

March 22, 2018

Great Western Operating Company, LLC
1801 Broadway, Suite 500
Denver, Colorado 80202

Attention: Scot Donato, EH&S/Regulatory Manager

Subject: February 2018 Groundwater Sampling
Haas #1 Former Production Site
Weld County, Colorado
Project Number 160884.EC

Dear Mr. Donato,

As requested, A. G. Wassenaar, Inc. (AGW) has conducted groundwater sampling at the Haas #1 former production site in Weld County, Colorado. The sampling activities were completed on February 12, 2018. This was the third sampling event to occur since AGW installed three (3) monitoring wells at the site in March 2017. The previous sampling event was conducted in September 2017. This letter summarizes the project activities and analytical results.

BACKGROUND

The site is located in the northeast $\frac{1}{4}$ of the southeast $\frac{1}{4}$ of Section 15, Township 6 North, Range 67 West; northwest of the intersection of Highway 392 and County Road 21 in Weld County, Colorado. The site formerly contained one (1) aboveground steel tank for condensate storage, one (1) aboveground tank for produced water storage, and one (1) separate earthen containment berm for the separator.

In March 2016, Great Western Operating Company, LLC (GWOC) requested that AGW visit the Haas #1 facility to collect soil samples following the excavation of approximately 250 cubic yards of visibly impacted soil in the vicinity of the former produced water storage vessel. On March 15, 2016, AGW collected soil samples from the walls and base of the excavation, and from the stockpiled soils. Based on the analytical results, impacted soils remained at the site.

GWOC notified the COGCC, Weld County, the Town of Windsor, and the surface owner of the historical release on March 22, 2016, and a Form 19 Spill/Release Report was submitted on March 24, 2016. A supplemental Spill/Release Report was submitted on April 1, 2016.

In May 2016, AGW completed additional soil and groundwater sampling to define the extent of impact in the vicinity of the release. The results of the May 3, 2016 investigation determined that groundwater had been impacted at the site, that impacted soil remained at the site, and additional excavation was needed.

To address the remaining impacted soils and groundwater at the site, on October 4 and October 5, 2016, the excavation at the Haas #1 facility was extended, and 650 cubic yards of additional impacted soils were

removed. AGW conducted post-excavation soil sampling from each of the four walls of the excavation. Based on the analytical results, impacted soils were removed laterally and to the depth of groundwater. 1,150 pounds of COGAC™ (Chemically Oxygenated Granular Activated Carbon) were incorporated into the soil and groundwater at the base of the excavation. COGAC™, a patented material manufactured by Remington Technologies, LLC, degrades contaminants via chemical oxidation and passive bio-stimulation, as well as mitigating desorbed contaminant mass. Additionally, PVC pipe was installed horizontally within the excavation to provide access to groundwater for possible future remediation efforts.

To monitor the effectiveness of the remediation activities, in March 2017, AGW installed and sampled three (3) monitoring wells at the Haas #1 site. The three (3) wells were sampled again on September 22, 2017 and February 12, 2018. Details of the groundwater sampling methods and results are included below.

GROUNDWATER SAMPLING

AGW conducted the third groundwater sampling event of the three (3) onsite monitoring wells on February 12, 2018.

Groundwater Elevation Measurements

Table 1, below, summarizes the groundwater depth measurements and elevations on February 12, 2018.

**Table 1: Groundwater Depths
Haas #1
February 12, 2018**

Well Number	Top of Casing (TOC) Elevation	Depth to Groundwater (TOC)	Groundwater Elevation
MW-1	100.00	9.16	90.84
MW-2	99.45	9.00	90.45
MW-3	99.74	9.21	90.53

Elevations are in feet based on a site datum of 100.00 feet. Benchmark is the top of MW-1 well pipe casing.

Based on the survey elevation data and groundwater levels collected on February 12, 2018, groundwater at the Haas #1 site flows to the south-southwest. Figure 1 in Attachment A illustrates the groundwater elevations and estimated flow direction.

Groundwater Sampling Methods

AGW collected groundwater samples from monitoring wells MW-1, MW-2, and MW-3 for analytical testing. To collect the samples, AGW utilized a dedicated plastic bailer attached to nylon cord at each borehole. Each sample was transferred into three acid-preserved glass vials supplied by the laboratory. The filled sample containers were immediately sealed, labeled, and placed into a cooler with ice (a preservative). The samples were delivered to Origins Laboratory, Inc. (Origins) of Denver, Colorado for analytical testing. During this project, AGW followed chain-of-custody procedures in general accordance with Environmental Protection Agency (EPA) guidelines. Origins analyzed all three groundwater samples for Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) using EPA Method 8260C.

Groundwater Analytical Results

Table 2, below, summarizes the groundwater analytical results. A copy of the laboratory report is included in Attachment B. The results are also illustrated on Figure 2 in Attachment A.

**Table 2: Groundwater Analytical Results
Haas #1**

Sample Number	Date Sampled	Benzene	Toluene	Ethylbenzene	Total Xylenes
MW-1	3/17/17	0.00147	ND	ND	0.00365
	9/22/17	0.0103	ND	ND	ND
	2/12/18	ND	ND	ND	ND
MW-2	3/17/17	7.29	0.791	0.535	2.38
	9/22/17	3.980	0.0373	0.170	0.464
	2/12/18	5.260	ND	0.333	1.100
MW-3	3/17/17	ND	ND	ND	ND
	9/22/17	ND	ND	ND	ND
	2/12/18	ND	ND	ND	ND
COGCC Table 910-1 Concentrations (mg/L)		0.005	1.0	0.70	10.0

All concentrations are in mg/L = Milligrams per liter, parts per million

ND = Not detected above laboratory detection limits

Analytes in **bold** exceed their respective COGCC Table 910-1 concentration

To evaluate the groundwater analytical results, AGW consulted the Table 910-1 Concentration Levels provided within COGCC 900 Series Rules for Exploration and Production Waste Management. Based on the analytical results, groundwater from MW-1 and MW-3 did not contain BTEX concentrations greater than their respective COGCC Table 910-1 standards in any of the three sampling events. Groundwater collected from MW-2 has contained benzene concentrations in exceedance of the COGCC Table 910-1 value of 0.005 mg/L in all three sampling events; the February 2018 benzene concentration of 5.260 mg/L has increased from the September 2017 concentration of 3.980 mg/L, but is lower than the March 2017 concentration of 7.29 mg/L.

DISCUSSION AND CONCLUSIONS

On February 12, 2018, AGW conducted the third groundwater sampling event of three (3) monitoring wells at the Haas #1 former production site, following well installation in March 2017. Based on analytical results, groundwater collected from MW-1, located in the area of the original release, and MW-3, located cross gradient of the original release, did not contain BTEX concentrations above the COGCC Table 910-1

concentrations. Groundwater collected from MW-2, located downgradient of the original release, contained benzene at a concentration greater than the COGCC Table 910-1 standard. The benzene concentration in groundwater at MW-2 has decreased since the March 2017 sampling event, but increased slightly from the previous event in September 2017. The concentrations overall suggest that natural attenuation following soil removal is occurring, however, ongoing quarterly groundwater monitoring is recommended to determine the continued effectiveness of remediation efforts at the Haas #1 former production site. The next quarterly groundwater sampling event is scheduled for May 2018.

Thank you for your review of this report. If you have any questions or require further information, please call us at (303) 759-8373.

Sincerely,
A.G. Wassenaar, Inc.

A handwritten signature in black ink that reads "Rachel A. Peterson". The signature is written in a cursive style and is positioned above a horizontal line.

Rachel A. Peterson, P.G.
Senior Project Manager

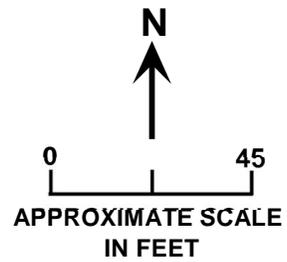
RAP/alb/mjg

Attachments

ATTACHMENT A

DIAGRAMS





LEGEND

- MONITORING WELL LOCATION
- GROUNDWATER ELEVATION (FEET)
- GROUNDWATER ELEVATION CONTOUR

NOTE: ALL LOCATIONS ARE APPROXIMATE

A.G. WASSENAAR | **INC.**

HAAS #1
WELD COUNTY, COLORADO
AGW PROJECT NUMBER: 160884

FIGURE 1
GROUNDWATER ELEVATIONS
AND FLOW DIRECTION

February 12, 2018



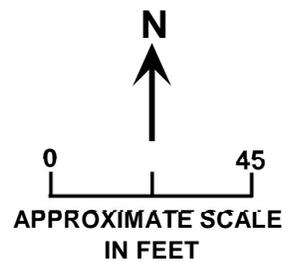
LEGEND

▲ - MONITORING WELL LOCATION

B: BENZENE
 T: TOLUENE
 E: ETHYLBENZENE
 X: TOTAL XYLENES

ND: Not detected above laboratory detection limits

NOTE: All locations are approximate
 Concentrations in milligrams per liter (mg/L)
 Concentrations in **BOLD** exceed COGCC
 Table 910-1



A.G. WASSENAAR | INC.

<p>HAAS #1 WELD COUNTY, COLORADO AGW PROJECT NUMBER: 160884</p>		<p>FIGURE 2 GROUNDWATER ANALYTICAL RESULTS February 12, 2018</p>
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ATTACHMENT B

LABORATORY ANALYTICAL REPORTS



February 20, 2018

A.G. Wassenaar

Rachel Peterson

2180 South Ivanhoe Street - Suite 5

Denver

CO 80222

Project Name - HAAS #1

Project Number - 160884

Attached are your analytical results for HAAS #1 received by Origins Laboratory, Inc. February 12, 2018. This project is associated with Origins project number Y802169-01.

The analytical results in the following report were analyzed under the guidelines of EPA Methods. These methods are identified as follows; "SW" are defined in SW-846, "EPA" are defined in 40CFR part 136 and "SM" are defined in the most current revision of Standard Methods For the Examination of Water and Wastewater.

The analytical results apply specifically to the samples and analyses specified per the attached Chain of Custody. As such, this report shall not be reproduced except in full, without the written approval of Origin's laboratory.

Unless otherwise noted, the analytical results for all soil samples are reported on a wet weight basis. All analytical analyses were performed under NELAP guidelines unless noted by a data qualifier.

Any holding time exceedances, deviations from the method specifications or deviations from Origins Laboratory's Standard Operating Procedures are outlined in the case narrative.

Thank you for selecting Origins for your analytical needs. Please contact us with any questions concerning this report, or if we can help with anything at all.

Origins Laboratory, Inc.
303.433.1322
o-squad@oelabinc.com



A.G. Wassenaar
2180 South Ivanhoe Street - Suite 5
Denver CO 80222

Rachel Peterson
Project Number: 160884
Project: HAAS #1

CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-1	Y802169-01	Water	February 12, 2018 15:05	02/12/2018 17:30
MW-2	Y802169-02	Water	February 12, 2018 15:10	02/12/2018 17:30
MW-3	Y802169-03	Water	February 12, 2018 15:00	02/12/2018 17:30

Origins Laboratory, Inc.



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A.G. Wassenaar
 2180 South Ivanhoe Street - Suite 5
 Denver CO 80222

Rachel Peterson
 Project Number: 160884
 Project: HAAS #1

Origins Laboratory

F-012207-01-R1
 Effective Date: 01/09/12

Sample Receipt Checklist

Origins Work Order: 17862169

Client: A.G. Wassenaar

Client Project ID: HAAS #1

Checklist Completed by: Joe Lee

Shipped Via: HD
(UPS, FedEx, Hand Delivered, Pick-up, etc.)

Date/time completed: 2-13-12

Airbill #: NA

Matrix(s) Received: (Check all that apply): Soil/Solid Water Other: _____

Cooler Number/Temperature: 1 / 3.5 °C _____ / _____ °C _____ / _____ °C _____ / _____ °C (Describe)

Thermometer ID: 1003

Requirement Description	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature between 0°C to ≤ 6°C ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Is there ice present (document if blue ice is used)	<input checked="" type="checkbox"/>			
Are custody seals present on cooler? (if so, document in comments if they are signed and dated, broken or intact)		<input checked="" type="checkbox"/>		
Are custody seals present on each sample container? (if so, document in comments if they are signed and dated, broken or intact)		<input checked="" type="checkbox"/>		
Were all samples received intact ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Was adequate sample volume provided ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Are short holding time analytes or samples with HTs due within 48 hours present ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		NO
Is a chain-of-custody (COC) present and filled out completely ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Does the COC agree with the number and type of sample bottles received ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Do the sample IDs on the bottle labels match the COC ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Is the COC properly relinquished by the client with date and time recorded ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
For volatiles in water – is there headspace (> ¼ inch bubble) present? If yes, contact client and note in narrative.		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	NO
Are samples preserved that require preservation and was it checked ⁽¹⁾ ? (note ID of confirmation instrument used in comments) / (preservation is not confirmed for subcontracted analyses in order to insure sample integrity)/(pH <2 for samples preserved with HNO ₃ , HCL, H ₂ SO ₄) / (pH >10 for samples preserved with NaAsO ₂ +NaOH, ZnAc+NaOH)			<input checked="" type="checkbox"/>	
Additional Comments (if any):				

⁽¹⁾If NO, then contact the client before proceeding with analysis and note date/time and person contacted as well as the corrective action to in the additional comments (above) and the case narrative.

Reviewed by (Project Manager) Joe Lee

Date/Time Reviewed 2/14/12

Origins Laboratory, Inc.



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A.G. Wassenaar
2180 South Ivanhoe Street - Suite 5
Denver CO 80222

Rachel Peterson
Project Number: 160884
Project: HAAS #1

MW-1

2/12/2018 3:05:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.
Y802169-01 (Water)

BTEX by EPA 8260C

Benzene	ND	1.00	ug/L	1	B8B1404	02/14/2018	02/14/2018	U
Toluene	ND	1.00	"	"	"	"	"	U
Ethylbenzene	ND	1.00	"	"	"	"	"	U
Xylenes, total	ND	1.00	"	"	"	"	"	U
Surrogate: 1,2-Dichloroethane-d4	98.3 %	84-121			"	"	"	
Surrogate: Toluene-d8	101 %	85-115			"	"	"	
Surrogate: 4-Bromofluorobenzene	99.1 %	84-114			"	"	"	

Origins Laboratory, Inc.



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A.G. Wassenaar
 2180 South Ivanhoe Street - Suite 5
 Denver CO 80222

Rachel Peterson
 Project Number: 160884
 Project: HAAS #1

MW-2

2/12/2018 3:10:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.
Y802169-02 (Water)

BTEX by EPA 8260C

Benzene	5260	50.0	ug/L	50	B8B1404	02/14/2018	02/14/2018	
Toluene	ND	50.0	"	"	"	"	"	U
Ethylbenzene	333	50.0	"	"	"	"	"	
Xylenes, total	1100	50.0	"	"	"	"	"	
Surrogate: 1,2-Dichloroethane-d4	97.0 %	84-121			"	"	"	
Surrogate: Toluene-d8	102 %	85-115			"	"	"	
Surrogate: 4-Bromofluorobenzene	99.7 %	84-114			"	"	"	

Origins Laboratory, Inc.



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A.G. Wassenaar
 2180 South Ivanhoe Street - Suite 5
 Denver CO 80222

Rachel Peterson
 Project Number: 160884
 Project: HAAS #1

MW-3
2/12/2018 3:00:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.
Y802169-03 (Water)

BTEX by EPA 8260C

Benzene	ND	1.00	ug/L	1	B8B1404	02/14/2018	02/14/2018	U
Toluene	ND	1.00	"	"	"	"	"	U
Ethylbenzene	ND	1.00	"	"	"	"	"	U
Xylenes, total	ND	1.00	"	"	"	"	"	U
Surrogate: 1,2-Dichloroethane-d4	98.6 %	84-121			"	"	"	
Surrogate: Toluene-d8	102 %	85-115			"	"	"	
Surrogate: 4-Bromofluorobenzene	97.3 %	84-114			"	"	"	

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 Denver CO 80222

Rachel Peterson
 Project Number: 160884
 Project: HAAS #1

Volatile Organic Compounds by GC/MS SW846 8260C - Quality Control
Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B8B1404 - EPA 5030B (Water)

Blank (B8B1404-BLK1)

Prepared: 02/14/2018 Analyzed: 02/14/2018

Benzene	ND	1.00	ug/L							U
Toluene	ND	1.00	"							U
Ethylbenzene	ND	1.00	"							U
Xylenes, total	ND	1.00	"							U
Surrogate: 1,2-Dichloroethane-d4	65		"	62.5		105	84-121			
Surrogate: Toluene-d8	61		"	62.5		97.0	85-115			
Surrogate: 4-Bromofluorobenzene	62		"	62.5		99.6	84-114			

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Rachel Peterson
 Project Number: 160884
 Project: HAAS #1

Volatile Organic Compounds by GC/MS SW846 8260C - Quality Control
Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B8B1404 - EPA 5030B (Water)

LCS (B8B1404-BS1)

Prepared: 02/14/2018 Analyzed: 02/14/2018

Benzene	49.3	1.00	ug/L	50.0		98.7	73.3-129			
Toluene	48.3	1.00	"	50.0		96.5	76.2-123			
Ethylbenzene	49.5	1.00	"	50.0		99.0	73.6-130			
m,p-Xylene	99.7	2.00	"	100		99.7	76.1-126			
o-Xylene	49.8	1.00	"	50.0		99.7	76.6-124			
Surrogate: 1,2-Dichloroethane-d4	60		"	62.5		96.2	84-121			
Surrogate: Toluene-d8	63		"	62.5		101	85-115			
Surrogate: 4-Bromofluorobenzene	64		"	62.5		102	84-114			

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Rachel Peterson
 Project Number: 160884
 Project: HAAS #1

Volatile Organic Compounds by GC/MS SW846 8260C - Quality Control
Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B8B1404 - EPA 5030B (Water)

Matrix Spike (B8B1404-MS1)	Source: Y802161-01			Prepared: 02/14/2018 Analyzed: 02/15/2018						
Benzene	64.0	1.00	ug/L	50.0	ND	128	74-130			
Toluene	62.6	1.00	"	50.0	ND	125	73-131			
Ethylbenzene	66.2	1.00	"	50.0	ND	132	76-132			
m,p-Xylene	128	2.00	"	100	0.290	128	69-139			
o-Xylene	62.2	1.00	"	50.0	ND	124	74-131			
Surrogate: 1,2-Dichloroethane-d4	58		"	62.5		93.4	84-121			
Surrogate: Toluene-d8	64		"	62.5		102	85-115			
Surrogate: 4-Bromofluorobenzene	63		"	62.5		100	84-114			

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Rachel Peterson
 Project Number: 160884
 Project: HAAS #1

Volatile Organic Compounds by GC/MS SW846 8260C - Quality Control
Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B8B1404 - EPA 5030B (Water)

Matrix Spike Dup (B8B1404-MSD1)	Source: Y802161-01			Prepared: 02/14/2018 Analyzed: 02/14/2018						
Benzene	65.1	1.00	ug/L	50.0	ND	130	74-130	1.61	20	
Toluene	64.5	1.00	"	50.0	ND	129	73-131	2.98	20	
Ethylbenzene	65.8	1.00	"	50.0	ND	132	76-132	0.697	20	
m,p-Xylene	130	2.00	"	100	0.290	129	69-139	1.21	20	
o-Xylene	65.6	1.00	"	50.0	ND	131	74-131	5.34	20	
Surrogate: 1,2-Dichloroethane-d4	57		"	62.5		91.6	84-121			
Surrogate: Toluene-d8	64		"	62.5		102	85-115			
Surrogate: 4-Bromofluorobenzene	62		"	62.5		99.6	84-114			

Origins Laboratory, Inc.



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A.G. Wassenaar
2180 South Ivanhoe Street - Suite 5
Denver CO 80222

Rachel Peterson
Project Number: 160884
Project: HAAS #1

Notes and Definitions

U Sample is Non-Detect.

ND Analyte NOT DETECTED at or above the reporting limit

RPD Relative Percent Difference

All soil results are reported at a wet weight basis.

Origins Laboratory, Inc.



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Jen Pellegrini For Noelle Doyle Mathis, President