 2.91 | 3.00 | | | 1 |
| 1,2,3,7,8-PeCDF | 34.1 | | 8.35 | 15.0 | 1.43 | 1.001 | 1 |
| 2,3,4,7,8-PeCDF | 75.2 | | 9.15 | 15.0 | 1.67 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDF | 316 | | 28.6 | 28.6 | 1.22 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDF | 81.5 | | 28.2 | 28.2 | 1.32 | 1.001 | 1 |
| 1,2,3,7,8,9-HxCDF | 85.2 | | 51.1 | 51.1 | 1.13 | 1.000 | 1 |
| 2,3,4,6,7,8-HxCDF | 141 | | 33.0 | 33.0 | 1.20 | 0.999 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 7290 | | 20.6 | 20.6 | 1.04 | 1.000 | 1 |
| 1,2,3,4,7,8,9-HpCDF | 422 | | 21.4 | 21.4 | 1.02 | 1.000 | 1 |
| OCDF | 29300**JK** | | 4850 | 30000 | 0.55 | 1.005 | 1000 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:00 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | E-4 5-6.5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-015 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/31/15 02:58 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.094g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235310 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235303 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | 66.7 | | 2.11 | 3.00 | 0.65 | | 1 |
| Total Penta-Dioxins | 1050 | | 4.24 | 15.0 | 1.61 | | 1 |
| Total Hexa-Dioxins | 26200 | | 14.7 | 15.0 | 1.28 | | 1 |
| Total Hepta-Dioxins | 253000 | | 159 | 159 | 1.05 | | 1 |
| Total Tetra-Furans | 33.9 | | 2.91 | 3.00 | 0.87 | | 1 |
| Total Penta-Furans | 520 | | 1.69 | 15.0 | 1.54 | | 1 |
| Total Hexa-Furans | 8790 | | 32.3 | 32.3 | 1.27 | | 1 |
| Total Hepta-Furans | 34200 | | 20.9 | 20.9 | 1.04 | | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:00 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | E-4 5-6.5' | **Units:** | Percent |
| **Lab Code:** | K1501100-015 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/31/15 02:58 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.094g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235310 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235303 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1407.233 | 70 | | 40-135 | 0.77 | 1.024 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1553.250 | 78 | | 40-135 | 1.66 | 1.196 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1186.603 | 59 | | 40-135 | 1.25 | 0.990 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1111.705 | 56 | | 40-135 | 1.28 | 0.993 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1144.219 | 57 | | 40-135 | 1.06 | 1.061 |
| 13C-OCDD | 4000 | 1987.432 | 50 | | 40-135 | 0.94 | 1.134 |
| | | | | | | | |
| 13C-2,3,7,8-TCDF | 2000 | 1385.120 | 69 | | 40-135 | 0.82 | 0.993 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1527.818 | 76 | | 40-135 | 1.65 | 1.152 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1595.961 | 80 | | 40-135 | 1.61 | 1.187 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1155.271 | 58 | | 40-135 | 0.53 | 0.967 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1079.984 | 54 | | 40-135 | 0.52 | 0.970 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 505.045 | 25 | **Y** | 40-135 | 0.51 | 1.006 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1118.549 | 56 | | 40-135 | 0.51 | 0.987 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 1024.724 | 51 | | 40-135 | 0.45 | 1.037 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1311.199 | 66 | | 40-135 | 0.43 | 1.073 |
| | | | | | | | |
| 37Cl-2,3,7,8-TCDD | 800 | 639.617 | 80 | | 40-135 | NA | 1.024 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:00 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | E-4 5-6.5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-015 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

**Analysis Method:** 8290
**Prep Method:** Method

### Toxicity Equivalency Quotient

| Analyte Name | Result | DL | MRL | Dilution Factor | TEF | TEF - Adjusted Concentration |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | **3.80** | 2.11 | 3.00 | 1 | 1 | 3.80 |
| 1,2,3,7,8-PeCDD | **55.3** | 4.24 | 15.0 | 1 | 1 | 55.3 |
| 1,2,3,4,7,8-HxCDD | **275** | 14.7 | 15.0 | 1 | 0.1 | 27.5 |
| 1,2,3,6,7,8-HxCDD | **1050** | 15.1 | 15.1 | 1 | 0.1 | 105 |
| 1,2,3,7,8,9-HxCDD | **407** | 14.3 | 15.0 | 1 | 0.1 | 40.7 |
| 1,2,3,4,6,7,8-HpCDD | **55100** | 1890 | 15000 | 1000 | 0.01 | 551 |
| OCDD | **397000** | 5390 | 30000 | 1000 | 0.0003 | 119 |
| 2,3,7,8-TCDF | ND | 2.91 | 3.00 | 1 | 0.1 | |
| 1,2,3,7,8-PeCDF | **34.1** | 8.35 | 15.0 | 1 | 0.03 | 1.02 |
| 2,3,4,7,8-PeCDF | **75.2** | 9.15 | 15.0 | 1 | 0.3 | 22.6 |
| 1,2,3,4,7,8-HxCDF | **316** | 28.6 | 28.6 | 1 | 0.1 | 31.6 |
| 1,2,3,6,7,8-HxCDF | **81.5** | 28.2 | 28.2 | 1 | 0.1 | 8.15 |
| 1,2,3,7,8,9-HxCDF | **85.2** | 51.1 | 51.1 | 1 | 0.1 | 8.52 |
| 2,3,4,6,7,8-HxCDF | **141** | 33.0 | 33.0 | 1 | 0.1 | 14.1 |
| 1,2,3,4,6,7,8-HpCDF | **7290** | 20.6 | 20.6 | 1 | 0.01 | 72.9 |
| 1,2,3,4,7,8,9-HpCDF | **422** | 21.4 | 21.4 | 1 | 0.01 | 4.22 |
| OCDF | **29300** | 4850 | 30000 | 1000 | 0.0003 | 8.79 |
| | | Total TEQ | | | | 1070 |

2005 WHO TEFs, ND = 0

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:05 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | E-4 6.5-9' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-016 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/31/15 00:33 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.272g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235307 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235303 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | 47.2 | | 0.475 | 1.48 | 0.73 | 1.001 | 1 |
| 1,2,3,7,8-PeCDD | 124 | | 0.328 | 7.40 | 1.54 | 1.000 | 1 |
| 1,2,3,4,7,8-HxCDD | 31.6 | | 2.59 | 7.40 | 1.43 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 279 | | 2.40 | 7.40 | 1.23 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 54.1 | | 2.39 | 7.40 | 1.16 | 1.007 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 22500 | | 539 | 740 | 1.10 | 1.000 | 100 |
| OCDD | 134000 | | 120 | 1480 | 0.94 | 1.000 | 100 |
| 2,3,7,8-TCDF | 40.7 | | 0.353 | 1.48 | 0.77 | 1.000 | 1 |
| 1,2,3,7,8-PeCDF | 123 | | 0.190 | 7.40 | 1.55 | 1.001 | 1 |
| 2,3,4,7,8-PeCDF | 2.66**J** | | 0.219 | 7.40 | 1.55 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDF | 21.7 | | 2.25 | 7.40 | 1.21 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDF | 72.7 | | 2.17 | 7.40 | 1.24 | 1.001 | 1 |
| 1,2,3,7,8,9-HxCDF | ND | U | 4.22 | 7.40 | | | 1 |
| 2,3,4,6,7,8-HxCDF | 9.92 | | 2.53 | 7.40 | 1.32 | 0.999 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 1350 | | 2.65 | 7.40 | 1.04 | 1.000 | 1 |
| 1,2,3,4,7,8,9-HpCDF | 67.9 | | 3.31 | 7.40 | 0.94 | 1.000 | 1 |
| OCDF | 9360 | | 0.372 | 14.8 | 0.89 | 1.005 | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:05 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | E-4 6.5-9' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-016 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/31/15 00:33 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.272g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235307 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235303 |

### Native Analyte Results

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | 47.2 | | 0.475 | 1.48 | 0.73 | | 1 |
| Total Penta-Dioxins | 198 | | 0.328 | 7.40 | 1.62 | | 1 |
| Total Hexa-Dioxins | 6940 | | 2.46 | 7.40 | 1.28 | | 1 |
| Total Hepta-Dioxins | 88200 | | 31.6 | 31.6 | 1.05 | | 1 |
| Total Tetra-Furans | 41.1 | | 0.353 | 1.48 | 0.75 | | 1 |
| Total Penta-Furans | 131 | | 0.195 | 7.40 | 1.48 | | 1 |
| Total Hexa-Furans | 1320 | | 2.50 | 7.40 | 1.29 | | 1 |
| Total Hepta-Furans | 7500 | | 2.95 | 7.40 | 1.04 | | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:05 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | E-4 6.5-9' | **Units:** | Percent |
| **Lab Code:** | K1501100-016 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/31/15 00:33 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.272g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235307 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235303 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1767.852 | 88 | | 40-135 | 0.78 | 1.024 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1529.612 | 76 | | 40-135 | 1.58 | 1.197 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1250.877 | 63 | | 40-135 | 1.28 | 0.991 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1217.628 | 61 | | 40-135 | 1.30 | 0.993 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1156.034 | 58 | | 40-135 | 1.07 | 1.060 |
| 13C-OCDD | 4000 | 2341.785 | 59 | | 40-135 | 0.93 | 1.133 |
| | | | | | | | |
| 13C-2,3,7,8-TCDF | 2000 | 1603.497 | 80 | | 40-135 | 0.80 | 0.995 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1548.821 | 77 | | 40-135 | 1.60 | 1.152 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1613.543 | 81 | | 40-135 | 1.60 | 1.187 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1159.455 | 58 | | 40-135 | 0.52 | 0.967 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1078.066 | 54 | | 40-135 | 0.53 | 0.970 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 434.459 | 22 | **Y** | 40-135 | 0.53 | 1.006 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1065.502 | 53 | | 40-135 | 0.53 | 0.987 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 1181.053 | 59 | | 40-135 | 0.44 | 1.036 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1259.437 | 63 | | 40-135 | 0.43 | 1.072 |
| | | | | | | | |
| 37Cl-2,3,7,8-TCDD | 800 | 645.327 | 81 | | 40-135 | NA | 1.025 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:05 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | E-4 6.5-9' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-016 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

**Analysis Method:** 8290
**Prep Method:** Method

**Toxicity Equivalency Quotient**

| Analyte Name | Result | DL | MRL | Dilution Factor | TEF | TEF - Adjusted Concentration |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | **47.2** | 0.475 | 1.48 | 1 | 1 | 47.2 |
| 1,2,3,7,8-PeCDD | **124** | 0.328 | 7.40 | 1 | 1 | 124 |
| 1,2,3,4,7,8-HxCDD | **31.6** | 2.59 | 7.40 | 1 | 0.1 | 3.16 |
| 1,2,3,6,7,8-HxCDD | **279** | 2.40 | 7.40 | 1 | 0.1 | 27.9 |
| 1,2,3,7,8,9-HxCDD | **54.1** | 2.39 | 7.40 | 1 | 0.1 | 5.41 |
| 1,2,3,4,6,7,8-HpCDD | **22500** | 539 | 740 | 100 | 0.01 | 225 |
| OCDD | **134000** | 120 | 1480 | 100 | 0.0003 | 40.2 |
| 2,3,7,8-TCDF | **40.7** | 0.353 | 1.48 | 1 | 0.1 | 4.07 |
| 1,2,3,7,8-PeCDF | **123** | 0.190 | 7.40 | 1 | 0.03 | 3.69 |
| 2,3,4,7,8-PeCDF | **2.66** | 0.219 | 7.40 | 1 | 0.3 | 0.798 |
| 1,2,3,4,7,8-HxCDF | **21.7** | 2.25 | 7.40 | 1 | 0.1 | 2.17 |
| 1,2,3,6,7,8-HxCDF | **72.7** | 2.17 | 7.40 | 1 | 0.1 | 7.27 |
| 1,2,3,7,8,9-HxCDF | ND | 4.22 | 7.40 | 1 | 0.1 | |
| 2,3,4,6,7,8-HxCDF | **9.92** | 2.53 | 7.40 | 1 | 0.1 | 0.992 |
| 1,2,3,4,6,7,8-HpCDF | **1350** | 2.65 | 7.40 | 1 | 0.01 | 13.5 |
| 1,2,3,4,7,8,9-HpCDF | **67.9** | 3.31 | 7.40 | 1 | 0.01 | 0.679 |
| OCDF | **9360** | 0.372 | 14.8 | 1 | 0.0003 | 2.81 |
| | | Total TEQ | | | | 509 |

2005 WHO TEFs, ND = 0

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:10 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | E-4 9-10' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-017 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/31/15 04:35 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.206g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235312 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235303 |

### Native Analyte Results

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | ND | U | 1.47 | 1.47 | | | 1 |
| 1,2,3,7,8-PeCDD | 35.9**K** | | 3.76 | 6.00 | 1.16 | 1.002 | 1 |
| 1,2,3,4,7,8-HxCDD | 184 | | 37.1 | 37.1 | 1.22 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 2050 | | 47.9 | 47.9 | 1.26 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 168 | | 40.0 | 40.0 | 1.30 | 1.005 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 232000 | | 2510 | 30000 | 0.94 | 1.000 | 5000 |
| OCDD | 2220000 | | 2650 | 60000 | 0.86 | 1.000 | 5000 |
| 2,3,7,8-TCDF | ND | U | 1.17 | 1.20 | | | 1 |
| 1,2,3,7,8-PeCDF | 1.66**JK** | | 0.856 | 6.00 | 1.04 | 1.001 | 1 |
| 2,3,4,7,8-PeCDF | ND | U | 3.02 | 6.00 | | | 1 |
| 1,2,3,4,7,8-HxCDF | 170 | | 9.40 | 9.40 | 1.23 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDF | 30.3 | | 9.46 | 9.46 | 1.31 | 1.001 | 1 |
| 1,2,3,7,8,9-HxCDF | ND | U | 31.5 | 31.5 | | | 1 |
| 2,3,4,6,7,8-HxCDF | 64.8 | | 15.2 | 15.2 | 1.15 | 0.999 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 12400**J** | | 981 | 30000 | 1.15 | 1.000 | 5000 |
| 1,2,3,4,7,8,9-HpCDF | 533 | | 12.8 | 12.8 | 1.06 | 1.000 | 1 |
| OCDF | 91700 | | 3090 | 60000 | 0.77 | 1.005 | 5000 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:10 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | E-4 9-10' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-017 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/31/15 04:35 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.206g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235312 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235303 |

### Native Analyte Results

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | ND | U | 1.47 | 1.47 | | | 1 |
| Total Penta-Dioxins | 470 | | 3.76 | 6.00 | 1.62 | | 1 |
| Total Hexa-Dioxins | 164000 | | 41.1 | 41.1 | 1.24 | | 1 |
| Total Hepta-Dioxins | 810000 | | 299 | 299 | 1.03 | | 1 |
| Total Tetra-Furans | 2.29 | | 1.17 | 1.20 | 0.71 | | 1 |
| Total Penta-Furans | 21.8 | | 1.06 | 6.00 | 1.56 | | 1 |
| Total Hexa-Furans | 10400 | | 11.9 | 11.9 | 1.24 | | 1 |
| Total Hepta-Furans | 59000 | | 12.8 | 12.8 | 1.02 | | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:10 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | E-4 9-10' | **Units:** | Percent |
| **Lab Code:** | K1501100-017 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/31/15 04:35 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.206g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235312 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235303 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1620.044 | 81 | | 40-135 | 0.75 | 1.032 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1679.437 | 84 | | 40-135 | 1.61 | 1.193 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 2562.847 | 128 | | 40-135 | 1.22 | 0.993 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1740.957 | 87 | | 40-135 | 1.33 | 0.995 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 3226.544 | 161 | **Y** | 40-135 | 1.10 | 1.050 |
| 13C-OCDD | 4000 | 7840.595 | 196 | **Y** | 40-135 | 0.96 | 1.123 |
| 13C-2,3,7,8-TCDF | 2000 | 1557.485 | 78 | | 40-135 | 0.78 | 1.001 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1369.333 | 68 | | 40-135 | 1.62 | 1.151 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1375.329 | 69 | | 40-135 | 1.65 | 1.182 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 5672.022 | 284 | **Y** | 40-135 | 0.50 | 0.974 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 5069.427 | 253 | **Y** | 40-135 | 0.53 | 0.978 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 996.476 | 50 | | 40-135 | 0.51 | 1.004 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 2615.138 | 131 | | 40-135 | 0.53 | 0.992 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 4276.117 | 214 | **Y** | 40-135 | 0.45 | 1.028 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 5157.015 | 258 | **Y** | 40-135 | 0.45 | 1.062 |
| 37Cl-2,3,7,8-TCDD | 800 | 699.922 | 87 | | 40-135 | NA | 1.033 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:10 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | E-4 9-10' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-017 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

**Analysis Method:** 8290
**Prep Method:** Method

**Toxicity Equivalency Quotient**

| Analyte Name | Result | DL | MRL | Dilution Factor | TEF | TEF - Adjusted Concentration |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | ND | 1.47 | 1.47 | 1 | 1 | |
| 1,2,3,7,8-PeCDD | **35.9** | 3.76 | 6.00 | 1 | 1 | 35.9 |
| 1,2,3,4,7,8-HxCDD | **184** | 37.1 | 37.1 | 1 | 0.1 | 18.4 |
| 1,2,3,6,7,8-HxCDD | **2050** | 47.9 | 47.9 | 1 | 0.1 | 205 |
| 1,2,3,7,8,9-HxCDD | **168** | 40.0 | 40.0 | 1 | 0.1 | 16.8 |
| 1,2,3,4,6,7,8-HpCDD | **232000** | 2510 | 30000 | 5000 | 0.01 | 2320 |
| OCDD | **2220000** | 2650 | 60000 | 5000 | 0.0003 | 666 |
| 2,3,7,8-TCDF | ND | 1.17 | 1.20 | 1 | 0.1 | |
| 1,2,3,7,8-PeCDF | **1.66** | 0.856 | 6.00 | 1 | 0.03 | 0.0498 |
| 2,3,4,7,8-PeCDF | ND | 3.02 | 6.00 | 1 | 0.3 | |
| 1,2,3,4,7,8-HxCDF | **170** | 9.40 | 9.40 | 1 | 0.1 | 17.0 |
| 1,2,3,6,7,8-HxCDF | **30.3** | 9.46 | 9.46 | 1 | 0.1 | 3.03 |
| 1,2,3,7,8,9-HxCDF | ND | 31.5 | 31.5 | 1 | 0.1 | |
| 2,3,4,6,7,8-HxCDF | **64.8** | 15.2 | 15.2 | 1 | 0.1 | 6.48 |
| 1,2,3,4,6,7,8-HpCDF | **12400** | 981 | 30000 | 5000 | 0.01 | 124 |
| 1,2,3,4,7,8,9-HpCDF | **533** | 12.8 | 12.8 | 1 | 0.01 | 5.33 |
| OCDF | **91700** | 3090 | 60000 | 5000 | 0.0003 | 27.5 |
| | | Total TEQ | | | | 3450 |

2005 WHO TEFs, ND = 0

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 12:25 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | F-3 4-5.5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-018 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/31/15 03:46 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.143g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235311 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235303 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | 26.5 | | 1.36 | 1.91 | 0.75 | 1.002 | 1 |
| 1,2,3,7,8-PeCDD | 190 | | 5.93 | 9.55 | 1.47 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDD | 547 | | 11.8 | 11.8 | 1.28 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 2440 | | 12.3 | 12.3 | 1.29 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 800 | | 11.5 | 11.5 | 1.30 | 1.006 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 72000 | | 1870 | 9550 | 1.01 | 1.000 | 1000 |
| OCDD | 602000 | | 1710 | 19100 | 0.94 | 1.000 | 1000 |
| 2,3,7,8-TCDF | 28.9 | **K** | 1.62 | 1.91 | 0.94 | 1.001 | 1 |
| 1,2,3,7,8-PeCDF | 88.3 | | 8.57 | 9.55 | 1.40 | 1.000 | 1 |
| 2,3,4,7,8-PeCDF | 237 | | 9.79 | 9.79 | 1.52 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDF | 847 | | 28.0 | 28.0 | 1.23 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDF | 290 | | 27.1 | 27.1 | 1.26 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDF | 258 | | 57.8 | 57.8 | 1.26 | 1.000 | 1 |
| 2,3,4,6,7,8-HxCDF | 186 | **K** | 27.3 | 27.3 | 1.47 | 1.000 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 17800 | | 430 | 9550 | 0.99 | 1.000 | 1000 |
| 1,2,3,4,7,8,9-HpCDF | 1270 | | 30.2 | 30.2 | 1.03 | 1.000 | 1 |
| OCDF | 91300 | | 2310 | 19100 | 0.80 | 1.005 | 1000 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 12:25 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | F-3 4-5.5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-018 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/31/15 03:46 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.143g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235311 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235303 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | 1290 | | 1.36 | 1.91 | 0.77 | | 1 |
| Total Penta-Dioxins | 5160 | | 5.93 | 9.55 | 1.59 | | 1 |
| Total Hexa-Dioxins | 31000 | | 11.9 | 11.9 | 1.27 | | 1 |
| Total Hepta-Dioxins | 186000 | | 66.6 | 66.6 | 1.06 | | 1 |
| Total Tetra-Furans | 579 | | 1.62 | 1.91 | 0.78 | | 1 |
| Total Penta-Furans | 3780 | | 0.962 | 9.55 | 1.59 | | 1 |
| Total Hexa-Furans | 33100 | | 30.1 | 30.1 | 1.21 | | 1 |
| Total Hepta-Furans | 94600 | | 30.5 | 30.5 | 1.03 | | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 12:25 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | F-3 4-5.5' | **Units:** | Percent |
| **Lab Code:** | K1501100-018 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/31/15 03:46 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.143g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235311 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235303 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1527.344 | 76 | | 40-135 | 0.77 | 1.025 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1683.853 | 84 | | 40-135 | 1.60 | 1.198 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1536.124 | 77 | | 40-135 | 1.36 | 0.992 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1285.792 | 64 | | 40-135 | 1.33 | 0.994 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1307.838 | 65 | | 40-135 | 1.09 | 1.059 |
| 13C-OCDD | 4000 | 2262.506 | 57 | | 40-135 | 0.91 | 1.133 |
| 13C-2,3,7,8-TCDF | 2000 | 1489.478 | 74 | | 40-135 | 0.78 | 0.995 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1675.618 | 84 | | 40-135 | 1.61 | 1.154 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1742.788 | 87 | | 40-135 | 1.58 | 1.189 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1338.316 | 67 | | 40-135 | 0.56 | 0.968 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1269.755 | 63 | | 40-135 | 0.53 | 0.971 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 452.378 | 23 | **Y** | 40-135 | 0.53 | 1.006 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1384.795 | 69 | | 40-135 | 0.53 | 0.989 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 1217.034 | 61 | | 40-135 | 0.43 | 1.034 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1554.851 | 78 | | 40-135 | 0.45 | 1.071 |
| 37Cl-2,3,7,8-TCDD | 800 | 746.175 | 93 | | 40-135 | NA | 1.026 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 12:25 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | F-3 4-5.5' | **Units:** | ng/Kg |
| **Lab Code:** | K1501100-018 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

**Analysis Method:** 8290
**Prep Method:** Method

**Toxicity Equivalency Quotient**

| Analyte Name | Result | DL | MRL | Dilution Factor | TEF | TEF - Adjusted Concentration |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | **26.5** | 1.36 | 1.91 | 1 | 1 | 26.5 |
| 1,2,3,7,8-PeCDD | **190** | 5.93 | 9.55 | 1 | 1 | 190 |
| 1,2,3,4,7,8-HxCDD | **547** | 11.8 | 11.8 | 1 | 0.1 | 54.7 |
| 1,2,3,6,7,8-HxCDD | **2440** | 12.3 | 12.3 | 1 | 0.1 | 244 |
| 1,2,3,7,8,9-HxCDD | **800** | 11.5 | 11.5 | 1 | 0.1 | 80.0 |
| 1,2,3,4,6,7,8-HpCDD | **72000** | 1870 | 9550 | 1000 | 0.01 | 720 |
| OCDD | **602000** | 1710 | 19100 | 1000 | 0.0003 | 181 |
| 2,3,7,8-TCDF | **28.9** | 1.62 | 1.91 | 1 | 0.1 | 2.89 |
| 1,2,3,7,8-PeCDF | **88.3** | 8.57 | 9.55 | 1 | 0.03 | 2.65 |
| 2,3,4,7,8-PeCDF | **237** | 9.79 | 9.79 | 1 | 0.3 | 71.1 |
| 1,2,3,4,7,8-HxCDF | **847** | 28.0 | 28.0 | 1 | 0.1 | 84.7 |
| 1,2,3,6,7,8-HxCDF | **290** | 27.1 | 27.1 | 1 | 0.1 | 29.0 |
| 1,2,3,7,8,9-HxCDF | **258** | 57.8 | 57.8 | 1 | 0.1 | 25.8 |
| 2,3,4,6,7,8-HxCDF | **186** | 27.3 | 27.3 | 1 | 0.1 | 18.6 |
| 1,2,3,4,6,7,8-HpCDF | **17800** | 430 | 9550 | 1000 | 0.01 | 178 |
| 1,2,3,4,7,8,9-HpCDF | **1270** | 30.2 | 30.2 | 1 | 0.01 | 12.7 |
| OCDF | **91300** | 2310 | 19100 | 1000 | 0.0003 | 27.4 |
| | | Total TEQ | | | | 1950 |

2005 WHO TEFs, ND = 0

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Method Blank | **Units:** | ng/Kg |
| **Lab Code:** | EQ1500199-01 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/19/15 21:11 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.277g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235018 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235015 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | ND | U | 0.173 | 0.487 | | | 1 |
| 1,2,3,7,8-PeCDD | ND | U | 0.184 | 2.43 | | | 1 |
| 1,2,3,4,7,8-HxCDD | ND | U | 0.269 | 2.43 | | | 1 |
| 1,2,3,6,7,8-HxCDD | ND | U | 0.278 | 2.43 | | | 1 |
| 1,2,3,7,8,9-HxCDD | ND | U | 0.262 | 2.43 | | | 1 |
| 1,2,3,4,6,7,8-HpCDD | 0.836**JK** | | 0.302 | 2.43 | 1.47 | 1.000 | 1 |
| OCDD | 3.95**J** | | 0.298 | 4.87 | 0.87 | 1.000 | 1 |
| 2,3,7,8-TCDF | ND | U | 0.185 | 0.487 | | | 1 |
| 1,2,3,7,8-PeCDF | ND | U | 0.140 | 2.43 | | | 1 |
| 2,3,4,7,8-PeCDF | ND | U | 0.138 | 2.43 | | | 1 |
| 1,2,3,4,7,8-HxCDF | ND | U | 0.156 | 2.43 | | | 1 |
| 1,2,3,6,7,8-HxCDF | ND | U | 0.148 | 2.43 | | | 1 |
| 1,2,3,7,8,9-HxCDF | ND | U | 0.181 | 2.43 | | | 1 |
| 2,3,4,6,7,8-HxCDF | ND | U | 0.149 | 2.43 | | | 1 |
| 1,2,3,4,6,7,8-HpCDF | 0.266**JK** | | 0.131 | 2.43 | 0.60 | 1.000 | 1 |
| 1,2,3,4,7,8,9-HpCDF | ND | U | 0.180 | 2.43 | | | 1 |
| OCDF | 1.46**JK** | | 0.136 | 4.87 | 0.74 | 1.005 | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Method Blank | **Units:** | ng/Kg |
| **Lab Code:** | EQ1500199-01 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/19/15 21:11 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.277g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235018 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235015 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | ND | U | 0.173 | 0.487 | | | 1 |
| Total Penta-Dioxins | ND | U | 0.184 | 2.43 | | | 1 |
| Total Hexa-Dioxins | ND | U | 0.270 | 2.43 | | | 1 |
| Total Hepta-Dioxins | ND | U | 0.302 | 2.43 | | | 1 |
| Total Tetra-Furans | ND | U | 0.185 | 0.487 | | | 1 |
| Total Penta-Furans | ND | U | 0.0990 | 2.43 | | | 1 |
| Total Hexa-Furans | ND | U | 0.158 | 2.43 | | | 1 |
| Total Hepta-Furans | ND | U | 0.153 | 2.43 | | | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Method Blank | **Units:** | Percent |
| **Lab Code:** | EQ1500199-01 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/19/15 21:11 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.277g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235018 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235015 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1654.986 | 83 | | 40-135 | 0.77 | 1.022 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1931.858 | 97 | | 40-135 | 1.57 | 1.193 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1573.381 | 79 | | 40-135 | 1.39 | 0.991 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1514.957 | 76 | | 40-135 | 1.22 | 0.994 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1706.566 | 85 | | 40-135 | 1.06 | 1.067 |
| 13C-OCDD | 4000 | 3115.620 | 78 | | 40-135 | 0.90 | 1.141 |
| | | | | | | | |
| 13C-2,3,7,8-TCDF | 2000 | 1644.143 | 82 | | 40-135 | 0.81 | 0.993 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1890.211 | 95 | | 40-135 | 1.64 | 1.149 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1981.904 | 99 | | 40-135 | 1.67 | 1.183 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1534.947 | 77 | | 40-135 | 0.52 | 0.971 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1566.040 | 78 | | 40-135 | 0.53 | 0.974 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1656.114 | 83 | | 40-135 | 0.54 | 1.009 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1647.189 | 82 | | 40-135 | 0.53 | 0.988 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 1622.344 | 81 | | 40-135 | 0.45 | 1.042 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1723.000 | 86 | | 40-135 | 0.46 | 1.080 |
| | | | | | | | |
| 37Cl-2,3,7,8-TCDD | 800 | 435.089 | 54 | | 40-135 | NA | 1.023 |

# Accuracy & Precision

**ALS Environmental - Houston HRMS**
10450 Stancliff Rd., Suite 210, Houston TX 77099
Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Analyzed:** | 03/25/15 |
| **Sample Matrix:** | Soil | **Date Extracted:** | 03/16/15 |

## Duplicate Lab Control Sample Summary
## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Units:** | ng/Kg |
| **Prep Method:** | Method | **Basis:** | Dry |
| | | **Analysis Lot:** | 437945 |

| | Lab Control Sample EQ1500199-02 | | | Duplicate Lab Control Sample EQ1500199-03 | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Analyte Name** | **Result** | **Spike Amount** | **% Rec** | **Result** | **Spike Amount** | **% Rec** | **% Rec Limits** | **RPD** | **RPD Limit** |
| 1,2,3,4,6,7,8-HpCDD | 144 | 95.3 | 151 * | 147 | 98.4 | 149 * | 70-130 | 2 | 25 |
| 1,2,3,4,7,8-HxCDD | 101 | 95.3 | 106 | 104 | 98.4 | 106 | 70-130 | 3 | 25 |
| 1,2,3,6,7,8-HxCDD | 101 | 95.3 | 106 | 103 | 98.4 | 105 | 70-130 | 2 | 25 |
| 1,2,3,7,8,9-HxCDD | 101 | 95.3 | 106 | 101 | 98.4 | 103 | 70-130 | <1 | 25 |
| 1,2,3,7,8-PeCDD | 98.1 | 95.3 | 103 | 100 | 98.4 | 102 | 70-130 | 2 | 25 |
| 2,3,7,8-TCDD | 19.0 | 19.1 | 100 | 19.4 | 19.7 | 99 | 70-130 | 2 | 25 |
| OCDD | 539 | 191 | 283 * | 536 | 197 | 273 * | 70-130 | <1 | 25 |
| | | | | | | | | | |
| 1,2,3,4,6,7,8-HpCDF | 114 | 95.3 | 120 | 120 | 98.4 | 122 | 70-130 | 5 | 25 |
| 1,2,3,4,7,8,9-HpCDF | 89.9 | 95.3 | 94 | 90.8 | 98.4 | 92 | 70-130 | <1 | 25 |
| 1,2,3,4,7,8-HxCDF | 91.2 | 95.3 | 96 | 92.8 | 98.4 | 94 | 70-130 | 2 | 25 |
| 1,2,3,6,7,8-HxCDF | 89.9 | 95.3 | 94 | 90.7 | 98.4 | 92 | 70-130 | <1 | 25 |
| 1,2,3,7,8,9-HxCDF | 88.5 | 95.3 | 93 | 92.2 | 98.4 | 94 | 70-130 | 4 | 25 |
| 1,2,3,7,8-PeCDF | 93.6 | 95.3 | 98 | 95.0 | 98.4 | 97 | 70-130 | 1 | 25 |
| 2,3,4,6,7,8-HxCDF | 90.3 | 95.3 | 95 | 92.5 | 98.4 | 94 | 70-130 | 2 | 25 |
| 2,3,4,7,8-PeCDF | 93.9 | 95.3 | 99 | 94.6 | 98.4 | 96 | 70-130 | <1 | 25 |
| 2,3,7,8-TCDF | 19.1 | 19.1 | 100 | 19.5 | 19.7 | 99 | 70-130 | 2 | 25 |
| OCDF | 307 | 191 | 161 * | 308 | 197 | 157 * | 70-130 | <1 | 25 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Lab Control Sample | **Units:** | ng/Kg |
| **Lab Code:** | EQ1500199-02 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/25/15 20:57 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.494g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P177105 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P177096 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | 19.0 | | 0.0960 | 0.476 | 0.77 | 1.001 | 1 |
| 1,2,3,7,8-PeCDD | 98.1 | | 0.0677 | 2.38 | 1.60 | 1.000 | 1 |
| 1,2,3,4,7,8-HxCDD | 101 | | 0.0374 | 2.38 | 1.27 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 101 | | 0.0399 | 2.38 | 1.28 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 101 | | 0.0360 | 2.38 | 1.26 | 1.007 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 144 | | 0.0716 | 2.38 | 1.04 | 1.000 | 1 |
| OCDD | 539 | | 0.206 | 4.76 | 0.90 | 1.000 | 1 |
| 2,3,7,8-TCDF | 19.1 | | 0.107 | 0.476 | 0.77 | 1.001 | 1 |
| 1,2,3,7,8-PeCDF | 93.6 | | 0.0728 | 2.38 | 1.57 | 1.000 | 1 |
| 2,3,4,7,8-PeCDF | 93.9 | | 0.0662 | 2.38 | 1.60 | 1.000 | 1 |
| 1,2,3,4,7,8-HxCDF | 91.2 | | 0.0797 | 2.38 | 1.24 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDF | 89.9 | | 0.0741 | 2.38 | 1.26 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDF | 88.5 | | 0.0807 | 2.38 | 1.26 | 1.000 | 1 |
| 2,3,4,6,7,8-HxCDF | 90.3 | | 0.0794 | 2.38 | 1.24 | 1.000 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 114 | | 0.163 | 2.38 | 1.04 | 1.000 | 1 |
| 1,2,3,4,7,8,9-HpCDF | 89.9 | | 0.172 | 2.38 | 1.03 | 1.000 | 1 |
| OCDF | 307 | | 0.133 | 4.76 | 0.92 | 1.005 | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Lab Control Sample | **Units:** | ng/Kg |
| **Lab Code:** | EQ1500199-02 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/25/15 20:57 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.494g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P177105 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P177096 |

### Native Analyte Results

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | 19.0 | | 0.0960 | 0.476 | 0.77 | | 1 |
| Total Penta-Dioxins | 98.1 | | 0.0677 | 2.38 | 1.60 | | 1 |
| Total Hexa-Dioxins | 307 | | 0.0377 | 2.38 | 1.33 | | 1 |
| Total Hepta-Dioxins | 177 | | 0.0716 | 2.38 | 1.08 | | 1 |
| Total Tetra-Furans | 19.4 | | 0.107 | 0.476 | 0.86 | | 1 |
| Total Penta-Furans | 188 | | 0.0393 | 2.38 | 1.72 | | 1 |
| Total Hexa-Furans | 379 | | 0.0784 | 2.38 | 1.31 | | 1 |
| Total Hepta-Furans | 286 | | 0.167 | 2.38 | 1.04 | | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Lab Control Sample | **Units:** | Percent |
| **Lab Code:** | EQ1500199-02 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/25/15 20:57 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.494g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P177105 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P177096 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1575.760 | 79 | | 40-135 | 0.77 | 1.019 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 2292.702 | 115 | | 40-135 | 1.58 | 1.176 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1494.741 | 75 | | 40-135 | 1.28 | 0.991 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1310.975 | 66 | | 40-135 | 1.26 | 0.994 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1450.067 | 73 | | 40-135 | 1.08 | 1.065 |
| 13C-OCDD | 4000 | 2528.709 | 63 | | 40-135 | 0.90 | 1.140 |
| 13C-2,3,7,8-TCDF | 2000 | 1429.914 | 71 | | 40-135 | 0.78 | 0.992 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1958.771 | 98 | | 40-135 | 1.60 | 1.136 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 2110.413 | 106 | | 40-135 | 1.60 | 1.166 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1294.237 | 65 | | 40-135 | 0.52 | 0.972 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1242.743 | 62 | | 40-135 | 0.53 | 0.975 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1531.871 | 77 | | 40-135 | 0.52 | 1.008 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1316.972 | 66 | | 40-135 | 0.52 | 0.988 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 1115.678 | 56 | | 40-135 | 0.44 | 1.041 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1496.585 | 75 | | 40-135 | 0.45 | 1.078 |
| 37Cl-2,3,7,8-TCDD | 800 | 709.762 | 89 | | 40-135 | NA | 1.020 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Duplicate Lab Control Sample | **Units:** | ng/Kg |
| **Lab Code:** | EQ1500199-03 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/25/15 21:45 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.162g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P177106 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P177096 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | 19.4 | | 0.0874 | 0.492 | 0.77 | 1.001 | 1 |
| 1,2,3,7,8-PeCDD | 100 | | 0.0588 | 2.46 | 1.60 | 1.000 | 1 |
| 1,2,3,4,7,8-HxCDD | 104 | | 0.0453 | 2.46 | 1.26 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 103 | | 0.0482 | 2.46 | 1.26 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 101 | | 0.0434 | 2.46 | 1.25 | 1.007 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 147 | | 0.119 | 2.46 | 1.03 | 1.000 | 1 |
| OCDD | 536 | | 0.0741 | 4.92 | 0.89 | 1.000 | 1 |
| 2,3,7,8-TCDF | 19.5 | | 0.0811 | 0.492 | 0.74 | 1.001 | 1 |
| 1,2,3,7,8-PeCDF | 95.0 | | 0.0479 | 2.46 | 1.57 | 1.000 | 1 |
| 2,3,4,7,8-PeCDF | 94.6 | | 0.0467 | 2.46 | 1.57 | 1.000 | 1 |
| 1,2,3,4,7,8-HxCDF | 92.8 | | 0.0732 | 2.46 | 1.24 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDF | 90.7 | | 0.0692 | 2.46 | 1.24 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDF | 92.2 | | 0.0778 | 2.46 | 1.26 | 1.000 | 1 |
| 2,3,4,6,7,8-HxCDF | 92.5 | | 0.0732 | 2.46 | 1.25 | 1.000 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 120 | | 0.277 | 2.46 | 1.07 | 1.000 | 1 |
| 1,2,3,4,7,8,9-HpCDF | 90.8 | | 0.303 | 2.46 | 1.05 | 1.000 | 1 |
| OCDF | 308 | | 0.106 | 4.92 | 0.90 | 1.005 | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Duplicate Lab Control Sample | **Units:** | ng/Kg |
| **Lab Code:** | EQ1500199-03 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/25/15 21:45 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.162g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P177106 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P177096 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | 19.4 | | 0.0874 | 0.492 | 0.77 | | 1 |
| Total Penta-Dioxins | 100 | | 0.0588 | 2.46 | 1.60 | | 1 |
| Total Hexa-Dioxins | 312 | | 0.0456 | 2.46 | 1.29 | | 1 |
| Total Hepta-Dioxins | 180 | | 0.119 | 2.46 | 1.03 | | 1 |
| Total Tetra-Furans | 21.4 | | 0.0811 | 0.492 | 0.70 | | 1 |
| Total Penta-Furans | 194 | | 0.0293 | 2.46 | 1.35 | | 1 |
| Total Hexa-Furans | 387 | | 0.0732 | 2.46 | 1.31 | | 1 |
| Total Hepta-Furans | 296 | | 0.289 | 2.46 | 1.07 | | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1501100 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Duplicate Lab Control Sample | **Units:** | Percent |
| **Lab Code:** | EQ1500199-03 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 03/25/15 21:45 |
| **Prep Method:** | Method | **Date Extracted:** | 3/16/15 |
| **Sample Amount:** | 10.162g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P177106 | **Blank File Name:** | P235018 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P177096 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1568.994 | 78 | | 40-135 | 0.77 | 1.019 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1878.015 | 94 | | 40-135 | 1.59 | 1.176 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1477.291 | 74 | | 40-135 | 1.33 | 0.991 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1306.720 | 65 | | 40-135 | 1.20 | 0.994 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1389.941 | 69 | | 40-135 | 1.04 | 1.065 |
| 13C-OCDD | 4000 | 2362.459 | 59 | | 40-135 | 0.88 | 1.140 |
| | | | | | | | |
| 13C-2,3,7,8-TCDF | 2000 | 1427.052 | 71 | | 40-135 | 0.79 | 0.992 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1712.808 | 86 | | 40-135 | 1.59 | 1.136 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1715.775 | 86 | | 40-135 | 1.58 | 1.167 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1302.997 | 65 | | 40-135 | 0.52 | 0.972 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1255.496 | 63 | | 40-135 | 0.53 | 0.975 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1461.762 | 73 | | 40-135 | 0.53 | 1.008 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1321.497 | 66 | | 40-135 | 0.52 | 0.988 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 1050.471 | 53 | | 40-135 | 0.45 | 1.041 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1383.233 | 69 | | 40-135 | 0.44 | 1.078 |
| | | | | | | | |
| 37Cl-2,3,7,8-TCDD | 800 | 705.071 | 88 | | 40-135 | NA | 1.020 |

ALS Environmental
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**F :** +1 360 636 1068
**www.alsglobal.com**

April 28, 2015

**Analytical Report for Service Request No:** K1503395

Terri Olson
Barr Engineering
4700 West 77th Street
Minneapolis, MN 55435

**RE: Joslyn OU5 2015 Soil / 23270110**

Dear Terri,

Enclosed are the results of the sample(s) submitted to our laboratory February 04, 2015
For your reference, these analyses have been assigned our service request number **K1503395.**

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3363. You may also contact me via email at Lisa.Domenighini@alsglobal.com.

Respectfully submitted,

**ALS Group USA, Corp. dba ALS Environmental**

Lisa A Domenighini

Lisa Domenighini
Project Manager

## Acronyms

| | |
|---|---|
| ASTM | American Society for Testing and Materials |
| A2LA | American Association for Laboratory Accreditation |
| CARB | California Air Resources Board |
| CAS Number | Chemical Abstract Service registry Number |
| CFC | Chlorofluorocarbon |
| CFU | Colony-Forming Unit |
| DEC | Department of Environmental Conservation |
| DEQ | Department of Environmental Quality |
| DHS | Department of Health Services |
| DOE | Department of Ecology |
| DOH | Department of Health |
| EPA | U. S. Environmental Protection Agency |
| ELAP | Environmental Laboratory Accreditation Program |
| GC | Gas Chromatography |
| GC/MS | Gas Chromatography/Mass Spectrometry |
| LOD | Limit of Detection |
| LOQ | Limit of Quantitation |
| LUFT | Leaking Underground Fuel Tank |
| M | Modified |
| MCL | Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA. |
| MDL | Method Detection Limit |
| MPN | Most Probable Number |
| MRL | Method Reporting Limit |
| NA | Not Applicable |
| NC | Not Calculated |
| NCASI | National Council of the Paper Industry for Air and Stream Improvement |
| ND | Not Detected |
| NIOSH | National Institute for Occupational Safety and Health |
| PQL | Practical Quantitation Limit |
| RCRA | Resource Conservation and Recovery Act |
| SIM | Selected Ion Monitoring |
| TPH | Total Petroleum Hydrocarbons |
| tr | Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL. |

## Inorganic Data Qualifiers

| | |
|---|---|
| * | The result is an outlier. See case narrative. |
| # | The control limit criteria is not applicable. See case narrative. |
| B | The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards. |
| E | The result is an estimate amount because the value exceeded the instrument calibration range. |
| J | The result is an estimated value. |
| U | The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution. |
| i | The MRL/MDL or LOQ/LOD is elevated due to a matrix interference. |
| X | See case narrative. |
| Q | See case narrative. One or more quality control criteria was outside the limits. |
| H | The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory. |

## Metals Data Qualifiers

| | |
|---|---|
| # | The control limit criteria is not applicable. See case narrative. |
| J | The result is an estimated value. |
| E | The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample. |
| M | The duplicate injection precision was not met. |
| N | The Matrix Spike sample recovery is not within control limits. See case narrative. |
| S | The reported value was determined by the Method of Standard Additions (MSA). |
| U | The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution. |
| W | The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance. |
| i | The MRL/MDL or LOQ/LOD is elevated due to a matrix interference. |
| X | See case narrative. |
| + | The correlation coefficient for the MSA is less than 0.995. |
| Q | See case narrative. One or more quality control criteria was outside the limits. |

## Organic Data Qualifiers

| | |
|---|---|
| * | The result is an outlier. See case narrative. |
| # | The control limit criteria is not applicable. See case narrative. |
| A | A tentatively identified compound, a suspected aldol-condensation product. |
| B | The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards. |
| C | The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data. |
| D | The reported result is from a dilution. |
| E | The result is an estimated value. |
| J | The result is an estimated value. |
| N | The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed. |
| P | The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results. |
| U | The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution. |
| i | The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference. |
| X | See case narrative. |
| Q | See case narrative. One or more quality control criteria was outside the limits. |

## Additional Petroleum Hydrocarbon Specific Qualifiers

| | |
|---|---|
| F | The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard. |
| L | The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard. |
| H | The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard. |
| O | The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard. |
| Y | The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard. |
| Z | The chromatographic fingerprint does not resemble a petroleum product. |

**ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso**
**State Certifications, Accreditations, and Licenses**

| Agency | Web Site | Number |
|---|---|---|
| Alaska DEC UST | http://dec.alaska.gov/applications/eh/ehllabreports/USTLabs.aspx | UST-040 |
| Arizona DHS | http://www.azdhs.gov/lab/license/env.htm | AZ0339 |
| Arkansas - DEQ | http://www.adeq.state.ar.us/techsvs/labcert.htm | 88-0637 |
| California DHS (ELAP) | http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx | 2795 |
| DOD ELAP | http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm | L14-51 |
| Florida DOH | http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm | E87412 |
| Hawaii DOH | Not available | - |
| Idaho DHW | http://www.healthandwelfare.idaho.gov/Health/Labs/CertificationDrinkingWaterLabs/tabid/1833/Default.aspx | - |
| ISO 17025 | http://www.pjlabs.com/ | L14-50 |
| Louisiana DEQ | http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx | 03016 |
| Maine DHS | Not available | WA01276 |
| Michigan DEQ | http://www.michigan.gov/deq/0,1607,7-135-3307_4131_4156---,00.html | 9949 |
| Minnesota DOH | http://www.health.state.mn.us/accreditation | 053-999-457 |
| Montana DPHHS | http://www.dphhs.mt.gov/publichealth/ | CERT0047 |
| Nevada DEP | http://ndep.nv.gov/bsdw/labservice.htm | WA01276 |
| New Jersey DEP | http://www.nj.gov/dep/oqa/ | WA005 |
| North Carolina DWQ | http://www.dwqlab.org/ | 605 |
| Oklahoma DEQ | http://www.deq.state.ok.us/CSDnew/labcert.htm | 9801 |
| Oregon – DEQ (NELAP) | http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx | WA100010 |
| South Carolina DHEC | http://www.scdhec.gov/environment/envserv/ | 61002 |
| Texas CEQ | http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html | T104704427 |
| Washington DOE | http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html | C544 |
| Wisconsin DNR | http://dnr.wi.gov/ | 998386840 |
| Wyoming (EPA Region 8) | http://www.epa.gov/region8/water/dwhome/wyomingdi.html | - |
| Kelso Laboratory Website | www.alsglobal.com | NA |

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.
Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

# Case Narrative

**ALS Environmental—Kelso Laboratory**
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

**ALS ENVIRONMENTAL**

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request No.:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil | **Date Received:** | 2/4/15 |
| **Sample Matrix:** | Soil | | |

**Case Narrative**

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix/Duplicate Matrix Spike (MS/DMS), and Laboratory/Duplicate Laboratory Control Sample (LCS/DLCS).

**Sample Receipt**

Four soil samples were received for analysis at ALS Environmental on 2/4/15. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4ºC upon receipt at the laboratory.

The samples included in this report were originally logged under service request K1501100. On April 3,2015 the client requested that the samples be re-issued and tested.

**General Chemistry Parameters**

**Total Organic Carbon by EPA Method ASTM D4129-05 Modified:**
All samples were re-issued past holding time. The analysis was performed as soon as possible after receipt by the laboratory. The data was flagged to indicate the holding time violation.

No other anomalies associated with the analysis of these samples were observed.

**Dioxins and Furans by EPA Method 8290**

Dioxin and Furan analysis by EPA Method 8290 was performed at ALS Environmental laboratory in Houston, TX. The narrative for this analysis can be found in the corresponding section of this data package.

**Approved by** Lisa A Jamenighini

# Chain of Custody

**ALS Environmental—Kelso Laboratory**
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

K15033955
K1501100

# Chain of Custody

BARR
4700 West 77th Street
Minneapolis, MN 55435-4803
(952) 832-2600

COC 1 of 2

Project Number: 23270110

Project Name: Joslyn 005 2015 Soil

Sample Origination State MN (use two letter postal state abbreviation)

COC Number: № 43800

Project Manager: John Hunt

Project QC Contact: Terri Olson

Sampled by: Alex Puetz

Laboratory: ALS

| | Location | Start Depth | Stop Depth | Depth Unit (m./ft. or in.) | Collection Date (mm/dd/yyyy) | Collection Time (hh:mm) | Matrix: Water | Matrix: Soil | Type: Grab | Type: Comp. | Type: QC | Number of Containers/Preservative — Water: VOCs (HCl) #1 | SVOCs (unpreserved) #2 | Dissolved Metals ($HNO_3$) | Total Metals ($HNO_3$) | General (unpreserved) #3 | Diesel Range Organics (HCl) | Nutrients ($H_2SO_4$) #4 | Soil: VOCs (tared MeOH) #1 | GRO, BTEX (tared MeOH) #1 | DRO (tared unpreserved) | Metals (unpreserved) | SVOCs (unpreserved) #2 | % Solids (plastic vial, unpres.) | Dioxins | TOC | Total Number Of Containers | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | B-1 | 2 | 3.5 | ft | 02/02/2015 | 10:35 | | X | | X | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 2. | B-1 | 3.5 | 5 | | | 11:40 | | X | | X | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 3. | B-1 | 5 | 6.5 | | | 11:45 | | X | | X | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 4. | B-1 | 6.5 | 9 | | | 11:50 | | X | | X | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 5. | B-1 | 9 | 10 | | | 12:00 | | X | | X | | | | | | | | | | | | | | 1 | 1 | 2 | HOLD |
| 6. | B-3 | 5 | 6.5 | | | 14:15 | | X | | X | | | | | | | | | | | | | | 1 | 1 | 2 | ALL |
| 7. | B-3 | 6.5 | 9 | | | 14:20 | | X | | X | | | | | | | | | | | | | | 1 | 1 | 2 | SAMPLES |
| 8. | B-3 | 9 | 10 | | | 14:25 | | X | | X | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 9. | C-3 | 5 | 6.5 | | | 13:40 | | X | | X | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 10. | C-3 | 6.5 | 9 | | | 13:45 | | X | | X | | | | | | | | | | | | | | 1 | 1 | 2 | |

Common Parameter/Container - Preservation Key

*#1 - Volatile Organics = BTEX, GRO, TPH, 8260 Full List*
*#2 - Semivolatile Organics = PAHs, PCP, Dioxins, 8270 Full List, Herbicide/Pesticide/PCBs*
*#3 - General = pH, Chloride, Fluoride, Alkalinity, TSS, TDS, TS, Sulfate*
*#4 - Nutrients = COD, TOC, Phenols, Ammonia Nitrogen, TKN*

| Relinquished By: | On Ice? | Date | Time | Received by: | Date | Time |
|---|---|---|---|---|---|---|
| [signature] | (X) N | 02/02/15 | 16:15 | [signature] | 02/02/15 | 16:15 |
| [signature] | (X) N | 02/03/15 | 14:12 | [signature] | 2/4/15 | 0940 |

Samples Shipped VIA: ☐ Air Freight ☐ Federal Express ☐ Sampler ☐ Other: _____

Air Bill Number:

Distribution: White-Original Accompanies Shipment to Lab; Yellow - Field Copy; Pink - Lab Coordinator

H:\RI GIS\TEFORMS\Chain Of Custody Form 2009 RLG Rev. 09\01\09

K1503395
K1501110

# Chain of Custody

BARR
4700 West 77th Street
Minneapolis, MN 55435-4803
(952) 832-2600

COC 2 of 2

Project Number: 23270110

Project Name: Joslyn OUS 2015 Soil

Sample Origination State MN (use two letter postal state abbreviation)

COC Number: № 43801

Project Manager: John Hunt

Project QC Contact: Terri Olson

Sampled by: Alex Puetz

Laboratory: ALS

| | Location | Start Depth | Stop Depth | Depth Unit (m./ft. or in.) | Collection Date (mm/dd/yyyy) | Collection Time (hh:mm) | Matrix: Water | Matrix: Soil | Type: Grab | Type: Comp. | Type: QC | Water: VOCs (HCl) #1 | Water: SVOCs (unpreserved) #2 | Water: Dissolved Metals ($HNO_3$) | Water: Total Metals ($HNO_3$) | Water: General (unpreserved) #3 | Water: Diesel Range Organics (HCl) | Water: Nutrients ($H_2SO_4$) #4 | Soil: VOCs (tared MeOH) #1 | Soil: GRO, BTEX (tared MeOH) #1 | Soil: DRO (tared unpreserved) | Soil: Metals (unpreserved) | Soil: SVOCs (unpreserved) #2 | Soil: % Solids (plastic vial, unpres.) | Dioxins | TOC | Total Number Of Containers | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | C-3 | 9 | 10 | ft | 02/02/2015 | 13:50 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 2. | D-1 | 2 | 3.5 | | | 11:05 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 3. | D-1 | 3.5 | 9 | | | 11:10 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 4. | D-1 | 9 | 10 | | | 11:20 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 5. | E-4 | 5 | 6.5 | | | 13:00 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | – HOLD |
| 6. | E-4 | 6.5 | 9 | | | 13:05 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | ALL |
| 7. | E-4 | 9 | 10 | | | 13:10 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | SAMPLES |
| 8. | F-3 | 4 | 5.5 | | | 12:25 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 9. | F-3 | 5.5 | 9 | | | 12:30 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 10. | F-3 | 9 | 10 | ↓ | ↓ | 12:35 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |

Common Parameter/Container - Preservation Key

*#1 - Volatile Organics = BTEX, GRO, TPH, 8260 Full List*
*#2 - Semivolatile Organics = PAHs, PCP, Dioxins, 8270 Full List, Herbicide/Pesticide/PCBs*
*#3 - General = pH, Chloride, Fluoride, Alkalinity, TSS, TDS, TS, Sulfate*
*#4 - Nutrients = COD, TOC, Phenols, Ammonia Nitrogen, TKN*

| Relinquished By: | On Ice? | Date | Time | Received by: | Date | Time |
|---|---|---|---|---|---|---|
| | (Y) N | 02/02/15 | 16:15 | | 02/02/15 | 16:15 |
| Relinquished By: | On Ice? | Date | Time | Received by: | Date | Time |
| | (Y) N | 02/03/15 | 14:12 | | 2/4/15 | 0940 |

Samples Shipped VIA: ☐ Air Freight ☐ Federal Express ☐ Sampler ☐ Other: _____ Air Bill Number:

Distribution: White-Original Accompanies Shipment to Lab; Yellow - Field Copy; Pink - Lab Coordinator

K1503395
K1501100 revised

# Chain of Custody

BARR
4700 West 77th Street
Minneapolis, MN 55435-4803
(952) 832-2600

COC 2 of 2

Project Number: 23270110

Project Name: Joslyn OUS 2015 Sc 1

Sample Origination State MN (use two letter postal state abbreviation)

COC Number: [illegible] 13801

Project Manager: John Hunt

Project QC Contact: Terri Olson

Sampled by: Alex Rietz

Laboratory: ALS

| Location | Start Depth | Stop Depth | Depth Unit (m./ft. or in.) | Collection Date (mm/dd/yyyy) | Collection Time (hh:mm) | Matrix: Water | Matrix: Soil | Type: Grab | Type: Comp. | Type: QC | Number of Containers/Preservative — Water: VOCs (HCl) #1 | SVOCs (unpreserved) #2 | Dissolved Metals ($HNO_3$) | Total Metals ($HNO_3$) | General (unpreserved) #3 | Diesel Range Organics (HCl) | Nutrients ($H_2SO_4$) #4 | Soil: VOCs (tared MeOH) #1 | GRO, BTEX (tared MeOH) #1 | DRO (tared, unpreserved) | Metals (unpreserved) | SVOCs (unpreserved) #2 | % Solids (plastic vial, unpres.) | Diox.; TOC | Total Number Of Containers | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. C-3 | 9 | 10 | ft | 02/02/2015 | 13:50 | | X | | X | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 2. D-1 | 2 | 3.5 | | | 11:05 | | X | | X | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 3. D-1 | 3.5 | 9 | | | 11:10 | | X | | X | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 4. D-1 | 9 | 10 | | | 11:20 | | X | | X | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 5. E-4 | 0 | 0.5 | | | 13:00 | | X | | X | | | | | | | | | | | | | | 1 | 1 | 2 | HOLD |
| 6. E-4 | 0.5 | 9 | | | 13:05 | | X | | X | | | | | | | | | | | | | | 1 | 1 | 2 | ALL |
| 7. E-4 | 9 | 10 | | | 13:10 | | X | | X | | | | | | | | | | | | | | 1 | 1 | 2 | SAMPLES |
| 8. F-3 | 4 | 5.5 | | | 12:25 | | X | | X | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 9. [illegible] | 5.5 | 9 | | | 12:30 | | X | | X | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 10. F-3 | 9 | 10 | ↓ | ↓ | 12:35 | | X | | X | | | | | | | | | | | | | | 1 | 1 | 2 | |

Common Parameter/Container - Preservation Key

*#1 - Volatile Organics = BTEX, GRO, TPH, 8260 Full List*
*#2 - Semivolatile Organics = PAHs, PCB, Dioxins, 8270 Full List, Herbicide/Pesticide/PCBs*
*#3 - General = pH, Chloride, Fluoride, Alkalinity, TSS, TDS, TS, Sulfate*
*#4 - Nutrients = COD, TOC, Phenols, Ammonia Nitrogen, TKN*

| Relinquished By: | On Ice? | Date | Time | Received by: | Date | Time |
|---|---|---|---|---|---|---|
| [signature] | (Y) N | 02/02/15 | 16:15 | [signature] | 02/02/15 | 16:15 |
| Relinquished By: | On Ice? | Date | Time | Received by: | Date | Time |
| [signature] | (Y) N | 02/03/15 | 14:32 | | | |

Samples Shipped VIA: ☐ Air Freight ☐ Federal Express ☐ Sampler ☐ Other: _____

Air Bill Number:

Distribution: White-Original Accompanies Shipment to Lab Yellow - Field Copy; Pink - Lab Coordinator

H:\RLG\STDFORMS\Chain Of Custody Form 2009 RLG Rev 09\01\09

ALS

PC lisa

# Cooler Receipt and Preservation Form

03395

Client / Project: Barr Service Request *K15* 3110

Received: 2/4/15 Opened: 2/4/15 By: Sue Unloaded: 2/4/15 By: Sue

1. Samples were received via? *Mail* *Fed Ex* *UPS* *DHL* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) *Cooler* *Box* *Envelope* *Other* _____ *NA*
3. Were custody seals on coolers? NA (Y) N If yes, how many and where? one, front
   If present, were custody seals intact? (Y) N If present, were they signed and dated? (Y) N

| Raw Cooler Temp | Corrected Cooler Temp | Raw Temp Blank | Corrected Temp Blank | Corr. Factor | Thermometer ID | Cooler/COC ID (NA) | Tracking Number (NA) | Filed |
|---|---|---|---|---|---|---|---|---|
| 5.7 | 5.8 | 5.7 | 5.6 | +0.1 | 347 | 43799 | 6275 1644 7472 | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

4. Packing material: *Inserts* *Baggies* *Bubble Wrap* *Gel Packs* *Wet Ice* *Dry Ice* *Sleeves* _____
5. Were custody papers properly filled out (ink, signed, etc.)? NA (Y) N
6. Did all bottles arrive in good condition (unbroken)? *Indicate in the table below.* NA (Y) N
7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA (Y) N
8. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* NA (Y) N
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA (Y) N
10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* (NA) Y N
11. Were VOA vials received without headspace? *Indicate in the table below.* (NA) Y N
12. Was C12/Res negative? (NA) Y N

| Sample ID on Bottle | Sample ID on COC | Identified by: |
|---|---|---|
| | | |
| | | |
| | | |

| Sample ID | Bottle Count Bottle Type | Out of Temp | Head-space | Broke | pH | Reagent | Volume added | Reagent Lot Number | Initials | Time |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

*Notes, Discrepancies, & Resolutions:* _____

*Page* ____ *of* ____

# General Chemistry

**ALS Environmental—Kelso Laboratory**
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/2/15 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/4/15 |
| **Analysis Method:** | 160.3 Modified | **Units:** | Percent |
| **Prep Method:** | None | **Basis:** | As Received |

**Solids, Total**

| Sample Name | Lab Code | Result | MRL | Dil. | Date Analyzed | Q |
|---|---|---|---|---|---|---|
| B-3 6.5-9' | K1503395-001 | **27.6** | - | 1 | 04/03/15 14:05 | |
| C-3 6.5-9' | K1503395-002 | **18.7** | - | 1 | 04/03/15 14:05 | |
| D-1 3.5-9' | K1503395-003 | **39.9** | - | 1 | 04/03/15 14:05 | |
| F-3 5.5-9' | K1503395-004 | **13.4** | - | 1 | 04/03/15 14:05 | |

**ALS Group USA, Corp.**

**dba ALS Environmental**

QA/QC Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 |
| | | **Date Analyzed:** | 04/03/15 |

**Replicate Sample Summary**

**General Chemistry Parameters**

| | | | |
|---|---|---|---|
| **Sample Name:** | F-3 5.5-9' | **Units:** | Percent |
| **Lab Code:** | K1503395-004 | **Basis:** | As Received |

| Analyte Name | Analysis Method | MRL | Sample Result | Duplicate Sample K1503395-004DUP Result | Average | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|
| Solids, Total | 160.3 Modified | - | 13.4 | 15.1 | 14.3 | 12 | 20 |

**Results flagged with an asterisk (*) indicate values outside control criteria.**

**Results flagged with a pound (#) indicate the control criteria is not applicable.**

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/2/15 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/4/15 |
| **Analysis Method:** | ASTM D4129-05 Modified | **Units:** | Percent |
| **Prep Method:** | ALS SOP | **Basis:** | Dry, per Method |

## Carbon, Total Organic (TOC)

| Sample Name | Lab Code | Result | MRL | Dil. | Date Analyzed | Date Extracted | Q |
|---|---|---|---|---|---|---|---|
| B-3 6.5-9' | K1503395-001 | **11.3** | 0.050 | 1 | 04/17/15 15:45 | 4/17/15 | * |
| C-3 6.5-9' | K1503395-002 | **32.2** | 0.050 | 1 | 04/17/15 15:45 | 4/17/15 | * |
| D-1 3.5-9' | K1503395-003 | **14.3** | 0.050 | 1 | 04/17/15 15:45 | 4/17/15 | * |
| F-3 5.5-9' | K1503395-004 | **38.4** | 0.050 | 1 | 04/17/15 15:45 | 4/17/15 | * |
| Method Blank | K1503395-MB | ND U | 0.050 | 1 | 04/17/15 15:45 | 4/17/15 | |

**ALS Group USA, Corp.**

**dba ALS Environmental**

QA/QC Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| | | **Date Analyzed:** | 04/17/15 |

## Replicate Sample Summary
## General Chemistry Parameters

| | | | |
|---|---|---|---|
| **Sample Name:** | Batch QC | **Units:** | Percent |
| **Lab Code:** | K1503242-001 | **Basis:** | Dry, per Method |

| Analyte Name | Analysis Method | MRL | Sample Result | Duplicate Sample K1503242-001DUP Result | Average | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|
| Carbon, Total Organic (TOC) | ASTM D4129-05 Modified | 0.050 | 0.070 | 0.067 | 0.0684 | 6 | 20 |

**Results flagged with an asterisk (*) indicate values outside control criteria.**

**Results flagged with a pound (#) indicate the control criteria is not applicable.**

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

**ALS Group USA, Corp.**
**dba ALS Environmental**

QA/QC Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | N/A |
| **Sample Matrix:** | Soil | **Date Received:** | N/A |
| | | **Date Analyzed:** | 04/17/15 |
| | | **Date Extracted:** | 04/17/15 |

**Duplicate Matrix Spike Summary**
**Carbon, Total Organic (TOC)**

| | | | |
|---|---|---|---|
| **Sample Name:** | Batch QC | **Units:** | Percent |
| **Lab Code:** | K1503242-001 | **Basis:** | Dry, per Method |
| **Analysis Method:** | ASTM D4129-05 Modified | | |
| **Prep Method:** | ALS SOP | | |

| | | Matrix Spike | | | Duplicate Matrix Spike | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | K1503242-001MS | | | K1503242-001DMS | | | | | |
| **Analyte Name** | **Sample Result** | **Result** | **Spike Amount** | **% Rec** | **Result** | **Spike Amount** | **% Rec** | **% Rec Limits** | **RPD** | **RPD Limit** |
| Carbon, Total Organic (TOC) | 0.070 | 3.14 | 3.21 | 96 | 3.24 | 3.22 | 98 | 70-122 | 2 | 20 |

**Results flagged with an asterisk (*) indicate values outside control criteria.**

**Results flagged with a pound (#) indicate the control criteria is not applicable.**

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Analyzed:** | 04/17/15 |
| **Sample Matrix:** | Soil | **Date Extracted:** | 04/17/15 |

## Lab Control Sample Summary
## Carbon, Total Organic (TOC)

| | | | |
|---|---|---|---|
| **Analysis Method:** | ASTM D4129-05 Modified | **Units:** | Percent |
| **Prep Method:** | ALS SOP | **Basis:** | Dry, per Method |
| | | **Analysis Lot:** | 441059 |

| Sample Name | Lab Code | Result | Spike Amount | % Rec | % Rec Limits |
|---|---|---|---|---|---|
| Lab Control Sample | K1503395-LCS | 0.497 | 0.543 | 92 | 72-122 |

# Subcontract Lab Results

**ALS Environmental—Kelso Laboratory**
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

10450 Stancliff Rd., Suite 210
Houston, TX 77099
T: +1 713 266 1599
F: +1 713 266 1599
www.alsglobal.com

April 21, 2015. Service Request No: K1503395

Lisa Domenighini.

ALS Environmental
1317 South 13th Avenue
Kelso, WA 98626

**Laboratory Result for: Barr Engineering.**
Dear Lisa:

Enclosed are the results of the sample(s) submitted to our laboratory on April 07, 2015. For Your reference, these analyses have been assigned our service request number: **K1503395.**

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current TNI standards, where applicable, and considered in their entirety, and ALS Environmental is not responsible for use of less than the final complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report. In accordance to the TNI 2009 Standard, a statement on the estimated uncertainty of measurement of any quantitative analysis will be supplied upon request.

Please contact me if you have any questions. My direct line is 281-575-2279. You may also contact me via email at Arthi.Kodur@alsglobal.com

Respectfully submitted,

**ALS Group USA Corp., dba ALS Environmental**

Arthi Kodur
Project Manager

Page 1 of _____

*For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com.*

# Certificate of Analysis

**ALS Environmental - Houston HRMS**
10450 Stancliff Rd, Suite 210, Houston TX 77099
Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

**ALS ENVIRONMENTAL**

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request No.:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Received:** | 4/7/15 |
| **Sample Matrix:** | Soil | | |

**ALS ENVIRONMENTAL NARRATIVE**

All analyses were performed in adherence to the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II. When appropriate to the method, method blank results have been reported with each analytical test.

**Sample Receipt**

Four soil samples were received for analysis at ALS Environmental on 4/7/15.

Please note the reporting forms are currently referencing the date ALS Environmental-Kelso received the samples (2/4/15) and not the date ALS Environmental-Houston received the samples (4/7/15).

The samples were received at 3°C in good condition and are consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4°C upon receipt at the laboratory.

**Data Validation Notes and Discussion**

**B flags – Method Blanks**

The Method Blank EQ1500276-01 contained low levels of 1234678-HpCDD and 1,2,3,7,8,9-HxCDF below the Method Reporting Limit (MRL).

**MS/MSD**

EQ1500276: Laboratory Control Spike/Duplicate Laboratory Control Spike (LCS/DLCS) samples were analyzed and reported in lieu of an MS/MSD for this extraction batch. The batch quality control criteria were met.

**2378-TCDF**

Samples analyzed on the DB-5MSUI column were analyzed under conditions were sufficient separation between 2,3,7,8-TCDF and its closest eluter was achieved. Confirmation of this result was not required.

**Y flags – Labeled Standards**

Quantification of the native 2,3,7,8-substituted analytes is based on isotopic dilution, which automatically corrects for variation in extraction efficiency and provides accurate values even with poor recovery. Samples that had recoveries of labeled standards outside the acceptance limits are qualified with 'Y' flags on the Labeled Compound summary pages. In all cases, the signal-to-noise ratios are greater than 10:1 and detection limit were below the Method Reporting Limit.

**Dilutions**

Sample K1503395-002 (C-3 6.5-9') had elevated levels of target analytes , which required dilutions. The undiluted and diluted results were combined into one Total TEQ summary report for each sample. This reports a 'Total' result that includes the most appropriate concentration found for the associated target analyte.

**E flags**

When OCDD and/or OCDF exceed the upper method calibration limit (MCL), Method 8290 Section 7.9.3 advises the chemist to "report the measured concentration and indicate that the value exceeds the MCL." We use 'E' flag on the Sample Analytical Report results page results to indicate a compound has exceeded the MCL.

Sample K1503395-003 (D-1 3.5-9') and 004 (F-3 5.5-9') were E flagged.

**K flags**

EMPC - When the ion abundance ratios associated with a particular compound are outside the QC limits, samples are flagged with a 'K' flag. A 'K' flag indicates an estimated maximum possible concentration for the associated compound.

**Detection Limits**

Detection limits are calculated for each analyte in each sample by measuring the height of the noise level for each quantitation ion for the associated labeled standard. The concentration equivalent to 2.5 times the height of the noise is then calculated using the appropriate response factor and the weight of the sample. The calculated concentration equals the detection limit.

**The TEQ Summary results for each sample have been calculated by ALS ENVIRONMENTAL/Houston to include:**

- WHO-2005 TEFs, The 2005 World Health Organization Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds (M. Van den Berg et al., Toxicological Sciences 93(2):223-241, 2006)
- Non-detected compounds are not included in the 'Total'

**Client:** Barr Engineering Company **Service Request:**K1503395

**Project:** Joslyn OU5 2015 Soil/23270110

## SAMPLE CROSS-REFERENCE

| SAMPLE # | CLIENT SAMPLE ID | DATE | TIME |
|---|---|---|---|
| K1503395-001 | B-3 6.5-9' | 2/2/2015 | 1420 |
| K1503395-002 | C-3 6.5-9' | 2/2/2015 | 1345 |
| K1503395-003 | D-1 3.5-9' | 2/2/2015 | 1110 |
| K1503395-004 | F-3 5.5-9' | 2/2/2015 | 1230 |

# Service Request Summary

**Folder #:** **K1503395**
Client Name: Barr Engineering Company
Project Name: Joslyn OU5 2015 Soil
Project Number: 23270110

**Report To:** Terri Olson
Barr Engineering
4700 West 77th Street
Minneapolis, MN 55435
USA
Phone Number: 952-842-3578
Cell Number:
Fax Number:
E-mail: tolson@barr.com

Project Chemist: Lisa Domenighini
Originating Lab: KELSO
Logged By: SWOLF
Date Received: 02/04/15
Internal Due Date: 4/17/2015
QAP: LAB QAP
Qualifier Set: Lab Standard
Formset: Lab Standard
Merged?: Y
Report to MDL?: N, Y
P.O. Number:
EDD: BARR - EQUIS

8 4 oz-Glass Jar WM CLEAR Teflon Liner Unpreserved
**Location:** K-Delilah-41, EHRMS-WIC 2D
**Pressure Gas:**
**NPDES**

| | | | | KELSO | | HOUSTON |
|---|---|---|---|---|---|---|
| **Lab Samp No.** | **Client Samp No** | **Matrix** | **Collected** | TOC/ASTM D4129-05 Modified | TS/160.3 Modified | PCDD PCDF/8290 |
| K1503395-001 | B-3 6.5-9' | Soil | 02/02/15 1420 | II | II | II |
| K1503395-002 | C-3 6.5-9' | Soil | 02/02/15 1345 | II | II | II |
| K1503395-003 | D-1 3.5-9' | Soil | 02/02/15 1110 | II | II | II |
| K1503395-004 | F-3 5.5-9' | Soil | 02/02/15 1230 | II | II | II |

## Folder Comments:

Tier II except when requested otherwise. Add narrative note that Benzo(b)fluoranthene cannot be separated from Benzo(j)fluoranthene.
Samples are a re-issue from K1501100.

# Service Request Summary

**Folder #:** **K1503395**
Client Name: Barr Engineering Company
Project Name: Joslyn OU5 2015 Soil
Project Number: 23270110

**Report To:** Terri Olson
Barr Engineering
4700 West 77th Street
Minneapolis, MN 55435
USA
Phone Number: 952-842-3578
Cell Number:
Fax Number:
E-mail: tolson@barr.com

Project Chemist: Lisa Domenighini
Originating Lab: KELSO
Logged By: SWOLF
Date Received: 02/04/15
Internal Due Date: 4/17/2015
QAP: LAB QAP
Qualifier Set: Lab Standard
Formset: Lab Standard
Merged?: Y
Report to MDL?: N, Y
P.O. Number:
EDD: BARR - EQUIS

8 4 oz-Glass Jar WM CLEAR Teflon Liner Unpreserved
**Location:** K-Delilah-41, EHRMS-WIC 2D
**Pressure Gas:**
**NPDES**

## Test Comments:

| Group | Test/Method | Samples | Comments |
|---|---|---|---|
| Semivoa GCMS | PCDD PCDF/8290 | 5 | full list<br>rcvd 4/7/15<br>must meet three week deadline |

# Data Qualifier Flags – Dioxin/Furans

**B** Indicates the associated analyte is found in the method blank, as well as in the sample

**C** 2378-TCDF is detected on the DB-5 column above the MRL, confirmation analysis was performed on a second column (DB-225.) The results from both the DB-5 column and the DB-225 column are included in this data package. The results from the DB-225 analyses should be used to evaluate the 2378-TCDF in the samples. The confirmed result are used in determining the TEQ value for TCDF.

**E** The reported result is above the instrument calibration range and is an estimated value.

**J** Indicates an estimated value – used when the analyte concentration is below the method reporting limit (MRL) and above the estimated detection limit (EDL)

**K** Ion abundance ratios between the primary and secondary ions were outside of theoretical acceptance limits. The reported result is an estimated maximum possible concentration (EMPC)

**i** The associated MRL/MDL has been elevated due to matrix interference.

**U** Indicates the compound was analyzed for, but not detected (ND)

**Y** C13-Labeled standard percent recoveries are outside of method acceptance limits

**S** Peak is saturated; data not reportable

**P** Indicates chlorodiphenyl ether interference present at the retention time of the target compound.

**X** See case narrative

**Acronyms**

| | |
|---|---|
| Cal | Calibration |
| Conc | CONCentration |
| Dioxin(s) | Polychlorinated dibenzo-p-dioxin(s) |
| EDL | Estimated Detection Limit |
| EMPC | Estimated Maximum Possible Concentration |
| Flags | Data qualifiers |
| Furan(s) | Polychlorinated dibenzofuran(s) |
| g | Grams |
| ICAL | Initial CALibration |
| ID | IDentifier |
| Ions | Masses monitored for the analyte during data acquisition |
| L | Liter (s) |
| LCS | Laboratory Control Sample |
| DLCS | Duplicate Laboratory Control Sample |
| MB | Method Blank |
| MCL | Method Calibration Limit |
| MDL | Method Detection Limit |
| mL | Milliliters |
| MS | Matrix Spiked sample |
| DMS | Duplicate Matrix Spiked sample |
| NO | Number of peaks meeting all identification criteria |
| PCDD(s) | Polychlorinated dibenzo-p-dioxin(s) |
| PCDF(s) | Polychlorinated dibenzofuran(s) |
| ppb | Parts per billion |
| ppm | Parts per million |
| ppq | Parts per quadrillion |
| ppt | Parts per trillion |
| QA | Quality Assurance |
| QC | Quality Control |
| Ratio | Ratio of areas from monitored ions for an analyte |
| % Rec. | Percent recovery |
| RPD | Relative Percent Difference |
| RRF | Relative Response Factor |
| RT | Retention Time |
| SDG | Sample Delivery Group |
| S/N | Signal-to-noise ratio |
| TEF | Toxicity Equivalence Factor |
| TEQ | Toxicity Equivalence Quotient |

## State Certifications, Accreditations, and Licenses

| Agency | Number | Expire Date |
|---|---|---|
| American Association for Laboratory Accreditation | 2897.01 | 11/30/2015 |
| Arizona Department of Health Services | AZ0793 | 5/27/2015 |
| Arkansas Department of Environmental Quality | 14-038-0 | 6/16/2015 |
| Florida Department of Health | E87611 | 6/30/2015 |
| Hawaii Department of Health | TX02694 | 6/30/2015 |
| Illinois Environmental Protection Agency | 200057 | 10/6/2015 |
| Louisiana Department of Environmental Quality | 03048 | 6/30/2015 |
| Louisiana Department of Health and Hospitals | LA150026 | 12/31/2015 |
| Maine Center for Disease Control and Prevention | 2014019 | 6/5/2016 |
| Maryland Department of the Environment | 343 | 6/30/2015 |
| Michigan Depratment of Environmental Quality | 9971 | 6/30/2015 |
| Minnesota Department of Health | 840911 | 12/31/2015 |
| Nebraska Department of Health and Human Services | NE-OS-25-13 | 6/30/2015 |
| Nevada Department of Concervation and Natural Resources | TX014112013-2 | 7/31/2015 |
| New Jersey Department of Environmental Protection | NLC140001 | 6/30/2015 |
| New Mexico Environment Department | TX02694 | 6/30/2015 |
| Oklahoma Department of Environmental Quality | 2014 124 | 8/31/2015 |
| Oklahoma Department of Environmental Quality | 2014-124 | 8/31/2015 |
| Pennsylvania Department of Environmental Protection | 68-03441 | 6/30/2015 |
| Tennessee Department of Environment and Concervation | 04016 | 6/30/2015 |
| Texas Commision on Environmental Quality | TX104704216-14-5 | 6/30/2015 |
| United States Department of Agriculture | P330-14-00067 | 2/21/2017 |
| Utah Department of Health Environmental Laboratory Certification | TX02694 | 7/31/2015 |
| Washington Department of Health | c819 | 11/14/2015 |
| West Virginia Department of Environmental Protection | 347 | 6/30/2015 |

# ALS ENVIRONMENTAL – Houston
## Data Processing/Form Production and Peer Review Signatures

SR# Unique ID: K1503395 | DB-5 | DB-5MSUI | DB-225 | SPB-Octyl

**First Level - Data Processing** - to be filled by person generating the forms

| Date: | Analyst: | Samples: |
|---|---|---|
| 04/14/15 | JC | 001-004 |

**Second Level - Data Review** – to be filled by person doing peer review

| Date: | Analyst: | Samples: |
|---|---|---|
| 04/16/15 | MM | 001-004 |

PEER REVIEW PAGE.DOC

# ALS ENVIRONMENTAL – Houston
## Data Processing/Form Production and Peer Review Signatures

SR# Unique ID: K1503395 | DB-5 | DB-5MSUI | DB-225 | SPB-Octyl

**First Level - Data Processing - to be filled by person generating the forms**

| Date: | Analyst: | Samples: |
|---|---|---|
| 04/17/15 | TC | -0021L |

**Second Level - Data Review – to be filled by person doing peer review**

| Date: | Analyst: | Samples: |
|---|---|---|
| 04/18/15 | LW | 0021L |

PEER REVIEW PAGE

# Chain of Custody

**ALS Environmental - Houston HRMS**
10450 Stancliff Rd, Suite 210, Houston TX 77099
Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

# Intra-Network Chain of Custody

1317 South 13th Avenue • Kelso, WA 98626 • 1-360-577-7222 • FAX 1-360-636-1068

ALS Contact: Lisa Domenighini

**Project Name:** Joslyn OU5 2015 Soil
**Project Number:** 23270110
**Project Manager:** Terri Olson
**Company:** Barr Engineering

| Lab Code | Client Sample ID | # of Cont. | Matrix | Sample Date | Sample Time | Date Received | Send To | PCDD PCDF 8290 |
|---|---|---|---|---|---|---|---|---|
| K1503395-001 | B-3 6.5-9' | 1 | Soil | 2/2/15 | 1420 | 2/4/15 | HOUSTON | V |
| K1503395-002 | C-3 6.5-9' | 1 | Soil | 2/2/15 | 1345 | 2/4/15 | HOUSTON | V |
| K1503395-003 | D-1 3.5-9' | 1 | Soil | 2/2/15 | 1110 | 2/4/15 | HOUSTON | V |
| K1503395-004 | F-3 5.5-9' | 1 | Soil | 2/2/15 | 1230 | 2/4/15 | HOUSTON | V |

II

**Folder Comments:**
Tier II except when requested otherwise. Add narrative note that Benzo(b)fluoranthene cannot be separated from Benzo(j)fluoranthene.

K1503395 5
Barr Engineering
Joslyn OU5 2015 Soil

| Special Instructions/Comments | Turnaround Requirements | Report Requirements | Invoice Information |
|---|---|---|---|
| Please provide the electronic (PDF and EDD) report to the following e-mail address: ALKLS.Data@alsglobal.com.<br><br>pH Checked _____ | ____ RUSH (Surcharges Apply)<br>PLEASE CIRCLE WORK DAYS<br>1 2 3 4 5<br>X STANDARD<br>Requested FAX Date: _____<br>Requested Report Date: ~~04/17/15~~ 4/7/15 | ____ I. Results Only<br>____ II. Results + QC Summaries<br>____ III. Results + QC and Calibration Summaries<br>____ IV. Data Validation Report with Raw Data<br>PQL/MDL/J N<br>EDD Y | PO# 51K1503395<br>Bill to |

Relinquished By: [signature] 4/6/15 Received By: [signature] 4/7/15 Airbill Number: _____

ALS Environmental

# Cooler Receipt Form

Project Chemist AK

Client/Project Barr Engineering

Thermometer ID SM0

Date/Time Received: 4/7/15 905 Initials: AL

Date/Time Logged in: 4/7/15 Initials AL

1. Method of delivery: ○ US Mail ✓ Fed Ex ○ UPS ○ DHL ○ Courier ○ Client

2. Samples received in: ✓ Cooler ○ Box ○ Envelope ○ Other

3. Were custody seals on coolers? ✓ Yes ○ No

Were they intact? ✓ Yes ○ No ○ N/A

Were they signed and dated? ✓ Yes ○ No ○ N/A

If yes, how many and where? 1 Seal

4. Packing Material: ○ Inserts ○ Baggies ✓ Bubble Wrap ○ Gel Packs ○ Wet Ice ○ Sleeves ○ Other

5. Foreign or Regulated Soil? ○ Yes ✓ No Location of Sampling:

| Cooler Tracking Number | COC ID | Date Opened | Time Opened | Opened By | Temp. °C | Temp. Blank? |
|---|---|---|---|---|---|---|
| 5478 9743 1990 | | 4/7/15 | 913 | AL | 1.5/1.0 2/3 AL 4/7/15 | ☐ |
| | | | | | | ☐ |
| | | | | | | ☐ |
| | | | | | | ☐ |

6. Were custody papers properly filled out (ink, signed, dated, etc)? ✓ Yes ○ No

7. Did all bottles arrive in good condition (not broken, no signs of leakage)? ✓ Yes ○ No

8. Were all sample labels complete (i.e., sample ID, analysis, preservation, etc)? ✓ Yes ○ No

9. Were appropriate bottles/containers and volumes received for the requested tests? ✓ Yes ○ No

10. Did sample labels and tags agree with custody documents? ✓ Yes ○ No

Notes, Discrepancies, & Resolutions:

Service request Label: K1503395 5

Barr Engineering
Joslyn OU5 2015 Soil

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**www.alsglobal.com**

# SAMPLE ACCEPTANCE POLICY

This policy outlines the criteria samples must meet to be accepted by ALS Environmental – Houston HRMS.

**Cooler Custody Seals (desirable, mandatory if specified in SAP):**

- ✓ Intact on outside of cooler, signed and dated

**Chain-of-Custody (COC) documentation (mandatory):**

The following is required on each COC:

- ✓ Sample ID, the location, date and time of collection, collector's name, preservation type, sample type, and any other special remarks concerning the sampleThe COC must be completed in ink.
- ✓ Signature and date of relinquishing party.

In the absence of a COC at sample receipt, the COC will be requested from the client.

**Sample Integrity (mandatory):**

Samples are inspected upon arrival to ensure that sample integrity was not compromised during transfer to the laboratory.

- ✓ Sample containers must arrive in good condition (not broken or leaking).
- ✓ Samples must be labeled appropriately, including Sample IDs, and requested test using durable labels and indelible ink.
- ✓ The correct type of sample bottle must be used for the method requested.
- ✓ An appropriate sample volume, or weight, must be received.
- ✓ Sample IDs and number of containers must reconcile with the COC.
- ✓ Samples must be received within the method defined holding time.

**Temperature Requirement (varies by sample matrix):**

- ✓ Aqueous and Non-aqueous samples must be shipped and stored cold, at 0 to 6ºC.
- ✓ Tissue samples must be shipped and stored frozen, at -20 to -10ºC.
- ✓ Air samples are shipped and stored cold, at 0 to 6ºC
- ✓ The sample temperature must be recorded on the COC

All cooler inspections are documented on the Cooler Receipt Form (CRF). A separate CRF is completed for each service request. Any samples not meeting the above criteria are noted on the CRF and the Project Manager notified. The Project Manager must resolve any sample integrity issues with the client prior to proceeding with the analysis. Such resolutions are documented in writing and filed with the project folder. Data associated with samples received outside of this acceptance policy will be qualified on the case narrative of the final report

# Preparation Information Benchsheets

**ALS Environmental - Houston HRMS**
10450 Stancliff Rd., Suite 210, Houston, TX 77099
Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

# *Preparation Information Benchsheet*

**Prep Run#:** 233132 **Prep WorkFlow:** OrgExtDioxS(30) **Status:** Prepped
**Team:** Semivoa GCMS/DEDWARDS **Prep Method:** Method **Prep Date/Time:** 4/8/15 12:00 PM

| # | Lab Code | Client ID | B# | Method /Test | pH | Matrix | Amt. Ext. | Sample Description |
|---|---|---|---|---|---|---|---|---|
| 1 | EQ1500276-01 | MB | | 8290/PCDD PCDF | | Solid | 10.260g | |
| 2 | EQ1500276-02 | LCS | | 8290/PCDD PCDF | | Solid | 10.428g | |
| 3 | EQ1500276-03 | DLCS | | 8290/PCDD PCDF | | Solid | 10.381g | |
| 4 | K1503395-001 | B-3 6.5-9' | .02 | 8290/PCDD PCDF | | Soil | 10.230g | Black Soft Mosit Soil |
| 5 | K1503395-002 | C-3 6.5-9' | .02 | 8290/PCDD PCDF | | Soil | 10.137g | Black Soft Mosit Soil |
| 6 | K1503395-003 | D-1 3.5-9' | .02 | 8290/PCDD PCDF | | Soil | 10.313g | Black Soft Mosit Soil |
| 7 | K1503395-004 | F-3 5.5-9' | .02 | 8290/PCDD PCDF | | Soil | 10.108g | Black Soft Mosit Soil w/Roots |

## Spiking Solutions

Name: 1613B Matrix Working Standard Inventory ID 79845 Logbook Ref: 2-20 ng/ml 79845 WM 3/24/15 Expires On: 03/24/2016

EQ1500276-02 100.00µL EQ1500276-03 100.00µL

Name: 1613B Labeled Working Standard Inventory ID 79921 Logbook Ref: 2-4 ng/ml 79921 WM 3/27/15 Expires On: 03/17/2016

EQ1500276-01 1,000.00µL EQ1500276-02 1,000.00µL EQ1500276-03 1,000.00µL K1503395-001 1,000.00µL K1503395-002 1,000.00µL K1503395-002.F 1,000.00µL

Name: 1613B Labeled Working Standard Inventory ID 79924 Logbook Ref: 2-4 ng/ml 79924 WM 3/27/15 Expires On: 03/27/2016

K1503395-003 1,000.00µL K1503395-004 1,000.00µL

Name: 8290/1613B Cleanup Working Standard Inventory ID 80227 Logbook Ref: 80227 04/09/2015/CID Expires On: 10/06/2015

EQ1500276-01 100.00µL EQ1500276-02 100.00µL EQ1500276-03 100.00µL K1503395-001 100.00µL K1503395-002 100.00µL K1503395-002.F 100.00µL
K1503395-003 100.00µL K1503395-004 100.00µL

## Preparation Materials

| | | | | | |
|---|---|---|---|---|---|
| Carbon, High Purity | LM 3/25/15 (79883) | Ethyl Acetate 99.9% Minimum EtOAc | LM 2/27/15 (79153) | Glass Wool | AL 2/17/15 (78802) |
| Sulfuric Acid Reagent Grade H2SO4 | LM 3/4/15 (79265) | Hexanes 95% | AL 03/24/15 (79848) | Dichloromethane (Methylene Chloride) 99.9% MeCl2 | LM 2/20/15 (78906) |
| Sodium Chloride Reagent Grade NaCl | C2-65-5 (38670) | Sodium Sulfate Anhydrous Reagent Grade Na2SO4 | LM 11/25/14 (76864) | Tridecane (n-Tridecane) | AL 03/10/15 (79360) |
| Silica Gel Reagent Grade | AL 03/13/15 (79494) | Toluene 99.9% Minimum | DE 3/23/15 (79829) | Sodium Hydroxide Reagent Grade NaOH | LM 09/02/14 (74232) |

# *Preparation Information Benchsheet*

**Prep Run#:** 233132 **Prep WorkFlow:** OrgExtDioxS(30) **Status:** Prepped
**Team:** Semivoa GCMS/DEDWARDS **Prep Method:** Method **Prep Date/Time:** 4/8/15 12:00 PM

**Preparation Steps**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Step: | Extraction | Step: | Acid Clean | Step: | Silica Gel Clean | Step: | Final Volume |
| Started: | 4/8/15 12:00 | Started: | 4/9/15 11:00 | Started: | 4/10/15 06:50 | Started: | 4/10/15 12:00 |
| Finished: | 4/9/15 04:15 | Finished: | 4/9/15 11:20 | Finished: | 4/10/15 08:45 | Finished: | 4/10/15 12:25 |
| By: | DEDWARDS | By: | CDIAZ | By: | CDIAZ | By: | CDIAZ |
| Comments | | Comments | | Comments | | Comments | |

Comments: _____

Reviewed By: LM Date: 4/17/15

Chain of Custody

Relinquished By: _____ Date: _____

Received By: _____ Date: _____

Extracts Examined
Yes No

# Analytical Results

**ALS Environmental - Houston HRMS**
10450 Stancliff Rd., Suite 210, Houston, TX 77099
Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 14:20 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-3 6.5-9' | **Units:** | ng/Kg |
| **Lab Code:** | K1503395-001 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 04/11/15 03:01 |
| **Prep Method:** | Method | **Date Extracted:** | 4/8/15 |
| **Sample Amount:** | 10.230g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235508 | **Blank File Name:** | P235507 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235504 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | ND | U | 0.592 | 1.77 | | | 1 |
| 1,2,3,7,8-PeCDD | ND | U | 0.755 | 8.85 | | | 1 |
| 1,2,3,4,7,8-HxCDD | ND | U | 0.454 | 8.85 | | | 1 |
| 1,2,3,6,7,8-HxCDD | 2.37**JK** | | 0.454 | 8.85 | 0.71 | 1.001 | 1 |
| 1,2,3,7,8,9-HxCDD | ND | U | 0.435 | 8.85 | | | 1 |
| 1,2,3,4,6,7,8-HpCDD | 72.3 | | 0.850 | 8.85 | 0.91 | 1.000 | 1 |
| OCDD | 828 | | 0.756 | 17.7 | 0.92 | 1.000 | 1 |
| 2,3,7,8-TCDF | ND | U | 1.64 | 1.77 | | | 1 |
| 1,2,3,7,8-PeCDF | ND | U | 0.379 | 8.85 | | | 1 |
| 2,3,4,7,8-PeCDF | ND | U | 0.368 | 8.85 | | | 1 |
| 1,2,3,4,7,8-HxCDF | 1.09**JK** | | 0.379 | 8.85 | 2.30 | 1.001 | 1 |
| 1,2,3,6,7,8-HxCDF | ND | U | 0.354 | 8.85 | | | 1 |
| 1,2,3,7,8,9-HxCDF | ND | U | 0.471 | 8.85 | | | 1 |
| 2,3,4,6,7,8-HxCDF | ND | U | 0.372 | 8.85 | | | 1 |
| 1,2,3,4,6,7,8-HpCDF | 25.7**K** | | 0.683 | 8.85 | 1.39 | 1.000 | 1 |
| 1,2,3,4,7,8,9-HpCDF | ND | U | 0.812 | 8.85 | | | 1 |
| OCDF | 153 | | 1.33 | 17.7 | 0.88 | 1.005 | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 14:20 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-3 6.5-9' | **Units:** | ng/Kg |
| **Lab Code:** | K1503395-001 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 04/11/15 03:01 |
| **Prep Method:** | Method | **Date Extracted:** | 4/8/15 |
| **Sample Amount:** | 10.230g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235508 | **Blank File Name:** | P235507 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235504 |

### Native Analyte Results

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | ND | U | 0.592 | 1.77 | | | 1 |
| Total Penta-Dioxins | ND | U | 0.755 | 8.85 | | | 1 |
| Total Hexa-Dioxins | 5.66**J** | | 0.447 | 8.85 | 1.35 | | 1 |
| Total Hepta-Dioxins | 72.3 | | 0.850 | 8.85 | 0.91 | | 1 |
| Total Tetra-Furans | ND | U | 1.64 | 1.77 | | | 1 |
| Total Penta-Furans | ND | U | 0.652 | 8.85 | | | 1 |
| Total Hexa-Furans | 22.3 | | 0.390 | 8.85 | 1.30 | | 1 |
| Total Hepta-Furans | 96.7 | | 0.744 | 8.85 | 1.11 | | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 14:20 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-3 6.5-9' | **Units:** | Percent |
| **Lab Code:** | K1503395-001 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 04/11/15 03:01 |
| **Prep Method:** | Method | **Date Extracted:** | 4/8/15 |
| **Sample Amount:** | 10.230g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235508 | **Blank File Name:** | P235507 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235504 |

### Labeled Standard Results

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1239.767 | 62 | | 40-135 | 0.77 | 1.023 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1463.638 | 73 | | 40-135 | 1.60 | 1.203 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1103.924 | 55 | | 40-135 | 1.26 | 0.991 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1205.427 | 60 | | 40-135 | 1.29 | 0.993 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1145.915 | 57 | | 40-135 | 1.06 | 1.068 |
| 13C-OCDD | 4000 | 2005.131 | 50 | | 40-135 | 0.89 | 1.140 |
| | | | | | | | |
| 13C-2,3,7,8-TCDF | 2000 | 1210.250 | 61 | | 40-135 | 0.82 | 0.993 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1394.427 | 70 | | 40-135 | 1.63 | 1.158 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1457.582 | 73 | | 40-135 | 1.59 | 1.192 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1070.171 | 54 | | 40-135 | 0.49 | 0.970 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1150.238 | 58 | | 40-135 | 0.51 | 0.973 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1153.946 | 58 | | 40-135 | 0.50 | 1.008 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1201.178 | 60 | | 40-135 | 0.51 | 0.988 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 1015.224 | 51 | | 40-135 | 0.43 | 1.043 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1241.171 | 62 | | 40-135 | 0.46 | 1.081 |
| | | | | | | | |
| 37Cl-2,3,7,8-TCDD | 800 | 697.205 | 87 | | 40-135 | NA | 1.024 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 14:20 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | B-3 6.5-9' | **Units:** | ng/Kg |
| **Lab Code:** | K1503395-001 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

**Analysis Method:** 8290
**Prep Method:** Method

### Toxicity Equivalency Quotient

| Analyte Name | Result | DL | MRL | Dilution Factor | TEF | TEF - Adjusted Concentration |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | ND | 0.592 | 1.77 | 1 | 1 | |
| 1,2,3,7,8-PeCDD | ND | 0.755 | 8.85 | 1 | 1 | |
| 1,2,3,4,7,8-HxCDD | ND | 0.454 | 8.85 | 1 | 0.1 | |
| 1,2,3,6,7,8-HxCDD | **2.37** | 0.454 | 8.85 | 1 | 0.1 | 0.237 |
| 1,2,3,7,8,9-HxCDD | ND | 0.435 | 8.85 | 1 | 0.1 | |
| 1,2,3,4,6,7,8-HpCDD | **72.3** | 0.850 | 8.85 | 1 | 0.01 | 0.723 |
| OCDD | **828** | 0.756 | 17.7 | 1 | 0.0003 | 0.248 |
| 2,3,7,8-TCDF | ND | 1.64 | 1.77 | 1 | 0.1 | |
| 1,2,3,7,8-PeCDF | ND | 0.379 | 8.85 | 1 | 0.03 | |
| 2,3,4,7,8-PeCDF | ND | 0.368 | 8.85 | 1 | 0.3 | |
| 1,2,3,4,7,8-HxCDF | **1.09** | 0.379 | 8.85 | 1 | 0.1 | 0.109 |
| 1,2,3,6,7,8-HxCDF | ND | 0.354 | 8.85 | 1 | 0.1 | |
| 1,2,3,7,8,9-HxCDF | ND | 0.471 | 8.85 | 1 | 0.1 | |
| 2,3,4,6,7,8-HxCDF | ND | 0.372 | 8.85 | 1 | 0.1 | |
| 1,2,3,4,6,7,8-HpCDF | **25.7** | 0.683 | 8.85 | 1 | 0.01 | 0.257 |
| 1,2,3,4,7,8,9-HpCDF | ND | 0.812 | 8.85 | 1 | 0.01 | |
| OCDF | **153** | 1.33 | 17.7 | 1 | 0.0003 | 0.0459 |
| | | Total TEQ | | | | 1.62 |

2005 WHO TEFs, ND = 0

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:45 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | C-3 6.5-9' | **Units:** | ng/Kg |
| **Lab Code:** | K1503395-002 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 04/11/15 03:49 |
| **Prep Method:** | Method | **Date Extracted:** | 4/8/15 |
| **Sample Amount:** | 10.137g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235509 | **Blank File Name:** | P235507 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235504 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | ND | U | 2.50 | 2.64 | | | 1 |
| 1,2,3,7,8-PeCDD | 29.4 | | 3.09 | 13.2 | 1.44 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDD | 111 | | 2.87 | 13.2 | 1.39 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 1280 | | 3.04 | 13.2 | 1.30 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 284 | | 2.84 | 13.2 | 1.26 | 1.007 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 73200 | | 327 | 327 | 1.05 | 1.000 | 20 |
| OCDD | 725000 | | 34.8 | 528 | 0.90 | 1.000 | 20 |
| 2,3,7,8-TCDF | 17.3**K** | | 1.85 | 2.64 | 1.21 | 1.001 | 1 |
| 1,2,3,7,8-PeCDF | 85.6 | | 14.5 | 14.5 | 1.71 | 1.001 | 1 |
| 2,3,4,7,8-PeCDF | 200 | | 14.7 | 14.7 | 1.65 | 1.002 | 1 |
| 1,2,3,4,7,8-HxCDF | 890 | | 52.9 | 52.9 | 1.34 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDF | 205 | | 48.6 | 48.6 | 1.28 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDF | 288 | | 61.7 | 61.7 | 1.32 | 1.001 | 1 |
| 2,3,4,6,7,8-HxCDF | 344 | | 55.0 | 55.0 | 1.20 | 1.001 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 35600 | | 295 | 295 | 1.05 | 1.000 | 20 |
| 1,2,3,4,7,8,9-HpCDF | 1060 | | 22.0 | 22.0 | 1.05 | 1.000 | 1 |
| OCDF | 147000 | | 76.9 | 528 | 0.90 | 1.005 | 20 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:45 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | C-3 6.5-9' | **Units:** | ng/Kg |
| **Lab Code:** | K1503395-002 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 04/11/15 03:49 |
| **Prep Method:** | Method | **Date Extracted:** | 4/8/15 |
| **Sample Amount:** | 10.137g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235509 | **Blank File Name:** | P235507 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235504 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | 44.2 | | 2.50 | 2.64 | 0.70 | | 1 |
| Total Penta-Dioxins | 349 | | 3.09 | 13.2 | 1.59 | | 1 |
| Total Hexa-Dioxins | 6230 | | 2.92 | 13.2 | 1.27 | | 1 |
| Total Hepta-Dioxins | 80000 | | 80.6 | 80.6 | 1.05 | | 1 |
| Total Tetra-Furans | 60.6 | | 1.85 | 2.64 | 0.88 | | 1 |
| Total Penta-Furans | 1500 | | 1.04 | 13.2 | 1.54 | | 1 |
| Total Hexa-Furans | 20800 | | 54.1 | 54.1 | 1.30 | | 1 |
| Total Hepta-Furans | 94700 | | 22.1 | 22.1 | 1.05 | | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:45 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | C-3 6.5-9' | **Units:** | Percent |
| **Lab Code:** | K1503395-002 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 04/11/15 03:49 |
| **Prep Method:** | Method | **Date Extracted:** | 4/8/15 |
| **Sample Amount:** | 10.137g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235509 | **Blank File Name:** | P235507 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235504 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1074.000 | 54 | | 40-135 | 0.73 | 1.023 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1269.755 | 63 | | 40-135 | 1.57 | 1.202 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1048.311 | 52 | | 40-135 | 1.31 | 0.991 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1015.579 | 51 | | 40-135 | 1.24 | 0.993 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1007.932 | 50 | | 40-135 | 1.11 | 1.067 |
| 13C-OCDD | 4000 | 1744.223 | 44 | | 40-135 | 0.92 | 1.141 |
| | | | | | | | |
| 13C-2,3,7,8-TCDF | 2000 | 1024.216 | 51 | | 40-135 | 0.82 | 0.992 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1243.242 | 62 | | 40-135 | 1.59 | 1.157 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1250.670 | 63 | | 40-135 | 1.63 | 1.192 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 980.292 | 49 | | 40-135 | 0.51 | 0.970 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1032.342 | 52 | | 40-135 | 0.50 | 0.973 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1036.297 | 52 | | 40-135 | 0.53 | 1.008 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1012.225 | 51 | | 40-135 | 0.52 | 0.987 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 718.508 | 36 | **Y** | 40-135 | 0.42 | 1.043 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1089.097 | 54 | | 40-135 | 0.44 | 1.080 |
| | | | | | | | |
| 37Cl-2,3,7,8-TCDD | 800 | 650.179 | 81 | | 40-135 | NA | 1.024 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:45 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | C-3 6.5-9' | **Units:** | ng/Kg |
| **Lab Code:** | K1503395-002 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

**Analysis Method:** 8290
**Prep Method:** Method

**Toxicity Equivalency Quotient**

| Analyte Name | Result | DL | MRL | Dilution Factor | TEF | TEF - Adjusted Concentration |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | ND | 2.50 | 2.64 | 1 | 1 | |
| 1,2,3,7,8-PeCDD | **29.4** | 3.09 | 13.2 | 1 | 1 | 29.4 |
| 1,2,3,4,7,8-HxCDD | **111** | 2.87 | 13.2 | 1 | 0.1 | 11.1 |
| 1,2,3,6,7,8-HxCDD | **1280** | 3.04 | 13.2 | 1 | 0.1 | 128 |
| 1,2,3,7,8,9-HxCDD | **284** | 2.84 | 13.2 | 1 | 0.1 | 28.4 |
| 1,2,3,4,6,7,8-HpCDD | **73200** | 327 | 327 | 20 | 0.01 | 732 |
| OCDD | **725000** | 34.8 | 528 | 20 | 0.0003 | 218 |
| 2,3,7,8-TCDF | **17.3** | 1.85 | 2.64 | 1 | 0.1 | 1.73 |
| 1,2,3,7,8-PeCDF | **85.6** | 14.5 | 14.5 | 1 | 0.03 | 2.57 |
| 2,3,4,7,8-PeCDF | **200** | 14.7 | 14.7 | 1 | 0.3 | 60.0 |
| 1,2,3,4,7,8-HxCDF | **890** | 52.9 | 52.9 | 1 | 0.1 | 89.0 |
| 1,2,3,6,7,8-HxCDF | **205** | 48.6 | 48.6 | 1 | 0.1 | 20.5 |
| 1,2,3,7,8,9-HxCDF | **288** | 61.7 | 61.7 | 1 | 0.1 | 28.8 |
| 2,3,4,6,7,8-HxCDF | **344** | 55.0 | 55.0 | 1 | 0.1 | 34.4 |
| 1,2,3,4,6,7,8-HpCDF | **35600** | 295 | 295 | 20 | 0.01 | 356 |
| 1,2,3,4,7,8,9-HpCDF | **1060** | 22.0 | 22.0 | 1 | 0.01 | 10.6 |
| OCDF | **147000** | 76.9 | 528 | 20 | 0.0003 | 44.1 |
| | | Total TEQ | | | | 1790 |

2005 WHO TEFs, ND = 0

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 11:10 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | D-1 3.5-9' | **Units:** | ng/Kg |
| **Lab Code:** | K1503395-003 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 04/11/15 04:38 |
| **Prep Method:** | Method | **Date Extracted:** | 4/8/15 |
| **Sample Amount:** | 10.313g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235510 | **Blank File Name:** | P235507 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235504 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | ND | U | 0.824 | 1.22 | | | 1 |
| 1,2,3,7,8-PeCDD | 1.72**JK** | | 0.492 | 6.08 | 2.30 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDD | 7.17 | | 0.397 | 6.08 | 1.42 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 52.3 | | 0.425 | 6.08 | 1.19 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 13.5**K** | | 0.394 | 6.08 | 1.01 | 1.007 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 1860 | | 7.20 | 7.20 | 1.04 | 1.000 | 1 |
| OCDD | 25300**E** | | 0.863 | 12.2 | 0.90 | 1.000 | 1 |
| | | | | | | | |
| 2,3,7,8-TCDF | ND | U | 0.863 | 1.22 | | | 1 |
| 1,2,3,7,8-PeCDF | 3.03**JK** | | 1.68 | 6.08 | 1.12 | 1.000 | 1 |
| 2,3,4,7,8-PeCDF | 5.14**J** | | 1.72 | 6.08 | 1.52 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDF | 41.6 | | 2.69 | 6.08 | 1.35 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDF | 9.58**K** | | 2.55 | 6.08 | 1.68 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDF | 10.5 | | 3.16 | 6.08 | 1.21 | 1.001 | 1 |
| 2,3,4,6,7,8-HxCDF | 13.5 | | 2.78 | 6.08 | 1.11 | 1.000 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 547 | | 4.52 | 6.08 | 1.04 | 1.000 | 1 |
| 1,2,3,4,7,8,9-HpCDF | 38.0 | | 4.71 | 6.08 | 1.01 | 1.000 | 1 |
| OCDF | 2750 | | 0.996 | 12.2 | 0.88 | 1.005 | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 11:10 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | D-1 3.5-9' | **Units:** | ng/Kg |
| **Lab Code:** | K1503395-003 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 04/11/15 04:38 |
| **Prep Method:** | Method | **Date Extracted:** | 4/8/15 |
| **Sample Amount:** | 10.313g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235510 | **Blank File Name:** | P235507 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235504 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | ND | U | 0.824 | 1.22 | | | 1 |
| Total Penta-Dioxins | 2.41**J** | | 0.492 | 6.08 | 1.73 | | 1 |
| Total Hexa-Dioxins | 206 | | 0.406 | 6.08 | 1.25 | | 1 |
| Total Hepta-Dioxins | 3610 | | 7.20 | 7.20 | 1.03 | | 1 |
| Total Tetra-Furans | ND | U | 0.863 | 1.22 | | | 1 |
| Total Penta-Furans | 49.2 | | 0.390 | 6.08 | 1.46 | | 1 |
| Total Hexa-Furans | 612 | | 2.78 | 6.08 | 1.25 | | 1 |
| Total Hepta-Furans | 2680 | | 4.60 | 6.08 | 1.04 | | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 11:10 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | D-1 3.5-9' | **Units:** | Percent |
| **Lab Code:** | K1503395-003 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 04/11/15 04:38 |
| **Prep Method:** | Method | **Date Extracted:** | 4/8/15 |
| **Sample Amount:** | 10.313g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235510 | **Blank File Name:** | P235507 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235504 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1340.355 | 67 | | 40-135 | 0.83 | 1.023 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1575.277 | 79 | | 40-135 | 1.63 | 1.202 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1231.223 | 62 | | 40-135 | 1.27 | 0.991 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1229.820 | 61 | | 40-135 | 1.25 | 0.993 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1226.566 | 61 | | 40-135 | 1.06 | 1.067 |
| 13C-OCDD | 4000 | 2225.152 | 56 | | 40-135 | 0.88 | 1.140 |
| | | | | | | | |
| 13C-2,3,7,8-TCDF | 2000 | 1263.566 | 63 | | 40-135 | 0.77 | 0.993 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1503.643 | 75 | | 40-135 | 1.62 | 1.157 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1532.670 | 77 | | 40-135 | 1.57 | 1.192 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1169.706 | 58 | | 40-135 | 0.52 | 0.970 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1212.757 | 61 | | 40-135 | 0.53 | 0.973 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1289.187 | 64 | | 40-135 | 0.50 | 1.008 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1256.326 | 63 | | 40-135 | 0.52 | 0.988 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 954.832 | 48 | | 40-135 | 0.45 | 1.043 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1333.337 | 67 | | 40-135 | 0.43 | 1.080 |
| | | | | | | | |
| 37Cl-2,3,7,8-TCDD | 800 | 722.559 | 90 | | 40-135 | NA | 1.024 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 11:10 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | D-1 3.5-9' | **Units:** | ng/Kg |
| **Lab Code:** | K1503395-003 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

**Analysis Method:** 8290
**Prep Method:** Method

**Toxicity Equivalency Quotient**

| Analyte Name | Result | DL | MRL | Dilution Factor | TEF | TEF - Adjusted Concentration |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | ND | 0.824 | 1.22 | 1 | 1 | |
| 1,2,3,7,8-PeCDD | **1.72** | 0.492 | 6.08 | 1 | 1 | 1.72 |
| 1,2,3,4,7,8-HxCDD | **7.17** | 0.397 | 6.08 | 1 | 0.1 | 0.717 |
| 1,2,3,6,7,8-HxCDD | **52.3** | 0.425 | 6.08 | 1 | 0.1 | 5.23 |
| 1,2,3,7,8,9-HxCDD | **13.5** | 0.394 | 6.08 | 1 | 0.1 | 1.35 |
| 1,2,3,4,6,7,8-HpCDD | **1860** | 7.20 | 7.20 | 1 | 0.01 | 18.6 |
| OCDD | **25300** | 0.863 | 12.2 | 1 | 0.0003 | 7.59 |
| 2,3,7,8-TCDF | ND | 0.863 | 1.22 | 1 | 0.1 | |
| 1,2,3,7,8-PeCDF | **3.03** | 1.68 | 6.08 | 1 | 0.03 | 0.0909 |
| 2,3,4,7,8-PeCDF | **5.14** | 1.72 | 6.08 | 1 | 0.3 | 1.54 |
| 1,2,3,4,7,8-HxCDF | **41.6** | 2.69 | 6.08 | 1 | 0.1 | 4.16 |
| 1,2,3,6,7,8-HxCDF | **9.58** | 2.55 | 6.08 | 1 | 0.1 | 0.958 |
| 1,2,3,7,8,9-HxCDF | **10.5** | 3.16 | 6.08 | 1 | 0.1 | 1.05 |
| 2,3,4,6,7,8-HxCDF | **13.5** | 2.78 | 6.08 | 1 | 0.1 | 1.35 |
| 1,2,3,4,6,7,8-HpCDF | **547** | 4.52 | 6.08 | 1 | 0.01 | 5.47 |
| 1,2,3,4,7,8,9-HpCDF | **38.0** | 4.71 | 6.08 | 1 | 0.01 | 0.380 |
| OCDF | **2750** | 0.996 | 12.2 | 1 | 0.0003 | 0.825 |
| | | Total TEQ | | | | 51.0 |

2005 WHO TEFs, ND = 0

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 12:30 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | F-3 5.5-9' | **Units:** | ng/Kg |
| **Lab Code:** | K1503395-004 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 04/11/15 05:26 |
| **Prep Method:** | Method | **Date Extracted:** | 4/8/15 |
| **Sample Amount:** | 10.108g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235511 | **Blank File Name:** | P235507 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235504 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | 17.7 | | 1.47 | 3.69 | 0.72 | 1.001 | 1 |
| 1,2,3,7,8-PeCDD | 98.3 | | 2.25 | 18.5 | 1.66 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDD | 265 | | 2.46 | 18.5 | 1.31 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 480 | | 2.65 | 18.5 | 1.31 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 301 | | 2.45 | 18.5 | 1.30 | 1.008 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 11500 | | 30.2 | 30.2 | 1.05 | 1.000 | 1 |
| OCDD | 145000 | **E** | 2.36 | 36.9 | 0.90 | 1.000 | 1 |
| 2,3,7,8-TCDF | 18.6 | | 1.38 | 3.69 | 0.76 | 1.001 | 1 |
| 1,2,3,7,8-PeCDF | 61.2 | | 3.52 | 18.5 | 1.78 | 1.001 | 1 |
| 2,3,4,7,8-PeCDF | 136 | | 3.57 | 18.5 | 1.66 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDF | 379 | | 14.5 | 18.5 | 1.35 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDF | 106 | | 13.4 | 18.5 | 1.33 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDF | 164 | | 13.9 | 18.5 | 1.36 | 1.000 | 1 |
| 2,3,4,6,7,8-HxCDF | 162 | | 15.4 | 18.5 | 1.12 | 1.000 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 3150 | | 10.3 | 18.5 | 1.06 | 1.000 | 1 |
| 1,2,3,4,7,8,9-HpCDF | 298 | | 10.7 | 18.5 | 0.99 | 1.000 | 1 |
| OCDF | 7960 | | 1.73 | 36.9 | 0.89 | 1.005 | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 12:30 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | F-3 5.5-9' | **Units:** | ng/Kg |
| **Lab Code:** | K1503395-004 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 04/11/15 05:26 |
| **Prep Method:** | Method | **Date Extracted:** | 4/8/15 |
| **Sample Amount:** | 10.108g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235511 | **Blank File Name:** | P235507 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235504 |

### Native Analyte Results

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | 690 | | 1.47 | 3.69 | 0.73 | | 1 |
| Total Penta-Dioxins | 2090 | | 2.25 | 18.5 | 1.50 | | 1 |
| Total Hexa-Dioxins | 7220 | | 2.52 | 18.5 | 1.31 | | 1 |
| Total Hepta-Dioxins | 28800 | | 30.2 | 30.2 | 1.04 | | 1 |
| Total Tetra-Furans | 151 | | 1.38 | 3.69 | 0.82 | | 1 |
| Total Penta-Furans | 835 | | 0.669 | 18.5 | 1.54 | | 1 |
| Total Hexa-Furans | 6130 | | 14.3 | 18.5 | 1.30 | | 1 |
| Total Hepta-Furans | 13900 | | 10.5 | 18.5 | 1.06 | | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 12:30 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | F-3 5.5-9' | **Units:** | Percent |
| **Lab Code:** | K1503395-004 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 04/11/15 05:26 |
| **Prep Method:** | Method | **Date Extracted:** | 4/8/15 |
| **Sample Amount:** | 10.108g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235511 | **Blank File Name:** | P235507 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235504 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1545.026 | 77 | | 40-135 | 0.77 | 1.024 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1880.662 | 94 | | 40-135 | 1.61 | 1.202 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1508.146 | 75 | | 40-135 | 1.29 | 0.990 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1368.556 | 68 | | 40-135 | 1.31 | 0.992 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1371.042 | 69 | | 40-135 | 1.05 | 1.064 |
| 13C-OCDD | 4000 | 2370.585 | 59 | | 40-135 | 0.92 | 1.137 |
| | | | | | | | |
| 13C-2,3,7,8-TCDF | 2000 | 1501.026 | 75 | | 40-135 | 0.80 | 0.993 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1768.418 | 88 | | 40-135 | 1.56 | 1.157 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1840.899 | 92 | | 40-135 | 1.57 | 1.192 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1394.495 | 70 | | 40-135 | 0.51 | 0.968 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1400.569 | 70 | | 40-135 | 0.53 | 0.971 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1291.425 | 65 | | 40-135 | 0.53 | 1.007 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1506.820 | 75 | | 40-135 | 0.53 | 0.986 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 1149.630 | 57 | | 40-135 | 0.43 | 1.040 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1531.509 | 77 | | 40-135 | 0.43 | 1.077 |
| | | | | | | | |
| 37Cl-2,3,7,8-TCDD | 800 | 712.331 | 89 | | 40-135 | NA | 1.024 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 12:30 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | F-3 5.5-9' | **Units:** | ng/Kg |
| **Lab Code:** | K1503395-004 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

**Analysis Method:** 8290
**Prep Method:** Method

**Toxicity Equivalency Quotient**

| Analyte Name | Result | DL | MRL | Dilution Factor | TEF | TEF - Adjusted Concentration |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | **17.7** | 1.47 | 3.69 | 1 | 1 | 17.7 |
| 1,2,3,7,8-PeCDD | **98.3** | 2.25 | 18.5 | 1 | 1 | 98.3 |
| 1,2,3,4,7,8-HxCDD | **265** | 2.46 | 18.5 | 1 | 0.1 | 26.5 |
| 1,2,3,6,7,8-HxCDD | **480** | 2.65 | 18.5 | 1 | 0.1 | 48.0 |
| 1,2,3,7,8,9-HxCDD | **301** | 2.45 | 18.5 | 1 | 0.1 | 30.1 |
| 1,2,3,4,6,7,8-HpCDD | **11500** | 30.2 | 30.2 | 1 | 0.01 | 115 |
| OCDD | **145000** | 2.36 | 36.9 | 1 | 0.0003 | 43.5 |
| 2,3,7,8-TCDF | **18.6** | 1.38 | 3.69 | 1 | 0.1 | 1.86 |
| 1,2,3,7,8-PeCDF | **61.2** | 3.52 | 18.5 | 1 | 0.03 | 1.84 |
| 2,3,4,7,8-PeCDF | **136** | 3.57 | 18.5 | 1 | 0.3 | 40.8 |
| 1,2,3,4,7,8-HxCDF | **379** | 14.5 | 18.5 | 1 | 0.1 | 37.9 |
| 1,2,3,6,7,8-HxCDF | **106** | 13.4 | 18.5 | 1 | 0.1 | 10.6 |
| 1,2,3,7,8,9-HxCDF | **164** | 13.9 | 18.5 | 1 | 0.1 | 16.4 |
| 2,3,4,6,7,8-HxCDF | **162** | 15.4 | 18.5 | 1 | 0.1 | 16.2 |
| 1,2,3,4,6,7,8-HpCDF | **3150** | 10.3 | 18.5 | 1 | 0.01 | 31.5 |
| 1,2,3,4,7,8,9-HpCDF | **298** | 10.7 | 18.5 | 1 | 0.01 | 2.98 |
| OCDF | **7960** | 1.73 | 36.9 | 1 | 0.0003 | 2.39 |
| | | Total TEQ | | | | 542 |

2005 WHO TEFs, ND = 0

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Method Blank | **Units:** | ng/Kg |
| **Lab Code:** | EQ1500276-01 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 04/11/15 02:13 |
| **Prep Method:** | Method | **Date Extracted:** | 4/8/15 |
| **Sample Amount:** | 10.260g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235507 | **Blank File Name:** | P235507 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235504 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | ND | U | 0.353 | 0.487 | | | 1 |
| 1,2,3,7,8-PeCDD | ND | U | 0.0694 | 2.44 | | | 1 |
| 1,2,3,4,7,8-HxCDD | ND | U | 0.0548 | 2.44 | | | 1 |
| 1,2,3,6,7,8-HxCDD | ND | U | 0.0587 | 2.44 | | | 1 |
| 1,2,3,7,8,9-HxCDD | ND | U | 0.0545 | 2.44 | | | 1 |
| 1,2,3,4,6,7,8-HpCDD | 0.143**JK** | | 0.0863 | 2.44 | 1.80 | 1.000 | 1 |
| OCDD | ND | U | 0.125 | 4.87 | | | 1 |
| 2,3,7,8-TCDF | ND | U | 0.323 | 0.487 | | | 1 |
| 1,2,3,7,8-PeCDF | ND | U | 0.0984 | 2.44 | | | 1 |
| 2,3,4,7,8-PeCDF | ND | U | 0.0960 | 2.44 | | | 1 |
| 1,2,3,4,7,8-HxCDF | ND | U | 0.0885 | 2.44 | | | 1 |
| 1,2,3,6,7,8-HxCDF | ND | U | 0.0781 | 2.44 | | | 1 |
| 1,2,3,7,8,9-HxCDF | 0.190**JK** | | 0.106 | 2.44 | 3.81 | 1.001 | 1 |
| 2,3,4,6,7,8-HxCDF | ND | U | 0.0840 | 2.44 | | | 1 |
| 1,2,3,4,6,7,8-HpCDF | ND | U | 0.0601 | 2.44 | | | 1 |
| 1,2,3,4,7,8,9-HpCDF | ND | U | 0.0726 | 2.44 | | | 1 |
| OCDF | ND | U | 0.247 | 4.87 | | | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Method Blank | **Units:** | ng/Kg |
| **Lab Code:** | EQ1500276-01 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 04/11/15 02:13 |
| **Prep Method:** | Method | **Date Extracted:** | 4/8/15 |
| **Sample Amount:** | 10.260g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235507 | **Blank File Name:** | P235507 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235504 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | ND | U | 0.353 | 0.487 | | | 1 |
| Total Penta-Dioxins | ND | U | 0.0694 | 2.44 | | | 1 |
| Total Hexa-Dioxins | ND | U | 0.0561 | 2.44 | | | 1 |
| Total Hepta-Dioxins | ND | U | 0.0863 | 2.44 | | | 1 |
| Total Tetra-Furans | ND | U | 0.323 | 0.487 | | | 1 |
| Total Penta-Furans | ND | U | 0.110 | 2.44 | | | 1 |
| Total Hexa-Furans | ND | U | 0.0882 | 2.44 | | | 1 |
| Total Hepta-Furans | ND | U | 0.0659 | 2.44 | | | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Method Blank | **Units:** | Percent |
| **Lab Code:** | EQ1500276-01 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 04/11/15 02:13 |
| **Prep Method:** | Method | **Date Extracted:** | 4/8/15 |
| **Sample Amount:** | 10.260g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235507 | **Blank File Name:** | P235507 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235504 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1462.592 | 73 | | 40-135 | 0.77 | 1.023 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1715.119 | 86 | | 40-135 | 1.56 | 1.202 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1354.912 | 68 | | 40-135 | 1.31 | 0.991 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1418.637 | 71 | | 40-135 | 1.30 | 0.993 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1423.902 | 71 | | 40-135 | 1.04 | 1.068 |
| 13C-OCDD | 4000 | 2610.449 | 65 | | 40-135 | 0.87 | 1.140 |
| | | | | | | | |
| 13C-2,3,7,8-TCDF | 2000 | 1383.849 | 69 | | 40-135 | 0.77 | 0.992 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1642.614 | 82 | | 40-135 | 1.62 | 1.157 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1681.144 | 84 | | 40-135 | 1.60 | 1.192 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1265.640 | 63 | | 40-135 | 0.50 | 0.970 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1364.076 | 68 | | 40-135 | 0.53 | 0.973 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1352.905 | 68 | | 40-135 | 0.53 | 1.008 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1391.655 | 70 | | 40-135 | 0.51 | 0.988 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 1236.325 | 62 | | 40-135 | 0.46 | 1.043 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1439.680 | 72 | | 40-135 | 0.43 | 1.081 |
| | | | | | | | |
| 37Cl-2,3,7,8-TCDD | 800 | 682.388 | 85 | | 40-135 | NA | 1.023 |

# Accuracy & Precision

**ALS Environmental - Houston HRMS**
10450 Stancliff Rd., Suite 210, Houston TX 77099
Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

**ALS Group USA, Corp.**
**dba ALS Environmental**

QA/QC Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Analyzed:** | 04/10/15 |
| **Sample Matrix:** | Soil | **Date Extracted:** | 04/08/15 |

**Duplicate Lab Control Sample Summary**
**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Units:** | ng/Kg |
| **Prep Method:** | Method | **Basis:** | Dry |
| | | **Analysis Lot:** | 440493 |

| | Lab Control Sample EQ1500276-02 | | | Duplicate Lab Control Sample EQ1500276-03 | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Analyte Name** | **Result** | **Spike Amount** | **% Rec** | **Result** | **Spike Amount** | **% Rec** | **% Rec Limits** | **RPD** | **RPD Limit** |
| 1,2,3,4,6,7,8-HpCDD | 98.8 | 95.9 | 103 | 98.4 | 96.3 | 102 | 70-130 | <1 | 25 |
| 1,2,3,4,7,8-HxCDD | 99.5 | 95.9 | 104 | 99.4 | 96.3 | 103 | 70-130 | <1 | 25 |
| 1,2,3,6,7,8-HxCDD | 101 | 95.9 | 106 | 101 | 96.3 | 105 | 70-130 | <1 | 25 |
| 1,2,3,7,8,9-HxCDD | 105 | 95.9 | 110 | 105 | 96.3 | 109 | 70-130 | <1 | 25 |
| 1,2,3,7,8-PeCDD | 106 | 95.9 | 111 | 107 | 96.3 | 111 | 70-130 | <1 | 25 |
| 2,3,7,8-TCDD | 19.6 | 19.2 | 102 | 20.3 | 19.3 | 105 | 70-130 | 3 | 25 |
| OCDD | 202 | 192 | 105 | 198 | 193 | 103 | 70-130 | 2 | 25 |
| | | | | | | | | | |
| 1,2,3,4,6,7,8-HpCDF | 98.8 | 95.9 | 103 | 106 | 96.3 | 110 | 70-130 | 7 | 25 |
| 1,2,3,4,7,8,9-HpCDF | 97.1 | 95.9 | 101 | 101 | 96.3 | 105 | 70-130 | 4 | 25 |
| 1,2,3,4,7,8-HxCDF | 108 | 95.9 | 112 | 105 | 96.3 | 109 | 70-130 | 2 | 25 |
| 1,2,3,6,7,8-HxCDF | 101 | 95.9 | 106 | 106 | 96.3 | 110 | 70-130 | 4 | 25 |
| 1,2,3,7,8,9-HxCDF | 101 | 95.9 | 105 | 101 | 96.3 | 105 | 70-130 | <1 | 25 |
| 1,2,3,7,8-PeCDF | 103 | 95.9 | 108 | 105 | 96.3 | 109 | 70-130 | 1 | 25 |
| 2,3,4,6,7,8-HxCDF | 102 | 95.9 | 106 | 101 | 96.3 | 105 | 70-130 | <1 | 25 |
| 2,3,4,7,8-PeCDF | 103 | 95.9 | 107 | 103 | 96.3 | 107 | 70-130 | <1 | 25 |
| 2,3,7,8-TCDF | 20.8 | 19.2 | 108 | 20.4 | 19.3 | 106 | 70-130 | 2 | 25 |
| OCDF | 215 | 192 | 112 | 207 | 193 | 107 | 70-130 | 4 | 25 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Lab Control Sample | **Units:** | ng/Kg |
| **Lab Code:** | EQ1500276-02 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 04/10/15 20:35 |
| **Prep Method:** | Method | **Date Extracted:** | 4/8/15 |
| **Sample Amount:** | 10.428g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235500 | **Blank File Name:** | P235507 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235491 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | 19.6 | | 0.227 | 0.479 | 0.81 | 1.001 | 1 |
| 1,2,3,7,8-PeCDD | 106 | | 0.167 | 2.40 | 1.55 | 1.000 | 1 |
| 1,2,3,4,7,8-HxCDD | 99.5 | | 0.0477 | 2.40 | 1.29 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 101 | | 0.0499 | 2.40 | 1.23 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 105 | | 0.0468 | 2.40 | 1.32 | 1.007 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 98.8 | | 0.0865 | 2.40 | 1.06 | 1.000 | 1 |
| OCDD | 202 | | 0.121 | 4.79 | 0.88 | 1.000 | 1 |
| 2,3,7,8-TCDF | 20.8 | | 0.288 | 0.479 | 0.74 | 1.001 | 1 |
| 1,2,3,7,8-PeCDF | 103 | | 0.0634 | 2.40 | 1.55 | 1.000 | 1 |
| 2,3,4,7,8-PeCDF | 103 | | 0.0612 | 2.40 | 1.54 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDF | 108 | | 0.0576 | 2.40 | 1.27 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDF | 101 | | 0.0539 | 2.40 | 1.29 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDF | 101 | | 0.0712 | 2.40 | 1.28 | 1.000 | 1 |
| 2,3,4,6,7,8-HxCDF | 102 | | 0.0582 | 2.40 | 1.26 | 1.000 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 98.8 | | 0.247 | 2.40 | 1.05 | 1.000 | 1 |
| 1,2,3,4,7,8,9-HpCDF | 97.1 | | 0.286 | 2.40 | 1.02 | 1.000 | 1 |
| OCDF | 215 | | 0.312 | 4.79 | 0.94 | 1.005 | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Lab Control Sample | **Units:** | ng/Kg |
| **Lab Code:** | EQ1500276-02 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 04/10/15 20:35 |
| **Prep Method:** | Method | **Date Extracted:** | 4/8/15 |
| **Sample Amount:** | 10.428g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235500 | **Blank File Name:** | P235507 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235491 |

### Native Analyte Results

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | 19.8 | | 0.227 | 0.479 | 0.70 | | 1 |
| Total Penta-Dioxins | 106 | | 0.167 | 2.40 | 1.55 | | 1 |
| Total Hexa-Dioxins | 306 | | 0.0482 | 2.40 | 1.29 | | 1 |
| Total Hepta-Dioxins | 98.8 | | 0.0865 | 2.40 | 1.06 | | 1 |
| Total Tetra-Furans | 20.8 | | 0.288 | 0.479 | 0.74 | | 1 |
| Total Penta-Furans | 209 | | 0.136 | 2.40 | | | 1 |
| Total Hexa-Furans | 412 | | 0.0597 | 2.40 | 1.27 | | 1 |
| Total Hepta-Furans | 196 | | 0.265 | 2.40 | 1.05 | | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Lab Control Sample | **Units:** | Percent |
| **Lab Code:** | EQ1500276-02 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 04/10/15 20:35 |
| **Prep Method:** | Method | **Date Extracted:** | 4/8/15 |
| **Sample Amount:** | 10.428g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235500 | **Blank File Name:** | P235507 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235491 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1594.818 | 80 | | 40-135 | 0.77 | 1.023 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1828.477 | 91 | | 40-135 | 1.57 | 1.202 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1415.582 | 71 | | 40-135 | 1.29 | 0.991 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1464.951 | 73 | | 40-135 | 1.29 | 0.994 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1461.252 | 73 | | 40-135 | 1.07 | 1.068 |
| 13C-OCDD | 4000 | 2578.425 | 64 | | 40-135 | 0.89 | 1.140 |
| | | | | | | | |
| 13C-2,3,7,8-TCDF | 2000 | 1501.532 | 75 | | 40-135 | 0.78 | 0.992 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1747.738 | 87 | | 40-135 | 1.57 | 1.157 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1813.223 | 91 | | 40-135 | 1.57 | 1.192 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1363.773 | 68 | | 40-135 | 0.55 | 0.970 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1407.904 | 70 | | 40-135 | 0.50 | 0.973 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1411.793 | 71 | | 40-135 | 0.52 | 1.009 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1449.451 | 72 | | 40-135 | 0.51 | 0.988 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 1272.754 | 64 | | 40-135 | 0.45 | 1.043 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1558.997 | 78 | | 40-135 | 0.44 | 1.081 |
| | | | | | | | |
| 37Cl-2,3,7,8-TCDD | 800 | 689.748 | 86 | | 40-135 | NA | 1.024 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Duplicate Lab Control Sample | **Units:** | ng/Kg |
| **Lab Code:** | EQ1500276-03 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 04/10/15 21:24 |
| **Prep Method:** | Method | **Date Extracted:** | 4/8/15 |
| **Sample Amount:** | 10.381g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235501 | **Blank File Name:** | P235507 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235491 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | 20.3 | | 0.323 | 0.482 | 0.80 | 1.001 | 1 |
| 1,2,3,7,8-PeCDD | 107 | | 0.159 | 2.41 | 1.62 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDD | 99.4 | | 0.0513 | 2.41 | 1.24 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 101 | | 0.0524 | 2.41 | 1.29 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 105 | | 0.0497 | 2.41 | 1.30 | 1.007 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 98.4 | | 0.0657 | 2.41 | 1.03 | 1.000 | 1 |
| OCDD | 198 | | 0.111 | 4.82 | 0.88 | 1.000 | 1 |
| 2,3,7,8-TCDF | 20.4 | | 0.339 | 0.482 | 0.74 | 1.001 | 1 |
| 1,2,3,7,8-PeCDF | 105 | | 0.189 | 2.41 | 1.53 | 1.000 | 1 |
| 2,3,4,7,8-PeCDF | 103 | | 0.186 | 2.41 | 1.53 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDF | 105 | | 0.0274 | 2.41 | 1.22 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDF | 106 | | 0.0257 | 2.41 | 1.27 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDF | 101 | | 0.0324 | 2.41 | 1.29 | 1.000 | 1 |
| 2,3,4,6,7,8-HxCDF | 101 | | 0.0263 | 2.41 | 1.27 | 1.000 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 106 | | 0.199 | 2.41 | 1.03 | 1.000 | 1 |
| 1,2,3,4,7,8,9-HpCDF | 101 | | 0.226 | 2.41 | 1.11 | 1.000 | 1 |
| OCDF | 207 | | 0.321 | 4.82 | 0.88 | 1.005 | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Duplicate Lab Control Sample | **Units:** | ng/Kg |
| **Lab Code:** | EQ1500276-03 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 04/10/15 21:24 |
| **Prep Method:** | Method | **Date Extracted:** | 4/8/15 |
| **Sample Amount:** | 10.381g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235501 | **Blank File Name:** | P235507 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235491 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | 20.3 | | 0.323 | 0.482 | 0.80 | | 1 |
| Total Penta-Dioxins | 107 | | 0.159 | 2.41 | 1.62 | | 1 |
| Total Hexa-Dioxins | 305 | | 0.0511 | 2.41 | 1.24 | | 1 |
| Total Hepta-Dioxins | 98.4 | | 0.0657 | 2.41 | 1.03 | | 1 |
| Total Tetra-Furans | 20.7 | | 0.339 | 0.482 | 0.74 | | 1 |
| Total Penta-Furans | 208 | | 0.0951 | 2.41 | | | 1 |
| Total Hexa-Furans | 414 | | 0.0277 | 2.41 | 1.22 | | 1 |
| Total Hepta-Furans | 207 | | 0.211 | 2.41 | 1.03 | | 1 |

**ALS Group USA, Corp. dba ALS Environmental**

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1503395 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Duplicate Lab Control Sample | **Units:** | Percent |
| **Lab Code:** | EQ1500276-03 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 04/10/15 21:24 |
| **Prep Method:** | Method | **Date Extracted:** | 4/8/15 |
| **Sample Amount:** | 10.381g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235501 | **Blank File Name:** | P235507 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235491 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1631.421 | 82 | | 40-135 | 0.79 | 1.023 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1885.105 | 94 | | 40-135 | 1.56 | 1.202 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1400.629 | 70 | | 40-135 | 1.23 | 0.991 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1505.855 | 75 | | 40-135 | 1.27 | 0.993 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1461.607 | 73 | | 40-135 | 1.08 | 1.068 |
| 13C-OCDD | 4000 | 2722.278 | 68 | | 40-135 | 0.92 | 1.140 |
| | | | | | | | |
| 13C-2,3,7,8-TCDF | 2000 | 1541.859 | 77 | | 40-135 | 0.78 | 0.992 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1804.592 | 90 | | 40-135 | 1.56 | 1.157 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1852.790 | 93 | | 40-135 | 1.56 | 1.192 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1347.253 | 67 | | 40-135 | 0.52 | 0.970 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1390.139 | 70 | | 40-135 | 0.53 | 0.973 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1435.637 | 72 | | 40-135 | 0.51 | 1.009 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1453.614 | 73 | | 40-135 | 0.52 | 0.988 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 1268.590 | 63 | | 40-135 | 0.44 | 1.043 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1558.491 | 78 | | 40-135 | 0.44 | 1.081 |
| | | | | | | | |
| 37Cl-2,3,7,8-TCDD | 800 | 716.713 | 90 | | 40-135 | NA | 1.024 |

ALS Environmental
ALS Group USA, Corp
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**www.alsglobal.com**

May 29, 2015

**Analytical Report for Service Request No:** K1504931

Terri Olson
Barr Engineering
4700 West 77th Street
Minneapolis, MN 55435

**RE: Joslyn OU5 2015 Soil / 23270110**

Dear Terri,

Enclosed are the results of the sample(s) submitted to our laboratory February 04, 2015
For your reference, these analyses have been assigned our service request number **K1504931.**

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3363. You may also contact me via email at Lisa.Domenighini@alsglobal.com.

Respectfully submitted,

**ALS Group USA, Corp. dba ALS Environmental**

Lisa Domenighini
Project Manager

## Acronyms

| | |
|---|---|
| ASTM | American Society for Testing and Materials |
| A2LA | American Association for Laboratory Accreditation |
| CARB | California Air Resources Board |
| CAS Number | Chemical Abstract Service registry Number |
| CFC | Chlorofluorocarbon |
| CFU | Colony-Forming Unit |
| DEC | Department of Environmental Conservation |
| DEQ | Department of Environmental Quality |
| DHS | Department of Health Services |
| DOE | Department of Ecology |
| DOH | Department of Health |
| EPA | U. S. Environmental Protection Agency |
| ELAP | Environmental Laboratory Accreditation Program |
| GC | Gas Chromatography |
| GC/MS | Gas Chromatography/Mass Spectrometry |
| LOD | Limit of Detection |
| LOQ | Limit of Quantitation |
| LUFT | Leaking Underground Fuel Tank |
| M | Modified |
| MCL | Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA. |
| MDL | Method Detection Limit |
| MPN | Most Probable Number |
| MRL | Method Reporting Limit |
| NA | Not Applicable |
| NC | Not Calculated |
| NCASI | National Council of the Paper Industry for Air and Stream Improvement |
| ND | Not Detected |
| NIOSH | National Institute for Occupational Safety and Health |
| PQL | Practical Quantitation Limit |
| RCRA | Resource Conservation and Recovery Act |
| SIM | Selected Ion Monitoring |
| TPH | Total Petroleum Hydrocarbons |
| tr | Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL. |

## Inorganic Data Qualifiers

| | |
|---|---|
| * | The result is an outlier. See case narrative. |
| # | The control limit criteria is not applicable. See case narrative. |
| B | The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards. |
| E | The result is an estimate amount because the value exceeded the instrument calibration range. |
| J | The result is an estimated value. |
| U | The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution. |
| i | The MRL/MDL or LOQ/LOD is elevated due to a matrix interference. |
| X | See case narrative. |
| Q | See case narrative. One or more quality control criteria was outside the limits. |
| H | The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory. |

## Metals Data Qualifiers

| | |
|---|---|
| # | The control limit criteria is not applicable. See case narrative. |
| J | The result is an estimated value. |
| E | The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample. |
| M | The duplicate injection precision was not met. |
| N | The Matrix Spike sample recovery is not within control limits. See case narrative. |
| S | The reported value was determined by the Method of Standard Additions (MSA). |
| U | The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution. |
| W | The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance. |
| i | The MRL/MDL or LOQ/LOD is elevated due to a matrix interference. |
| X | See case narrative. |
| + | The correlation coefficient for the MSA is less than 0.995. |
| Q | See case narrative. One or more quality control criteria was outside the limits. |

## Organic Data Qualifiers

| | |
|---|---|
| * | The result is an outlier. See case narrative. |
| # | The control limit criteria is not applicable. See case narrative. |
| A | A tentatively identified compound, a suspected aldol-condensation product. |
| B | The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards. |
| C | The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data. |
| D | The reported result is from a dilution. |
| E | The result is an estimated value. |
| J | The result is an estimated value. |
| N | The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed. |
| P | The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results. |
| U | The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution. |
| i | The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference. |
| X | See case narrative. |
| Q | See case narrative. One or more quality control criteria was outside the limits. |

## Additional Petroleum Hydrocarbon Specific Qualifiers

| | |
|---|---|
| F | The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard. |
| L | The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard. |
| H | The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard. |
| O | The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard. |
| Y | The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard. |
| Z | The chromatographic fingerprint does not resemble a petroleum product. |

**ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso**
**State Certifications, Accreditations, and Licenses**

| Agency | Web Site | Number |
|---|---|---|
| Alaska DEC UST | http://dec.alaska.gov/applications/eh/ehllabreports/USTLabs.aspx | UST-040 |
| Arizona DHS | http://www.azdhs.gov/lab/license/env.htm | AZ0339 |
| Arkansas - DEQ | http://www.adeq.state.ar.us/techsvs/labcert.htm | 88-0637 |
| California DHS (ELAP) | http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx | 2795 |
| DOD ELAP | http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm | L14-51 |
| Florida DOH | http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm | E87412 |
| Hawaii DOH | Not available | - |
| Idaho DHW | http://www.healthandwelfare.idaho.gov/Health/Labs/CertificationDrinkingWaterLabs/tabid/1833/Default.aspx | - |
| ISO 17025 | http://www.pjlabs.com/ | L14-50 |
| Louisiana DEQ | http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx | 03016 |
| Maine DHS | Not available | WA01276 |
| Michigan DEQ | http://www.michigan.gov/deq/0,1607,7-135-3307_4131_4156---,00.html | 9949 |
| Minnesota DOH | http://www.health.state.mn.us/accreditation | 053-999-457 |
| Montana DPHHS | http://www.dphhs.mt.gov/publichealth/ | CERT0047 |
| Nevada DEP | http://ndep.nv.gov/bsdw/labservice.htm | WA01276 |
| New Jersey DEP | http://www.nj.gov/dep/oqa/ | WA005 |
| North Carolina DWQ | http://www.dwqlab.org/ | 605 |
| Oklahoma DEQ | http://www.deq.state.ok.us/CSDnew/labcert.htm | 9801 |
| Oregon – DEQ (NELAP) | http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx | WA100010 |
| South Carolina DHEC | http://www.scdhec.gov/environment/envserv/ | 61002 |
| Texas CEQ | http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html | T104704427 |
| Washington DOE | http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html | C544 |
| Wisconsin DNR | http://dnr.wi.gov/ | 998386840 |
| Wyoming (EPA Region 8) | http://www.epa.gov/region8/water/dwhome/wyomingdi.html | - |
| Kelso Laboratory Website | www.alsglobal.com | NA |

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.
Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

# Case Narrative

**ALS Environmental—Kelso Laboratory**
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

**ALS ENVIRONMENTAL**

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request No.:** | K1504931 |
| **Project:** | Joslyn OU5 2015 Soil/ 23270110 | **Date Received:** | 02/04/15 |
| **Sample Matrix:** | Soil | | |

**Case Narrative**

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix Spike (MS), and Matrix/Duplicate Matrix Spike (MS/DMS).

**Sample Receipt**

Two soil samples were received for analysis at ALS Environmental on 02/04/15. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4ºC upon receipt at the laboratory. These samples were originally logged under Service Request K1501100.

**General Chemistry Parameters**

**Total Organic Carbon by ASTM D4129-05 Modified:**
All samples were received past holding time. The analysis was performed as soon as possible after receipt by the laboratory. The data was flagged to indicate the holding time violation.

No other anomalies associated with the analysis of these samples were observed.

**Dioxins and Furans by EPA Method 8290**

The analysis for Dioxins and Furans was performed at ALS Environmental in Houston, Texas. The data for this analysis is included in the corresponding section of this report.

**Approved by** Lisa A Jamenighini

# Chain of Custody

**ALS Environmental—Kelso Laboratory**
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

K1504931
K1501100

# Chain of Custody

BARR
4700 West 77th Street
Minneapolis, MN 55435-4803
(952) 832-2600

COC 1 of 2

Project Number: 23270110

Project Name: Joslyn OU5 2015 Soil

Sample Origination State MN (use two letter postal state abbreviation)

COC Number: № 43800

Project Manager: John Hunt

Project QC Contact: Terri Olson

Sampled by: Alex Puetz

Laboratory: ALS

| | Location | Start Depth | Stop Depth | Depth Unit (m./ft. or in.) | Collection Date (mm/dd/yyyy) | Collection Time (hh:mm) | Matrix: Water | Matrix: Soil | Type: Grab | Type: Comp. | Type: QC | Number of Containers/Preservative — Water: VOCs (HCl) #1 | SVOCs (unpreserved) #2 | Dissolved Metals ($HNO_3$) | Total Metals ($HNO_3$) | General (unpreserved) #3 | Diesel Range Organics (HCl) | Nutrients ($H_2SO_4$) #4 | Soil: VOCs (tared MeOH) #1 | GRO, BTEX (tared MeOH) #1 | DRO (tared unpreserved) | Metals (unpreserved) | SVOCs (unpreserved) #2 | % Solids (plastic vial, unpres.) | Dioxins | TOC | Total Number Of Containers | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | B-1 | 2 | 3.5 | ft | 02/02/2015 | 10:35 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 2. | B-1 | 3.5 | 5 | | | 11:40 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 3. | B-1 | 5 | 6.5 | | | 11:45 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 4. | B-1 | 6.5 | 9 | | | 11:50 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 5. | B-1 | 9 | 10 | | | 12:00 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | HOLD |
| 6. | B-3 | 5 | 6.5 | | | 14:15 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | ALL |
| 7. | B-3 | 6.5 | 9 | | | 14:20 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | SAMPLES |
| 8. | B-3 | 9 | 10 | | | 14:25 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 9. | C-3 | 5 | 6.5 | | | 13:40 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 10. | C-3 | 6.5 | 9 | ↓ | ↓ | 13:45 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |

Common Parameter/Container - Preservation Key

*#1 - Volatile Organics = BTEX, GRO, TPH, 8260 Full List*
*#2 - Semivolatile Organics = PAHs, PCP, Dioxins, 8270 Full List, Herbicide/Pesticide/PCBs*
*#3 - General = pH, Chloride, Fluoride, Alkalinity, TSS, TDS, TS, Sulfate*
*#4 - Nutrients = COD, TOC, Phenols, Ammonia Nitrogen, TKN*

| Relinquished By: | On Ice? | Date | Time | Received by: | Date | Time |
|---|---|---|---|---|---|---|
| [signature] | (Y) N | 02/02/15 | 16:15 | [signature] | 02/02/15 | 16:15 |
| [signature] | (Y) N | 02/03/15 | 14:12 | [signature] | 2/4/15 | 0940 |

Samples Shipped VIA: ☐ Air Freight ☐ Federal Express ☐ Sampler ☐ Other: _____

Air Bill Number:

Distribution: White-Original Accompanies Shipment to Lab; Yellow - Field Copy; Pink - Lab Coordinator

H:\RI GIS\TDFORMS\Chain Of Custody Form 2009 RLG Rev. 09\01\09

K150931
K150110

# Chain of Custody

BARR
4700 West 77th Street
Minneapolis, MN 55435-4803
(952) 832-2600

COC 2 of 2

Project Number: 23270110

Project Name: Joslyn OUS 2015 Soil

Sample Origination State MN (use two letter postal state abbreviation)

COC Number: № 43801

Project Manager: John Hunt

Project QC Contact: Terri Olson

Sampled by: Alex Puetz

Laboratory: ALS

| | Location | Start Depth | Stop Depth | Depth Unit (m./ft. or in.) | Collection Date (mm/dd/yyyy) | Collection Time (hh:mm) | Matrix: Water | Matrix: Soil | Type: Grab | Type: Comp. | Type: QC | Number of Containers/Preservative — Water: VOCs (HCl) #1 | SVOCs (unpreserved) #2 | Dissolved Metals ($HNO_3$) | Total Metals ($HNO_3$) | General (unpreserved) #3 | Diesel Range Organics (HCl) | Nutrients ($H_2SO_4$) #4 | Soil: VOCs (tared MeOH) #1 | GRO, BTEX (tared MeOH) #1 | DRO (tared unpreserved) | Metals (unpreserved) | SVOCs (unpreserved) #2 | % Solids (plastic vial, unpres.) | Dioxins | TOC | Total Number Of Containers | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | C-3 | 9 | 10 | ft | 02/02/2015 | 13:50 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 2. | D-1 | 2 | 3.5 | | | 11:05 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 3. | D-1 | 3.5 | 9 | | | 11:10 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 4. | D-1 | 9 | 10 | | | 11:20 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 5. | E-4 | 5 | 6.5 | | | 13:00 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | – HOLD |
| 6. | E-4 | 6.5 | 9 | | | 13:05 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | ALL |
| 7. | E-4 | 9 | 10 | | | 13:10 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | SAMPLES |
| 8. | F-3 | 4 | 5.5 | | | 12:25 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 9. | F-3 | 5.5 | 9 | | | 12:30 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |
| 10. | F-3 | 9 | 10 | ↓ | ↓ | 12:35 | | X | | X | | | | | | | | | | | | | | | 1 | 1 | 2 | |

Common Parameter/Container - Preservation Key

*#1 - Volatile Organics = BTEX, GRO, TPH, 8260 Full List*
*#2 - Semivolatile Organics = PAHs, PCP, Dioxins, 8270 Full List, Herbicide/Pesticide/PCBs*
*#3 - General = pH, Chloride, Fluoride, Alkalinity, TSS, TDS, TS, Sulfate*
*#4 - Nutrients = COD, TOC, Phenols, Ammonia Nitrogen, TKN*

| Relinquished By: | On Ice? | Date | Time | Received by: | Date | Time |
|---|---|---|---|---|---|---|
| [signature] | (Y) N | 02/02/15 | 16:15 | [signature] | 02/02/15 | 16:15 |
| Relinquished By: | On Ice? | Date | Time | Received by: | Date | Time |
| [signature] | (Y) N | 02/03/15 | 14:12 | [signature] | 2/4/15 | 0940 |

Samples Shipped VIA: ☐ Air Freight ☐ Federal Express ☐ Sampler ☐ Other: _____

Air Bill Number:

Distribution: White-Original Accompanies Shipment to Lab; Yellow - Field Copy; Pink - Lab Coordinator

PC lisa

## Cooler Receipt and Preservation Form

Client / Project: Barr Service Request *K15* ~~JHO~~ K1504931

Received: 2/4/15 Opened: 2/4/15 By: [illegible] Unloaded: 2/4/15 By: [illegible]

1. Samples were received via? *Mail* (*Fed Ex*) *UPS* *DHL* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) (*Cooler*) *Box* *Envelope* *Other* _____ *NA*
3. Were custody seals on coolers? NA (Y) N If yes, how many and where? one, front
   If present, were custody seals intact? (Y) N If present, were they signed and dated? (Y) N

| Raw Cooler Temp | Corrected Cooler Temp | Raw Temp Blank | Corrected Temp Blank | Corr. Factor | Thermometer ID | Cooler/COC ID ~~NA~~ | Tracking Number NA | Filed |
|---|---|---|---|---|---|---|---|---|
| 5.7 | 5.8 | 5.9 | 5.0 | +0.1 | 347 | 43799 | 6275 1644 7472 | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

4. Packing material: *Inserts* (*Baggies*) (*Bubble Wrap*) *Gel Packs* (*Wet Ice*) *Dry Ice* *Sleeves* _____
5. Were custody papers properly filled out (ink, signed, etc.)? NA (Y) N
6. Did all bottles arrive in good condition (unbroken)? *Indicate in the table below.* NA (Y) N
7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA (Y) N
8. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* NA (Y) N
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA (Y) N
10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* (NA) Y N
11. Were VOA vials received without headspace? *Indicate in the table below.* (NA) Y N
12. Was C12/Res negative? (NA) Y N

| Sample ID on Bottle | Sample ID on COC | Identified by: |
|---|---|---|
| | | |
| | | |
| | | |

| Sample ID | Bottle Count Bottle Type | Out of Temp | Head-space | Broke | pH | Reagent | Volume added | Reagent Lot Number | Initials | Time |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

*Notes, Discrepancies, & Resolutions:* _____

*Page* ____ *of* ____

# General Chemistry

**ALS Environmental—Kelso Laboratory**
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1504931 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/2/15 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/4/15 |
| **Analysis Method:** | 160.3 Modified | **Units:** | Percent |
| **Prep Method:** | None | **Basis:** | As Received |

**Solids, Total**

| Sample Name | Lab Code | Result | MRL | Dil. | Date Analyzed | Q |
|---|---|---|---|---|---|---|
| C-3 9-10' | K1504931-001 | **35.5** | - | 1 | 05/11/15 16:49 | |
| F-3 9-10' | K1504931-002 | **30.6** | - | 1 | 05/11/15 16:49 | |

**ALS Group USA, Corp.**

**dba ALS Environmental**

QA/QC Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1504931 |
| **Project** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Analysis Method:** | 160.3 Modified | **Units:** | Percent |
| **Prep Method:** | None | **Basis:** | As Received |

## Replicate Sample Summary

## Solids, Total

| Sample Name: | Lab Code: | MRL | Sample Result | Duplicate Result | Average | RPD | RPD Limit | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| Batch QC | K1504876-001DUP | - | 51.8 | 49.0 | 50.4 | 6 | 20 | 05/11/15 |
| Batch QC | K1504878-001DUP | - | 52.8 | 52.1 | 52.5 | 1 | 20 | 05/11/15 |
| Batch QC | K1504963-001DUP | - | 38.0 | 37.8 | 37.9 | <1 | 20 | 05/11/15 |
| Batch QC | K1504966-006DUP | - | 82.9 | 82.7 | 82.8 | <1 | 20 | 05/11/15 |

**Results flagged with an asterisk (*) indicate values outside control criteria.**

**Results flagged with a pound (#) indicate the control criteria is not applicable.**

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1504931 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/2/15 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/4/15 |
| **Analysis Method:** | ASTM D4129-05 Modified | **Units:** | Percent |
| **Prep Method:** | ALS SOP | **Basis:** | Dry, per Method |

## Carbon, Total Organic (TOC)

| Sample Name | Lab Code | Result | MRL | Dil. | Date Analyzed | Date Extracted | Q |
|---|---|---|---|---|---|---|---|
| C-3 9-10' | K1504931-001 | **7.33** | 0.050 | 1 | 05/22/15 10:10 | 5/21/15 | * |
| F-3 9-10' | K1504931-002 | **11.8** | 0.050 | 1 | 05/22/15 10:10 | 5/21/15 | * |
| Method Blank | K1504931-MB | ND U | 0.050 | 1 | 05/22/15 10:10 | 5/21/15 | |

**ALS Group USA, Corp.**
**dba ALS Environmental**

QA/QC Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1504931 |
| **Project** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Analysis Method:** | ASTM D4129-05 Modified | **Units:** | Percent |
| **Prep Method:** | ALS SOP | **Basis:** | Dry, per Method |

**Replicate Sample Summary**
**Carbon, Total Organic (TOC)**

| Sample Name: | Lab Code: | MRL | Sample Result | Duplicate Result | Average | RPD | RPD Limit | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| Batch QC | K1504599-029DUP | 0.050 | 0.948 | 1.01 | 0.980 | 6 | 20 | 05/22/15 |
| Batch QC | K1504634-002DUP | 0.050 | 1.16 | 1.17 | 1.17 | <1 | 20 | 05/22/15 |

**Results flagged with an asterisk (*) indicate values outside control criteria.**

**Results flagged with a pound (#) indicate the control criteria is not applicable.**

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

**ALS Group USA, Corp.**
**dba ALS Environmental**

QA/QC Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1504931 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | N/A |
| **Sample Matrix:** | Soil | **Date Received:** | N/A |
| | | **Date Analyzed:** | 05/22/15 |
| | | **Date Extracted:** | 05/21/15 |

**Duplicate Matrix Spike Summary**
**Carbon, Total Organic (TOC)**

| | | | |
|---|---|---|---|
| **Sample Name:** | Batch QC | **Units:** | Percent |
| **Lab Code:** | K1504599-029 | **Basis:** | Dry, per Method |
| **Analysis Method:** | ASTM D4129-05 Modified | | |
| **Prep Method:** | ALS SOP | | |

| | | Matrix Spike | | | Duplicate Matrix Spike | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | K1504599-029MS | | | K1504599-029DMS | | | | | |
| **Analyte Name** | **Sample Result** | **Result** | **Spike Amount** | **% Rec** | **Result** | **Spike Amount** | **% Rec** | **% Rec Limits** | **RPD** | **RPD Limit** |
| Carbon, Total Organic (TOC) | 0.948 | 3.66 | 2.99 | 91 | 3.91 | 3.24 | 91 | 70-122 | <1 | 20 |

**Results flagged with an asterisk (*) indicate values outside control criteria.**

**Results flagged with a pound (#) indicate the control criteria is not applicable.**

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

**ALS Group USA, Corp.**
**dba ALS Environmental**

QA/QC Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1504931 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | N/A |
| **Sample Matrix:** | Soil | **Date Received:** | N/A |
| | | **Date Analyzed:** | 05/22/15 |
| | | **Date Extracted:** | 05/21/15 |

**Duplicate Matrix Spike Summary**
**Carbon, Total Organic (TOC)**

| | | | |
|---|---|---|---|
| **Sample Name:** | Batch QC | **Units:** | Percent |
| **Lab Code:** | K1504634-002 | **Basis:** | Dry, per Method |
| **Analysis Method:** | ASTM D4129-05 Modified | | |
| **Prep Method:** | ALS SOP | | |

| | | **Matrix Spike** | | | **Duplicate Matrix Spike** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | K1504634-002MS | | | K1504634-002DMS | | | | | |
| **Analyte Name** | **Sample Result** | **Result** | **Spike Amount** | **% Rec** | **Result** | **Spike Amount** | **% Rec** | **% Rec Limits** | **RPD** | **RPD Limit** |
| Carbon, Total Organic (TOC) | 1.16 | 4.89 | 3.88 | 96 | 5.09 | 4.00 | 98 | 70-122 | 2 | 20 |

**Results flagged with an asterisk (*) indicate values outside control criteria.**

**Results flagged with a pound (#) indicate the control criteria is not applicable.**

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

**ALS Group USA, Corp.**
**dba ALS Environmental**

QA/QC Report

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1504931 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Analyzed:** | 05/22/15 |
| **Sample Matrix:** | Soil | **Date Extracted:** | 05/21/15 |

**Lab Control Sample Summary**
**Carbon, Total Organic (TOC)**

| | | | |
|---|---|---|---|
| **Analysis Method:** | ASTM D4129-05 Modified | **Units:** | Percent |
| **Prep Method:** | ALS SOP | **Basis:** | Dry, per Method |
| | | **Analysis Lot:** | 446119 |

| Sample Name | Lab Code | Result | Spike Amount | % Rec | % Rec Limits |
|---|---|---|---|---|---|
| Lab Control Sample | K1504931-LCS | 0.522 | 0.543 | 96 | 72-122 |

# Subcontract Lab Results

**ALS Environmental—Kelso Laboratory**
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

10450 Stancliff Rd., Suite 210
Houston, TX 77099
T: +1 713 266 1599
F: +1 713 266 1599
www.alsglobal.com

May 21, 2015. Service Request No: K1504931

Lisa Domenighini

ALS Environmental
1317 South 13th Avenue
Kelso, WA 98626

**Laboratory Result for: Barr Engineering.**
Dear Lisa:

Enclosed are the results of the sample(s) submitted to our laboratory on May 12, 2015. For Your reference, these analyses have been assigned our service request number: **K1504931.**

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current TNI standards, where applicable, and considered in their entirety, and ALS Environmental is not responsible for use of less than the final complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report. In accordance to the TNI 2009 Standard, a statement on the estimated uncertainty of measurement of any quantitative analysis will be supplied upon request.

Please contact me if you have any questions. My direct line is 281-575-2279. You may also contact me via email at Arthi.Kodur@alsglobal.com

Respectfully submitted,

**ALS Group USA Corp., dba ALS Environmental**

Arthi Kodur
Project Manager

Page 1 of _____

*For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com.*

# Certificate of Analysis

**ALS Environmental - Houston HRMS**
10450 Stancliff Rd, Suite 210, Houston TX 77099
Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

**ALS ENVIRONMENTAL**

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request No.:** | K1504931 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Received:** | 5/12/15 |
| **Sample Matrix:** | Soil | | |

**ALS ENVIRONMENTAL NARRATIVE**

All analyses were performed in adherence to the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II. When appropriate to the method, method blank results have been reported with each analytical test.

**Sample Receipt**

Two soil samples were received for analysis at ALS Environmental on 5/12/15.

Please note the reporting forms are currently referencing the date ALS Environmental-Kelso received the samples (2/4/15) and not the date ALS Environmental-Houston received the samples (5/12/15).

The samples were received at 1.7°C in good condition and are consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4°C upon receipt at the laboratory.

**Data Validation Notes and Discussion**

**B flags – Method Blanks**

The Method Blank EQ1500362-01 contained low levels of various analytes at or below the Method Reporting Limit (MRL).

**MS/MSD/Duplicate**

EQ1500362: Laboratory Control Spike (LCS) sample was analyzed and reported in addition to an MS/MSD for this extraction batch. The batch quality control criteria were met. The batch precision (MS/DMS/DUP) measurements were determined on another order in the extraction batch. The MS/DMS results are not included in this report.

**2378-TCDF**

Samples analyzed on the DB-5MSUI column were analyzed under conditions were sufficient separation between 2,3,7,8-TCDF and its closest eluter was achieved. Confirmation of this result was not required.

**K flags**

EMPC - When the ion abundance ratios associated with a particular compound are outside the QC limits, samples are flagged with a 'K' flag. A 'K' flag indicates an estimated maximum possible concentration for the associated compound.

**Detection Limits**

Detection limits are calculated for each analyte in each sample by measuring the height of the noise level for each quantitation ion for the associated labeled standard. The concentration equivalent to 2.5 times the height of the noise is then calculated using the appropriate response factor and the weight of the sample. The calculated concentration equals the detection limit.

**The TEQ Summary results for each sample have been calculated by ALS ENVIRONMENTAL/Houston to include:**

- WHO-2005 TEFs, The 2005 World Health Organization Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds (M. Van den Berg et al., Toxicological
- Non-detected compounds are not included in the 'Total'

*The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.*

*Use of ALS group USA Corp dba ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.*

## SAMPLE CROSS-REFERENCE

| SAMPLE # | CLIENT SAMPLE ID | DATE | TIME |
|---|---|---|---|
| K1504931-001 | C-3 9-10' | 2/2/2015 | 1350 |
| K1504931-002 | F-3 9-10' | 2/2/2015 | 1235 |

# Service Request Summary

**Folder #:** **K1504931**
Client Name: Barr Engineering Company
Project Name: Joslyn OU5 2015 Soil
Project Number: 23270110

**Report To:** Terri Olson
Barr Engineering
4700 West 77th Street
Minneapolis, MN 55435
USA
Phone Number: 952-842-3578
Cell Number:
Fax Number:
E-mail: tolson@barr.com

Project Chemist: Lisa Domenighini
Originating Lab: KELSO
Logged By: SWOLF
Date Received: 02/04/15
Internal Due Date: 5/25/2015
QAP: LAB QAP
Qualifier Set: Lab Standard
Formset: Lab Standard
Merged?: Y
Report to MDL?: N, Y
P.O. Number:
EDD: BARR - EQUIS

4 4 oz-Glass Jar WM CLEAR Teflon Liner Unpreserved
**Location:** EHRMS-WIC 4D, K-Delilah-41
**Pressure Gas:**
**NPDES**

| | | | | KELSO | | HOUSTON |
|---|---|---|---|---|---|---|
| **Lab Samp No.** | **Client Samp No** | **Matrix** | **Collected** | TOC/ASTM D4129-05 Modified | TS/160.3 Modified | PCDD PCDF/8290 |
| K1504931-001 | C-3 9-10' | Soil | 02/02/15 1350 | II | II | II |
| K1504931-002 | F-3 9-10' | Soil | 02/02/15 1235 | II | II | II |

## Folder Comments:

Tier II except when requested otherwise. Add narrative note that Benzo(b)fluoranthene cannot be separated from Benzo(j)fluoranthene.

# Service Request Summary

| | |
|---|---|
| **Folder #:** | **K1504931** |
| Client Name: | Barr Engineering Company |
| Project Name: | Joslyn OU5 2015 Soil |
| Project Number: | 23270110 |

**Report To:** Terri Olson
Barr Engineering
4700 West 77th Street
Minneapolis, MN 55435
USA

| | |
|---|---|
| Phone Number: | 952-842-3578 |
| Cell Number: | |
| Fax Number: | |
| E-mail: | tolson@barr.com |

| | |
|---|---|
| Project Chemist: | Lisa Domenighini |
| Originating Lab: | KELSO |
| Logged By: | SWOLF |
| Date Received: | 02/04/15 |
| Internal Due Date: | 5/25/2015 |
| QAP: | LAB QAP |
| Qualifier Set: | Lab Standard |
| Formset: | Lab Standard |
| Merged?: | Y |
| Report to MDL?: | N, Y |
| P.O. Number: | |
| EDD: | BARR - EQUIS |

4 4 oz-Glass Jar WM CLEAR Teflon Liner Unpreserved

**Location:** EHRMS-WIC 4D, K-Delilah-41

**Pressure Gas:**

**NPDES**

## Test Comments:

| Group | Test/Method | Samples | Comments |
|---|---|---|---|
| Semivoa GCMS | PCDD PCDF/8290 | 2 | full list (ak 5/12/15) |

# Data Qualifier Flags – Dioxin/Furans

**B** Indicates the associated analyte is found in the method blank, as well as in the sample

**C** 2378-TCDF is detected on the DB-5 column above the MRL, confirmation analysis was performed on a second column (DB-225.) The results from both the DB-5 column and the DB-225 column are included in this data package. The results from the DB-225 analyses should be used to evaluate the 2378-TCDF in the samples. The confirmed result are used in determining the TEQ value for TCDF.

**E** The reported result is above the instrument calibration range and is an estimated value.

**J** Indicates an estimated value – used when the analyte concentration is below the method reporting limit (MRL) and above the estimated detection limit (EDL)

**K** Ion abundance ratios between the primary and secondary ions were outside of theoretical acceptance limits. The reported result is an estimated maximum possible concentration (EMPC)

**i** The associated MRL/MDL has been elevated due to matrix interference.

**U** Indicates the compound was analyzed for, but not detected (ND)

**Y** C13-Labeled standard percent recoveries are outside of method acceptance limits

**S** Peak is saturated; data not reportable

**P** Indicates chlorodiphenyl ether interference present at the retention time of the target compound.

**X** See case narrative

# ALS Laboratory Group

**Acronyms**

| | |
|---|---|
| Cal | Calibration |
| Conc | CONCentration |
| Dioxin(s) | Polychlorinated dibenzo-p-dioxin(s) |
| EDL | Estimated Detection Limit |
| EMPC | Estimated Maximum Possible Concentration |
| Flags | Data qualifiers |
| Furan(s) | Polychlorinated dibenzofuran(s) |
| g | Grams |
| ICAL | Initial CALibration |
| ID | IDentifier |
| Ions | Masses monitored for the analyte during data acquisition |
| L | Liter (s) |
| LCS | Laboratory Control Sample |
| DLCS | Duplicate Laboratory Control Sample |
| MB | Method Blank |
| MCL | Method Calibration Limit |
| MDL | Method Detection Limit |
| mL | Milliliters |
| MS | Matrix Spiked sample |
| DMS | Duplicate Matrix Spiked sample |
| NO | Number of peaks meeting all identification criteria |
| PCDD(s) | Polychlorinated dibenzo-p-dioxin(s) |
| PCDF(s) | Polychlorinated dibenzofuran(s) |
| ppb | Parts per billion |
| ppm | Parts per million |
| ppq | Parts per quadrillion |
| ppt | Parts per trillion |
| QA | Quality Assurance |
| QC | Quality Control |
| Ratio | Ratio of areas from monitored ions for an analyte |
| % Rec. | Percent recovery |
| RPD | Relative Percent Difference |
| RRF | Relative Response Factor |
| RT | Retention Time |
| SDG | Sample Delivery Group |
| S/N | Signal-to-noise ratio |
| TEF | Toxicity Equivalence Factor |
| TEQ | Toxicity Equivalence Quotient |

## State Certifications, Accreditations, and Licenses

| Agency | Number | Expire Date |
|---|---|---|
| American Association for Laboratory Accreditation | 2897.01 | 11/30/2015 |
| Arizona Department of Health Services | AZ0793 | 5/27/2016 |
| Arkansas Department of Environmental Quality | 14-038-0 | 6/16/2016 |
| Florida Department of Health | E87611 | 6/30/2015 |
| Hawaii Department of Health | TX02694 | 6/30/2015 |
| Illinois Environmental Protection Agency | 200057 | 10/6/2015 |
| Louisiana Department of Environmental Quality | 03048 | 6/30/2015 |
| Louisiana Department of Health and Hospitals | LA150026 | 12/31/2015 |
| Maine Center for Disease Control and Prevention | 2014019 | 6/5/2016 |
| Maryland Department of the Environment | 343 | 6/30/2015 |
| Michigan Depratment of Environmental Quality | 9971 | 6/30/2015 |
| Minnesota Department of Health | 840911 | 12/31/2015 |
| Nebraska Department of Health and Human Services | NE-OS-25-13 | 6/30/2015 |
| Nevada Department of Concervation and Natural Resources | TX014112013-2 | 7/31/2015 |
| New Jersey Department of Environmental Protection | NLC140001 | 6/30/2015 |
| New Mexico Environment Department | TX02694 | 6/30/2015 |
| New York Department of Health | 11707 | 4/1/2016 |
| Oklahoma Department of Environmental Quality | 2014 124 | 8/31/2015 |
| Oregon Environmental Laboratory Accreditation Program | TX200002 | 3/24/2016 |
| Pennsylvania Department of Environmental Protection | 68-03441 | 6/30/2015 |
| Tennessee Department of Environment and Concervation | 04016 | 6/30/2015 |
| Texas Commision on Environmental Quality | TX104704216-14-5 | 6/30/2015 |
| United States Department of Agriculture | P330-14-00067 | 2/21/2017 |
| Utah Department of Health Environmental Laboratory Certification | TX02694 | 7/31/2015 |
| Washington Department of Health | c819 | 11/14/2015 |
| West Virginia Department of Environmental Protection | 347 | 6/30/2015 |

# ALS ENVIRONMENTAL – Houston
## Data Processing/Form Production and Peer Review Signatures

SR# Unique ID: K1504931 | DB-5MSUI | SPB-Octyl

**First Level - Data Processing** - to be filled by person generating the forms

Date: 05/20/15 Analyst: [signature] Samples: 001,002

**Second Level - Data Review** – to be filled by person doing peer review

Date: 05/20/15 Analyst: [signature] Samples: 001,002

# Chain of Custody

**ALS Environmental - Houston HRMS**
10450 Stancliff Rd, Suite 210, Houston TX 77099
Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

# Intra-Network Chain of Custody

1317 South 13th Avenue • Kelso, WA 98626 • 1-360-577-7222 • FAX 1-360-636-1068

ALS Contact: Lisa Domenighini

**Project Name:** Joslyn OU5 2015 Soil
**Project Number:** 23270110
**Project Manager:** Terri Olson
**Company:** Barr Engineering

| Lab Code | Client Sample ID | # of Cont. | Matrix | Sample Date | Sample Time | Date Received | Send To | PCDD PCDF 8290 |
|---|---|---|---|---|---|---|---|---|
| K1504931-001 | C-3 9-10' | 1 | Soil | 2/2/15 | 1350 | 2/4/15 | HOUSTON | IV |
| K1504931-002 | F-3 9-10' | 1 | Soil | 2/2/15 | 1235 | 2/4/15 | HOUSTON | IV |

**Folder Comments:**
Tier II except when requested otherwise. Add narrative note that Benzo(b)fluoranthene cannot be separated from Benzo(j)fluoranthene.

K1504931 5
Barr Engineering
Joslyn OU5 2015 Soil

**Special Instructions/Comments**
Please provide the electronic (PDF and EDD) report to the following e-mail address:
ALKLS.Data@alsglobal.com.

pH Checked _____

**Turnaround Requirements**
____ **RUSH** (Surcharges Apply)
**PLEASE CIRCLE WORK DAYS**
1 2 3 4 5
X **STANDARD**
Requested FAX Date: 5/28/15
Requested Report Date: ~~05-25-15~~

**Report Requirements**
___ I. Results Only
X II. Results + QC Summaries
___ III. Results + QC and Calibration Summaries
___ IV. Data Validation Report with Raw Data
PQL/MDL/J N
EDD Y

**Invoice Information**
PO# 51K1504931
Bill to

Relinquished By: Karla Smith 5/11/15 1036 Received By: 5/12/15 Airbill Number:

# Cooler Receipt Form

ALS Environmental

Project Chemist AK

Client/Project Barr Engineering

Thermometer ID SMO 4

Date/Time Received: 5/12/15 925 Initials: AL

Date/Time Logged in: 5/12/15 Initials AL

1. Method of delivery: ○ US Mail ✓ Fed Ex ○ UPS ○ DHL ○ Courier ○ Client

2. Samples received in: ✓ Cooler ○ Box ○ Envelope ○ Other

3. Were custody seals on coolers? ✓ Yes ○ No

If yes, how many and where? 1 Seal

Were they intact? ✓ Yes ○ No ○ N/A

Were they signed and dated? ✓ Yes ○ No ○ N/A

4. Packing Material: ○ Inserts ○ Baggies ✓ Bubble Wrap ✓ Gel Packs ○ Wet Ice ○ Sleeves ○ Other

5. Foreign or Regulated Soil? ○ Yes ✓ No Location of Sampling:

| Cooler Tracking Number | COC ID | Date Opened | Time Opened | Opened By | Temp. °C | Temp Blank? |
|---|---|---|---|---|---|---|
| 5478 9744 3949 | | 5/12/15 | 945 | AL | 0.6/1.7 | ☐ |
| | | | | | | ☐ |
| | | | | | | ☐ |
| | | | | | | ☐ |

6. Were custody papers properly filled out (ink, signed, dated, etc)? ✓ Yes ○ No

7. Did all bottles arrive in good condition (not broken, no signs of leakage)? ✓ Yes ○ No

8. Were all sample labels complete (i.e., sample ID, analysis, preservation, etc)? ✓ Yes ○ No

9. Were appropriate bottles/containers and volumes received for the requested tests? ✓ Yes ○ No

10. Did sample labels and tags agree with custody documents? ✓ Yes ○ No

Notes, Discrepancies, & Resolutions:

Service request Label:

K1504931 5

Barr Engineering
Joslyn OU6 2015 Soil

Effective 10/04/2013

ALS Environmental - Houston HRMS

10450 Stancliff Rd., Suite 210
Houston, TX 77099
**T:** +1 713 266 1599
**F:** +1 713 266 1599
**www.alsglobal.com**

# SAMPLE ACCEPTANCE POLICY

This policy outlines the criteria samples must meet to be accepted by ALS Environmental – Houston HRMS.

**Cooler Custody Seals (desirable, mandatory if specified in SAP):**

- ✓ Intact on outside of cooler, signed and dated

**Chain-of-Custody (COC) documentation (mandatory):**

The following is required on each COC:

- ✓ Sample ID, the location, date and time of collection, collector's name, preservation type, sample type, and any other special remarks concerning the sampleThe COC must be completed in ink.
- ✓ Signature and date of relinquishing party.

In the absence of a COC at sample receipt, the COC will be requested from the client.

**Sample Integrity (mandatory):**

Samples are inspected upon arrival to ensure that sample integrity was not compromised during transfer to the laboratory.

- ✓ Sample containers must arrive in good condition (not broken or leaking).
- ✓ Samples must be labeled appropriately, including Sample IDs, and requested test using durable labels and indelible ink.
- ✓ The correct type of sample bottle must be used for the method requested.
- ✓ An appropriate sample volume, or weight, must be received.
- ✓ Sample IDs and number of containers must reconcile with the COC.
- ✓ Samples must be received within the method defined holding time.

**Temperature Requirement (varies by sample matrix):**

- ✓ Aqueous and Non-aqueous samples must be shipped and stored cold, at 0 to 6ºC.
- ✓ Tissue samples must be shipped and stored frozen, at -20 to -10ºC.
- ✓ Air samples are shipped and stored cold, at 0 to 6ºC
- ✓ The sample temperature must be recorded on the COC

All cooler inspections are documented on the Cooler Receipt Form (CRF). A separate CRF is completed for each service request. Any samples not meeting the above criteria are noted on the CRF and the Project Manager notified. The Project Manager must resolve any sample integrity issues with the client prior to proceeding with the analysis. Such resolutions are documented in writing and filed with the project folder. Data associated with samples received outside of this acceptance policy will be qualified on the case narrative of the final report

# Preparation Information Benchsheets

**ALS Environmental - Houston HRMS**
10450 Stancliff Rd., Suite 210, Houston, TX 77099
Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

# *Preparation Information Benchsheet*

**Prep Run#:** 236086 **Prep WorkFlow:** OrgExtDioxS(30) **Status:** Prepped
**Team:** Semivoa GCMS/DEDWARDS **Prep Method:** Method **Prep Date/Time:** 5/18/15 11:00 AM

| # | Lab Code | Client ID | B# | Method /Test | pH | Matrix | Amt. Ext. | Sample Description |
|---|---|---|---|---|---|---|---|---|
| 1 | EQ1500362-01 | MB | | 8290/PCDD PCDF | | Solid | 10.244g | |
| 2 | EQ1500362-02 | DMMU1 MS | .05 | 8290/PCDD PCDF | | Solid | 10.104g | |
| 3 | EQ1500362-03 | DMMU1 DMS | .05 | 8290/PCDD PCDF | | Solid | 10.131g | |
| 4 | EQ1500362-04 | DMMU1 DUP | .05 | 8290/PCDD PCDF | | Solid | 10.061g | |
| 5 | EQ1500362-05 | LCS | | 8290/PCDD PCDF | | Solid | 10.261g | |
| 6 | K1504876-001 | DMMU1 | .05 | 8290/PCDD PCDF | | Sediment | 10.014g | Watery Green Sludge |
| 7 | K1504876-002 | DMMU2 | .05 | 8290/PCDD PCDF | | Sediment | 10.215g | Watery Green Sludge |
| 8 | K1504931-001 | C-3 9-10' | .02 | 8290/PCDD PCDF | | Soil | 10.484g | Moist Soil Brown |
| 9 | K1504931-002 | F-3 9-10' | .02 | 8290/PCDD PCDF | | Soil | 10.346g | Moist Soil Brown |

## Spiking Solutions

Name: 1613B Matrix Working Standard Inventory ID 80458 Logbook Ref: 2-20ng/mL 80458 LM 4/21/15 Expires On: 04/21/2016

EQ1500362-02 100.00µL EQ1500362-03 100.00µL EQ1500362-05 100.00µL

Name: 1613B Labeled Working Standard Inventory ID 80832 Logbook Ref: 80832 DE 2-4ng/mL 5/5/15 Expires On: 02/18/2016

EQ1500362-01 1,000.00µL EQ1500362-02 1,000.00µL EQ1500362-03 1,000.00µL EQ1500362-04 1,000.00µL EQ1500362-05 1,000.00µL K1504876-001 1,000.00µL
K1504876-002 1,000.00µL

Name: 1613B Labeled Working Standard Inventory ID 80874 Logbook Ref: 80874 LM 2-4ng/mL 5/6/15 Expires On: 10/24/2015

K1504931-001 1,000.00µL K1504931-002 1,000.00µL

Name: 8290/1613B Cleanup Working Standard Inventory ID 80976 Logbook Ref: 80976 CID 05/12/2015 Expires On: 11/08/2015

EQ1500362-01 100.00µL EQ1500362-02 100.00µL EQ1500362-03 100.00µL EQ1500362-04 100.00µL EQ1500362-05 100.00µL K1504876-001 100.00µL
K1504876-002 100.00µL K1504931-001 100.00µL K1504931-002 100.00µL

## Preparation Materials

| | | | | | |
|---|---|---|---|---|---|
| Carbon, High Purity | LM 4/27/15 (80629) | Ethyl Acetate 99.9% Minimum EtOAc | LM 2/27/15 (79153) | Glass Wool | AL 04/17/15 (80420) |
| Sulfuric Acid Reagent Grade H2SO4 | LM 3/4/15 (79265) | Hexanes 95% | LM 3/27/15 (79967) | Sodium Chloride Reagent Grade NaCl | C2-65-5 (38670) |
| Sodium Sulfate Anhydrous Reagent Grade Na2SO4 | AL 04/21/15 (80462) | Tridecane (n-Tridecane) | AL 03/31/15 (79997) | Silica Gel Reagent Grade | AL 04/17/15 (80421) |
| Toluene 99.9% Minimum | AL 04/10/15 (80254) | Sodium Hydroxide Reagent Grade NaOH | LM 09/02/14 (74232) | | |

# *Preparation Information Benchsheet*

**Prep Run#:** 236086 **Prep WorkFlow:** OrgExtDioxS(30) **Status:** Prepped
**Team:** Semivoa GCMS/DEDWARDS **Prep Method:** Method **Prep Date/Time:** 5/18/15 11:00 AM

**Preparation Steps**

| Step: | Extraction | Step: | Acid Clean | Step: | Silica Gel Clean | Step: | Final Volume |
|---|---|---|---|---|---|---|---|
| Started: | 5/18/15 11:00 | Started: | 5/19/15 09:00 | Started: | 5/19/15 11:15 | Started: | 5/19/15 16:27 |
| Finished: | 5/19/15 07:00 | Finished: | 5/19/15 09:15 | Finished: | 5/19/15 13:35 | Finished: | 5/19/15 17:04 |
| By: | DEDWARDS | By: | CDIAZ | By: | CDIAZ | By: | AKODUR |
| Comments | | Comments | | Comments | | Comments | |

Comments: _____

Reviewed By: ak Date: 5/20/15

Chain of Custody

Relinquished By: _____ Date: _____

Received By: _____ Date: _____

Extracts Examined
Yes No

# Analytical Results

**ALS Environmental - Houston HRMS**
10450 Stancliff Rd., Suite 210, Houston, TX 77099
Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1504931 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:50 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | C-3 9-10' | **Units:** | ng/Kg |
| **Lab Code:** | K1504931-001 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 05/19/15 20:49 |
| **Prep Method:** | Method | **Date Extracted:** | 5/18/15 |
| **Sample Amount:** | 10.484g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235854 | **Blank File Name:** | P178117 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235849 |

### Native Analyte Results

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | ND | U | 0.224 | 1.34 | | | 1 |
| 1,2,3,7,8-PeCDD | 0.268**JK** | | 0.146 | 6.72 | 0.97 | 1.000 | 1 |
| 1,2,3,4,7,8-HxCDD | 1.11**JK** | | 0.194 | 6.72 | 1.66 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 8.76 | | 0.211 | 6.72 | 1.25 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 1.78**J** | | 0.194 | 6.72 | 1.20 | 1.006 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 351 | | 0.519 | 6.72 | 1.03 | 1.000 | 1 |
| OCDD | 3750 | | 0.240 | 13.4 | 0.90 | 1.000 | 1 |
| 2,3,7,8-TCDF | ND | U | 0.291 | 1.34 | | | 1 |
| 1,2,3,7,8-PeCDF | 0.700**J** | | 0.192 | 6.72 | 1.36 | 1.001 | 1 |
| 2,3,4,7,8-PeCDF | 1.22**J** | | 0.185 | 6.72 | 1.48 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDF | 4.90**J** | | 0.291 | 6.72 | 1.15 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDF | 1.45**J** | | 0.287 | 6.72 | 1.05 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDF | 1.71**J** | | 0.303 | 6.72 | 1.28 | 1.001 | 1 |
| 2,3,4,6,7,8-HxCDF | 2.34**J** | | 0.287 | 6.72 | 1.12 | 1.001 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 101 | | 0.482 | 6.72 | 0.98 | 1.000 | 1 |
| 1,2,3,4,7,8,9-HpCDF | 5.89**J** | | 0.677 | 6.72 | 1.10 | 1.000 | 1 |
| OCDF | 571 | | 0.459 | 13.4 | 0.90 | 1.005 | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1504931 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:50 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | C-3 9-10' | **Units:** | ng/Kg |
| **Lab Code:** | K1504931-001 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 05/19/15 20:49 |
| **Prep Method:** | Method | **Date Extracted:** | 5/18/15 |
| **Sample Amount:** | 10.484g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235854 | **Blank File Name:** | P178117 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235849 |

### Native Analyte Results

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | ND | U | 0.224 | 1.34 | | | 1 |
| Total Penta-Dioxins | ND | U | 0.146 | 6.72 | | | 1 |
| Total Hexa-Dioxins | 78.8 | | 0.200 | 6.72 | 1.28 | | 1 |
| Total Hepta-Dioxins | 934 | | 0.519 | 6.72 | 1.06 | | 1 |
| Total Tetra-Furans | ND | U | 0.291 | 1.34 | | | 1 |
| Total Penta-Furans | 7.88 | | 0.125 | 6.72 | 1.52 | | 1 |
| Total Hexa-Furans | 117 | | 0.291 | 6.72 | 1.17 | | 1 |
| Total Hepta-Furans | 552 | | 0.571 | 6.72 | 0.98 | | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1504931 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:50 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | C-3 9-10' | **Units:** | Percent |
| **Lab Code:** | K1504931-001 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 05/19/15 20:49 |
| **Prep Method:** | Method | **Date Extracted:** | 5/18/15 |
| **Sample Amount:** | 10.484g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235854 | **Blank File Name:** | P178117 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235849 |

### Labeled Standard Results

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1418.732 | 71 | | 40-135 | 0.78 | 1.020 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1615.859 | 81 | | 40-135 | 1.58 | 1.176 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1286.117 | 64 | | 40-135 | 1.29 | 0.991 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1185.144 | 59 | | 40-135 | 1.30 | 0.994 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1118.906 | 56 | | 40-135 | 1.07 | 1.066 |
| 13C-OCDD | 4000 | 1778.362 | 44 | | 40-135 | 0.92 | 1.141 |
| | | | | | | | |
| 13C-2,3,7,8-TCDF | 2000 | 1340.960 | 67 | | 40-135 | 0.81 | 0.993 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1536.441 | 77 | | 40-135 | 1.61 | 1.136 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1635.194 | 82 | | 40-135 | 1.60 | 1.166 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1216.141 | 61 | | 40-135 | 0.53 | 0.972 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1165.637 | 58 | | 40-135 | 0.53 | 0.974 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1372.936 | 69 | | 40-135 | 0.52 | 1.008 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1259.807 | 63 | | 40-135 | 0.53 | 0.987 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 997.322 | 50 | | 40-135 | 0.44 | 1.041 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1066.934 | 53 | | 40-135 | 0.44 | 1.079 |
| | | | | | | | |
| 37Cl-2,3,7,8-TCDD | 800 | 611.513 | 76 | | 40-135 | NA | 1.020 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1504931 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 13:50 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | C-3 9-10' | **Units:** | ng/Kg |
| **Lab Code:** | K1504931-001 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

**Analysis Method:** 8290
**Prep Method:** Method

**Toxicity Equivalency Quotient**

| Analyte Name | Result | DL | MRL | Dilution Factor | TEF | TEF - Adjusted Concentration |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | ND | 0.224 | 1.34 | 1 | 1 | |
| 1,2,3,7,8-PeCDD | **0.268** | 0.146 | 6.72 | 1 | 1 | 0.268 |
| 1,2,3,4,7,8-HxCDD | **1.11** | 0.194 | 6.72 | 1 | 0.1 | 0.111 |
| 1,2,3,6,7,8-HxCDD | **8.76** | 0.211 | 6.72 | 1 | 0.1 | 0.876 |
| 1,2,3,7,8,9-HxCDD | **1.78** | 0.194 | 6.72 | 1 | 0.1 | 0.178 |
| 1,2,3,4,6,7,8-HpCDD | **351** | 0.519 | 6.72 | 1 | 0.01 | 3.51 |
| OCDD | **3750** | 0.240 | 13.4 | 1 | 0.0003 | 1.13 |
| 2,3,7,8-TCDF | ND | 0.291 | 1.34 | 1 | 0.1 | |
| 1,2,3,7,8-PeCDF | **0.700** | 0.192 | 6.72 | 1 | 0.03 | 0.0210 |
| 2,3,4,7,8-PeCDF | **1.22** | 0.185 | 6.72 | 1 | 0.3 | 0.366 |
| 1,2,3,4,7,8-HxCDF | **4.90** | 0.291 | 6.72 | 1 | 0.1 | 0.490 |
| 1,2,3,6,7,8-HxCDF | **1.45** | 0.287 | 6.72 | 1 | 0.1 | 0.145 |
| 1,2,3,7,8,9-HxCDF | **1.71** | 0.303 | 6.72 | 1 | 0.1 | 0.171 |
| 2,3,4,6,7,8-HxCDF | **2.34** | 0.287 | 6.72 | 1 | 0.1 | 0.234 |
| 1,2,3,4,6,7,8-HpCDF | **101** | 0.482 | 6.72 | 1 | 0.01 | 1.01 |
| 1,2,3,4,7,8,9-HpCDF | **5.89** | 0.677 | 6.72 | 1 | 0.01 | 0.0589 |
| OCDF | **571** | 0.459 | 13.4 | 1 | 0.0003 | 0.171 |
| | | Total TEQ | | | | 8.74 |

2005 WHO TEFs, ND = 0

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1504931 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 12:35 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | F-3 9-10' | **Units:** | ng/Kg |
| **Lab Code:** | K1504931-002 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 05/19/15 21:37 |
| **Prep Method:** | Method | **Date Extracted:** | 5/18/15 |
| **Sample Amount:** | 10.346g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235855 | **Blank File Name:** | P178117 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235849 |

### Native Analyte Results

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | ND | U | 0.298 | 1.58 | | | 1 |
| 1,2,3,7,8-PeCDD | 0.850**J** | | 0.171 | 7.90 | 1.61 | 1.000 | 1 |
| 1,2,3,4,7,8-HxCDD | 0.826**JK** | | 0.143 | 7.90 | 1.02 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 2.63**JK** | | 0.149 | 7.90 | 1.45 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 1.37**J** | | 0.140 | 7.90 | 1.07 | 1.007 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 62.7 | | 0.315 | 7.90 | 1.04 | 1.000 | 1 |
| OCDD | 685 | | 0.312 | 15.8 | 0.91 | 1.000 | 1 |
| 2,3,7,8-TCDF | ND | U | 0.312 | 1.58 | | | 1 |
| 1,2,3,7,8-PeCDF | 1.01**JK** | | 0.256 | 7.90 | 1.18 | 1.001 | 1 |
| 2,3,4,7,8-PeCDF | 0.732**J** | | 0.252 | 7.90 | 1.67 | 1.000 | 1 |
| 1,2,3,4,7,8-HxCDF | 1.53**J** | | 0.158 | 7.90 | 1.25 | 1.001 | 1 |
| 1,2,3,6,7,8-HxCDF | 0.844**JK** | | 0.149 | 7.90 | 1.48 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDF | 1.57**J** | | 0.173 | 7.90 | 1.20 | 1.000 | 1 |
| 2,3,4,6,7,8-HxCDF | 1.08**J** | | 0.155 | 7.90 | 1.25 | 1.000 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 16.7 | | 0.325 | 7.90 | 0.99 | 1.000 | 1 |
| 1,2,3,4,7,8,9-HpCDF | 2.02**BJ** | | 0.501 | 7.90 | 1.14 | 1.000 | 1 |
| OCDF | 106 | | 0.428 | 15.8 | 0.87 | 1.005 | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1504931 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 12:35 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | F-3 9-10' | **Units:** | ng/Kg |
| **Lab Code:** | K1504931-002 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 05/19/15 21:37 |
| **Prep Method:** | Method | **Date Extracted:** | 5/18/15 |
| **Sample Amount:** | 10.346g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235855 | **Blank File Name:** | P178117 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235849 |

### Native Analyte Results

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | ND | U | 0.298 | 1.58 | | | 1 |
| Total Penta-Dioxins | 0.850**J** | | 0.171 | 7.90 | 1.61 | | 1 |
| Total Hexa-Dioxins | 4.27**J** | | 0.144 | 7.90 | 1.35 | | 1 |
| Total Hepta-Dioxins | 120 | | 0.315 | 7.90 | 1.04 | | 1 |
| Total Tetra-Furans | ND | U | 0.312 | 1.58 | | | 1 |
| Total Penta-Furans | 0.732**J** | | 0.176 | 7.90 | | | 1 |
| Total Hexa-Furans | 19.5 | | 0.158 | 7.90 | 1.12 | | 1 |
| Total Hepta-Furans | 97.6 | | 0.401 | 7.90 | 0.99 | | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1504931 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 12:35 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | F-3 9-10' | **Units:** | Percent |
| **Lab Code:** | K1504931-002 | **Basis:** | Dry |

## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 05/19/15 21:37 |
| **Prep Method:** | Method | **Date Extracted:** | 5/18/15 |
| **Sample Amount:** | 10.346g | **Instrument Name:** | E-HRMS-04 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P235855 | **Blank File Name:** | P178117 |
| **ICAL Date:** | 10/28/14 | **Cal Ver. File Name:** | P235849 |

### Labeled Standard Results

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1568.133 | 78 | | 40-135 | 0.77 | 1.019 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1730.765 | 87 | | 40-135 | 1.57 | 1.176 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1412.435 | 71 | | 40-135 | 1.28 | 0.991 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1375.518 | 69 | | 40-135 | 1.25 | 0.993 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1352.152 | 68 | | 40-135 | 1.07 | 1.066 |
| 13C-OCDD | 4000 | 2184.399 | 55 | | 40-135 | 0.93 | 1.141 |
| | | | | | | | |
| 13C-2,3,7,8-TCDF | 2000 | 1483.752 | 74 | | 40-135 | 0.81 | 0.993 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1658.457 | 83 | | 40-135 | 1.60 | 1.135 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1722.700 | 86 | | 40-135 | 1.61 | 1.166 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1377.189 | 69 | | 40-135 | 0.53 | 0.971 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1335.831 | 67 | | 40-135 | 0.52 | 0.974 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1527.107 | 76 | | 40-135 | 0.53 | 1.008 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1438.238 | 72 | | 40-135 | 0.53 | 0.988 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 1173.506 | 59 | | 40-135 | 0.45 | 1.041 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1141.182 | 57 | | 40-135 | 0.44 | 1.079 |
| | | | | | | | |
| 37Cl-2,3,7,8-TCDD | 800 | 689.344 | 86 | | 40-135 | NA | 1.020 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1504931 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | 02/02/15 12:35 |
| **Sample Matrix:** | Soil | **Date Received:** | 02/04/15 09:40 |
| **Sample Name:** | F-3 9-10' | **Units:** | ng/Kg |
| **Lab Code:** | K1504931-002 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

**Analysis Method:** 8290
**Prep Method:** Method

**Toxicity Equivalency Quotient**

| Analyte Name | Result | DL | MRL | Dilution Factor | TEF | TEF - Adjusted Concentration |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | ND | 0.298 | 1.58 | 1 | 1 | |
| 1,2,3,7,8-PeCDD | **0.850** | 0.171 | 7.90 | 1 | 1 | 0.850 |
| 1,2,3,4,7,8-HxCDD | **0.826** | 0.143 | 7.90 | 1 | 0.1 | 0.0826 |
| 1,2,3,6,7,8-HxCDD | **2.63** | 0.149 | 7.90 | 1 | 0.1 | 0.263 |
| 1,2,3,7,8,9-HxCDD | **1.37** | 0.140 | 7.90 | 1 | 0.1 | 0.137 |
| 1,2,3,4,6,7,8-HpCDD | **62.7** | 0.315 | 7.90 | 1 | 0.01 | 0.627 |
| OCDD | **685** | 0.312 | 15.8 | 1 | 0.0003 | 0.206 |
| 2,3,7,8-TCDF | ND | 0.312 | 1.58 | 1 | 0.1 | |
| 1,2,3,7,8-PeCDF | **1.01** | 0.256 | 7.90 | 1 | 0.03 | 0.0303 |
| 2,3,4,7,8-PeCDF | **0.732** | 0.252 | 7.90 | 1 | 0.3 | 0.220 |
| 1,2,3,4,7,8-HxCDF | **1.53** | 0.158 | 7.90 | 1 | 0.1 | 0.153 |
| 1,2,3,6,7,8-HxCDF | **0.844** | 0.149 | 7.90 | 1 | 0.1 | 0.0844 |
| 1,2,3,7,8,9-HxCDF | **1.57** | 0.173 | 7.90 | 1 | 0.1 | 0.157 |
| 2,3,4,6,7,8-HxCDF | **1.08** | 0.155 | 7.90 | 1 | 0.1 | 0.108 |
| 1,2,3,4,6,7,8-HpCDF | **16.7** | 0.325 | 7.90 | 1 | 0.01 | 0.167 |
| 1,2,3,4,7,8,9-HpCDF | **2.02** | 0.501 | 7.90 | 1 | 0.01 | 0.0202 |
| OCDF | **106** | 0.428 | 15.8 | 1 | 0.0003 | 0.0318 |
| | | Total TEQ | | | | 3.14 |

2005 WHO TEFs, ND = 0

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1504931 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Method Blank | **Units:** | ng/Kg |
| **Lab Code:** | EQ1500362-01 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 05/20/15 15:35 |
| **Prep Method:** | Method | **Date Extracted:** | 5/18/15 |
| **Sample Amount:** | 10.244g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P178117 | **Blank File Name:** | P178117 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P178115 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | ND | U | 0.334 | 0.488 | | | 1 |
| 1,2,3,7,8-PeCDD | ND | U | 0.331 | 2.44 | | | 1 |
| 1,2,3,4,7,8-HxCDD | ND | U | 0.254 | 2.44 | | | 1 |
| 1,2,3,6,7,8-HxCDD | ND | U | 0.269 | 2.44 | | | 1 |
| 1,2,3,7,8,9-HxCDD | ND | U | 0.243 | 2.44 | | | 1 |
| 1,2,3,4,6,7,8-HpCDD | 0.656**J** | | 0.271 | 2.44 | 1.05 | 1.000 | 1 |
| OCDD | 2.36**JK** | | 0.800 | 4.88 | 1.30 | 1.000 | 1 |
| 2,3,7,8-TCDF | ND | U | 0.641 | 0.641 | | | 1 |
| 1,2,3,7,8-PeCDF | ND | U | 0.297 | 2.44 | | | 1 |
| 2,3,4,7,8-PeCDF | ND | U | 0.287 | 2.44 | | | 1 |
| 1,2,3,4,7,8-HxCDF | ND | U | 0.248 | 2.44 | | | 1 |
| 1,2,3,6,7,8-HxCDF | ND | U | 0.231 | 2.44 | | | 1 |
| 1,2,3,7,8,9-HxCDF | ND | U | 0.319 | 2.44 | | | 1 |
| 2,3,4,6,7,8-HxCDF | ND | U | 0.246 | 2.44 | | | 1 |
| 1,2,3,4,6,7,8-HpCDF | 0.379**J** | | 0.172 | 2.44 | 0.99 | 1.000 | 1 |
| 1,2,3,4,7,8,9-HpCDF | 0.320**JK** | | 0.229 | 2.44 | 1.70 | 1.000 | 1 |
| OCDF | ND | U | 0.638 | 4.88 | | | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1504931 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Method Blank | **Units:** | ng/Kg |
| **Lab Code:** | EQ1500362-01 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 05/20/15 15:35 |
| **Prep Method:** | Method | **Date Extracted:** | 5/18/15 |
| **Sample Amount:** | 10.244g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P178117 | **Blank File Name:** | P178117 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P178115 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | ND | U | 0.334 | 0.488 | | | 1 |
| Total Penta-Dioxins | ND | U | 0.331 | 2.44 | | | 1 |
| Total Hexa-Dioxins | ND | U | 0.255 | 2.44 | | | 1 |
| Total Hepta-Dioxins | 0.656**J** | | 0.271 | 2.44 | 1.05 | | 1 |
| Total Tetra-Furans | ND | U | 0.641 | 0.641 | | | 1 |
| Total Penta-Furans | ND | U | 0.176 | 2.44 | | | 1 |
| Total Hexa-Furans | ND | U | 0.258 | 2.44 | | | 1 |
| Total Hepta-Furans | 0.782**J** | | 0.198 | 2.44 | 0.99 | | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1504931 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Method Blank | **Units:** | Percent |
| **Lab Code:** | EQ1500362-01 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 05/20/15 15:35 |
| **Prep Method:** | Method | **Date Extracted:** | 5/18/15 |
| **Sample Amount:** | 10.244g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P178117 | **Blank File Name:** | P178117 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P178115 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1339.239 | 67 | | 40-135 | 0.82 | 1.022 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1668.407 | 83 | | 40-135 | 1.54 | 1.193 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1347.898 | 67 | | 40-135 | 1.31 | 0.991 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1340.832 | 67 | | 40-135 | 1.27 | 0.993 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1191.142 | 60 | | 40-135 | 1.03 | 1.066 |
| 13C-OCDD | 4000 | 2038.055 | 51 | | 40-135 | 0.88 | 1.139 |
| 13C-2,3,7,8-TCDF | 2000 | 1324.795 | 66 | | 40-135 | 0.79 | 0.993 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1583.466 | 79 | | 40-135 | 1.61 | 1.149 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1598.827 | 80 | | 40-135 | 1.61 | 1.183 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1343.478 | 67 | | 40-135 | 0.55 | 0.970 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1392.275 | 70 | | 40-135 | 0.52 | 0.973 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1396.189 | 70 | | 40-135 | 0.53 | 1.008 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1363.926 | 68 | | 40-135 | 0.52 | 0.987 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 1090.097 | 55 | | 40-135 | 0.43 | 1.042 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1248.010 | 62 | | 40-135 | 0.45 | 1.079 |
| 37Cl-2,3,7,8-TCDD | 800 | 616.243 | 77 | | 40-135 | NA | 1.022 |

# Accuracy & Precision

**ALS Environmental - Houston HRMS**
10450 Stancliff Rd., Suite 210, Houston TX 77099
Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1504931 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Analyzed:** | 05/19/15 |
| **Sample Matrix:** | Soil | **Date Extracted:** | 05/18/15 |

## Lab Control Sample Summary
## Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Units:** | ng/Kg |
| **Prep Method:** | Method | **Basis:** | Dry |
| | | **Analysis Lot:** | 445679 |

**Lab Control Sample**
**EQ1500362-05**

| Analyte Name | Result | Spike Amount | % Rec | % Rec Limits |
|---|---|---|---|---|
| 1,2,3,4,6,7,8-HpCDD | 104 | 97.5 | 106 | 70-130 |
| 1,2,3,4,7,8-HxCDD | 112 | 97.5 | 114 | 70-130 |
| 1,2,3,6,7,8-HxCDD | 109 | 97.5 | 111 | 70-130 |
| 1,2,3,7,8,9-HxCDD | 107 | 97.5 | 109 | 70-130 |
| 1,2,3,7,8-PeCDD | 112 | 97.5 | 115 | 70-130 |
| 2,3,7,8-TCDD | 21.2 | 19.5 | 109 | 70-130 |
| OCDD | 219 | 195 | 113 | 70-130 |
| | | | | |
| 1,2,3,4,6,7,8-HpCDF | 102 | 97.5 | 105 | 70-130 |
| 1,2,3,4,7,8,9-HpCDF | 95.2 | 97.5 | 98 | 70-130 |
| 1,2,3,4,7,8-HxCDF | 101 | 97.5 | 104 | 70-130 |
| 1,2,3,6,7,8-HxCDF | 94.6 | 97.5 | 97 | 70-130 |
| 1,2,3,7,8,9-HxCDF | 98.5 | 97.5 | 101 | 70-130 |
| 1,2,3,7,8-PeCDF | 102 | 97.5 | 105 | 70-130 |
| 2,3,4,6,7,8-HxCDF | 98.5 | 97.5 | 101 | 70-130 |
| 2,3,4,7,8-PeCDF | 103 | 97.5 | 105 | 70-130 |
| 2,3,7,8-TCDF | 21.1 | 19.5 | 108 | 70-130 |
| OCDF | 202 | 195 | 104 | 70-130 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1504931 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Lab Control Sample | **Units:** | ng/Kg |
| **Lab Code:** | EQ1500362-05 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 05/19/15 18:56 |
| **Prep Method:** | Method | **Date Extracted:** | 5/18/15 |
| **Sample Amount:** | 10.261g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P178110 | **Blank File Name:** | P178117 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P178103 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| 2,3,7,8-TCDD | 21.2 | | 0.154 | 0.487 | 0.76 | 1.001 | 1 |
| 1,2,3,7,8-PeCDD | 112 | | 0.0760 | 2.44 | 1.58 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDD | 112 | | 0.118 | 2.44 | 1.28 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDD | 109 | | 0.125 | 2.44 | 1.26 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDD | 107 | | 0.113 | 2.44 | 1.28 | 1.007 | 1 |
| 1,2,3,4,6,7,8-HpCDD | 104 | | 0.111 | 2.44 | 1.08 | 1.000 | 1 |
| OCDD | 219 | | 1.05 | 4.87 | 0.88 | 1.000 | 1 |
| 2,3,7,8-TCDF | 21.1 | | 0.190 | 0.487 | 0.74 | 1.001 | 1 |
| 1,2,3,7,8-PeCDF | 102 | | 0.112 | 2.44 | 1.54 | 1.001 | 1 |
| 2,3,4,7,8-PeCDF | 103 | | 0.108 | 2.44 | 1.60 | 1.001 | 1 |
| 1,2,3,4,7,8-HxCDF | 101 | | 0.0690 | 2.44 | 1.24 | 1.000 | 1 |
| 1,2,3,6,7,8-HxCDF | 94.6 | | 0.0650 | 2.44 | 1.26 | 1.000 | 1 |
| 1,2,3,7,8,9-HxCDF | 98.5 | | 0.0880 | 2.44 | 1.29 | 1.001 | 1 |
| 2,3,4,6,7,8-HxCDF | 98.5 | | 0.0702 | 2.44 | 1.24 | 1.000 | 1 |
| 1,2,3,4,6,7,8-HpCDF | 102 | | 0.302 | 2.44 | 1.02 | 1.000 | 1 |
| 1,2,3,4,7,8,9-HpCDF | 95.2 | | 0.378 | 2.44 | 1.02 | 1.000 | 1 |
| OCDF | 202 | | 0.751 | 4.87 | 0.91 | 1.005 | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1504931 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Lab Control Sample | **Units:** | ng/Kg |
| **Lab Code:** | EQ1500362-05 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 05/19/15 18:56 |
| **Prep Method:** | Method | **Date Extracted:** | 5/18/15 |
| **Sample Amount:** | 10.261g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P178110 | **Blank File Name:** | P178117 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P178103 |

**Native Analyte Results**

| Analyte Name | Result | Q | EDL | MRL | Ion Ratio | RRT | Dilution Factor |
|---|---|---|---|---|---|---|---|
| Total Tetra-Dioxins | 21.2 | | 0.154 | 0.487 | 0.76 | | 1 |
| Total Penta-Dioxins | 112 | | 0.0760 | 2.44 | 1.58 | | 1 |
| Total Hexa-Dioxins | 327 | | 0.119 | 2.44 | 1.28 | | 1 |
| Total Hepta-Dioxins | 104 | | 0.111 | 2.44 | 1.12 | | 1 |
| Total Tetra-Furans | 21.3 | | 0.190 | 0.487 | 0.74 | | 1 |
| Total Penta-Furans | 208 | | 0.0614 | 2.44 | | | 1 |
| Total Hexa-Furans | 393 | | 0.0722 | 2.44 | 1.24 | | 1 |
| Total Hepta-Furans | 198 | | 0.337 | 2.44 | 1.02 | | 1 |

| | | | |
|---|---|---|---|
| **Client:** | Barr Engineering Company | **Service Request:** | K1504931 |
| **Project:** | Joslyn OU5 2015 Soil/23270110 | **Date Collected:** | NA |
| **Sample Matrix:** | Soil | **Date Received:** | NA |
| **Sample Name:** | Lab Control Sample | **Units:** | Percent |
| **Lab Code:** | EQ1500362-05 | **Basis:** | Dry |

**Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS**

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8290 | **Date Analyzed:** | 05/19/15 18:56 |
| **Prep Method:** | Method | **Date Extracted:** | 5/18/15 |
| **Sample Amount:** | 10.261g | **Instrument Name:** | E-HRMS-03 |
| | | **GC Column:** | DB-5MSUI |
| **Data File Name:** | P178110 | **Blank File Name:** | P178117 |
| **ICAL Date:** | 10/18/14 | **Cal Ver. File Name:** | P178103 |

**Labeled Standard Results**

| Labeled Compounds | Spike Conc.(pg) | Conc. Found (pg) | % Rec | Q | Control Limits | Ion Ratio | RRT |
|---|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | 2000 | 1377.335 | 69 | | 40-135 | 0.77 | 1.022 |
| 13C-1,2,3,7,8-PeCDD | 2000 | 1714.764 | 86 | | 40-135 | 1.56 | 1.193 |
| 13C-1,2,3,4,7,8-HxCDD | 2000 | 1393.897 | 70 | | 40-135 | 1.27 | 0.991 |
| 13C-1,2,3,6,7,8-HxCDD | 2000 | 1316.672 | 66 | | 40-135 | 1.28 | 0.993 |
| 13C-1,2,3,4,6,7,8-HpCDD | 2000 | 1218.353 | 61 | | 40-135 | 1.08 | 1.066 |
| 13C-OCDD | 4000 | 1967.558 | 49 | | 40-135 | 0.90 | 1.139 |
| 13C-2,3,7,8-TCDF | 2000 | 1342.490 | 67 | | 40-135 | 0.77 | 0.992 |
| 13C-1,2,3,7,8-PeCDF | 2000 | 1635.652 | 82 | | 40-135 | 1.61 | 1.149 |
| 13C-2,3,4,7,8-PeCDF | 2000 | 1656.976 | 83 | | 40-135 | 1.61 | 1.183 |
| 13C-1,2,3,4,7,8-HxCDF | 2000 | 1341.510 | 67 | | 40-135 | 0.53 | 0.970 |
| 13C-1,2,3,6,7,8-HxCDF | 2000 | 1375.905 | 69 | | 40-135 | 0.53 | 0.973 |
| 13C-1,2,3,7,8,9-HxCDF | 2000 | 1396.435 | 70 | | 40-135 | 0.51 | 1.008 |
| 13C-2,3,4,6,7,8-HxCDF | 2000 | 1374.731 | 69 | | 40-135 | 0.54 | 0.987 |
| 13C-1,2,3,4,6,7,8-HpCDF | 2000 | 1054.570 | 53 | | 40-135 | 0.44 | 1.042 |
| 13C-1,2,3,4,7,8,9-HpCDF | 2000 | 1257.000 | 63 | | 40-135 | 0.44 | 1.079 |
| 37Cl-2,3,7,8-TCDD | 800 | 646.565 | 81 | | 40-135 | NA | 1.022 |