



**Nicholson GeoSolutions LLC**

3433 East Lake Drive  
Centennial, CO 80121

November 6, 2017

Mr. Terry Pape  
HRM Resources, LLC  
410 17<sup>th</sup> Street, Suite 1600  
Denver, CO 80202

**Subject: Lipplemann “P” Landfarm Sampling Results  
COGCC Remediation #9058**

Dear Terry:

Nicholson GeoSolutions LLC was retained by HRM Resources II LLC (HRM) to conduct soil sampling of the landfarm on the Lipplemann “P” lease, Washington County, Colorado. Sampling of the landfarm was conducted at the required rate of approximately one sample per 100 yards of material on October 23<sup>rd</sup>, 2017. The landfarm was previously sampled on October 18<sup>th</sup>, 2015, May 25<sup>th</sup>, 2016, October 29<sup>th</sup>, 2016, and May 16<sup>th</sup>, 2017.

GPS mapping showed that three landfarm cells cover a total of about 0.38 acres and contain an estimated 980 yards of material. Eleven discrete soil samples were collected at depths of approximately 12-16 inches from approximately the same locations as those previously collected. The extent of the landfarm cells and the locations of the samples are shown on Figure 1.

All samples were analyzed for Total Volatile Petroleum Hydrocarbons (TVPH – gasoline range), Total Extractable Petroleum Hydrocarbons (TEPH – diesel and motor oil range) and BTEX (benzene, toluene, ethylbenzene, and xylenes) to evaluate compliance with the COGCC Table 910-1 standards and further treatment needs. SAR, pH, and conductivity were previously analyzed in October 2016 for the landfarm samples from this site.

Table 1 provides a summary of the analytical results for the samples. The laboratory report is contained in Appendix A. For the October 2017 sampling event, the sum of the concentrations of gasoline, diesel, and motor oil range petroleum hydrocarbons (total petroleum hydrocarbons [TPH]) exceeded the COGCC standard of 500 mg/kg for 10 of the 11 samples and ranged from 129 mg/kg to 9,966 mg/kg.

**Table 1 Lippelmann “P” Landfarm Sample Results – October 23, 2017**

	Table 910-1 Standards	Lippelmann LF-1	Lippelmann LF-2	Lippelmann LF-3	Lippelmann LF-4	Lippelmann LF-5
TVPH – gasoline range	500 <sup>1</sup>	<0.1	46.0	<0.1	0.122	<0.1
TEPH – diesel/motor oil range		741	9,920	902	3,750	2,590
benzene	0.17	0.00231	<0.0125	0.000991	0.00118	0.000893
toluene	85	<0.005	<0.125	<0.005	<0.005	<0.005
ethylbenzene	100	0.000698	0.567	<0.0005	<0.0005	<0.0005
xylenes	175	0.00178	0.191	<0.0015	<0.0015	<0.0015

	Standards	Lippelmann LF-6	Lippelmann LF-7	Lippelmann LF-8	Lippelmann LF-9	Lippelmann LF-10	Lippelmann LF-11
TVPH	500 <sup>1</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	108
TEPH		3,530	2,550	2,790	1,615	129	4,600
benzene	0.17	0.000985	<0.0005	0.00132	0.00203	0.00197	0.0671
toluene	85	<0.005	<0.005	<0.005	<0.005	<0.005	0.13
ethylbenzene	100	<0.0005	<0.0005	0.000535	0.000721	0.000628	1.20
xylenes	175	<0.0015	<0.0015	<0.0015	0.00167	0.00195	0.282

<sup>1</sup>The standard is 500 for the combined total of TVPH and TEPH All units in mg/kg

Values in bold type exceed standards

Table 2 provides the TPH results for the October 18<sup>th</sup>, 2015 and October 23<sup>rd</sup>, 2017 samples and the percent difference between the two samples at each sample location. TPH ranged from 932 mg/kg to 8,160 mg/kg for the October 2015 samples and from 129 mg/kg to 9,966 mg/kg for the October 2017 samples. The TPH concentration was lower for the October 2017 samples at 6 of the 11 sample locations and higher at five locations.

**Table 2 Comparison of TPH Results, October 18, 2015 and October 23, 2017**

Sample Location	TPH (mg/kg) October 18, 2015	TPH (mg/kg) October 23, 2017	%Difference
Lippelmann-LF-1	932	741	-20.5
Lippelmann-LF-2	7,351	9,966	35.6
Lippelmann-LF-3	2,339	902	-61.4
Lippelmann-LF-4	3,155	3,750.1	18.9
Lippelmann-LF-5	4,951	2,590	-47.7
Lippelmann-LF-6	2,874	3,530	22.8
Lippelmann-LF-7	5,840	2,550	-56.3
Lippelmann-LF-8	1,582	2,790	76.4
Lippelmann-LF-9	8,160	1,615	-80.2
Lippelmann-LF-10 <sup>1</sup>	65,653	129	-99.8
Lippelmann-LF-11 <sup>1</sup>	2,449	4,708	92.2

<sup>1</sup>comparison is between May 25<sup>th</sup>, 2016 and October 23<sup>rd</sup>, 2017

Table 3 provides summary statistics for the two sampling events. The average TPH concentration for the eleven samples decreased from 4,132 mg/kg to 3,025 mg/kg between October 18<sup>th</sup>, 2015 and October 23<sup>rd</sup>, 2017. The median concentration dropped from 3,155 mg/kg to 2,590 mg/kg. Using the results provided above in Table 2, the average % TPH decrease for the overall landfarm was -26.8%.

**Table 3            Summary Statistics for the October 2015 and October 2017 Samples**

<b>Sample Date</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Average</b>	<b>Median</b>	<b>Average % Difference</b>
Oct 18, 2015	932	8,160	4,132	3,155	
Oct 23, 2017	129.3	9,966	3,025	2,590	-26.8

Using the difference between the average TPH concentrations of 1,107 mg/kg, and the time period of 736 days, a biodegradation rate of 1.5 mg/kg-day is obtained. Using these data, and assuming a linear rate of decay, approximately 1,683 days of treatment remain to reach the standard of 500 mg/kg. The actual time required to reach the standard may be more than estimated if the decay is not linear.

Based on the analytical results, bioremediation of the TPH contained in the soils in the landfarm cells at the Lipplemann "P" lease is occurring. Tilling of the landfarm was performed on March 14<sup>th</sup>, April 25<sup>th</sup>, and September 30<sup>th</sup> during 2017. In addition, a nitrogen fertilizer was added during the April 2017 tilling. Additional treatment of the landfarm cells including tilling and the addition of water during dry periods should be conducted prior to the next sampling event in May 2018.

Nicholson GeoSolutions LLC



David K. Nicholson, P.G.  
Principal Geologist





**APPENDIX A**  
**Laboratory Report**



November 08, 2017

## HRM Resources, LLC - Denver, CO

Sample Delivery Group: L946609

Samples Received: 10/26/2017

Project Number:

Description: Lipplemann

Report To: Dave Nicholson  
410 17th St., Ste. 1600  
Denver, CO 80202

Entire Report Reviewed By:



Mark W. Beasley  
Technical Service Representative

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.



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# SAMPLE SUMMARY

ONE LAB. NATIONWIDE.



## LIPPLEMANN-LF-1 L946609-01 Solid

			Collected by DK Nicholson	Collected date/time 10/23/17 10:45	Received date/time 10/26/17 08:45
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (GC) by Method 8015/8021	WG1036417	1	10/27/17 13:27	10/28/17 12:05	BMB
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1037969	10	11/02/17 11:51	11/04/17 12:45	ADF

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

## LIPPLEMANN-LF-2 L946609-02 Solid

			Collected by DK Nicholson	Collected date/time 10/23/17 10:50	Received date/time 10/26/17 08:45
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (GC) by Method 8015/8021	WG1036417	25	10/27/17 13:27	11/02/17 13:32	ACG
Volatile Organic Compounds (GC) by Method 8021	WG1036417	25	10/27/17 13:27	11/02/17 17:30	BMB
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1037969	100	11/02/17 11:51	11/04/17 16:27	ADF

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

## LIPPLEMANN-LF-3 L946609-03 Solid

			Collected by DK Nicholson	Collected date/time 10/23/17 10:55	Received date/time 10/26/17 08:45
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (GC) by Method 8015/8021	WG1036417	1	10/27/17 13:27	11/02/17 13:56	ACG
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1037969	50	11/02/17 11:51	11/06/17 20:21	ACM

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

## LIPPLEMANN-LF-4 L946609-04 Solid

			Collected by DK Nicholson	Collected date/time 10/23/17 11:00	Received date/time 10/26/17 08:45
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (GC) by Method 8015/8021	WG1036417	1	10/27/17 13:27	11/02/17 14:20	ACG
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1037969	50	11/02/17 11:51	11/04/17 17:01	ADF

## LIPPLEMANN-LF-5 L946609-05 Solid

			Collected by DK Nicholson	Collected date/time 10/23/17 11:05	Received date/time 10/26/17 08:45
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (GC) by Method 8015/8021	WG1036417	1	10/27/17 13:27	11/02/17 14:44	ACG
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1037969	50	11/02/17 11:51	11/04/17 17:18	ADF

## LIPPLEMANN-LF-6 L946609-06 Solid

			Collected by DK Nicholson	Collected date/time 10/23/17 11:10	Received date/time 10/26/17 08:45
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (GC) by Method 8015/8021	WG1036417	1	10/27/17 13:27	11/02/17 15:08	ACG
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1037969	100	11/02/17 11:51	11/04/17 17:35	ADF

## LIPPLEMANN-LF-7 L946609-07 Solid

			Collected by DK Nicholson	Collected date/time 10/23/17 11:15	Received date/time 10/26/17 08:45
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (GC) by Method 8015/8021	WG1036417	1	10/27/17 13:27	10/28/17 14:24	BMB
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1037969	100	11/02/17 11:51	11/04/17 17:52	ADF

ACCOUNT:

HRM Resources, LLC - Denver, CO

PROJECT:

SDG:

L946609

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# SAMPLE SUMMARY

ONE LAB. NATIONWIDE.



## LIPPLEMANN-LF-8 L946609-08 Solid

Collected by  
DK Nicholson

Collected date/time  
10/23/17 11:20

Received date/time  
10/26/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (GC) by Method 8015/8021	WG1036417	1	10/27/17 13:27	11/02/17 15:32	ACG
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1037969	100	11/02/17 11:51	11/04/17 18:09	ADF

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

## LIPPLEMANN-LF-9 L946609-09 Solid

Collected by  
DK Nicholson

Collected date/time  
10/23/17 11:25

Received date/time  
10/26/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (GC) by Method 8015/8021	WG1036417	1	10/27/17 13:27	10/28/17 15:10	BMB
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1037969	50	11/02/17 11:51	11/04/17 18:26	ADF

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

## LIPPLEMANN-LF-10 L946609-10 Solid

Collected by  
DK Nicholson

Collected date/time  
10/23/17 11:30

Received date/time  
10/26/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (GC) by Method 8015/8021	WG1036417	1	10/27/17 13:27	11/02/17 15:56	ACG
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1037969	10	11/02/17 11:51	11/06/17 20:05	ACM

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

## LIPPLEMANN-LF-11 L946609-11 Solid

Collected by  
DK Nicholson

Collected date/time  
10/23/17 11:35

Received date/time  
10/26/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (GC) by Method 8015/8021	WG1036417	25	10/27/17 13:27	11/02/17 16:20	ACG
Volatile Organic Compounds (GC) by Method 8021	WG1036417	25	10/27/17 13:27	11/02/17 17:53	BMB
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1037969	50	11/02/17 11:51	11/04/17 19:00	ADF

ACCOUNT:

HRM Resources, LLC - Denver, CO

PROJECT:

SDG:

L946609

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All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times. All MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Mark W. Beasley  
Technical Service Representative

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



## Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.00231		0.000500	1	10/28/2017 12:05	<a href="#">WG1036417</a>
Toluene	ND		0.00500	1	10/28/2017 12:05	<a href="#">WG1036417</a>
Ethylbenzene	0.000698		0.000500	1	10/28/2017 12:05	<a href="#">WG1036417</a>
Total Xylene	0.00178		0.00150	1	10/28/2017 12:05	<a href="#">WG1036417</a>
TPH (GC/FID) Low Fraction	ND		0.100	1	10/28/2017 12:05	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(FID)	65.2	<a href="#">J2</a>	77.0-120		10/28/2017 12:05	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(PID)	65.8	<a href="#">J2</a>	75.0-128		10/28/2017 12:05	<a href="#">WG1036417</a>

## Sample Narrative:

L946609-01 WG1036417: Surrogate failure confirmed by previous run.

## Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
C10-C28 Diesel Range	394		40.0	10	11/04/2017 12:45	<a href="#">WG1037969</a>
C28-C40 Oil Range	347		40.0	10	11/04/2017 12:45	<a href="#">WG1037969</a>
(S) o-Terphenyl	59.8		18.0-148		11/04/2017 12:45	<a href="#">WG1037969</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



## Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.0125	25	11/02/2017 17:30	<a href="#">WG1036417</a>
Toluene	ND		0.125	25	11/02/2017 13:32	<a href="#">WG1036417</a>
Ethylbenzene	0.567		0.0125	25	11/02/2017 13:32	<a href="#">WG1036417</a>
Total Xylene	0.191		0.0375	25	11/02/2017 13:32	<a href="#">WG1036417</a>
TPH (GC/FID) Low Fraction	46.0		2.50	25	11/02/2017 13:32	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(FID)	100		77.0-120		11/02/2017 17:30	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(FID)	101		77.0-120		11/02/2017 13:32	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(PID)	101		75.0-128		11/02/2017 17:30	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(PID)	104		75.0-128		11/02/2017 13:32	<a href="#">WG1036417</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

## Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
C10-C28 Diesel Range	5810		400	100	11/04/2017 16:27	<a href="#">WG1037969</a>
C28-C40 Oil Range	4110		400	100	11/04/2017 16:27	<a href="#">WG1037969</a>
(S) o-Terphenyl	0.000	J7	18.0-148		11/04/2017 16:27	<a href="#">WG1037969</a>

6 Qc

7 Gl

8 Al

9 Sc



## Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.000991		0.000500	1	11/02/2017 13:56	<a href="#">WG1036417</a>
Toluene	ND		0.00500	1	11/02/2017 13:56	<a href="#">WG1036417</a>
Ethylbenzene	ND		0.000500	1	11/02/2017 13:56	<a href="#">WG1036417</a>
Total Xylene	ND		0.00150	1	11/02/2017 13:56	<a href="#">WG1036417</a>
TPH (GC/FID) Low Fraction	ND		0.100	1	11/02/2017 13:56	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(FID)	81.6		77.0-120		11/02/2017 13:56	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(PID)	84.1		75.0-128		11/02/2017 13:56	<a href="#">WG1036417</a>

## Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
C10-C28 Diesel Range	432		200	50	11/06/2017 20:21	<a href="#">WG1037969</a>
C28-C40 Oil Range	470		200	50	11/06/2017 20:21	<a href="#">WG1037969</a>
(S) o-Terphenyl	73.5	<a href="#">J7</a>	18.0-148		11/06/2017 20:21	<a href="#">WG1037969</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc





## Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.00118		0.000500	1	11/02/2017 14:20	<a href="#">WG1036417</a>
Toluene	ND		0.00500	1	11/02/2017 14:20	<a href="#">WG1036417</a>
Ethylbenzene	ND		0.000500	1	11/02/2017 14:20	<a href="#">WG1036417</a>
Total Xylene	ND		0.00150	1	11/02/2017 14:20	<a href="#">WG1036417</a>
TPH (GC/FID) Low Fraction	0.122		0.100	1	11/02/2017 14:20	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(FID)	74.9	<a href="#">J2</a>	77.0-120		11/02/2017 14:20	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(PID)	77.6		75.0-128		11/02/2017 14:20	<a href="#">WG1036417</a>

## Sample Narrative:

L946609-04 WG1036417: Surrogate failure confirmed by previous run.

## Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
C10-C28 Diesel Range	1860		200	50	11/04/2017 17:01	<a href="#">WG1037969</a>
C28-C40 Oil Range	1890		200	50	11/04/2017 17:01	<a href="#">WG1037969</a>
(S) o-Terphenyl	0.000	<a href="#">J7</a>	18.0-148		11/04/2017 17:01	<a href="#">WG1037969</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



## Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.000893		0.000500	1	11/02/2017 14:44	<a href="#">WG1036417</a>
Toluene	ND		0.00500	1	11/02/2017 14:44	<a href="#">WG1036417</a>
Ethylbenzene	ND		0.000500	1	11/02/2017 14:44	<a href="#">WG1036417</a>
Total Xylene	ND		0.00150	1	11/02/2017 14:44	<a href="#">WG1036417</a>
TPH (GC/FID) Low Fraction	ND		0.100	1	11/02/2017 14:44	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(FID)	84.6		77.0-120		11/02/2017 14:44	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(PID)	87.6		75.0-128		11/02/2017 14:44	<a href="#">WG1036417</a>

## Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
C10-C28 Diesel Range	1160		200	50	11/04/2017 17:18	<a href="#">WG1037969</a>
C28-C40 Oil Range	1430		200	50	11/04/2017 17:18	<a href="#">WG1037969</a>
(S) o-Terphenyl	0.000	<a href="#">J7</a>	18.0-148		11/04/2017 17:18	<a href="#">WG1037969</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



## Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.000985		0.000500	1	11/02/2017 15:08	<a href="#">WG1036417</a>
Toluene	ND		0.00500	1	11/02/2017 15:08	<a href="#">WG1036417</a>
Ethylbenzene	ND		0.000500	1	11/02/2017 15:08	<a href="#">WG1036417</a>
Total Xylene	ND		0.00150	1	11/02/2017 15:08	<a href="#">WG1036417</a>
TPH (GC/FID) Low Fraction	ND		0.100	1	11/02/2017 15:08	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(FID)	85.2		77.0-120		11/02/2017 15:08	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(PID)	87.6		75.0-128		11/02/2017 15:08	<a href="#">WG1036417</a>

## Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
C10-C28 Diesel Range	1610		400	100	11/04/2017 17:35	<a href="#">WG1037969</a>
C28-C40 Oil Range	1920		400	100	11/04/2017 17:35	<a href="#">WG1037969</a>
(S) o-Terphenyl	0.000	<a href="#">J7</a>	18.0-148		11/04/2017 17:35	<a href="#">WG1037969</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



## Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.000500	1	10/28/2017 14:24	<a href="#">WG1036417</a>
Toluene	ND		0.00500	1	10/28/2017 14:24	<a href="#">WG1036417</a>
Ethylbenzene	ND		0.000500	1	10/28/2017 14:24	<a href="#">WG1036417</a>
Total Xylene	ND		0.00150	1	10/28/2017 14:24	<a href="#">WG1036417</a>
TPH (GC/FID) Low Fraction	ND		0.100	1	10/28/2017 14:24	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(FID)	82.0		77.0-120		10/28/2017 14:24	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(PID)	82.0		75.0-128		10/28/2017 14:24	<a href="#">WG1036417</a>

## Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
C10-C28 Diesel Range	1270		400	100	11/04/2017 17:52	<a href="#">WG1037969</a>
C28-C40 Oil Range	1280		400	100	11/04/2017 17:52	<a href="#">WG1037969</a>
(S) o-Terphenyl	0.000	<a href="#">J7</a>	18.0-148		11/04/2017 17:52	<a href="#">WG1037969</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



## Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.00132		0.000500	1	11/02/2017 15:32	<a href="#">WG1036417</a>
Toluene	ND		0.00500	1	11/02/2017 15:32	<a href="#">WG1036417</a>
Ethylbenzene	0.000535		0.000500	1	11/02/2017 15:32	<a href="#">WG1036417</a>
Total Xylene	ND		0.00150	1	11/02/2017 15:32	<a href="#">WG1036417</a>
TPH (GC/FID) Low Fraction	ND		0.100	1	11/02/2017 15:32	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(FID)	84.7		77.0-120		11/02/2017 15:32	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(PID)	85.9		75.0-128		11/02/2017 15:32	<a href="#">WG1036417</a>

## Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
C10-C28 Diesel Range	1290		400	100	11/04/2017 18:09	<a href="#">WG1037969</a>
C28-C40 Oil Range	1500		400	100	11/04/2017 18:09	<a href="#">WG1037969</a>
(S) o-Terphenyl	0.000	<a href="#">J7</a>	18.0-148		11/04/2017 18:09	<a href="#">WG1037969</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc





## Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.00203		0.000500	1	10/28/2017 15:10	<a href="#">WG1036417</a>
Toluene	ND		0.00500	1	10/28/2017 15:10	<a href="#">WG1036417</a>
Ethylbenzene	0.000721		0.000500	1	10/28/2017 15:10	<a href="#">WG1036417</a>
Total Xylene	0.00167		0.00150	1	10/28/2017 15:10	<a href="#">WG1036417</a>
TPH (GC/FID) Low Fraction	ND		0.100	1	10/28/2017 15:10	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(FID)	79.0		77.0-120		10/28/2017 15:10	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(PID)	79.7		75.0-128		10/28/2017 15:10	<a href="#">WG1036417</a>

## Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
C10-C28 Diesel Range	785		200	50	11/04/2017 18:26	<a href="#">WG1037969</a>
C28-C40 Oil Range	830		200	50	11/04/2017 18:26	<a href="#">WG1037969</a>
(S) o-Terphenyl	0.000	<a href="#">J7</a>	18.0-148		11/04/2017 18:26	<a href="#">WG1037969</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



## Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.00197		0.000500	1	11/02/2017 15:56	<a href="#">WG1036417</a>
Toluene	ND		0.00500	1	11/02/2017 15:56	<a href="#">WG1036417</a>
Ethylbenzene	0.000628		0.000500	1	11/02/2017 15:56	<a href="#">WG1036417</a>
Total Xylene	0.00195		0.00150	1	11/02/2017 15:56	<a href="#">WG1036417</a>
TPH (GC/FID) Low Fraction	ND		0.100	1	11/02/2017 15:56	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(FID)	97.6		77.0-120		11/02/2017 15:56	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(PID)	101		75.0-128		11/02/2017 15:56	<a href="#">WG1036417</a>

## Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
C10-C28 Diesel Range	62.0		40.0	10	11/06/2017 20:05	<a href="#">WG1037969</a>
C28-C40 Oil Range	67.3		40.0	10	11/06/2017 20:05	<a href="#">WG1037969</a>
(S) o-Terphenyl	73.9		18.0-148		11/06/2017 20:05	<a href="#">WG1037969</a>

1  
Cp2  
Tc3  
Ss4  
Cn5  
Sr6  
Qc7  
Gl8  
Al9  
Sc



## Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
Benzene	0.0671		0.0125	25	11/02/2017 17:53	<a href="#">WG1036417</a>
Toluene	0.130		0.125	25	11/02/2017 16:20	<a href="#">WG1036417</a>
Ethylbenzene	1.20		0.0125	25	11/02/2017 16:20	<a href="#">WG1036417</a>
Total Xylene	0.282		0.0375	25	11/02/2017 16:20	<a href="#">WG1036417</a>
TPH (GC/FID) Low Fraction	108		2.50	25	11/02/2017 16:20	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(FID)	85.1		77.0-120		11/02/2017 17:53	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(FID)	96.9		77.0-120		11/02/2017 16:20	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(PID)	102		75.0-128		11/02/2017 16:20	<a href="#">WG1036417</a>
(S) a,a,a-Trifluorotoluene(PID)	99.3		75.0-128		11/02/2017 17:53	<a href="#">WG1036417</a>

## Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
C10-C28 Diesel Range	2580		200	50	11/04/2017 19:00	<a href="#">WG1037969</a>
C28-C40 Oil Range	2020		200	50	11/04/2017 19:00	<a href="#">WG1037969</a>
(S) o-Terphenyl	0.000	<a href="#">J7</a>	18.0-148		11/04/2017 19:00	<a href="#">WG1037969</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3262330-5 10/28/17 07:35

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Benzene	U		0.000120	0.000500
Toluene	U		0.000150	0.00500
Ethylbenzene	U		0.000110	0.000500
Total Xylene	U		0.000460	0.00150
TPH (GC/FID) Low Fraction	U		0.0217	0.100
(S) a,a,a-Trifluorotoluene(FID)	100			77.0-120
(S) a,a,a-Trifluorotoluene(PID)	100			75.0-128

1  
Cp

2  
Tc

3  
Ss

4  
Cn

5  
Sr

6  
Qc

7  
Gl

8  
Al

9  
Sc

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3262330-1 10/28/17 05:40 • (LCSD) R3262330-2 10/28/17 06:03

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Benzene	0.0500	0.0517	0.0495	103	98.9	71.0-121			4.48	20
Toluene	0.0500	0.0527	0.0500	105	100	72.0-120			5.27	20
Ethylbenzene	0.0500	0.0544	0.0516	109	103	76.0-121			5.31	20
Total Xylene	0.150	0.161	0.152	107	101	75.0-124			5.31	20
(S) a,a,a-Trifluorotoluene(FID)				100	100	77.0-120				
(S) a,a,a-Trifluorotoluene(PID)				99.4	99.3	75.0-128				

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3262330-3 10/28/17 06:26 • (LCSD) R3262330-4 10/28/17 06:49

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
TPH (GC/FID) Low Fraction	5.50	4.91	5.29	89.3	96.2	70.0-136			7.42	20
(S) a,a,a-Trifluorotoluene(FID)				98.8	99.9	77.0-120				
(S) a,a,a-Trifluorotoluene(PID)				107	109	75.0-128				



Method Blank (MB)

(MB) R3263043-1 11/03/17 17:49

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
C10-C28 Diesel Range	U		1.61	4.00
C28-C40 Oil Range	U		0.274	4.00
(S) o-Terphenyl	90.1			18.0-148

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3263043-2 11/03/17 18:06 • (LCSD) R3263043-3 11/03/17 18:23

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
C10-C28 Diesel Range	60.0	50.6	51.2	84.3	85.4	50.0-150			1.29	20
(S) o-Terphenyl				86.1	88.5	18.0-148				

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc





## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

## Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
J2	Surrogate recovery limits have been exceeded; values are outside lower control limits.
J7	Surrogate recovery cannot be used for control limit evaluation due to dilution.

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



ESC Lab Sciences is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our "one location" design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be **YOUR LAB OF CHOICE**.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

## State Accreditations

Alabama	40660	Nevada	TN-03-2002-34
Alaska	UST-080	New Hampshire	2975
Arizona	AZ0612	New Jersey–NELAP	TN002
Arkansas	88-0469	New Mexico	TN00003
California	01157CA	New York	11742
Colorado	TN00003	North Carolina	Env375
Connecticut	PH-0197	North Carolina <sup>1</sup>	DW21704
Florida	E87487	North Carolina <sup>2</sup>	41
Georgia	NELAP	North Dakota	R-140
Georgia <sup>1</sup>	923	Ohio–VAP	CL0069
Idaho	TN00003	Oklahoma	9915
Illinois	200008	Oregon	TN200002
Indiana	C-TN-01	Pennsylvania	68-02979
Iowa	364	Rhode Island	221
Kansas	E-10277	South Carolina	84004
Kentucky <sup>1</sup>	90010	South Dakota	n/a
Kentucky <sup>2</sup>	16	Tennessee <sup>14</sup>	2006
Louisiana	AI30792	Texas	T 104704245-07-TX
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	6157585858
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	109
Minnesota	047-999-395	Washington	C1915
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA
Nebraska	NE-OS-15-05		

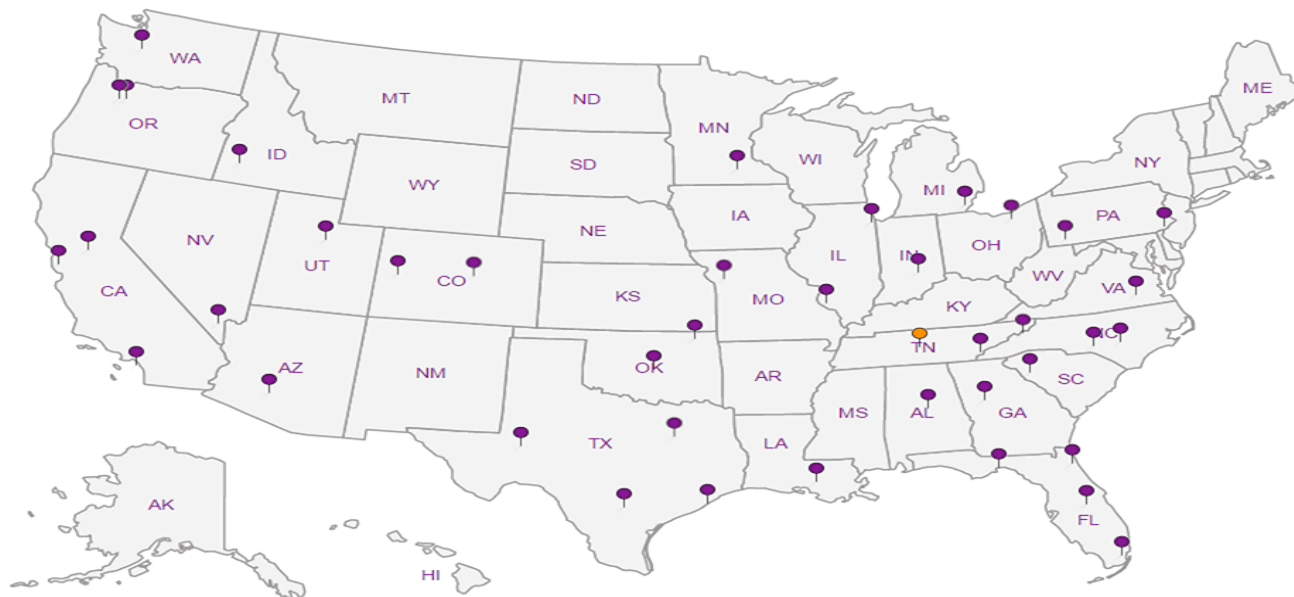
## Third Party & Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	S-67674
EPA–Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>n/a</sup> Accreditation not applicable

## Our Locations

ESC Lab Sciences has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. **ESC Lab Sciences performs all testing at our central laboratory.**



<b>Company Name/Address:</b> <b>Nicholson GeoSolutions. LLC.</b> 3433 E. Lake Dr. Centennial, CO 80121				<b>Billing Information:</b> Terry Pape HRM Resources 1600 17th St. Ste 1600 Denver, CO 80202			
<b>Report to:</b> Dave Nicholson				<b>Email To:</b> dknicholson@q.com			
<b>Project Description:</b> HRM Landform Sampling Lipplemann				<b>City/State Collected:</b>			
<b>Phone:</b> 303-601-2023 <b>Fax:</b>		<b>Client Project #</b>		<b>Lab Project #</b>			
<b>Collected by (print):</b>		<b>Site/Facility ID #</b>		<b>P.O. #</b>			
<b>Collected by (signature):</b> 		<b>Rush? (Lab MUST Be Notified)</b> <input type="checkbox"/> Same Day ..... 200% <input type="checkbox"/> Next Day ..... 100% <input type="checkbox"/> Two Day ..... 50% <input type="checkbox"/> Three Day ..... 25%		<b>Date Results Needed</b>			
<b>Immediately Packed on ice:</b> N <input checked="" type="checkbox"/> Y		<b>Email?</b> <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes <b>FAX?</b> <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes		<b>No. of Cntrs</b>			
Sample ID	Comp/Grab	Matrix *	Depth	Date	Time		
Lipplemann - LF-1		SS		10/23	1045	2 X X	
Lipplemann - LF-2		SS			1050	2 X X	
Lipplemann - LF-3		SS			1055	2 X X	
Lipplemann - LF-4		SS			1100	2 X X	
Lipplemann - LF-5		SS			1105	2 X X	
Lipplemann - LF-6		SS			1110	2 X X	
Lipplemann - LF-7		SS			1115	2 X X	
Lipplemann - LF-8		SS			1120	2 X X	
Lipplemann - LF-9		SS			1125	2 X X	
Lipplemann - LF-10		SS			1130	2 X X	
Lipplemann - LF-11		SS			1135	2 X X	
* Matrix: SS - Soil GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other _____							
<b>Remarks:</b> 4094 83072154							
<b>Relinquished by: (Signature)</b> 		<b>Date:</b> 10/25/17 <b>Time:</b> 1200		<b>Received by: (Signature)</b> 		<b>Samples returned via:</b> <input type="checkbox"/> UPS <input checked="" type="checkbox"/> FedEx <input type="checkbox"/> Courier <input type="checkbox"/> _____	
<b>Relinquished by: (Signature)</b> 		<b>Date:</b> <b>Time:</b>		<b>Received by: (Signature)</b> 		<b>Temp:</b> 68 °C <b>Bottles Received:</b> 22	
<b>Relinquished by: (Signature)</b> 		<b>Date:</b> <b>Time:</b>		<b>Received for lab by: (Signature)</b> 		<b>Date:</b> 10/26/17 <b>Time:</b> 8:45	

pH \_\_\_\_\_ Temp \_\_\_\_\_

Flow \_\_\_\_\_ Other \_\_\_\_\_


Hold # \_\_\_\_\_

Condition: \_\_\_\_\_ (lab use only) OK

COC Seal Intact: ☐ Y ☐ N ☐ NA

pH Checked: \_\_\_\_\_ NCF: \_\_\_\_\_

## ESC LAB SCIENCES Cooler Receipt Form

Client:	HRMPESDCO	SDG#	L946609	
Cooler Received/Opened On: 10/26/17	Temperature:		0.8	
Received by : Christian Kacar				
Signature: 				
<b>Receipt Check List</b>	<b>NP</b>	<b>Yes</b>	<b>No</b>	
COC Seal Present / Intact?	/			
COC Signed / Accurate?		/		
Bottles arrive intact?		/		
Correct bottles used?		/		
Sufficient volume sent?		/		
If Applicable				
VOA Zero headspace?				
Preservation Correct / Checked?				