# SAF-RC-236
# 100N Groundwater Sample Collection Supporting UPR-100-N-17
# FINAL DATA PACKAGE

**COMPLETE COPY OF DATA PACKAGE TO:**

Kathy Wendt H4-21 KW 12/18/12
INITIAL/DATE

**COMMENTS:**

**SDG K4030 SAF-RC-236**

Rad only ☑ Chem only Rad & Chem

☑ Complete Partial

**Sample Location: 100-N Groundwater Samples, Well 199-N-169 & 199-N-171**

LIONVILLE LABORATORY
A division of Eberline Analytical Corporation

264 Welsh Pool Road
Exton, Pennsylvania 19341
Phone (610) 280-3000
Fax (610) 280-3041

16 December 2012

Joan Kessner
WC-Hanford, Inc.
2620 Fermi Avenue
MSIN H4-21
Richland, WA 99354

Subject: Analytical Data Package

Dear Ms. Kessner:

Enclosed are the hard copy analytical reports for the batch number/fraction indicated (marked X) in the following table:

| | |
|---|---|
| LvLI Batch # | 1211065 |
| SDG # | K4030 |
| SAF # | RC-236 |
| Date Received | 11/16/12 |
| # Samples | 2 |
| Matrix | WATER |
| Volatiles | |
| Semivolatiles | |
| Pest/PCB | |
| Glycols | |
| DRO/KRO/GRO | X |
| PAHs | X |
| Herbicides | |
| Metals | X |
| Inorganics | X |

The electronic data deliverable (EDD) has been emailed. If you have any questions, please don't hesitate to contact me at (610) 280-3012.

Sincerely,

Lionville Laboratory
A Division of Eberline Analytical Corporation

Orlette S. Johnson
Project Manager

The results presented in this report relate only to the analytical testing and conditions of the samples at receipt and during storage. All pages of this report are integral parts of the analytical data. Therefore, this report should only be reproduced in its entirety of 57 pages.

R:\GROUP\PM\ORLETTE\Hanford\Data\B_ltrs.DOC

# CHAIN OF CUSTODY

Lionville Laboratory Use Only: 1211065

# Custody Transfer Record/Lab Work Request

Page 1 of 1

**FIELD PERSONNEL: COMPLETE ONLY SHADED AREAS**

Lionville Laboratory
A Division of Eberline Analytical Corporation

Client: WC Hanford SAF# RC-231
Est. Final Proj. Sampling Date:
Project#:
Project Contact/Phone#:
Lionville Laboratory Project Manager: Arlette Johnson
QC: SW Del: Std TAT: 15
Date Rec'd: 11-15-12 + 11-16-12 Date Due: 12-1-12

| | | AB | CD | E-H | I | | J | KL | M |
|---|---|---|---|---|---|---|---|---|---|
| Refrigerator # | | 2 | 2 | 2 | 2 | | 2 | 2 | 2 |
| #/Type Container | Liquid | 2aq1 | 2aq1 | 4aq1 | 1pl | | 1pl | 2aq1 | 1pl |
| | Solid | | | | | | | | |
| Volume | Liquid | 1L | 1L | 40 | 500 | | 250 | 1L | 500 |
| | Solid | | | | | | | | |
| Preservatives | | — | HCL | HCL | HNO3 | | — | HCL | — |
| ANALYSES REQUESTED | ORGANIC: VOA | | | | | | | | |
| | ORGANIC: BNA | | | | | | | | |
| | ORGANIC: Pest/PCB | | | | | | | | |
| | ORGANIC: Herb | | | | | | | | |
| | PAHS 8310 | | TPH-D | TPH-G | INORG: Metal | INORG: CN | Alk | Oil + Grease | IC Anions |
| Lionville Laboratory Use Only | | 8310 | DRO/KERO/MO | GRO | METALS | | ALKALINITY | HEM OIL | ANIONS |

MATRIX CODES:
W Water
WW Waste Water
GW Groundwater
WST Waste
WI Wipe
SO Solid
S Soil
SL Sludge
SE Sediment
PC Paint Chips
O Oil
NAL Non-Aqueous Liquid
L Leachate
A Air
T Tissue
F Fish

| Lab ID | Client ID/Description | Matrix QC Chosen (✓) MS | MSD | Matrix | Date Collected | Time Collected | 8310 | DRO/KERO/MO | GRO | METALS | | ALKALINITY | HEM OIL | ANIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | B2M B43 | | | W | 11.14.12 | 1057 | X | X (pH<2) | X | X | (pH<2) | X | X | X |
| 02 | B2M B45 | | | ↓ | ↓ | 0926 | X | X (pH<2) | X | X | (pH<2) | X | X | X |

Special Instructions:

Special Instructions: #
1. 02 C+D Rec'd unpreserved (pH=0)
2. 11/16/12 Sample -01 rec'd 11/15/12 @ 1600
3. 11/16/12 DRO = Kerosene, Diesel, Motor Oils
4.
5.
6.

| Relinquished by | Received by | Date | Time |
|---|---|---|---|
| Leo Ex | [illegible] | 11-15-12 | 1600 |
| Leo Ex | [illegible] | 11-16-12 | 1015 |

| Relinquished by | Received by | Date | Time |
|---|---|---|---|
| | | | |
| | | | |

| Relinquished by | Received by | Date | Time |
|---|---|---|---|
| | | | |
| | | | |

| Washington Closure Hanford | CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST | C.O.C. # RC-236-007 Page 1 of 1 |
|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Collector | F. M. Hall | Contact/Requester | THOMPSON, WS | Telephone No. | 372-9597 |
| SAF No. | RC-236 | Sampling Origin | Hanford Site | Purchase Order/Charge Code | 303123ES20 |
| Project Title | 100-N Groundwater Sample Collection S | Logbook No. | HNF-N-506 51/47 | Ice Chest No. | GWS-961 |
| Shipped To (Lab) | Lionville Laboratory Incorporated | Method of Shipment | Commercial Carrier | Bill of Lading/Air Bill No. | 7940 7699 9968 |
| Protocol | CHARACTERIZATION | Priority: 15 Days | PRIORITY | Offsite Property No. | |

**POSSIBLE SAMPLE HAZARDS/REMARKS**

**Contains Radioactive Material at concentrations that may or may not be regulated for transportation per 49 CFR/IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1.**

**SPECIAL INSTRUCTIONS** Hold Time Total Activity Exemption: Yes ☑ No ☐

** The field NCOs prior to purging the well for sample collection, will use a transparent bailer to collect a grab sample to evaluate the presence of an oil sheen. The are to record their observations, along with any odors observed on the Field Sampling Report provided.

** The RCCC acknowledges that the analytical holding time for Nitrate, Nitrite, and Phosphate by EPA methods 300.0 or 9056 will not be met.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| B2MB43 | N | W | 11/14/12 | 1057 | 2x1000-mL aG | TPH-DieselKerosene Range - WTPH-D (100 Area RIFS) | 14/40 Days | HCl to pH <2/Cool~4C |
| B2MB43 | N | W | | | 4x40-mL aGs* | TPH-Gasoline Range - WTPH-G (100 Area RIFS) | 14 Days | HCl to pH <2/Cool~4C |
| B2MB43 | N | W | | | 2x1-L G | Oil & Grease - 1664A | 28 Days | HCl to pH <2/Cool~4C |
| B2MB43 | N | W | | | 2x1-L aG | PAHs - 8310 (100 Area RI/FS) | 7/40 Days | Cool~4C |
| B2MB43 | N | W | | | 1x500-mL G/P | ICP Metals - 6010 (Supertrace);<br>ICP Metals - 6010 (Supertrace Add-On) | 6 Months | HNO3 to pH <2 |
| B2MB43 | N | W | | | 1x500-mL P | IC Anions - 300.0 (100 Area RI/FS) | 48 Hours | Cool~4C |
| B2MB43 | N | W | | | 1x250-mL G/P | 2320_ALKALINITY | 14 Days | Cool~4C |
| B2MB43 | N | W | 11/14/12 | 1057 | 1x20-mL P | Activity Scan | 6 Months | None |

| Relinquished By | Print | Sign | Date/Time | Received By | Print | Sign | Date/Time |
|---|---|---|---|---|---|---|---|
| F. M. Hall | | | NOV 14 2012 1400 | FEDEX | | | |
| Relinquished By | | | Date/Time | Received By | | | Date/Time |
| | | | 11-15-12 1600 | D. Smith | | | 11-15-12 1600 |
| Relinquished By | | | Date/Time | Received By | | | Date/Time |
| Relinquished By | | | Date/Time | Received By | | | Date/Time |

Matrix *

| | | | |
|---|---|---|---|
| S | = Soil | DS | = Drum Solids |
| SE | = Sediment | DL | = Drum Liquids |
| SO | = Solid | T | = Tissue |
| SL | = Sludge | WI | = Wipe |
| W | = Water | L | = Liquid |
| O | = Oil | V | = Vegetation |
| A | = Air | X | = Other |

| FINAL SAMPLE DISPOSITION | Disposal Method (e.g., Return to customer, per lab procedure, used in process) | Disposed By | Date/Time |
|---|---|---|---|

PRINTED ON 10/15/2012

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| Washington Closure Hanford | CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST | C.O.C. # RC-236-008 |
|---|---|---|
| | | Page 1 of 1 |

| | | | | | |
|---|---|---|---|---|---|
| Collector | F. M. Hall | Contact/Requester | THOMPSON, WS | Telephone No. | 372-9597 |
| SAF No. | RC-236 | Sampling Origin | Hanford Site | Purchase Order/Charge Code | 303123ES20 |
| Project Title | 100-N Groundwater Sample Collection S | Logbook No. | HNF-N-506 51/47 | Ice Chest No. | BWS-210 |
| Shipped To (Lab) | Lionville Laboratory Incorporated | Method of Shipment | Commercial Carrier | Bill of Lading/Air Bill No. | 7940 7699 9902 |
| Protocol | CHARACTERIZATION | Priority: 15 Days | PRIORITY | Offsite Property No. | |

**POSSIBLE SAMPLE HAZARDS/REMARKS**

**Contains Radioactive Material at concentrations that may or may not be regulated for transportation per 49 CFR/IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1.**

**SPECIAL INSTRUCTIONS** **Hold Time** Total Activity Exemption: Yes ☑ No ☐

** The field NCOs prior to purging the well for sample collection, will use a transparent bailer to collect a grab sample to evaluate the presence of an oil sheen. The are to record their observations, along with any odors observed on the Field Sampling Report provided.

** The RCCC acknowledges that the analytical holding time for Nitrate, Nitrite, and Phosphate by EPA methods 300.0 or 9056 will not be met.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| B2MB45 | N | W | 11/14/12 | 0926 | 2x1000-mL aG | TPH-DieselKerosene Range - WTPH-D (100 Area RIFS) | 14/40 Days | HCl to pH <2/Cool~4C |
| B2MB45 | N | W | | | 4x40-mL aGs* | TPH-Gasoline Range - WTPH-G (100 Area RIFS) | 14 Days | HCl to pH <2/Cool~4C |
| B2MB45 | N | W | | | 2x1-L G | Oil & Grease - 1664A | 28 Days | HCl to pH <2/Cool~4C |
| B2MB45 | N | W | | | 2x1-L aG | PAHs - 8310 (100 Area RI/FS) | 7/40 Days | Cool~4C |
| B2MB45 | N | W | | | 1x500-mL G/P | ICP Metals - 6010 (Supertrace);<br>ICP Metals - 6010 (Supertrace Add-On) | 6 Months | HNO3 to pH <2 |
| B2MB45 | N | W | | | 1x500-mL P | IC Anions - 300.0 (100 Area RI/FS) | 48 Hours | Cool~4C |
| B2MB45 | N | W | | | 1x250-mL G/P | 2320_ALKALINITY | 14 Days | Cool~4C |
| B2MB45 | N | W | 11/14/12 | 0926 | 1x20-mL P | Activity Scan | 6 Months | None |

| Relinquished By | Print / Sign | Date/Time | Received By | Print / Sign | Date/Time |
|---|---|---|---|---|---|
| F. M. Hall | F. M. Hall | NOV 14 2012 1400 | FEDEX | | ~~NOV 14 2012~~ 11.14.12 |
| | | 11-16-12 1015 | | | 11-16-12 1015 |
| | | | | | |
| | | | | | |

Matrix *

| | | | |
|---|---|---|---|
| S = Soil | | DS = Drum Solids | |
| SE = Sediment | | DL = Drum Liquids | |
| SO = Solid | | T = Tissue | |
| SL = Sludge | | WI = Wipe | |
| W = Water | | L = Liquid | |
| O = Oil | | V = Vegetation | |
| A = Air | | X = Other | |

| FINAL SAMPLE DISPOSITION | Disposal Method (e.g., Return to customer, per lab procedure, used in process) | Disposed By | Date/Time |
|---|---|---|---|
| | | | |

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A-6004-842 (REV 2)

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Lionville Laboratory

# SAMPLE RECEIPT CHECKLIST (SRC)

CLIENT: WC Hanford
Project/SAF/SOW/Release #: RC-236

Date: 11-15-12 11-16-12

LvL Batch #: 1211065

Sample Custodian: [illegible]

NOTE: EXPLAIN ALL DISCREPANCIES

| | | | |
|---|---|---|---|
| 1. Samples Hand Delivered or Shipped? | Carrier FedEx | | Airbill # 7940 7699 9968 9902 |
| 2. Custody Seals on coolers or shipping containers intact, signed & dated? | ☑ Yes | ☐ No | ☐ No Seals |
| 3. Outside of coolers or shipping containers are free from damage? | ☑ Yes | ☐ No | *Comments:* |
| 4. All expected paperwork received (coc & other client specific information) sealed in plactic bag and easily accessible? | ☑ Yes | ☐ No | |
| 5. Samples received cooled or ambient? | Temp 3.5 °C (4.6 °C) | | Cooler # GWS-961 # GWS-210 |
| How was the temperature taken? | ☑ IR | ☐ Temp. Blank | ☐ Other (Specify): |
| Is the Temp. Criteria met for these samples? (Hg in soils @ 4°C) | ☑ Yes | ☐ No | |
| 6. Custody seals on sample containers intact, signed and dated? | ☑ Yes | ☐ No | ☐ No Seals |
| 7. COC (Client & LvL) signed & dated? | ☑ Yes | ☐ No | |
| 8. Sample containers are intact? | ☑ Yes | ☐ No | |
| 9. All samples on COC received? | ☑ Yes | ☐ No | |
| All samples received on COC? | ☑ Yes | ☐ No | |
| 10. All sample label information matches COC? | ☑ Yes | ☐ No | |
| 11. Samples properly preserved? (If #5 is no, then this is no.) | ~~☑ Yes~~ [illegible] 11-16-12 | ~~☑ No~~ | # 02 C+D Rec'd unpreserved. |
| 12. Samples received within hold times? | ~~☑ Yes~~ [illegible] 11-16-12 | ~~☑ No~~ | |
| Short holds taken to wet lab? | ☑ Yes | ☐ No | ☐ N/A |
| 13. VOA, TOC, TOX free of headspace? | ☑ Yes | ☐ No | ☐ N/A |
| 14. QC stickers placed on bottles designated by client? | ~~☑ Yes~~ [illegible] 11-16-12 | ☐ No | ~~☑ N/A~~ |
| 15. Shipment meets LvL Sample Acceptance Policy? (Identify all bottles that do not meet the policy, which is on the reverse of this page.) | ~~☑ Yes~~ | ☐ No | |
| 16. Project Manager contacted concerning any discrepancies? | ☐ Yes | ☐ No | ~~☐ N/A~~ |
| Person Contacted _____ | | Date _____ | |

SR-002-B.doc

# DRO/MO

LIONVILLE LABORATORY
A division of Eberline Analytical Corporation

264 Welsh Pool Road
Exton, Pennsylvania 19341
Phone (610) 280-3000
Fax (610) 280-3041

# Case Narrative

**Client:** WC-HANFORD RC-236 K4030
**LVL #:** 1211065 **Date Received:** 11-16-2012

## DIESEL RANGE ORGANICS

Two (2) water samples were collected on 11-14-2012.

The samples and associated QC samples were extracted 11-21-2012 and analyzed 11-28-2012 according to criteria set forth in Lionville Laboratory SOPs. The extraction procedure was based on SW846 Method 3520C and the analysis procedure was based on SW846 Method 8015B for Diesel Range Organics.

Lionville Laboratory (LvL) is NELAP accredited by the State of Pennsylvania. For a complete listing of accrediting authorities and the corresponding analytes/methods, please contact your Project Manager. LvL certifies that all test results meet the requirements of NELAC with any exception noted in the following statements:

1. The results presented in this report are derived from samples that met LvL's sample acceptance policy with exceptions noted on the Sample Receipt Checklist.

2. All required holding times for extraction and analysis have been met.

3. All obtainable surrogate recoveries were within acceptance criteria.

4. The method blank was below the reporting limits for all target compounds.

5. All blank spike recoveries were within acceptance criteria.

6. Two (2) of four (4) matrix spike recoveries were outside acceptance criteria. A copy of the Sample Discrepancy Report (SDR# 12GC204) has been enclosed.

7. All initial calibrations associated with this data set were within acceptance criteria.

8. All continuing calibration standards analyzed prior to sample extracts were within acceptance criteria. Per SW846 Method 8000B, the attached table lists compounds where the % difference or drift was greater than 15%, and the mean across all compounds was used for the evaluation of the continuing calibration. Results associated with these compounds are considered to have greater uncertainty.


The results presented in this report relate only to the analytical testing and conditions of the samples at receipt and during storage. All pages of this report are integral parts of the analytical data. Therefore, this report should only be reproduced in its entirety of pages.

9. I certify that this sample data package is in compliance with SOW requirements, both technically and for completeness, other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the laboratory manager or a designee as verified by the following signature.

Iain Daniels
LvL Laboratory Manager

12/13/12
Date

8015B/C DRO/MO/KRO

Analytes with %Difference or %Drift >15%, Where Mean is Used for Continuing Calibration

| Analyte | 11/28/12 2:58:13 3:55:33 4:53:24 CCV1 | 11/28/12 2:29:29pm 3:26:36pm 4:24:52pm CCV2 | 11/29/12 1:03:40 2:01:20 2:59:06 CCV3 | CCV4 | CCV5 | CCV6 | CCV7 | CCV8 |
|---|---|---|---|---|---|---|---|---|
| p-Terphenyl (surrogate) | | | | | | | | |
| Diesel Range Organics | | | | | | | | |
| Kerosene Range Organics | | | 15.3 | | | | | |
| Motor Oil | | | | | | | | |
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| | | | | | | | | |
| Mean %D or %Drift | ~~8.5~~ 7.1 | 8.3 | 11.4 | | | | | |

Calc 11/29/12

Sample results reported from affected CCV:

CCV1: _____

CCV2: _____

CCV3: 1211065-02 (2.0x) L211190-MS2/MSD2 (2.0x)

CCV4: _____

CCV5: _____

CCV6: _____

CCV7: _____

CCV8: _____

# Lionville Laboratory Sample Discrepancy Report (SDR)

SDR #: 12GC204

Initiator: Catherine Carey
Date: 12/03/12
Client: WCH Hanford

Batch: 1211065
Samples: MS2/MSD2
Method: SW846/MCAWW/CLP/

Parameter: DRO
Matrix: water
Prep Batch: L211190

**1. Reason for SDR**

**a. COC Discrepancy**
__ Tech Profile Error
__ Transcription Error
__ Client Request
__ Wrong Test Code
__ Sampler Error on C-O-C
__ Other _____

**b. General Discrepancy***
__ Missing Sample/Extract
__ Hold Time Exceeded
__ Improper Bottle Type
__ Container Broken
__ Insufficient Sample
__ Not Amenable to Analysis
__ Wrong Sample Pulled
__ Preservation Wrong
__ Label ID's Illegible
__ Received Past Hold

Note*: Verified by [Log-In] or [Prep Group] (circle)...signature/date: _____

**c. Problem** (Include all relevant specific results; attach data if necessary)

Kerosene spike recoveries are high

**2. Known or Probable Causes(s)**

high concentration of DRO in sample

**3. Discussion and Proposed Action**

__ Re-log
__ Entire Batch
__ Following Samples: _____
__ Re-leach
__ Re-extract
__ Re-digest
__ Revise EDD
__ Change Test Code to _____
__ Place On/Take Off Hold (circle)

Other Description:
No Kerosene in samples. No impact on data
Narrate
JD.

12/13/12

**4. Project Manager Instructions**...signature/date: 12/13/12
__ Concur with Proposed Action
__ Disagree with Proposed Action; See Instruction
__ Include in Case Narrative
__ Client Contacted:
__ Date/Person _____
__ Add
__ Cancel

**5. Final Action**...signature/date: 12/13/12
✓ Verified re-[log][leach][extract][digest][analysis] (circle)
✓ Included in Case Narrative
__ Hard Copy COC Revised
__ Electronic COC Revised
__ EDD Corrections Completed

Other Explanation:

**When Final Action has been recorded, forward original to QA for diposition.**

Route
✓ Lab Manager: Daniels
✓ Project Mgr (circle): Johnson / Stone
__ Sample Prep (circle): Ford
__ Log-in: King

Route
__ Metals: Welsh / _____
__ Inorganic: Perrone / _____
✓ GC/LC: Carey / _____
__ MS VOA: Rubino / _____
__ MS BNA: Carden / _____
__ Other: _____

QA-139-A-0208

LIONVILLE LABORATORY INC.

# GLOSSARY OF DATA

## DATA QUALIFIERS

| | | |
|---|---|---|
| U | = | Indicates that the compound was analyzed for but not detected. The minimum detection limit for the sample (not the method detection limit) is reported with the U (e.g., 10U). |
| J | = | Indicates an estimated value. This flag is used in cases where a target analyte is detected at a level less than the lower quantification level. If the limit of quantification is 10 ug/L and a concentration of 3 ug/L is calculated, it is reported as 3J. |
| B | = | This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable blank contamination. |
| E | = | Indicates that the compound was detected beyond the calibration range and was subsequently analyzed at a dilution. |
| I | = | Interference. |
| .I | = | Indicates an interference on one analytical column only. Result is reported from remaining analytical column. |
| P | = | This flag is used for a dual column analysis (i.e. pesticides/PCB/herbicides) when there is greater than 40% difference for detected concentrations between the two GC columns; the lower of the two values is reported on Form 1 and flagged with a "P". |
| D | = | This flag identifies all compounds identified in an analysis at a secondary dilution factor. |
| C | = | This flag applies to a compound that has been confirmed by GC/MS. |

## ABBREVIATIONS

| | | |
|---|---|---|
| BS | = | Indicates blank spike in which reagent grade water is spiked with the CLP matrix spiking solutions and carried through all the steps in the method. Spike recoveries are reported. |
| BSD | = | Indicates blank spike duplicate. |
| MS | = | Indicates matrix spike. |
| MSD | = | Indicates matrix spike duplicate. |
| DL | = | Indicates that recoveries were not obtained because the extract had to be diluted for analysis. |
| NA | = | Not Applicable. |
| DF | = | Dilution Factor. |
| NR | = | Not Required. |
| NS | = | Not Spiked. |
| SP | = | Indicates Spiked Compound. |
| NPM | = | No pattern match for multi-component target analytes. |

264 Welsh Pool Road
Exton, PA 19341
Phone: 610-280-3000
Fax: 610-280-3041

| | | |
|---|---|---|
| WC-Hanford, Inc. | Project: RC-236 | |
| 2620 Fermi Avenue | Project Number: K4030 | **Reported:** |
| Richland WA, 99354 | Project Manager: Joan Kessner | 12/03/2012 21:57 |

## B2MB43
### 1211065-01 (Water)

| Analyte | Result and Qualifier | | Reporting Limit | Units | Dilution | Batch | Prepared | Analyzed | Method |
|---|---|---|---|---|---|---|---|---|---|
| **Lionville Laboratory** | | | | | | | | | |
| **Extractable Petroleum Hydrocarbons by SW846 8015** | | | | | | | | | |
| **Diesel Range Organics** | **1150** | | 100 | ug/L | 1 | L211190 | 11/21/2012 | 11/28/2012 | SW846 8015C |
| *Surrogate: p-Terphenyl* | *87 %* | | *35-130* | | | *L211190* | *11/21/2012* | *11/28/2012* | *SW846 8015C* |
| Kerosene | 300 | U | 300 | ug/L | 1 | L211190 | 11/21/2012 | 11/28/2012 | SW846 8015C |
| Motor Oil | 300 | U | 300 | ug/L | 1 | L211190 | 11/21/2012 | 11/28/2012 | SW846 8015C |

264 Welsh Pool Road
Exton, PA 19341
Phone: 610-280-3000
Fax: 610-280-3041

| | | |
|---|---|---|
| WC-Hanford, Inc. | Project: RC-236 | |
| 2620 Fermi Avenue | Project Number: K4030 | **Reported:** |
| Richland WA, 99354 | Project Manager: Joan Kessner | 12/03/2012 21:57 |

## B2MB45
### 1211065-02 (Water)

| Analyte | Result and Qualifier | | Reporting Limit | Units | Dilution | Batch | Prepared | Analyzed | Method |
|---|---|---|---|---|---|---|---|---|---|
| **Lionville Laboratory** | | | | | | | | | |
| **Extractable Petroleum Hydrocarbons by SW846 8015** | | | | | | | | | |
| **Diesel Range Organics** | **4620** | | 100 | ug/L | 1 | L211190 | 11/21/2012 | 11/28/2012 | SW846 8015C |
| *Surrogate: p-Terphenyl* | *60 %* | | *35-130* | | | *L211190* | *11/21/2012* | *11/28/2012* | *SW846 8015C* |
| Kerosene | 300 | U | 300 | ug/L | 1 | L211190 | 11/21/2012 | 11/28/2012 | SW846 8015C |
| Motor Oil | 300 | U | 300 | ug/L | 1 | L211190 | 11/21/2012 | 11/28/2012 | SW846 8015C |

# PREPARATION BENCH SHEET

L211190

**Lionville Laboratory**

**Printed: 11/27/2012 4:30:04PM**

00000015

**Matrix: Water**

**Prepared using: GC - SW~~3510~~/3520C/~~625~~ Run/6/12 TE**

**Surrogate used: 1201463**

| Lab Number | Analysis | Prepared | Initial (mL) | Final (mL) | Spike ID | Source ID | ul Spike | ul Surrogate | Client | Extraction Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 1211048-01 | 8015C DRO | 11/21/2012 15:27 | 1000 | 1 | | | | 1000 | WC-Hanford, Inc. | |
| 1211048-01 | 8015C KRO/MO | 11/21/2012 15:27 | 1000 | 1 | | | | 1000 | WC-Hanford, Inc. | |
| 1211065-01 | 8015C DRO | 11/21/2012 15:27 | 1000 | 1 | | | | 1000 | WC-Hanford, Inc. | |
| 1211065-01 | 8015C KRO/MO | 11/21/2012 15:27 | 1000 | 1 | | | | 1000 | WC-Hanford, Inc. | |
| 1211065-02 | 8015C DRO | 11/21/2012 15:27 | 1000 | 1 | | | | 1000 | WC-Hanford, Inc. | |
| 1211065-02 | 8015C KRO/MO | 11/21/2012 15:27 | 1000 | 1 | | | | 1000 | WC-Hanford, Inc. | |
| L211190-BLK1 | QC | 11/21/2012 15:27 | 1000 | 1 | | | | 1000 | | odro |
| L211190-BLK2 | QC | 11/21/2012 15:27 | 1000 | 1 | | | | 1000 | | |
| L211190-BS1 | QC | 11/21/2012 15:27 | 1000 | 1 | 1200846 | | | 1000 | | odro |
| L211190-BS2 | QC | 11/21/2012 15:27 | 1000 | 1 | 1201097 | | | 1000 | | |
| L211190-MS1 | QC | 11/21/2012 15:27 | 500 | 1 | 1200846 | 1211065-01 | | 1000 | | odro |
| L211190-MS2 | QC | 11/21/2012 15:27 | 500 | 1 | 1201097 | 1211065-02 | | 1000 | | |
| L211190-MSD1 | QC | 11/21/2012 15:27 | 500 | 1 | 1200846 | 1211065-01 | | 1000 | | odro |
| L211190-MSD2 | QC | 11/21/2012 15:27 | 500 | 1 | 1201097 | 1211065-02 | | 1000 | | |

11/27/12 1630
Extracts Relinquished By — Date

S Lak 11.27.12 16:30
Extracts Received By — Date

# PREPARATION BENCH SHEET

L211190

**Lionville Laboratory**

**Printed: 12/3/2012 9:01:22AM**

00000016

**Matrix: Water**

**Prepared using: Extraction - SW~~3510~~/3520C/~~625~~** Rev 6/12 TE

**(No Surrogate)**

| Lab Number | Analysis | Prepared | Initial (mL) | Final (mL) | Spike ID | Source ID | ul Spike | ul Surrogate | Client | Extraction Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 1211048-01 | 8015C DRO | 11/21/2012 15:27 | 1000 | 1 | | | | 1000 | WC-Hanford, Inc. | |
| 1211048-01 | 8015C KRO/MO | 11/21/2012 15:27 | 1000 | 1 | | | | 1000 | WC-Hanford, Inc. | |
| 1211065-01 | 8015C DRO | 11/21/2012 15:27 | 1000 | 1 | | | | 1000 | WC-Hanford, Inc. | |
| 1211065-01 | 8015C KRO/MO | 11/21/2012 15:27 | 1000 | 1 | | | | 1000 | WC-Hanford, Inc. | |
| 1211065-02 | 8015C DRO | 11/21/2012 15:27 | 1000 | 1 | | | | 1000 | WC-Hanford, Inc. | |
| 1211065-02 | 8015C KRO/MO | 11/21/2012 15:27 | 1000 | 1 | | | | 1000 | WC-Hanford, Inc. | |
| L211190-BLK1 | QC | 11/21/2012 15:27 | 1000 | 1 | | | | 1000 | | odro |
| L211190-BLK2 | QC | 11/21/2012 15:27 | 1000 | 1 | | | | 1000 | | |
| L211190-BS1 | QC | 11/21/2012 15:27 | 1000 | 1 | 1201538 | | 1000 | 1000 | | odro |
| L211190-BS2 | QC | 11/21/2012 15:27 | 1000 | 1 | 1201097 | | 300 | 1000 | | |
| L211190-MS1 | QC | 11/21/2012 15:27 | 500 | 1 | 1201538 | 1211065-01 | 1000 | 1000 | | odro |
| L211190-MS2 | QC | 11/21/2012 15:27 | 1000 | 1 | 1201097 | 1211065-02 | 300 | 1000 | | |
| L211190-MSD1 | QC | 11/21/2012 15:27 | 500 | 1 | 1201538 | 1211065-01 | 1000 | 1000 | | odro |
| L211190-MSD2 | QC | 11/21/2012 15:27 | 1000 | 1 | 1201097 | 1211065-02 | 300 | 1000 | | |

Revision CAC 12/03/12

Extracts Relinquished By Date

Extracts Received By Date

264 Welsh Pool Road
Exton, PA 19341
Phone: 610-280-3000
Fax: 610-280-3041

| | | |
|---|---|---|
| WC-Hanford, Inc. | Project: RC-236 | |
| 2620 Fermi Avenue | Project Number: K4030 | **Reported:** |
| Richland WA, 99354 | Project Manager: Joan Kessner | 12/03/2012 21:57 |

## Extractable Petroleum Hydrocarbons by SW846 8015 - Quality Control

## Lionville Laboratory

| Analyte | Result and Qualifiers | | Reporting Limit | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Batch L211190 - SW 3520C** | | | | | | | | | | |
| **Blank (L211190-BLK1)** | | | | Prepared: 11/21/2012 Analyzed: 11/28/2012 | | | | | | |
| Diesel Range Organics | 100 | U | 100 | ug/L | | | | | | |
| Motor Oil | 300 | U | 300 | ug/L | | | | | | |
| *Surrogate: p-Terphenyl* | *194* | | | *ug/L* | *200.00* | | *97* | *35-130* | | |
| **Blank (L211190-BLK2)** | | | | Prepared: 11/21/2012 Analyzed: 11/28/2012 | | | | | | |
| Kerosene | 300 | U | 300 | ug/L | | | | | | |
| *Surrogate: p-Terphenyl* | *194* | | | *ug/L* | *200.00* | | *97* | *35-130* | | |
| **LCS (L211190-BS1)** | | | | Prepared: 11/21/2012 Analyzed: 11/28/2012 | | | | | | |
| Diesel Range Organics | 1600 | | 100 | ug/L | 2000.0 | | 80 | 30-130 | | |
| *Surrogate: p-Terphenyl* | *210* | | | *ug/L* | *200.00* | | *105* | *35-130* | | |
| **LCS (L211190-BS2)** | | | | Prepared: 11/21/2012 Analyzed: 11/28/2012 | | | | | | |
| Kerosene | 505 | | 300 | ug/L | 1200.0 | | 42 | 35-110 | | |
| *Surrogate: p-Terphenyl* | *184* | | | *ug/L* | *200.00* | | *92* | *35-130* | | |
| **Matrix Spike (L211190-MS1)** | | **Source: 1211065-01** | | Prepared: 11/21/2012 Analyzed: 11/28/2012 | | | | | | |
| Diesel Range Organics | 4130 | | 200 | ug/L | 4000.0 | 1150 | 75 | 30-130 | | |
| *Surrogate: p-Terphenyl* | *347* | | | *ug/L* | *400.00* | | *87* | *35-130* | | |
| **Matrix Spike (L211190-MS2)** | | **Source: 1211065-02** | | Prepared: 11/21/2012 Analyzed: 11/28/2012 | | | | | | |
| Kerosene | 2250 | | 300 | ug/L | 1200.0 | 300 U | 187* | 35-110 | | |
| *Surrogate: p-Terphenyl* | *145* | | | *ug/L* | *200.00* | | *73* | *35-130* | | |
| **Matrix Spike Dup (L211190-MSD1)** | | **Source: 1211065-01** | | Prepared: 11/21/2012 Analyzed: 11/28/2012 | | | | | | |
| Diesel Range Organics | 3640 | | 200 | ug/L | 4000.0 | 1150 | 62 | 30-130 | 18 | 40 |
| *Surrogate: p-Terphenyl* | *317* | | | *ug/L* | *400.00* | | *79* | *35-130* | | |

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Fax: 610-280-3041

| | | |
|---|---|---|
| WC-Hanford, Inc. | Project: RC-236 | |
| 2620 Fermi Avenue | Project Number: K4030 | **Reported:** |
| Richland WA, 99354 | Project Manager: Joan Kessner | 12/03/2012 21:57 |

## Extractable Petroleum Hydrocarbons by SW846 8015 - Quality Control

## Lionville Laboratory

| Analyte | Result and Qualifiers | Reporting Limit | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|
| **Batch L211190 - SW 3520C** | | | | | | | | | |
| **Matrix Spike Dup (L211190-MSD2)** | | **Source: 1211065-02** | Prepared: 11/21/2012 Analyzed: 11/28/2012 | | | | | | |
| Kerosene | 4370 | 300 | ug/L | 1200.0 | 300 U | 364* | 35-110 | 64* | 40 |
| *Surrogate: p-Terphenyl* | *202* | | *ug/L* | *200.00* | | *101* | *35-130* | | |

# GASOLINE RANGE ORGANICS (GRO)

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Phone: 610-280-3000
Fax: 610-280-3041

| | | |
|---|---|---|
| WC-Hanford, Inc. | Project: RC-236 | |
| 2620 Fermi Avenue | Project Number: K4030 | **Reported:** |
| Richland WA, 99354 | Project Manager: Joan Kessner | 11/29/2012 10:52 |

## Analytical Report for GRO by SW846 8015

| Sample ID | Laboratory ID | Matrix | Date Sampled | Date Received |
|---|---|---|---|---|
| B2MB43 | 1211065-01 | Water | 11/14/2012 10:57 | 11/16/2012 10:15 |
| B2MB45 | 1211065-02 | Water | 11/14/2012 09:26 | 11/16/2012 10:15 |

LIONVILLE LABORATORY
A division of Eberline Analytical Corporation

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Exton, Pennsylvania 19341
Phone (610) 280-3000
Fax (610) 280-3041

# Case Narrative

**Client:** WC-HANFORD RC-236 K4030
**LVL #:** 1211065

**W.O. #:** 60049-001-001-0001-00
**Date Received:** 11-16-2012

## GASOLINE RANGE ORGANICS

Two (2) water samples were collected on 11-14-2012.

The samples and their associated QC samples were extracted and analyzed according to criteria set forth in Lionville Laboratory SOPs based on method 8015B for Gasoline Range Organics on 11-21-2012.

Lionville Laboratory (LvL) is NELAP accredited by the State of Pennsylvania. For a complete listing of accrediting authorities and the corresponding analytes/methods, please contact your Project Manager. LvL certifies that all test results meet the requirements of NELAC with any exception noted in the following statements:

1. The results presented in this report are derived from samples that met LvL's sample acceptance policy with exceptions noted on the Sample Receipt Checklist.
2. All required holding times for analysis have been met.
3. The method blank was below the reporting limits for all target compounds.
4. All obtainable surrogate recoveries were within acceptance criteria.
5. All blank spike recoveries were within acceptance criteria.
6. All matrix spike recoveries were within acceptance criteria.
7. All initial calibrations associated with this data set were within acceptance criteria.
8. All continuing calibration standards analyzed prior to sample extracts were within acceptance criteria. .
9. I certify that this sample data package is in compliance with SOW requirements, both technically and for completeness, other than the conditions detailed above. Release of the data contained in this hard-copy data package has been authorized by the laboratory Manager or a designee, as verified by the following signature.

Iain Daniels
LVL Laboratory Manager

12/13/12
Date

r:\group\data\2012\gro\wc hanford\1211065alm.doc

The results presented in this report relate only to the analytical testing and conditions of the samples at receipt and during storage. All pages of this report are integral parts of the analytical data. Therefore, this report should only be reproduced in its entirety of pages.

# GLOSSARY OF DATA

## DATA QUALIFIERS

| | | |
|---|---|---|
| U | = | Indicates that the compound was analyzed for but not detected. The minimum detection limit for the sample (not the method detection limit) is reported with the U (e.g., 10U). |
| J | = | Indicates an estimated value. This flag is used in cases where a target analyte is detected at a level less than the lower quantification level. If the limit of quantification is 10 ug/L and a concentration of 3 ug/L is calculated, it is reported as 3J. |
| B | = | This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable blank contamination. |
| E | = | Indicates that the compound was detected beyond the calibration range and was subsequently analyzed at a dilution. |
| I | = | Interference. |
| .I | = | Indicates an interference on one analytical column only. Result is reported from remaining analytical column. |
| P | = | This flag is used for a dual column analysis (i.e. pesticides/PCB/herbicides) when there is greater than 40% difference for detected concentrations between the two GC columns; the lower of the two values is reported on Form 1 and flagged with a "P". |
| D | = | This flag identifies all compounds identified in an analysis at a secondary dilution factor. |
| C | = | This flag applies to a compound that has been confirmed by GC/MS. |

## ABBREVIATIONS

| | | |
|---|---|---|
| BS | = | Indicates blank spike in which reagent grade water is spiked with the CLP matrix spiking solutions and carried through all the steps in the method. Spike recoveries are reported. |
| BSD | = | Indicates blank spike duplicate. |
| MS | = | Indicates matrix spike. |
| MSD | = | Indicates matrix spike duplicate. |
| DL | = | Indicates that recoveries were not obtained because the extract had to be diluted for analysis. |
| NA | = | Not Applicable. |
| DF | = | Dilution Factor. |
| NR | = | Not Required. |
| NS | = | Not Spiked. |
| SP | = | Indicates Spiked Compound. |
| NPM | = | No pattern match for multi-component target analytes. |

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Fax: 610-280-3041

| | | |
|---|---|---|
| WC-Hanford, Inc.<br>2620 Fermi Avenue<br>Richland WA, 99354 | Project: RC-236<br>Project Number: K4030<br>Project Manager: Joan Kessner | **Reported:**<br>11/29/2012 10:52 |

## B2MB43

### 1211065-01 (Water)

| Analyte | Result and Qualifier | | Reporting Limit | Units | Dilution | Batch | Prepared | Analyzed | Method |
|---|---|---|---|---|---|---|---|---|---|
| **Lionville Laboratory** | | | | | | | | | |
| **GRO by SW846 8015** | | | | | | | | | |
| Gasoline Range Organics | 30.0 | U | 30.0 | ug/L | 1 | L211187 | 11/21/2012 | 11/21/2012 | SW846 8015 |
| *Surrogate: Fluorobenzene* | *107 %* | | *50-150* | | | *L211187* | *11/21/2012* | *11/21/2012* | *SW846 8015* |

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| | | |
|---|---|---|
| WC-Hanford, Inc.<br>2620 Fermi Avenue<br>Richland WA, 99354 | Project: RC-236<br>Project Number: K4030<br>Project Manager: Joan Kessner | **Reported:**<br>11/29/2012 10:52 |

## B2MB45
### 1211065-02 (Water)

| Analyte | Result and Qualifier | Reporting Limit | Units | Dilution | Batch | Prepared | Analyzed | Method |
|---|---|---|---|---|---|---|---|---|
| | | **Lionville Laboratory** | | | | | | |
| **GRO by SW846 8015** | | | | | | | | |
| **Gasoline Range Organics** | **33.8** | 30.0 | ug/L | 1 | L211187 | 11/21/2012 | 11/21/2012 | SW846 8015 |
| *Surrogate: Fluorobenzene* | *107 %* | *50-150* | | | *L211187* | *11/21/2012* | *11/21/2012* | *SW846 8015* |

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Phone: 610-280-3000
Fax: 610-280-3041

| | | |
|---|---|---|
| WC-Hanford, Inc.<br>2620 Fermi Avenue<br>Richland WA, 99354 | Project: RC-236<br>Project Number: K4030<br>Project Manager: Joan Kessner | **Reported:**<br>11/29/2012 10:52 |

## GRO by SW846 8015 - Quality Control

## Lionville Laboratory

| Analyte | Result and Qualifiers | | Reporting Limit | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Batch L211187 - 8015** | | | | | | | | | | |
| **Blank (L211187-BLK1)** | | | | Prepared & Analyzed: 11/21/2012 | | | | | | |
| Gasoline Range Organics | 30.0 | U | 30.0 | ug/L | | | | | | |
| *Surrogate: Fluorobenzene* | *45.4* | | | *ug/L* | *45.000* | | *101* | *50-150* | | |
| **LCS (L211187-BS1)** | | | | Prepared & Analyzed: 11/21/2012 | | | | | | |
| Gasoline Range Organics | 449 | | 30.0 | ug/L | 450.00 | | 99.8 | 50-150 | | |
| *Surrogate: Fluorobenzene* | *49.0* | | | *ug/L* | *45.000* | | *109* | *50-150* | | |
| **Matrix Spike (L211187-MS2)** | | **Source: 1211065-01** | | Prepared & Analyzed: 11/21/2012 | | | | | | |
| Gasoline Range Organics | 440 | | 30.0 | ug/L | 450.00 | 30.0 U | 97.7 | 50-150 | | |
| *Surrogate: Fluorobenzene* | *44.5* | | | *ug/L* | *45.000* | | *98.9* | *50-150* | | |
| **Matrix Spike Dup (L211187-MSD2)** | | **Source: 1211065-01** | | Prepared & Analyzed: 11/21/2012 | | | | | | |
| Gasoline Range Organics | 432 | | 30.0 | ug/L | 450.00 | 30.0 U | 95.9 | 50-150 | 1.85 | 20 |
| *Surrogate: Fluorobenzene* | *46.5* | | | *ug/L* | *45.000* | | *103* | *50-150* | | |

# PREPARATION BENCH SHEET

L211187

**Lionville Laboratory**

**Printed: 11/21/2012 12:39:48PM**

000000026

**Matrix: Water** **Prepared using: GCVOA - 8015** **Surrogate used: 1200984**

| Lab Number | Analysis | Prepared | Initial (mL) | Final (mL) | Spike ID | Source ID | ul Spike | ul Surrogate | Client | Extraction Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 1211048-01 | 8015M GRO | 11/21/2012 12:38 | 5 | 5 | | | | 15 | WC-Hanford, Inc. | |
| 1211065-01 | 8015M GRO | 11/21/2012 12:38 | 5 | 5 | | | | 15 | WC-Hanford, Inc. | |
| 1211065-02 | 8015M GRO | 11/21/2012 12:38 | 5 | 5 | | | | 15 | WC-Hanford, Inc. | |
| L211187-BLK1 | QC | 11/21/2012 12:38 | 5 | 5 | | | | 15 | | |
| L211187-BS1 | QC | 11/21/2012 12:38 | 5 | 5 | 1200983 | | 15 | 15 | | |
| L211187-MS1 | QC | 11/21/2012 12:38 | 5 | 5 | 1200983 | 1211048-01 | 15 | 15 | | |
| L211187-MS2 | QC | 11/21/2012 12:38 | 5 | 5 | 1200983 | 1211065-01 | 15 | 15 | | |
| L211187-MSD1 | QC | 11/21/2012 12:38 | 5 | 5 | 1200983 | 1211048-01 | 15 | 15 | | |
| L211187-MSD2 | QC | 11/21/2012 12:38 | 5 | 5 | 1200983 | 1211065-01 | 15 | 15 | | |

LE 11-21-12

Extracts Relinquished By Date

Extracts Received By Date

# PAHs

264 Welsh Pool Road
Exton, PA 19341
Phone: 610-280-3000
Fax: 610-280-3041

| | | |
|---|---|---|
| WC-Hanford, Inc. | Project: RC-236 | |
| 2620 Fermi Avenue | Project Number: K4030 | **Reported:** |
| Richland WA, 99354 | Project Manager: Joan Kessner | 11/29/2012 20:01 |

## Analytical Report for Polynuclear Aromatic Compounds by SW846 8310

| Sample ID | Laboratory ID | Matrix | Date Sampled | Date Received |
|---|---|---|---|---|
| B2MB43 | 1211065-01 | Water | 11/14/2012 10:57 | 11/16/2012 10:15 |
| B2MB45 | 1211065-02 | Water | 11/14/2012 09:26 | 11/16/2012 10:15 |

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Exton, Pennsylvania 19341
Phone (610) 280-3000
Fax (610) 280-3041

# Case Narrative

**Client:** WC-HANFORD RC-236 K4030
**LVL #:** 1211065

**W.O. #:** 60049-001-001-0001-00
**Date Received:** 11-16-2012

## POLYNUCLEAR AROMATIC HYDROCARBONS (PAH)

Two (2) water samples were collected on 11-14-2012.

The samples and associated QC samples were extracted 11-19-2012 and analyzed 11-28-2012 according to criteria set forth in Lionville Laboratory SOPs. The extraction procedure was based on SW846 Method 3520C and the analysis procedure was based on SW846 Method 8310.

Lionville Laboratory (LvL) is NELAP accredited by the State of Pennsylvania. For a complete listing of accrediting authorities and the corresponding analytes/methods, please contact your Project Manager. LvL certifies that all test results meet the requirements of NELAC with any exception noted in the following statements:

1. The results presented in this report are derived from samples that met LvL's sample acceptance policy with exceptions noted on the Sample Receipt Checklist.

2. All required holding times for extraction and analysis have been met.

3. All obtainable surrogate recoveries were within acceptance criteria.

4. The method blank contained Fluorene at a level above the reporting limit. Fluorene was detected in both samples processed with this blank at levels at or above the reporting limit. A copy of the Sample Discrepancy Report (SDR # 12GC198) was enclosed.

5. All blank spike recoveries were within acceptance criteria.

6. The matrix spike analyses are associated with LvL lot 1211048. Please refer to the associated data package.

7. The initial calibrations associated with this data set were within acceptance criteria.

8. All continuing calibration standards analyzed prior to sample extracts were within acceptance criteria.

9. I certify that this sample data package is in compliance with SOW requirements, both technically and for completeness, other than the conditions detailed above. Release of the data contained in this hard-copy data package has been authorized by the laboratory manager or a designee as verified by the following signature.

Iain Daniels
LvL Laboratory Manager

12/13/12
Date

r:\group\data\2012\pah 8310\wc hanford\1211065alm.doc
The results presented in this report relate only to the analytical testing and conditions of the samples at receipt and during storage. All pages of this report are integral parts of the analytical data. Therefore, this report should only be reproduced in its entirety of pages.

# Lionville Laboratory Sample Discrepancy Report (SDR)

SDR #: 12GC198

Initiator: CatherineCarey
Date: 11/29/12
Client: WC-Hanford

Batch: 1211048 + 065
Samples: BLK MS1/MSD1
Method: SW846/MCAWW/CLP/

Parameter: PAH
Matrix: water
Prep Batch: L211159

**1. Reason for SDR**

**a. COC Discrepancy** __ Tech Profile Error __ Client Request __ Sampler Error on C-O-C __ Transcription Error __ Wrong Test Code __ Other _____

**b. General Discrepancy**

__ Missing Sample/Extract* __ Container Broken __ Wrong Sample Pulled __ Label ID's Illegible
__ Hold Time Exceeded __ Insufficient Sample* __ Preservation Wrong __ Received Past Hold
__ Improper Bottle Type __ Not Amenable to Analysis

Note*: Verified by [Log-In] or [Prep Group] (circle)...signature/date: _____

**c. Problem** (Include all relevant specific results; attach data if necessary)

Fluorene hit in blank.

Acenaphthylene recovery is low in MS1 + MSD1
(44%) (47%)

**2. Known or Probable Causes(s)**

MS/MSD recoveries are due to high levels of non target analytes in samples.

**3. Discussion and Proposed Action**

__ Re-log
__ Entire Batch
__ Following Samples: _____
__ Re-leach
__ Re-extract
__ Re-digest
__ Revise EDD
__ Change Test Code to _____
__ Place On/Take Off Hold (circle)

Other Description:

Fluorene hit in blank is well below client required detection limit

Narrate, JD.

**4. Project Manager Instructions**...signature/date: 12/13/12

✓ Concur with Proposed Action
__ Disagree with Proposed Action; See Instruction
__ Include in Case Narrative
__ Client Contacted:
Date/Person _____
__ Add
__ Cancel

**5. Final Action**...signature/date: _____

Other Explanation:

__ Verified re-[log][leach][extract][digest][analysis] (circle)
__ Included in Case Narrative
__ Hard Copy COC Revised
__ Electronic COC Revised
__ EDD Corrections Completed

**When Final Action has been recorded, forward original to QA for diposition.**

Route
✓ Lab Manager: Daniels
✓ Project Mgr (circle): Johnson / ~~Stone~~
__ Sample Prep (circle): Ford
__ Log-in: King

Route
__ Metals: Welsh / _____
__ Inorganic: Perrone / _____
✓ GC/LC: Carey / _____
__ MS VOA: Rubino / _____
__ MS BNA: Carden / _____
__ Other: _____

QA-139-A-0208

# GLOSSARY OF DATA

## DATA QUALIFIERS

| | | |
|---|---|---|
| U | = | Indicates that the compound was analyzed for but not detected. The minimum detection limit for the sample (not the method detection limit) is reported with the U (e.g., 10U). |
| J | = | Indicates an estimated value. This flag is used in cases where a target analyte is detected at a level less than the lower quantification level. If the limit of quantification is 10 ug/L and a concentration of 3 ug/L is calculated, it is reported as 3J. |
| B | = | This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable blank contamination. |
| E | = | Indicates that the compound was detected beyond the calibration range and was subsequently analyzed at a dilution. |
| I | = | Interference. |
| .I | = | Indicates an interference on one analytical column only. Result is reported from remaining analytical column. |
| P | = | This flag is used for a dual column analysis (i.e. pesticides/PCB/herbicides) when there is greater than 40% difference for detected concentrations between the two GC columns; the lower of the two values is reported on Form 1 and flagged with a "P". |
| D | = | This flag identifies all compounds identified in an analysis at a secondary dilution factor. |
| C | = | This flag applies to a compound that has been confirmed by GC/MS. |

## ABBREVIATIONS

| | | |
|---|---|---|
| BS | = | Indicates blank spike in which reagent grade water is spiked with the CLP matrix spiking solutions and carried through all the steps in the method. Spike recoveries are reported. |
| BSD | = | Indicates blank spike duplicate. |
| MS | = | Indicates matrix spike. |
| MSD | = | Indicates matrix spike duplicate. |
| DL | = | Indicates that recoveries were not obtained because the extract had to be diluted for analysis. |
| NA | = | Not Applicable. |
| DF | = | Dilution Factor. |
| NR | = | Not Required. |
| NS | = | Not Spiked. |
| SP | = | Indicates Spiked Compound. |
| NPM | = | No pattern match for multi-component target analytes. |

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| | | |
|---|---|---|
| WC-Hanford, Inc.<br>2620 Fermi Avenue<br>Richland WA, 99354 | Project: RC-236<br>Project Number: K4030<br>Project Manager: Joan Kessner | **Reported:**<br>11/29/2012 20:01 |

## B2MB43
### 1211065-01 (Water)

| Analyte | Result and Qualifier | | Reporting Limit | Units | Dilution | Batch | Prepared | Analyzed | Method |
|---|---|---|---|---|---|---|---|---|---|
| | | | **Lionville Laboratory** | | | | | | |
| **Polynuclear Aromatic Compounds by SW846 8310** | | | | | | | | | |
| **Naphthalene** | **0.264** | | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| **Acenaphthylene** | **1.49** | | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| Acenaphthene | 0.100 | U | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| **Fluorene** | **0.322** | | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| **Phenanthrene** | **0.758** | | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| **Anthracene** | **0.0755** | J | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| **Fluoranthene** | **0.900** | | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| Indeno[1,2,3-cd]pyrene | 0.100 | U | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| **Pyrene** | **0.0600** | J | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| **Benz[a]anthracene** | **0.0360** | J | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| Chrysene | 0.100 | U | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| Benzo[b] fluoranthene | 0.100 | U | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| Benzo[k] fluoranthene | 0.100 | U | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| Benzo[a] pyrene | 0.100 | U | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| Dibenz[a,h]anthracene | 0.100 | U | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| Benzo[g,h,i] perylene | 0.100 | U | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| *Surrogate: Triphenylene* | *91 %* | | *68-129* | | | *L211159* | *11/19/2012* | *11/28/2012* | *8310* |

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Fax: 610-280-3041

| | | |
|---|---|---|
| WC-Hanford, Inc.<br>2620 Fermi Avenue<br>Richland WA, 99354 | Project: RC-236<br>Project Number: K4030<br>Project Manager: Joan Kessner | **Reported:**<br>11/29/2012 20:01 |

## B2MB45
### 1211065-02 (Water)

| Analyte | Result and Qualifier | | Reporting Limit | Units | Dilution | Batch | Prepared | Analyzed | Method |
|---|---|---|---|---|---|---|---|---|---|
| **Lionville Laboratory** | | | | | | | | | |
| **Polynuclear Aromatic Compounds by SW846 8310** | | | | | | | | | |
| **Naphthalene** | **1.45** | | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| Acenaphthylene | 0.100 | U | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| **Acenaphthene** | **1.11** | | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| **Fluorene** | **3.45** | | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| **Phenanthrene** | **3.02** | | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| **Anthracene** | **1.05** | | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| **Fluoranthene** | **6.37** | | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| Indeno[1,2,3-cd]pyrene | 0.100 | U | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| Pyrene | 0.100 | U | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| Benz[a]anthracene | 0.100 | U | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| **Chrysene** | **0.0350** | J | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| Benzo[b] fluoranthene | 0.100 | U | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| Benzo[k] fluoranthene | 0.100 | U | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| Benzo[a] pyrene | 0.100 | U | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| Dibenz[a,h]anthracene | 0.100 | U | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| Benzo[g,h,i] perylene | 0.100 | U | 0.100 | ug/L | 1 | L211159 | 11/19/2012 | 11/28/2012 | 8310 |
| *Surrogate: Triphenylene* | *110 %* | | *68-129* | | | *L211159* | *11/19/2012* | *11/28/2012* | *8310* |

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| | | |
|---|---|---|
| WC-Hanford, Inc.<br>2620 Fermi Avenue<br>Richland WA, 99354 | Project: RC-236<br>Project Number: K4030<br>Project Manager: Joan Kessner | **Reported:**<br>11/29/2012 20:01 |

## Polynuclear Aromatic Compounds by SW846 8310 - Quality Control

## Lionville Laboratory

| Analyte | Result and Qualifiers | | Reporting Limit | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Batch L211159 - SW 3520C** | | | | | | | | | | |
| **Blank (L211159-BLK1)** | | | | Prepared: 11/19/2012 Analyzed: 11/28/2012 | | | | | | |
| Naphthalene | 0.100 | U | 0.100 | ug/L | | | | | | |
| Acenaphthylene | 0.100 | U | 0.100 | ug/L | | | | | | |
| Acenaphthene | 0.100 | U | 0.100 | ug/L | | | | | | |
| Fluorene | 0.166 | | 0.100 | ug/L | | | | | | |
| Phenanthrene | 0.100 | U | 0.100 | ug/L | | | | | | |
| Anthracene | 0.100 | U | 0.100 | ug/L | | | | | | |
| Fluoranthene | 0.100 | U | 0.100 | ug/L | | | | | | |
| Indeno[1,2,3-cd]pyrene | 0.100 | U | 0.100 | ug/L | | | | | | |
| Pyrene | 0.100 | U | 0.100 | ug/L | | | | | | |
| Benz[a]anthracene | 0.100 | U | 0.100 | ug/L | | | | | | |
| Chrysene | 0.100 | U | 0.100 | ug/L | | | | | | |
| Benzo[b] fluoranthene | 0.100 | U | 0.100 | ug/L | | | | | | |
| Benzo[k] fluoranthene | 0.100 | U | 0.100 | ug/L | | | | | | |
| Benzo[a] pyrene | 0.100 | U | 0.100 | ug/L | | | | | | |
| Dibenz[a,h]anthracene | 0.100 | U | 0.100 | ug/L | | | | | | |
| Benzo[g,h,i] perylene | 0.100 | U | 0.100 | ug/L | | | | | | |
| *Surrogate: Triphenylene* | *4.27* | | | *ug/L* | *5.0000* | | *85* | *68-129* | | |
| **LCS (L211159-BS1)** | | | | Prepared: 11/19/2012 Analyzed: 11/28/2012 | | | | | | |
| Naphthalene | 4.22 | | 0.100 | ug/L | 5.0000 | | 84 | 0-127 | | |
| Acenaphthylene | 4.01 | | 0.100 | ug/L | 5.0000 | | 80 | 50-140 | | |
| Acenaphthene | 3.82 | | 0.100 | ug/L | 5.0000 | | 76 | 17-139 | | |
| Fluorene | 4.23 | | 0.100 | ug/L | 5.0000 | | 85 | 28-145 | | |
| Phenanthrene | 4.20 | | 0.100 | ug/L | 5.0000 | | 84 | 30-152 | | |
| Anthracene | 4.11 | | 0.100 | ug/L | 5.0000 | | 82 | 19-171 | | |
| Fluoranthene | 4.29 | | 0.100 | ug/L | 5.0000 | | 86 | 34-159 | | |
| Indeno[1,2,3-cd]pyrene | 4.53 | | 0.100 | ug/L | 5.0000 | | 91 | 31-156 | | |
| Pyrene | 4.58 | | 0.100 | ug/L | 5.0000 | | 92 | 33-152 | | |
| Benz[a]anthracene | 4.72 | | 0.100 | ug/L | 5.0000 | | 94 | 32-157 | | |
| Chrysene | 4.58 | | 0.100 | ug/L | 5.0000 | | 92 | 31-159 | | |
| Benzo[b] fluoranthene | 5.12 | | 0.100 | ug/L | 5.0000 | | 102 | 33-164 | | |
| Benzo[k] fluoranthene | 4.82 | | 0.100 | ug/L | 5.0000 | | 96 | 28-161 | | |
| Benzo[a] pyrene | 4.70 | | 0.100 | ug/L | 5.0000 | | 94 | 29-149 | | |
| Dibenz[a,h]anthracene | 4.92 | | 0.100 | ug/L | 5.0000 | | 98 | 27-153 | | |
| Benzo[g,h,i] perylene | 5.00 | | 0.100 | ug/L | 5.0000 | | 100 | 32-157 | | |
| *Surrogate: Triphenylene* | *4.50* | | | *ug/L* | *5.0000* | | *90* | *68-129* | | |

# PREPARATION BENCH SHEET

L211159

**Lionville Laboratory**

**Printed: 11/27/2012 4:29:56PM**

00000035

**Matrix: Water** **Prepared using: HPLC - SW 3520C** **Surrogate used: 1200612**

| Lab Number | Analysis | Prepared | Initial (mL) | Final (mL) | Spike ID | Source ID | ul Spike | ul Surrogate | Client | Extraction Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 1211048-01 | 8310 PAH | 11/19/2012 21:46 | 1000 | 5 | | | | 50 | WC-Hanford, Inc. | |
| 1211065-01 | 8310 PAH | 11/19/2012 21:46 | 1000 | 5 | | | | 50 | WC-Hanford, Inc. | |
| 1211065-02 | 8310 PAH | 11/19/2012 21:46 | 1000 | 5 | | | | 50 | WC-Hanford, Inc. | |
| L211159-BLK1 | QC | 11/19/2012 21:46 | 1000 | 5 | | | | 50 | | |
| L211159-BS1 | QC | 11/19/2012 21:46 | 1000 | 5 | 1200963 | | 50 | 50 | | |
| L211159-MS1 | QC | 11/19/2012 21:46 | 500 | 5 | 1200963 | 1211048-01 | 50 | 50 | | |
| L211159-MSD1 | QC | 11/19/2012 21:46 | 500 | 5 | 1200963 | 1211048-01 | 50 | 50 | | |

11/27/12 1629
Extracts Relinquished By Date

S Lock 11.27.12 16:30
Extracts Received By Date

# METALS

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Phone: 610-280-3000
Fax: 610-280-3041

| | | |
|---|---|---|
| WC-Hanford, Inc. | Project: RC-236 | |
| 2620 Fermi Avenue | Project Number: K4030 | **Reported:** |
| Richland WA, 99354 | Project Manager: Joan Kessner | 12/03/2012 13:45 |

## Analytical Report for Metals by SW846 6000/7000 series

| Sample ID | Laboratory ID | Matrix | Date Sampled | Date Received |
|---|---|---|---|---|
| B2MB43 | 1211065-01 | Water | 11/14/2012 10:57 | 11/16/2012 10:15 |
| B2MB45 | 1211065-02 | Water | 11/14/2012 09:26 | 11/16/2012 10:15 |

LIONVILLE LABORATORY
A division of Eberline Analytical Corporation

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Exton, Pennsylvania 19341
Phone (610) 280-3000
Fax (610) 280-3041

# Case Narrative

**Client:** WC-HANFORD RC-236
**LVL#:** 1211065
**SDG/SAF#:** K4030/RC-236

**W.O.#:** 60049-001-001-0001-00
**Date Received:** 11-16-12

## METALS

The following is a summary of the QC results accompanying the sample results. Lionville Laboratory (LvL) certifies that all test results meet the requirements of NELAC except as noted below.

1. This narrative covers the analyses of 2 water samples.

2. The samples were prepared and analyzed in accordance with methods listed on the data report forms.

3. All analyses were performed within the required holding times.

4. Please refer to the Sample Receipt Check List for any sample discrepancies in LvL's sample acceptance policy.

5. All Initial and Continuing Calibration Verifications (ICV/CCVs) were within the 90-110% control limits.

6. All Initial and Continuing Calibration Blanks (ICB/CCBs) were within control limits (less than the LOQ) with the exception of CCB3 for Iron (65.8µg/L, RDL=50µg/L). The method blank L211194-MB1 was below the 50µg/L RDL and sample B2MB43 result for Iron was surrounded by CCBs within control. Sample B2MB45 result for Iron was significantly higher than the client's required detection level for Iron. The samples were reported and sample B2MB45 may be biased slightly high for Iron.

7. All preparation/method blanks (MB) were within method criteria {less than the Limit of Quantitation, or samples were greater than 20X MB value}.

8. All ICP Interference Check Standards were within control limits.

9. All laboratory control samples (LCS) were within the 80-120% control limits.

10. All matrix spike (MS) recoveries were within the 75-125% control limits.


The results presented in this report relate only to the analytical testing and conditions of the samples at receipt and during storage. All pages of this report are integral parts of the analytical data. Therefore, this report should only be reproduced in its entirety of pages.

12. All duplicate analyses were within the 20% Relative Percent Difference (RPD) control limit critieria. The ± 20% RPD control limit applies to sample results greater than ten times the MDL. The sample result for Molybdenum was less than ten times the MDL.

13. For the purposes of this report, the data have been reported to the Limit of Detection (LOD). Values between the LOD and the Limit of Quantitation (LOQ) are acquired in a region of less-certain quantification.

14. LvL is NELAP accredited by the State of Pennsylvania. For a complete listing of accrediting authorities and the corresponding analytes/methods, please contact your Project Manager.

15. I certify that this sample data package is in compliance with SOW requirements, both technically and for completeness, other than the conditions detailed above. Release of the data contained in this hard-copy data package has been authorized by the Laboratory Manager or a designee, as verified by the following signature.

Iain Daniels
Laboratory Manager
Lionville Laboratory

12/4/12
Date

alm/11-065

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Fax: 610-280-3041

| | | |
|---|---|---|
| WC-Hanford, Inc. | Project: RC-236 | |
| 2620 Fermi Avenue | Project Number: K4030 | **Reported:** |
| Richland WA, 99354 | Project Manager: Joan Kessner | 12/03/2012 13:45 |

## Notes and Definitions

| | |
|---|---|
| U | Analyte included in the analysis, but not detected |
| J | Detected but below the Reporting Limit; therefore, result is an estimated concentration (CLP J-Flag). |
| B | Detected but below the Reporting Limit; therefore, result is an estimated concentration (CLP J-Flag) |
| * | Value outside QC acceptance criteria |
| DET | Analyte DETECTED |
| ND | Analyte NOT DETECTED at or above the reporting limit |
| NR | Not Reported |
| dry | Sample results reported on a dry weight basis |
| wet | Sample results reported on a wet weight basis |
| RPD | Relative Percent Difference |

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| | | |
|---|---|---|
| WC-Hanford, Inc.<br>2620 Fermi Avenue<br>Richland WA, 99354 | Project: RC-236<br>Project Number: K4030<br>Project Manager: Joan Kessner | **Reported:**<br>12/03/2012 13:45 |

## B2MB43
### 1211065-01 (Water)

| Analyte | Result and Qualifier | | Reporting Limit | Units | Dilution | Batch | Prepared | Analyzed | Method |
|---|---|---|---|---|---|---|---|---|---|
| | | | **Lionville Laboratory** | | | | | | |
| **Metals by SW846 6000/7000 series** | | | | | | | | | |
| **Aluminum** | **169** | | 50.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| Antimony | 6.00 | U | 6.00 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| Arsenic | 10.0 | U | 10.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Barium** | **145** | | 5.00 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| Beryllium | 2.00 | U | 2.00 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| Bismuth | 100 | U | 100 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Boron** | **17.3** | B | 20.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| Cadmium | 2.00 | U | 2.00 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Calcium** | **140000** | | 1000 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Chromium** | **1.90** | B | 2.00 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Cobalt** | **2.55** | B | 20.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Copper** | **6.00** | B | 10.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Iron** | **270** | | 50.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| Lead | 5.00 | U | 5.00 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Lithium** | **10.8** | B | 25.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Magnesium** | **25700** | | 750 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Manganese** | **1640** | | 5.00 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Molybdenum** | **6.41** | B | 20.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Nickel** | **3.70** | B | 40.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Phosphorus** | **31.4** | B | 50.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Potassium** | **5540** | | 4000 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| Selenium | 10.0 | U | 10.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Silicon** | **14200** | | 25.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| Silver | 2.00 | U | 2.00 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Sodium** | **39400** | | 500 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Strontium** | **612** | | 10.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| Thallium | 5.00 | U | 5.00 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| Tin | 100 | U | 100 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| Uranium | 200 | U | 200 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Vanadium** | **16.5** | B | 25.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| Zinc | 10.0 | U | 10.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |

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| | | |
|---|---|---|
| WC-Hanford, Inc.<br>2620 Fermi Avenue<br>Richland WA, 99354 | Project: RC-236<br>Project Number: K4030<br>Project Manager: Joan Kessner | **Reported:**<br>12/03/2012 13:45 |

## B2MB45
### 1211065-02 (Water)

| Analyte | Result and Qualifier | | Reporting Limit | Units | Dilution | Batch | Prepared | Analyzed | Method |
|---|---|---|---|---|---|---|---|---|---|
| **Lionville Laboratory** | | | | | | | | | |
| **Metals by SW846 6000/7000 series** | | | | | | | | | |
| **Aluminum** | **12300** | | 50.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| Antimony | 6.00 | U | 6.00 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Arsenic** | **5.24** | B | 10.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Barium** | **399** | | 5.00 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Beryllium** | **0.241** | B | 2.00 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| Bismuth | 100 | U | 100 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Boron** | **21.1** | | 20.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Cadmium** | **0.462** | B | 2.00 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Calcium** | **198000** | | 1000 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Chromium** | **22.8** | | 2.00 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Cobalt** | **6.72** | B | 20.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Copper** | **35.3** | | 10.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Iron** | **19200** | | 50.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Lead** | **6.40** | | 5.00 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Lithium** | **19.4** | B | 25.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Magnesium** | **38700** | | 750 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Manganese** | **5020** | | 5.00 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Molybdenum** | **3.01** | B | 20.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Nickel** | **16.7** | B | 40.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Phosphorus** | **502** | | 50.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Potassium** | **7830** | | 4000 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| Selenium | 10.0 | U | 10.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Silicon** | **33600** | | 25.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| Silver | 2.00 | U | 2.00 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Sodium** | **39500** | | 500 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Strontium** | **918** | | 10.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| Thallium | 5.00 | U | 5.00 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Tin** | **3.13** | B | 100 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| Uranium | 200 | U | 200 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Vanadium** | **48.3** | | 25.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |
| **Zinc** | **48.6** | | 10.0 | ug/L | 1 | L211194 | 11/26/2012 | 11/29/2012 | 6010B |

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Fax: 610-280-3041

| | | |
|---|---|---|
| WC-Hanford, Inc.<br>2620 Fermi Avenue<br>Richland WA, 99354 | Project: RC-236<br>Project Number: K4030<br>Project Manager: Joan Kessner | **Reported:**<br>12/03/2012 13:45 |

## Metals by SW846 6000/7000 series - Quality Control

## Lionville Laboratory

| Analyte | Result and Qualifiers | | Reporting Limit | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Batch L211194 - SW 3005A** | | | | | | | | | | |
| **Blank (L211194-BLK1)** | | | | Prepared: 11/26/2012 Analyzed: 11/29/2012 | | | | | | |
| Aluminum | 50.0 | U | 50.0 | ug/L | | | | | | |
| Antimony | 6.00 | U | 6.00 | ug/L | | | | | | |
| Arsenic | 10.0 | U | 10.0 | ug/L | | | | | | |
| Barium | 5.00 | U | 5.00 | ug/L | | | | | | |
| Beryllium | 2.00 | U | 2.00 | ug/L | | | | | | |
| Bismuth | 100 | U | 100 | ug/L | | | | | | |
| Boron | 20.0 | U | 20.0 | ug/L | | | | | | |
| Cadmium | 2.00 | U | 2.00 | ug/L | | | | | | |
| Calcium | 1000 | U | 1000 | ug/L | | | | | | |
| Chromium | 2.00 | U | 2.00 | ug/L | | | | | | |
| Cobalt | 20.0 | U | 20.0 | ug/L | | | | | | |
| Copper | 10.0 | U | 10.0 | ug/L | | | | | | |
| Iron | 50.0 | U | 50.0 | ug/L | | | | | | |
| Lead | 5.00 | U | 5.00 | ug/L | | | | | | |
| Lithium | 25.0 | U | 25.0 | ug/L | | | | | | |
| Magnesium | 750 | U | 750 | ug/L | | | | | | |
| Manganese | 5.00 | U | 5.00 | ug/L | | | | | | |
| Molybdenum | 20.0 | U | 20.0 | ug/L | | | | | | |
| Nickel | 40.0 | U | 40.0 | ug/L | | | | | | |
| Phosphorus | 50.0 | U | 50.0 | ug/L | | | | | | |
| Potassium | 4000 | U | 4000 | ug/L | | | | | | |
| Selenium | 10.0 | U | 10.0 | ug/L | | | | | | |
| Silicon | 25.0 | U | 25.0 | ug/L | | | | | | |
| Silver | 2.00 | U | 2.00 | ug/L | | | | | | |
| Sodium | 500 | U | 500 | ug/L | | | | | | |
| Strontium | 10.0 | U | 10.0 | ug/L | | | | | | |
| Thallium | 5.00 | U | 5.00 | ug/L | | | | | | |
| Tin | 100 | U | 100 | ug/L | | | | | | |
| Uranium | 200 | U | 200 | ug/L | | | | | | |
| Vanadium | 25.0 | U | 25.0 | ug/L | | | | | | |
| Zinc | 10.0 | U | 10.0 | ug/L | | | | | | |

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| | | |
|---|---|---|
| WC-Hanford, Inc.<br>2620 Fermi Avenue<br>Richland WA, 99354 | Project: RC-236<br>Project Number: K4030<br>Project Manager: Joan Kessner | **Reported:**<br>12/03/2012 13:45 |

## Metals by SW846 6000/7000 series - Quality Control

## Lionville Laboratory

| Analyte | Result and Qualifiers | Reporting Limit | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|
| **Batch L211194 - SW 3005A** | | | | | | | | | |
| **LCS (L211194-BS1)** | | | Prepared: 11/26/2012 Analyzed: 11/29/2012 | | | | | | |
| Aluminum | 4870 | 50.0 | ug/L | 5000.0 | | 97 | 80-120 | | 20 |
| Antimony | 3060 | 6.00 | ug/L | 3000.0 | | 102 | 80-120 | | 20 |
| Arsenic | 10000 | 10.0 | ug/L | 10000 | | 100 | 80-120 | | 20 |
| Barium | 5090 | 5.00 | ug/L | 5000.0 | | 102 | 80-120 | | 20 |
| Beryllium | 247 | 2.00 | ug/L | 250.00 | | 99 | 80-120 | | 20 |
| Bismuth | 5150 | 100 | ug/L | 5000.0 | | 103 | 80-120 | | 20 |
| Boron | 5120 | 20.0 | ug/L | 5000.0 | | 102 | 80-120 | | 20 |
| Cadmium | 252 | 2.00 | ug/L | 250.00 | | 101 | 80-120 | | 20 |
| Calcium | 24700 | 1000 | ug/L | 25000 | | 99 | 80-120 | | 20 |
| Chromium | 487 | 2.00 | ug/L | 500.00 | | 97 | 80-120 | | 20 |
| Cobalt | 2490 | 20.0 | ug/L | 2500.0 | | 100 | 80-120 | | 20 |
| Copper | 1280 | 10.0 | ug/L | 1250.0 | | 102 | 80-120 | | 20 |
| Iron | 4950 | 50.0 | ug/L | 5000.0 | | 99 | 80-120 | | 20 |
| Lead | 2430 | 5.00 | ug/L | 2500.0 | | 97 | 80-120 | | 20 |
| Lithium | 5120 | 25.0 | ug/L | 5000.0 | | 102 | 80-120 | | 20 |
| Magnesium | 24400 | 750 | ug/L | 25000 | | 98 | 80-120 | | 20 |
| Manganese | 742 | 5.00 | ug/L | 750.00 | | 99 | 80-120 | | 20 |
| Molybdenum | 4990 | 20.0 | ug/L | 5000.0 | | 100 | 80-120 | | 20 |
| Nickel | 1980 | 40.0 | ug/L | 2000.0 | | 99 | 80-120 | | 20 |
| Phosphorus | 5070 | 50.0 | ug/L | 5000.0 | | 101 | 80-120 | | 20 |
| Potassium | 24500 | 4000 | ug/L | 25000 | | 98 | 80-120 | | 20 |
| Selenium | 10000 | 10.0 | ug/L | 10000 | | 100 | 80-120 | | 20 |
| Silicon | 4780 | 25.0 | ug/L | 5000.0 | | 96 | 80-120 | | 20 |
| Silver | 500 | 2.00 | ug/L | 500.00 | | 100 | 80-120 | | 20 |
| Sodium | 24800 | 500 | ug/L | 25000 | | 99 | 80-120 | | 20 |
| Strontium | 5020 | 10.0 | ug/L | 5000.0 | | 100 | 80-120 | | 20 |
| Thallium | 9790 | 5.00 | ug/L | 10000 | | 98 | 80-120 | | 20 |
| Tin | 5030 | 100 | ug/L | 5000.0 | | 101 | 80-120 | | 20 |
| Uranium | 4800 | 200 | ug/L | 5000.0 | | 96 | 80-120 | | 20 |
| Vanadium | 2490 | 25.0 | ug/L | 2500.0 | | 100 | 80-120 | | 20 |
| Zinc | 1040 | 10.0 | ug/L | 1000.0 | | 104 | 80-120 | | 20 |

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Fax: 610-280-3041

| | | |
|---|---|---|
| WC-Hanford, Inc.<br>2620 Fermi Avenue<br>Richland WA, 99354 | Project: RC-236<br>Project Number: K4030<br>Project Manager: Joan Kessner | **Reported:**<br>12/03/2012 13:45 |

## Metals by SW846 6000/7000 series - Quality Control

## Lionville Laboratory

| Analyte | Result and Qualifiers | | Reporting Limit | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Batch L211194 - SW 3005A** | | | | | | | | | | |
| **Duplicate (L211194-DUP2)** | | **Source: 1211065-01** | | Prepared: 11/26/2012 Analyzed: 11/29/2012 | | | | | | |
| Aluminum | 178 | | 50.0 | ug/L | | 169 | | | 5 | 20 |
| Antimony | 6.00 | U | 6.00 | ug/L | | 6.00 U | | | | 20 |
| Arsenic | 10.0 | U | 10.0 | ug/L | | 10.0 U | | | | 20 |
| Barium | 145 | | 5.00 | ug/L | | 145 | | | 0.1 | 20 |
| Beryllium | 2.00 | U | 2.00 | ug/L | | 2.00 U | | | | 20 |
| Bismuth | 100 | U | 100 | ug/L | | 100 U | | | | 20 |
| Boron | 16.7 | B | 20.0 | ug/L | | 17.3 | | | 3 | 20 |
| Cadmium | 2.00 | U | 2.00 | ug/L | | 2.00 U | | | | 20 |
| Calcium | 140000 | | 1000 | ug/L | | 140000 | | | 0.1 | 20 |
| Chromium | 1.89 | B | 2.00 | ug/L | | 1.90 | | | 0.7 | 20 |
| Cobalt | 2.53 | B | 20.0 | ug/L | | 2.55 | | | 0.9 | 20 |
| Copper | 6.85 | B | 10.0 | ug/L | | 6.00 | | | 13 | 20 |
| Iron | 283 | | 50.0 | ug/L | | 270 | | | 5 | 20 |
| Lead | 5.00 | U | 5.00 | ug/L | | 5.00 U | | | | 20 |
| Lithium | 10.1 | B | 25.0 | ug/L | | 10.8 | | | 6 | 20 |
| Magnesium | 25700 | | 750 | ug/L | | 25700 | | | 0.2 | 20 |
| Manganese | 1640 | | 5.00 | ug/L | | 1640 | | | 0.4 | 20 |
| Molybdenum | 2.74 | B | 20.0 | ug/L | | 6.41 | | | 80* | 20 |
| Nickel | 3.64 | B | 40.0 | ug/L | | 3.70 | | | 1 | 20 |
| Phosphorus | 30.5 | B | 50.0 | ug/L | | 31.4 | | | 3 | 20 |
| Potassium | 5540 | | 4000 | ug/L | | 5540 | | | 0.2 | 20 |
| Selenium | 10.0 | U | 10.0 | ug/L | | 10.0 U | | | | 20 |
| Silicon | 14200 | | 25.0 | ug/L | | 14200 | | | 0.5 | 20 |
| Silver | 2.00 | U | 2.00 | ug/L | | 2.00 U | | | | 20 |
| Sodium | 39800 | | 500 | ug/L | | 39400 | | | 1 | 20 |
| Strontium | 618 | | 10.0 | ug/L | | 612 | | | 0.9 | 20 |
| Thallium | 5.00 | U | 5.00 | ug/L | | 5.00 U | | | | 20 |
| Tin | 100 | U | 100 | ug/L | | 100 U | | | | 20 |
| Uranium | 200 | U | 200 | ug/L | | 200 U | | | | 20 |
| Vanadium | 16.2 | B | 25.0 | ug/L | | 16.5 | | | 2 | 20 |
| Zinc | 10.0 | U | 10.0 | ug/L | | 10.0 U | | | | 20 |

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|---|---|---|
| WC-Hanford, Inc.<br>2620 Fermi Avenue<br>Richland WA, 99354 | Project: RC-236<br>Project Number: K4030<br>Project Manager: Joan Kessner | **Reported:**<br>12/03/2012 13:45 |

## Metals by SW846 6000/7000 series - Quality Control

## Lionville Laboratory

| Analyte | Result and Qualifiers | Reporting Limit | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|
| **Batch L211194 - SW 3005A** | | | | | | | | | |
| **Matrix Spike (L211194-MS2)** | **Source: 1211065-01** | Prepared: 11/26/2012 Analyzed: 11/29/2012 | | | | | | | |
| Aluminum | 2180 | 50.0 | ug/L | 2000.0 | 169 | 100 | 75-125 | | 20 |
| Antimony | 513 | 6.00 | ug/L | 500.00 | 6.00 U | 103 | 75-125 | | 20 |
| Arsenic | 2050 | 10.0 | ug/L | 2000.0 | 10.0 U | 102 | 75-125 | | 20 |
| Barium | 2200 | 5.00 | ug/L | 2000.0 | 145 | 103 | 75-125 | | 20 |
| Beryllium | 49.9 | 2.00 | ug/L | 50.000 | 2.00 U | 100 | 75-125 | | 20 |
| Bismuth | 5200 | 100 | ug/L | 5000.0 | 100 U | 104 | 75-125 | | 20 |
| Boron | 1030 | 20.0 | ug/L | 1000.0 | 17.3 | 102 | 75-125 | | 20 |
| Cadmium | 50.7 | 2.00 | ug/L | 50.000 | 2.00 U | 101 | 75-125 | | 20 |
| Calcium | 166000 | 1000 | ug/L | 25000 | 140000 | 104 | 75-125 | | 20 |
| Chromium | 196 | 2.00 | ug/L | 200.00 | 1.90 | 97 | 75-125 | | 20 |
| Cobalt | 483 | 20.0 | ug/L | 500.00 | 2.55 | 96 | 75-125 | | 20 |
| Copper | 252 | 10.0 | ug/L | 250.00 | 6.00 | 98 | 75-125 | | 20 |
| Iron | 1280 | 50.0 | ug/L | 1000.0 | 270 | 101 | 75-125 | | 20 |
| Lead | 472 | 5.00 | ug/L | 500.00 | 5.00 U | 94 | 75-125 | | 20 |
| Lithium | 1040 | 25.0 | ug/L | 1000.0 | 10.8 | 103 | 75-125 | | 20 |
| Magnesium | 50000 | 750 | ug/L | 25000 | 25700 | 97 | 75-125 | | 20 |
| Manganese | 2130 | 5.00 | ug/L | 500.00 | 1640 | 97 | 75-125 | | 20 |
| Molybdenum | 982 | 20.0 | ug/L | 1000.0 | 6.41 | 98 | 75-125 | | 20 |
| Nickel | 481 | 40.0 | ug/L | 500.00 | 3.70 | 96 | 75-125 | | 20 |
| Phosphorus | 5290 | 50.0 | ug/L | 5000.0 | 31.4 | 105 | 75-125 | | 20 |
| Potassium | 30900 | 4000 | ug/L | 25000 | 5540 | 101 | 75-125 | | 20 |
| Selenium | 2050 | 10.0 | ug/L | 2000.0 | 10.0 U | 103 | 75-125 | | 20 |
| Silicon | 15100 | 25.0 | ug/L | 1000.0 | 14200 | 94 | 75-125 | | 20 |
| Silver | 49.5 | 2.00 | ug/L | 50.000 | 2.00 U | 99 | 75-125 | | 20 |
| Sodium | 65600 | 500 | ug/L | 25000 | 39400 | 105 | 75-125 | | 20 |
| Strontium | 1640 | 10.0 | ug/L | 1000.0 | 612 | 102 | 75-125 | | 20 |
| Thallium | 1860 | 5.00 | ug/L | 2000.0 | 5.00 U | 93 | 75-125 | | 20 |
| Tin | 955 | 100 | ug/L | 1000.0 | 100 U | 95 | 75-125 | | 20 |
| Uranium | 4800 | 200 | ug/L | 5000.0 | 200 U | 96 | 75-125 | | 20 |
| Vanadium | 516 | 25.0 | ug/L | 500.00 | 16.5 | 100 | 75-125 | | 20 |
| Zinc | 519 | 10.0 | ug/L | 500.00 | 10.0 U | 104 | 75-125 | | 20 |

**Lionville Laboratory** Logbook #: 1154

# SAMPLE DIGESTION RECORD

Digestion Batch #: L211194
Date/Time Initiated: 11/26/12 1100
Date/Time Completed: 11/26/12 2010
Analyst: MW
Matrix (circle): Soil Water Other
Method (circle one): 3005A 3010A 3050 200.7 (1994)
pH/Turbidity: N/A for Solids.
NOTE: All temperatures are recorded as corrected temperatures

Digested / Undigested (circle one)
Balance #:
Balance Cal Verification: Y NA
Temp: 97°
BLOCK 1 2 (circle one)
3

| Work Order # | Spike Vol (mL) | Initial Wt/Vol (g/mL) | Final Vol (mL) | pH <2 | Type: To/Sol/ TC | Texture | Color / Appearance | Artifact | Turb |
|---|---|---|---|---|---|---|---|---|---|
| 1211048-01 | | 50 | 50 | < | TO | | slightly cloudy / colorless | | |
| L211194-DUP1 | | 50 | 50 | < | | | ⊥ ⊥ | | |
| MS1 | 0.5* | 50 | 50 | < | | | ⊥ ⊥ | | |
| 1211065-01 | | 50 | 50 | < | | | cloudy / colorless | | |
| L211194-DUP2 | | 50 | 50 | < | | | ⊥ ⊥ | | |
| MS2 | 0.5* | 50 | 50 | < | | | ⊥ ⊥ | | |
| 1211065-02 | | 50 | 50 | < | | | brown red / colorless | | |
| L211194-BLK1 | | 50 | 50 | | ⊥ | | clear / colorless | | |
| DS1 | 0.5* | 50 | 50 | | | | ⊥ ⊥ | | |

MW 11/26/12

Spiking IDs / Expiration Date:
MS# : 1201377

LCS#: 1201373

Reagent IDs:
$HNO_3$ 0000003390
HCl L13029
$H_2O_2$
1:1 $HNO_3$
1:1 HCl

File ID#:

Data Review By/Date:
CLM 11/29/12

* also 0.25 ml 1201292 (Bi)
0.25 ml 1200382 (P-)
0.25 ml 1200380 (O-)

R:\group\QA\SOP\
Signed\SPI\Metals Digestion log.doc

Page #:

# PREPARATION BENCH SHEET

L211194

**Lionville Laboratory**

**Printed: 11/30/2012 9:27:12AM**

**Matrix: Water** **Prepared using: METALS - SW 3005A** **(No Surrogate)**

| Lab Number | Analysis | Prepared | Initial (mL) | Final (mL) | Spike ID | Source ID | ul Spike | ul Surrogate | Client | Extraction Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 1211048-01 | 6010B HSL Metals | 11/26/2012 11:00 | 50 | 50 | | | | | WC-Hanford, Inc. | HSL + B, Bi, Li, Mo, P, Si, Sn, Sr, U |
| 1211065-01 | 6010B HSL Metals | 11/26/2012 11:00 | 50 | 50 | | | | | WC-Hanford, Inc. | HSL + B, Bi, Li, Mo, P, Si, Sn, Sr, U |
| 1211065-02 | 6010B HSL Metals | 11/26/2012 11:00 | 50 | 50 | | | | | WC-Hanford, Inc. | HSL + B, Bi, Li, Mo, P, Si, Sn, Sr, U |
| L211194-BLK1 | QC | 11/26/2012 11:00 | 50 | 50 | | | | | | |
| L211194-BS1 | QC | 11/26/2012 11:00 | 50 | 50 | 1201373 | | 500 | | | |
| L211194-DUP1 | QC | 11/26/2012 11:00 | 50 | 50 | | 1211048-01 | | | | |
| L211194-DUP2 | QC | 11/26/2012 11:00 | 50 | 50 | | 1211065-01 | | | | |
| L211194-MS1 | QC | 11/26/2012 11:00 | 50 | 50 | 1201377 | 1211048-01 | 500 | | | |
| L211194-MS2 | QC | 11/26/2012 11:00 | 50 | 50 | 1201377 | 1211065-01 | 500 | | | |
| L211194-PS1 | QC | 11/26/2012 11:00 | 50 | 50 | 1001493 | 1211048-01 | 100 | | | |

revision correction for time and added post spike
aem 11/30/12

Extracts Relinquished By Date

Extracts Received By Date

# PREPARATION BENCH SHEET

L211194

**Lionville Laboratory**

**Printed: 11/26/2012 8:45:26PM**

**Matrix: Water** **Prepared using: METALS - SW 3005A** **(No Surrogate)**

| Lab Number | Analysis | Prepared | Initial (mL) | Final (mL) | Spike ID | Source ID | ul Spike | ul Surrogate | Client | Extraction Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 1211048-01 | 6010B HSL Metals | 11/26/2012 10:58 | 50 | 50 | | | | | WC-Hanford, Inc. | HSL + B, Bi, Li, Mo, P, Si, Sn, Sr, U |
| 1211065-01 | 6010B HSL Metals | 11/26/2012 10:58 | 50 | 50 | | | | | WC-Hanford, Inc. | HSL + B, Bi, Li, Mo, P, Si, Sn, Sr, U |
| 1211065-02 | 6010B HSL Metals | 11/26/2012 10:58 | 50 | 50 | | | | | WC-Hanford, Inc. | HSL + B, Bi, Li, Mo, P, Si, Sn, Sr, U |
| L211194-BLK1 | QC | 11/26/2012 10:58 | 50 | 50 | | | | | | |
| L211194-BS1 | QC | 11/26/2012 10:58 | 50 | 50 | 1201373 | | 500 | | | |
| L211194-DUP1 | QC | 11/26/2012 10:58 | 50 | 50 | | 1211048-01 | | | | |
| L211194-DUP2 | QC | 11/26/2012 10:58 | 50 | 50 | | 1211065-01 | | | | |
| L211194-MS1 | QC | 11/26/2012 10:58 | 50 | 50 | 1201377 | 1211048-01 | 500 | | | |
| L211194-MS2 | QC | 11/26/2012 10:58 | 50 | 50 | 1201377 | 1211065-01 | 500 | | | |

Extracts Relinquished By — Date: 11/26/12

Extracts Received By — Date: 11/28/12

# WET CHEMISTRY

Lionville Laboratory, PADEP Lab ID# 15-00009
264 Welsh Pool Road
Exton, PA 19341
Phone: 610-280-3000
Fax: 610-280-3041

| | | |
|---|---|---|
| WC-Hanford, Inc.<br>2620 Fermi Avenue<br>Richland WA, 99354 | Project: RC-236<br>Project Number: K4030<br>Project Manager: Joan Kessner | **Reported:**<br>11/30/2012 15:33 |

## Analytical Report for Wet Chemistry

| Sample ID | Laboratory ID | Matrix | Date Sampled | Date Received |
|---|---|---|---|---|
| B2MB43 | 1211065-01 | Water | 11/14/2012 10:57 | 11/16/2012 10:15 |
| B2MB45 | 1211065-02 | Water | 11/14/2012 09:26 | 11/16/2012 10:15 |

LIONVILLE LABORATORY
A division of Eberline Analytical Corporation

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Exton, Pennsylvania 19341
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# Case Narrative

**Client:** WC-HANFORD RC-236 K4030
**LVL#:** 1211065 **Date Received:** 11-16-12

## INORGANIC NARRATIVE

1. This narrative covers the analyses of 2 water samples.

2. The samples were prepared and analyzed in accordance with the methods indicated on the data summary report.

   Lionville Lab (LvL) is NELAP accredited by the State of Pennsylvania. For a complete list of accrediting authorities and the corresponding analytes/methods, please contact your Project Manager. LvL certifies that all test results meet the requirements of NELAC with any exception noted in the following statements.

3. Sample holding times as required by the method and/or contract were met with the exceptions of Nirtate, Nitrite and Orthophosphate that were analyzed past hold.

4. The results presented in this report are derived from samples that met LvL's sample acceptance policy.

5. The method blanks were within the method criteria.

6. The Laboratory Control Samples (LCS) were within the laboratory control limits.

7. The matrix spike recoveries were within the applicable control limits as noted in the Analytical Report.

8. The replicate analyses were within the 20% Relative Percent Difference (RPD) control limit.

9. I certify that this sample data package is in compliance with SOW requirements, both technically and for completeness, other than the conditions detailed above. Release of the data contained in this hard copy package has been authorized by the Laboratory Manager or a designee, as verified by the following signature.

Iain Daniels
Laboratory Manager
Lionville Laboratory

12/13/12
Date

njp\i11-065

The results presented in this report relate only to the analytical testing and conditions of the samples at receipt and during storage. All pages of this report are integral parts of the analytical data. Therefore, this report should only be reproduced in its entirety of 11 pages.

Lionville Laboratory, PADEP Lab ID# 15-00009
264 Welsh Pool Road
Exton, PA 19341
Phone: 610-280-3000
Fax: 610-280-3041

| | | |
|---|---|---|
| WC-Hanford, Inc. | Project: RC-236 | |
| 2620 Fermi Avenue | Project Number: K4030 | **Reported:** |
| Richland WA, 99354 | Project Manager: Joan Kessner | 11/30/2012 15:33 |

## Notes and Definitions

| | |
|---|---|
| U | Analyte included in the analysis, but not detected |
| D | Results reported from a dilution; related reporting limits are elevated due to the presence of an interference or a high target value. |
| * | Value outside QC acceptance criteria |
| DET | Analyte DETECTED |
| ND | Analyte NOT DETECTED at or above the reporting limit |
| NR | Not Reported |
| Dry | Sample results reported on a dry weight basis |
| Wet | Sample results reported on a wet weight basis |
| RPD | Relative Percent Difference |
| LOD | Limit of Detection (LOD): the minimum estimated concentration of a target analyte that can be detected reliably. Concentrations at the LOD or between the LOD and LOQ are flagged estimated with either a 'J' qualifier or client-specific qualifier. |
| LOQ | Limit of Quantitation (LOQ): the minimum concentration of a target analyte that can be quantified reliably |

Lionville Laboratory, PADEP Lab ID# 15-00009
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Exton, PA 19341
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| | | |
|---|---|---|
| WC-Hanford, Inc. | Project: RC-236 | |
| 2620 Fermi Avenue | Project Number: K4030 | **Reported:** |
| Richland WA, 99354 | Project Manager: Joan Kessner | 11/30/2012 15:33 |

# Wet Chemistry
## Lionville Laboratory

| Analyte | Result and Qualifier | | LOD | LOQ | Units | Dilution | Batch | Prepared | Analyzed | Method |
|---|---|---|---|---|---|---|---|---|---|---|
| **B2MB43 (1211065-01) Water** | | | | | | | | | | |
| Oil and Grease (HEM) | 2.0 | U | 2.0 | 10.0 | mg/L | 1 | L211207 | 11/25/2012 10:30 | 11/25/2012 10:30 | EPA 1664A |
| **Total Alkalinity** | **377** | | 1.2 | 2.5 | mg/L | 1 | L211160 | 11/19/2012 22:05 | 11/19/2012 23:04 | SM 2320B |
| **Bromide** | **0.26** | | 0.10 | 0.50 | mg/L | 1 | L211181 | 11/16/2012 14:00 | 11/16/2012 19:38 | EPA 300.0 (1993) |
| **Chloride** | **32.3** | D | 0.50 | 2.50 | mg/L | 5 | L211181 | 11/16/2012 14:00 | 11/16/2012 19:38 | EPA 300.0 (1993) |
| **Fluoride** | **0.11** | | 0.10 | 0.50 | mg/L | 1 | L211181 | 11/16/2012 14:00 | 11/16/2012 19:38 | EPA 300.0 (1993) |
| **Nitrate** | **22.8** | D | 0.50 | 2.50 | mg/L | 5 | L211181 | 11/16/2012 14:00 | 11/16/2012 19:38 | EPA 300.0 (1993) |
| **Nitrite** | **1.71** | | 0.10 | 0.50 | mg/L | 1 | L211181 | 11/16/2012 14:00 | 11/16/2012 19:38 | EPA 300.0 (1993) |
| Orthophosphate | 0.20 | U | 0.20 | 1.00 | mg/L | 1 | L211181 | 11/16/2012 14:00 | 11/16/2012 19:38 | EPA 300.0 (1993) |
| **Sulfate** | **132** | D | 2.00 | 10.0 | mg/L | 20 | L211182 | 11/19/2012 12:00 | 11/19/2012 15:20 | EPA 300.0 (1993) |
| **B2MB45 (1211065-02) Water** | | | | | | | | | | |
| Oil and Grease (HEM) | 2.1 | U | 2.1 | 10.5 | mg/L | 1 | L211207 | 11/25/2012 10:30 | 11/25/2012 10:30 | EPA 1664A |
| **Total Alkalinity** | **731** | | 1.2 | 2.5 | mg/L | 1 | L211160 | 11/19/2012 22:05 | 11/19/2012 23:04 | SM 2320B |
| **Bromide** | **0.42** | | 0.10 | 0.50 | mg/L | 1 | L211181 | 11/16/2012 14:00 | 11/16/2012 19:38 | EPA 300.0 (1993) |
| **Chloride** | **27.9** | D | 0.50 | 2.50 | mg/L | 5 | L211181 | 11/16/2012 14:00 | 11/16/2012 19:38 | EPA 300.0 (1993) |
| Fluoride | 0.10 | U | 0.10 | 0.50 | mg/L | 1 | L211181 | 11/16/2012 14:00 | 11/16/2012 19:38 | EPA 300.0 (1993) |
| Nitrate | 0.10 | U | 0.10 | 0.50 | mg/L | 1 | L211181 | 11/16/2012 14:00 | 11/16/2012 19:38 | EPA 300.0 (1993) |
| Nitrite | 0.10 | U | 0.10 | 0.50 | mg/L | 1 | L211181 | 11/16/2012 14:00 | 11/16/2012 19:38 | EPA 300.0 (1993) |
| Orthophosphate | 0.20 | U | 0.20 | 1.00 | mg/L | 1 | L211181 | 11/16/2012 14:00 | 11/16/2012 19:38 | EPA 300.0 (1993) |
| **Sulfate** | **33.9** | D | 0.50 | 2.50 | mg/L | 5 | L211181 | 11/16/2012 14:00 | 11/16/2012 19:38 | EPA 300.0 (1993) |

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|---|---|---|
| WC-Hanford, Inc. | Project: RC-236 | |
| 2620 Fermi Avenue | Project Number: K4030 | Reported: |
| Richland WA, 99354 | Project Manager: Joan Kessner | 11/30/2012 15:33 |

# Wet Chemistry - Quality Control

## Lionville Laboratory

| Analyte | Result and Qualifiers | LOD | LOQ | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Batch L211160 - Default Prep GenChem** | | | | | | | | | | |
| **Blank (L211160-BLK1)** | | | | Prepared: 11/19/2012 16:45 Analyzed: 11/19/2012 18:20 | | | | | | |
| Total Alkalinity | 0.1 U | 0.1 | 0.2 | mg/L | | | | | | |
| **LCS (L211160-BS1)** | | | | Prepared: 11/19/2012 16:45 Analyzed: 11/19/2012 18:20 | | | | | | |
| Total Alkalinity | 105 | 0.2 | 0.5 | mg/L | 100.00 | | 105 | 90-110 | | |
| **Duplicate (L211160-DUP2)** | **Source: 1211065-01** | | | Prepared: 11/19/2012 22:05 Analyzed: 11/19/2012 23:04 | | | | | | |
| Total Alkalinity | 382 | 1.2 | 2.5 | mg/L | | 377 | | | 1.47 | 20 |
| **Batch L211181 - Default Prep GenChem** | | | | | | | | | | |
| **Blank (L211181-BLK1)** | | | | Prepared: 11/16/2012 14:00 Analyzed: 11/16/2012 19:38 | | | | | | |
| Fluoride | 0.10 U | 0.10 | 0.50 | mg/L | | | | | | |
| Chloride | 0.10 U | 0.10 | 0.50 | mg/L | | | | | | |
| Nitrite | 0.10 U | 0.10 | 0.50 | mg/L | | | | | | |
| Bromide | 0.10 U | 0.10 | 0.50 | mg/L | | | | | | |
| Nitrate | 0.10 U | 0.10 | 0.50 | mg/L | | | | | | |
| Orthophosphate | 0.20 U | 0.20 | 1.00 | mg/L | | | | | | |
| Sulfate | 0.10 U | 0.10 | 0.50 | mg/L | | | | | | |
| **LCS (L211181-BS1)** | | | | Prepared: 11/16/2012 14:00 Analyzed: 11/16/2012 19:38 | | | | | | |
| Fluoride | 5.06 | 0.10 | 0.50 | mg/L | 5.0000 | | 101 | 90-110 | | |
| Chloride | 4.80 | 0.10 | 0.50 | mg/L | 5.0000 | | 96.0 | 90-110 | | |
| Nitrite | 4.85 | 0.10 | 0.50 | mg/L | 5.0000 | | 97.0 | 90-110 | | |
| Bromide | 4.99 | 0.10 | 0.50 | mg/L | 5.0000 | | 99.8 | 90-110 | | |
| Nitrate | 5.04 | 0.10 | 0.50 | mg/L | 5.0000 | | 101 | 90-110 | | |
| Orthophosphate | 4.75 | 0.20 | 1.00 | mg/L | 5.0000 | | 95.0 | 90-110 | | |
| Sulfate | 4.99 | 0.10 | 0.50 | mg/L | 5.0000 | | 99.8 | 90-110 | | |

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|---|---|---|
| WC-Hanford, Inc.<br>2620 Fermi Avenue<br>Richland WA, 99354 | Project: RC-236<br>Project Number: K4030<br>Project Manager: Joan Kessner | **Reported:**<br>11/30/2012 15:33 |

# Wet Chemistry - Quality Control

## Lionville Laboratory

| Analyte | Result and Qualifiers | | LOD | LOQ | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Batch L211181 - Default Prep GenChem** | | | | | | | | | | | |
| **Duplicate (L211181-DUP2)** | | **Source: 1211065-01** | | | Prepared: 11/16/2012 14:00 Analyzed: 11/16/2012 19:38 | | | | | | |
| Fluoride | 0.10 | | 0.10 | 0.50 | mg/L | | 0.11 | | | 9.52 | 20 |
| Chloride | 31.7 | D | 0.50 | 2.50 | mg/L | | 32.3 | | | 1.84 | 20 |
| Nitrite | 1.61 | | 0.10 | 0.50 | mg/L | | 1.71 | | | 6.02 | 20 |
| Bromide | 0.22 | | 0.10 | 0.50 | mg/L | | 0.26 | | | 16.7 | 20 |
| Nitrate | 22.8 | D | 0.50 | 2.50 | mg/L | | 22.8 | | | 0.00 | 20 |
| Orthophosphate | 0.20 | U | 0.20 | 1.00 | mg/L | | 0.20 U | | | | 20 |
| Sulfate | 0.10 | U | 0.10 | 0.50 | mg/L | | | | | | 20 |
| **Matrix Spike (L211181-MS4)** | | **Source: 1211065-01** | | | Prepared: 11/16/2012 14:00 Analyzed: 11/16/2012 19:38 | | | | | | |
| Fluoride | 5.48 | | 0.10 | 0.50 | mg/L | 5.0000 | 0.11 | 107 | 80-120 | | |
| Nitrite | 7.24 | | 0.10 | 0.50 | mg/L | 5.0000 | 1.71 | 111 | 80-120 | | |
| Bromide | 5.60 | | 0.10 | 0.50 | mg/L | 5.0000 | 0.26 | 107 | 80-120 | | |
| Orthophosphate | 4.61 | | 0.20 | 1.00 | mg/L | 5.0000 | 0.20 U | 92.2 | 80-120 | | |
| **Matrix Spike (L211181-MS5)** | | **Source: 1211065-01** | | | Prepared: 11/16/2012 14:00 Analyzed: 11/16/2012 19:38 | | | | | | |
| Chloride | 82.9 | D | 1.00 | 5.00 | mg/L | 50.000 | 32.3 | 101 | 80-120 | | |
| Nitrate | 74.3 | D | 1.00 | 5.00 | mg/L | 50.000 | 22.8 | 103 | 80-120 | | |
| **Batch L211182 - Default Prep GenChem** | | | | | | | | | | | |
| **Blank (L211182-BLK1)** | | | | | Prepared: 11/19/2012 12:00 Analyzed: 11/19/2012 15:20 | | | | | | |
| Sulfate | 0.10 | U | 0.10 | 0.50 | mg/L | | | | | | |
| **LCS (L211182-BS1)** | | | | | Prepared: 11/19/2012 12:00 Analyzed: 11/19/2012 15:20 | | | | | | |
| Sulfate | 4.85 | | 0.10 | 0.50 | mg/L | 5.0000 | | 97.0 | 90-110 | | |
| **Duplicate (L211182-DUP1)** | | **Source: 1211065-01** | | | Prepared: 11/19/2012 12:00 Analyzed: 11/19/2012 15:20 | | | | | | |
| Sulfate | 133 | D | 2.00 | 10.0 | mg/L | | 132 | | | 0.257 | 20 |

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|---|---|---|
| WC-Hanford, Inc. | Project: RC-236 | |
| 2620 Fermi Avenue | Project Number: K4030 | **Reported:** |
| Richland WA, 99354 | Project Manager: Joan Kessner | 11/30/2012 15:33 |

# Wet Chemistry - Quality Control

## Lionville Laboratory

| Analyte | Result and Qualifiers | LOD | LOQ | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Batch L211182 - Default Prep GenChem** | | | | | | | | | | |
| **Matrix Spike (L211182-MS1)** | **Source: 1211065-01** | | | Prepared: 11/19/2012 12:00 Analyzed: 11/19/2012 15:20 | | | | | | |
| Sulfate | 380 D | 5.00 | 25.0 | mg/L | 250.00 | 132 | 98.9 | 80-120 | | |
| **Batch L211207 - Default Prep GenChem** | | | | | | | | | | |
| **Blank (L211207-BLK1)** | | | | Prepared & Analyzed: 11/25/2012 10:30 | | | | | | |
| Oil and Grease (HEM) | 2.0 U | 2.0 | 10.0 | mg/L | | | | | | |
| **LCS (L211207-BS1)** | | | | Prepared & Analyzed: 11/25/2012 10:30 | | | | | | |
| Oil and Grease (HEM) | 39.0 | 2.0 | 10.0 | mg/L | 39.700 | | 98.2 | 80-120 | | |
| **LCS (L211207-BS2)** | | | | Prepared & Analyzed: 11/25/2012 10:30 | | | | | | |
| Oil and Grease (HEM) | 37.7 | 2.0 | 10.0 | mg/L | 39.700 | | 95.0 | 80-120 | | |
| **Matrix Spike (L211207-MS1)** | **Source: 1211065-01** | | | Prepared & Analyzed: 11/25/2012 10:30 | | | | | | |
| Oil and Grease (HEM) | 48.0 | 2.2 | 10.8 | mg/L | 42.919 | 2.0 U | 112 | 75-125 | | |