

COVER LETTER

Wednesday, May 20, 2009

Rick Beauheim  
Sandia National Lab  
4100 National Parks Hwy.  
MS1395  
Carlsbad, NM 88220

TEL: (505) 234-0006

FAX (505) 234-0061

RE: WIPP/H-18 (M)

Order No.: 0904340

Dear Rick Beauheim:

Hall Environmental Analysis Laboratory, Inc. received 1 sample(s) on 4/22/2009 for the analyses presented in the following report.

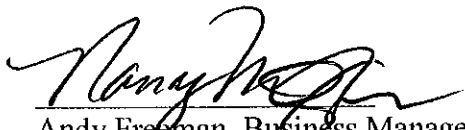
This report is an addendum to the report dated May 20, 2009. Sulfate has been updated for this report.

No determination of compounds below these (denoted by the ND or < sign) has been made. Please don't hesitate to contact Hall Environmental for any additional information or clarifications.

Reporting limits are determined by EPA methodology.

Please don't hesitate to contact HEAL for any additional information or clarifications.

Sincerely,



Andy Freeman, Business Manager

Nancy McDuffie, Laboratory Manager



# Hall Environmental Analysis Laboratory, Inc.

Date: 27-May-09

CLIENT: Sandia National Lab  
 Lab Order: 0904340  
 Project: WIPP/H-18 (M)  
 Lab ID: 0904340-01

Client Sample ID: H-18 (M)\_041709  
 Collection Date: 4/17/2009 8:05:00 AM  
 Date Received: 4/22/2009  
 Matrix: AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
						Analyst: IC
<b>EPA METHOD 300.0: ANIONS</b>						
Fluoride	1.5	0.10		mg/L	1	4/22/2009 10:54:53 PM
Chloride	1700	10		mg/L	100	5/6/2009 11:21:48 AM
Bromide	6.2	1.0		mg/L	10	4/22/2009 11:12:17 PM
Nitrate (As N)+Nitrite (As N)	5.0	4.0		mg/L	20	5/4/2009 1:22:56 PM
Phosphorus, Orthophosphate (As P)	ND	0.50		mg/L	1	4/22/2009 10:54:53 PM
Sulfate	2900	50		mg/L	100	5/6/2009 11:21:48 AM
						Analyst: NMO
<b>EPA METHOD 6010B: DISSOLVED METALS</b>						
Calcium	600	100		mg/L	100	5/5/2009 11:46:56 AM
Magnesium	200	100		mg/L	100	5/5/2009 11:46:56 AM
Potassium	18	1.0		mg/L	1	5/5/2009 10:17:39 AM
Sodium	1300	100		mg/L	100	5/5/2009 11:46:56 AM
Strontium	11	0.60		mg/L	100	5/14/2009 8:26:38 AM
						Analyst: NSB
<b>SM 2320B: ALKALINITY</b>						
Alkalinity, Total (As CaCO3)	44	20		mg/L CaCO3	1	4/23/2009
Carbonate	ND	2.0		mg/L CaCO3	1	4/23/2009
Bicarbonate	44	20		mg/L CaCO3	1	4/23/2009
						Analyst: NSB
<b>EPA 120.1: SPECIFIC CONDUCTANCE</b>						
Specific Conductance	8000	0.010		µmhos/cm	1	4/23/2009
						Analyst: NSB
<b>SM4500-H+B: PH</b>						
pH	7.47	0.1	H	pH units	1	4/23/2009
						Analyst: JMP
<b>SM2540C MOD: TOTAL DISSOLVED SOLIDS</b>						
Total Dissolved Solids	6200	100		mg/L	1	4/22/2009

Qualifiers: \* Value exceeds Maximum Contaminant Level  
 E Estimated value  
 J Analyte detected below quantitation limits  
 ND Not Detected at the Reporting Limit  
 S Spike recovery outside accepted recovery limits

B Analyte detected in the associated Method Blank  
 H Holding times for preparation or analysis exceeded  
 MCL Maximum Contaminant Level  
 RL Reporting Limit

# HALL ENVIRONMENTAL ANALYSIS LABORATORY

## CATION/ANION BALANCE SHEET FOR WATER ANALYSES

HEAL LAB NUMBER	H-18 (M)_041709 0904340-1									
CATIONS	mg/L	meq/L	mg/L	meq/L	mg/L	meq/L	mg/L	meq/L	mg/L	meq/L
Sodium	1300	56.55								
Potassium	18	0.46								
Calcium	600	29.94								
Magnesium	200	16.46								
<b>Total Cations</b>		103.41								
ANIONS	mg/L	meq/L	mg/L	meq/L	mg/L	meq/L	mg/L	meq/L	mg/L	meq/L
Sulfate	2900	60.38								
Chloride	1700	47.95								
Bicarbonate (CaCO <sub>3</sub> )	44	0.88								
Carbonate (CaCO <sub>3</sub> )	ND	*								
Phosphate (P)	ND	*								
Nitrite (N)	ND	*								
Nitrate (N)	5.0	0.36								
Fluoride	1.5	0.08								
Bromide	6.2	0.08								
<b>Total Anions</b>		109.73								
Elect. Cond. (µMhos/cm)	8000									
<b>CATION/ANION RATIO</b>		0.94								
% Difference		3								
TOTAL DISSOLVED SOLIDS RATIOS										
TDS (measured)	6200									
TDS (calculated)	6774									
Ratio meas TDS:calc TDS		0.9								
Ratio Meas. TDS:EC		0.78								
Ratio Calc. TDS:EC		0.85								
Ratio of anion sum:EC		1.4								
Ratio of cation sum:EC		1.3								

\* Analyte not detected (below method detection limit).

\*\* Values below 0.55 can be obtained in waters containing appreciable concentrations of free acid or alkalinity, or not within pH 6 to 9. Values much higher than 0.7 are possible in highly saline waters.

### GENERALLY ACCEPTED RANGES

Cation/Anion balance: 0-3 meq/L- 0.2 meq/L, 3-10 meq/L- 2%, >10 meq/L - 5%

Ratio measured TDS:calculated TDS -- 1.0-1.2. Ratio Calculated TDS:EC -- 0.55-0.7. Ratio Measured TDS:EC--0.55-0.7. Ratio of anion sum:EC -- 0.9-1.1.

Ratio of cation sum:EC -- 0.9-1.1

## QA/QC SUMMARY REPORT

**Client:** Sandia National Lab  
**Project:** WIPP/H-18 (M)

**Work Order:** 0904340

Analyte	Result	Units	PQL	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
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**Method:** EPA Method 300.0: Anions

<b>Sample ID: MB</b>		<i>MBLK</i>								Batch ID: <b>R33370</b> Analysis Date: 4/22/2009 1:12:14 PM
Fluoride	ND	mg/L	0.10							
Chloride	ND	mg/L	0.10							
Bromide	ND	mg/L	0.10							
Nitrate (As N)+Nitrite (As N)	ND	mg/L	0.20							
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50							
Sulfate	ND	mg/L	0.50							
<b>Sample ID: MB</b>		<i>MBLK</i>								Batch ID: <b>R33509</b> Analysis Date: 5/2/2009 1:01:19 PM
Fluoride	ND	mg/L	0.10							
Chloride	ND	mg/L	0.10							
Bromide	ND	mg/L	0.10							
Nitrate (As N)+Nitrite (As N)	ND	mg/L	0.20							
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50							
Sulfate	ND	mg/L	0.50							
<b>Sample ID: MB</b>		<i>MBLK</i>								Batch ID: <b>R33527</b> Analysis Date: 5/4/2009 12:13:18 PM
Fluoride	ND	mg/L	0.10							
Chloride	ND	mg/L	0.10							
Bromide	ND	mg/L	0.10							
Nitrate (As N)+Nitrite (As N)	ND	mg/L	0.20							
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50							
Sulfate	ND	mg/L	0.50							
<b>Sample ID: MB</b>		<i>MBLK</i>								Batch ID: <b>R33569</b> Analysis Date: 5/6/2009 9:19:55 AM
Fluoride	ND	mg/L	0.10							
Chloride	ND	mg/L	0.10							
Bromide	ND	mg/L	0.10							
Nitrate (As N)+Nitrite (As N)	ND	mg/L	0.20							
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50							
Sulfate	ND	mg/L	0.50							
<b>Sample ID: LCS</b>		<i>LCS</i>								Batch ID: <b>R33370</b> Analysis Date: 4/22/2009 1:29:38 PM
Fluoride	0.5316	mg/L	0.10	106	90	110				
Chloride	5.200	mg/L	0.10	104	90	110				
Bromide	2.652	mg/L	0.10	106	90	110				
Nitrate (As N)+Nitrite (As N)	3.608	mg/L	0.20	103	90	110				
Phosphorus, Orthophosphate (As P)	5.258	mg/L	0.50	105	90	110				
Sulfate	10.50	mg/L	0.50	105	90	110				
<b>Sample ID: LCS</b>		<i>LCS</i>								Batch ID: <b>R33509</b> Analysis Date: 5/2/2009 1:18:43 PM
Fluoride	0.4675	mg/L	0.10	93.5	90	110				
Chloride	5.064	mg/L	0.10	101	90	110				
Bromide	2.553	mg/L	0.10	102	90	110				
Nitrate (As N)+Nitrite (As N)	3.538	mg/L	0.20	101	90	110				
Phosphorus, Orthophosphate (As P)	5.077	mg/L	0.50	102	90	110				
Sulfate	10.20	mg/L	0.50	102	90	110				
<b>Sample ID: LCS</b>		<i>LCS</i>								Batch ID: <b>R33627</b> Analysis Date: 5/4/2009 12:30:42 PM
Fluoride	0.4664	mg/L	0.10	93.3	90	110				

**Qualifiers:**

E	Estimated value	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	S	Spike recovery outside accepted recovery limits

## QA/QC SUMMARY REPORT

**Client:** Sandia National Lab  
**Project:** WIPP/H-18 (M)

**Work Order:** 0904340

Analyte	Result	Units	PQL	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
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<b>Method:</b> EPA Method 300.0: Anions									
<b>Sample ID:</b> LCS		LCS				Batch ID: R33527	Analysis Date:	5/4/2009 12:30:42 PM	
Chloride	5.093	mg/L	0.10	102	90	110			
Bromide	2.668	mg/L	0.10	107	90	110			
Nitrate (As N)+Nitrite (As N)	3.565	mg/L	0.20	102	90	110			
Phosphorus, Orthophosphate (As P)	4.940	mg/L	0.50	98.8	90	110			
Sulfate	10.27	mg/L	0.50	103	90	110			
<b>Sample ID:</b> LCS		LCS				Batch ID: R33669	Analysis Date:	5/6/2009 9:37:19 AM	
Fluoride	0.4937	mg/L	0.10	98.7	90	110			
Chloride	5.009	mg/L	0.10	100	90	110			
Bromide	2.541	mg/L	0.10	102	90	110			
Nitrate (As N)+Nitrite (As N)	3.521	mg/L	0.20	101	90	110			
Phosphorus, Orthophosphate (As P)	5.167	mg/L	0.50	103	90	110			
Sulfate	10.21	mg/L	0.50	102	90	110			

<b>Method:</b> SM 2320B: Alkalinity									
<b>Sample ID:</b> MB		MBLK				Batch ID: R33386	Analysis Date:	4/23/2009	
Alkalinity, Total (As CaCO3)	ND	mg/L CaC	20						
Carbonate	ND	mg/L CaC	2.0						
Bicarbonate	ND	mg/L CaC	20						
<b>Sample ID:</b> 80PPM LCS		LCS				Batch ID: R33386	Analysis Date:	4/23/2009	
Alkalinity, Total (As CaCO3)	80.96	mg/L CaC	20	101	80	120			

**Qualifiers:**

- |  |  |
|--|--|
| E Estimated value                            | H Holding times for preparation or analysis exceeded |
| J Analyte detected below quantitation limits | ND Not Detected at the Reporting Limit               |
| R RPD outside accepted recovery limits       | S Spike recovery outside accepted recovery limits    |

## QA/QC SUMMARY REPORT

**Client:** Sandia National Lab  
**Project:** WIPP/H-18 (M)

**Work Order:** 0904340

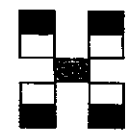
Analyte	Result	Units	PQL	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
<b>Method: EPA Method 6010B: Dissolved Metals</b>									
<b>Sample ID: MB</b>		<i>MBLK</i>							
Calcium	ND	mg/L	1.0						
Magnesium	ND	mg/L	1.0						
Potassium	ND	mg/L	1.0						
Sodium	ND	mg/L	1.0						
Batch ID: R33536 Analysis Date: 5/5/2009 10:03:59 AM									
<b>Sample ID: MB</b>		<i>MBLK</i>							
Calcium	ND	mg/L	1.0						
Magnesium	ND	mg/L	1.0						
Potassium	ND	mg/L	1.0						
Sodium	ND	mg/L	1.0						
Strontium	ND	mg/L	0.0060						
Batch ID: R33665 Analysis Date: 5/14/2009 8:20:34 AM									
<b>Sample ID: LCS</b>		<i>LCS</i>							
Calcium	52.58	mg/L	1.0	104	80	120			
Magnesium	52.26	mg/L	1.0	103	80	120			
Potassium	54.47	mg/L	1.0	98.9	80	120			
Sodium	56.98	mg/L	1.0	113	80	120			
Batch ID: R33536 Analysis Date: 5/5/2009 10:07:02 AM									
<b>Sample ID: LCS</b>		<i>LCS</i>							
Calcium	50.65	mg/L	1.0	100	80	120			
Magnesium	49.99	mg/L	1.0	99.0	80	120			
Potassium	52.66	mg/L	1.0	95.7	80	120			
Sodium	49.22	mg/L	1.0	97.5	80	120			
Strontium	0.1030	mg/L	0.0080	103	80	120			
Batch ID: R33665 Analysis Date: 5/14/2009 8:23:39 AM									

<b>Method: SM2540C MOD: Total Dissolved Solids</b>									
<b>Sample ID: MB-18917</b>		<i>MBLK</i>							
Total Dissolved Solids	ND	mg/L	20						
Batch ID: 18917 Analysis Date: 4/22/2009									
<b>Sample ID: LCS-18917</b>		<i>LCS</i>							
Total Dissolved Solids	968.0	mg/L	20	96.1	80	120			
Batch ID: 18917 Analysis Date: 4/22/2009									

**Qualifiers:**

E Estimated value	H Holding times for preparation or analysis exceeded
J Analyte detected below quantitation limits	ND Not Detected at the Reporting Limit
R RPD outside accepted recovery limits	S Spike recovery outside accepted recovery limits

# Chain-of-Custody Record



## HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

### Analysis Request

Client: Sandia National Laboratories

Turn-Around Time:

Standard  Rush

Mailing Address: 4100 National Parks Highway

Project Name:

WIPP / H-18 (M)

Carlsbad, NM 88220

Project #:

98806 / 1.4.2.3

Phone #: (575) 234-0107

email or Fax#: (575) 234-0061

Project Manager:

Rick Beauheim /  
Mike Hillesheim

QA/QC Package:

Standard  Level 4 (Full Validation)

Other \_\_\_\_\_

EDD (Type) \_\_\_\_\_

Sampler:

Wes DeYonge, Jeff Palmer

On Ice:

Yes  No

Sample Temperature: 5°

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No.	BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gas only)	TPH Method 8015B (Gas/Diesel)	TPH (Method 418.1)	EDB (Method 504.1)	8310 (PNA or PAH)	RCRA 8 Metals	Anions (F, Cl, NO <sub>3</sub> , NO <sub>2</sub> , PO <sub>4</sub> , SO <sub>4</sub> )	8081 Pesticides / 8082 PCB's	8260B (VOA)	8270 (Semi-VOA)	Cation / Anion Balance	pH, Cond, TDS, Alkalinity	NO <sub>2</sub> + NO <sub>3</sub>	Metals / Strontium	Air Bubbles (Y or N)	
4/17/09	8:05	H <sub>2</sub> O	H-18 (M)_041709	#1: 500 mL	NONE	0904340	-												X	X			
4/17/09	8:05	H <sub>2</sub> O	H-18 (M)_041709	#2: 125 mL	H <sub>2</sub> SO <sub>4</sub>	0904340	-														X		
4/17/09	8:05	H <sub>2</sub> O	H-18 (M)_041709	#3: 125 mL	HNO <sub>3</sub>	0904340	-															X	
			<b>END OF SAMPLE LIST</b>																				

Date: 4/21/09 Time: 09:00 AM Relinquished by: Wesley F. DeYonge  
*Wesley F. DeYonge*

Received by: *[Signature]* Date: 4/22/09 Time: 8:10

Remarks:  
Container #3 was filtered.  
Samples may contain high levels of salts.

Date: \_\_\_\_\_ Time: \_\_\_\_\_ Relinquished by: \_\_\_\_\_

Received by: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the analytical report.

# Chain of Custody

5

**Form Number:**  
 SP 13-1-1

Page 1 of 1  
 Attach more forms as needed

**ACTIVITY/  
 PROJECT  
 SPECIFIC  
 PROCEDURE**  
 Sandia National  
 Laboratories

**1. Initial Sample Custodian** Wesley F. DeYonge Organization: 6712 Date: 04/17/2009  
Printed Name

**2. Sample Collection or Creation Information** Scientific Notebook ID: Magenta Hydrology #9 Sample Team Members/Organization:  
 Test Plan ID: TP 00-03 Field Log ID: N/A Wes DeYonge/ 6712-RESPEC  
 Sample Location: WIPP Monitoring Well H-18 Jeff Palmer/ 6712-Intera  
i.e. borehole/core no./lab bldg. no./etc... enter n/a if none

3. Sample Identification	Date Collected	Container Type	Volume	Preservative	Analysis Request	Sample Description
H-18(M) 041709	04/17/09	PE Bottle	500 ml	None	Anions, pH, TDS, Cond., Alk.	H-18 Magenta water unpreserved -1
H-18(M) 041709	04/17/09	PE Bottle	125 ml	H2SO4	NO2+NO3	H-18 Magenta water preserved w/ sulfuric acid -1
H-18(M) 041709	04/17/09	PE Bottle	125 ml	HNO3	Cations, Metals	H-18 Magenta water filtered & preserved w/ nitric acid -1
--End of Sample List--					Strontium	
<small>enter n/a if none</small>						

**4. Sample Requirements**

Handling: Keep sealed until use

Storage & Preservation: Keep chilled/refrigerated

Shipping: Hand carry/Fed Ex

Archive: N/A

Disposition: Discard samples upon completion of testing

Expiration Date: 05/17/2009

5. Custody Transfer	Organization/Company	Date-Time	Sample Condition
a. Relinquished by: <u>Wesley F. DeYonge</u> <u>Wesley F. DeYonge</u>	<u>6712 / RESPEC</u>	<u>4/21/09 09:00</u>	<u>Containers intact &amp; sealed</u>
a. Received by: <u>[Signature]</u> <u>8:10 4/22/09</u>	<u>HEAL</u>	<u>4/22/09 08:10</u>	<u>5</u>
b. Relinquished by:			
b. Received by:			
c. Relinquished by:			
c. Received by:			

Upon sample receipt, note condition. This form (copy for your records) shall follow samples through its life, until final disposition, then send original to WIPP Records Center. For samples that are potentially hazardous & require packaging and shipping, contact Center 6800 ES&H Coordinator or see SNL ES&H Manual, Chpt. 12.