

State of TN Laboratory

Sample Delivery Group: L1627473
Samples Received: 06/20/2023
Project Number: OUTFALL X12
Description: Oak Ridge USDOE- ORNL
Site: TN0002941
Report To: Sarah Snyder
3711 Middlebrook Pike
Knoxville, TN 37921

Entire Report Reviewed By: 

Dorothy P Roberts
Project Manager

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 Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.

Pace Analytical National

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SAMPLE SUMMARY

OUTFALL X12 SAMPLE 1 L1627473-01 WW

Collected by Sarah Snyder Collected date/time 06/19/23 08:47 Received date/time 06/20/23 09:15

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Aquatic Toxicity by Method 1000.0	WG2081035	1	06/20/23 14:57	06/20/23 14:57	KCW	Mt. Juliet, TN
Aquatic Toxicity by Method 1002.0	WG2081035	1	06/20/23 14:21	06/20/23 14:21	KCW	Mt. Juliet, TN
Calculated Results	WG2082140	1	07/01/23 00:17	07/01/23 00:17	SPL	Mt. Juliet, TN
Wet Chemistry by Method 2320 B-2011	WG2085645	1	06/29/23 09:35	06/29/23 09:35	ARD	Mt. Juliet, TN
Metals (ICP) by Method 200.7	WG2082140	1	06/22/23 22:41	07/01/23 00:17	SPL	Mt. Juliet, TN

1 Cp

2 Tc

3 Ss

4 Cn

OUTFALL X12 SAMPLE 2 L1627473-02 WW

Collected by Sarah Snyder Collected date/time 06/21/23 08:19 Received date/time 06/22/23 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG2084204	1	07/05/23 23:38	07/05/23 23:38	ZSA	Mt. Juliet, TN
Wet Chemistry by Method 2320 B-2011	WG2085645	1	06/29/23 09:40	06/29/23 09:40	ARD	Mt. Juliet, TN
Metals (ICP) by Method 200.7	WG2084204	1	06/28/23 09:39	07/05/23 23:38	ZSA	Mt. Juliet, TN

5 Sr

6 Qc

7 Gl

8 Al

OUTFALL X12 SAMPLE 3 L1627473-03 WW

Collected by Sarah Snyder Collected date/time 06/23/23 07:50 Received date/time 06/24/23 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG2084204	1	07/05/23 23:41	07/05/23 23:41	ZSA	Mt. Juliet, TN
Wet Chemistry by Method 2320 B-2011	WG2085645	1	06/29/23 09:44	06/29/23 09:44	ARD	Mt. Juliet, TN
Metals (ICP) by Method 200.7	WG2084204	1	06/28/23 09:39	07/05/23 23:41	ZSA	Mt. Juliet, TN

9 Sc

CASE NARRATIVE

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. 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.



Dorothy P Roberts
Project Manager

Project Narrative

Please review all information in this report for accuracy and completeness. Contact our office within ten days if there are any questions.

Chronic Test Methods are described in "Short Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms" (EPA-821-R-02-013 October 2002, Fourth Edition).

Acute Test Methods are described in "Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms"(EPA-821-R-02-012 October 2002, Fifth Edition).

The Biomonitoring results in this report are only a summary of the tests performed. A detailed report will follow. The detailed report (not this summary sheet) must be submitted to the appropriate regulatory agency.

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

OUTFALL X12 SAMPLE 1

Collected date/time: 06/19/23 08:47

SAMPLE RESULTS - 01

L1627473

Aquatic Toxicity by Method 1000.0

Analyte	Result	Qualifier	Analysis date / time	Batch
IC25 - Minnow	>100 (PASS)		06/20/2023 14:57	WG2081035

Aquatic Toxicity by Method 1002.0

Analyte	Result	Qualifier	Analysis date / time	Batch
IC25 - C. dubia	>100 (PASS)		06/20/2023 14:21	WG2081035

Calculated Results

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Hardness (calculated) as CaCO3	72.2		0.118	2.50	1	07/01/2023 00:17	WG2082140

Wet Chemistry by Method 2320 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Alkalinity	90.7		8.45	20.0	1	06/29/2023 09:35	WG2085645

Sample Narrative:

L1627473-01 WG2085645: Endpoint pH 4.5

Metals (ICP) by Method 200.7

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Calcium	21.7		0.0473	1.00	1	07/01/2023 00:17	WG2082140
Magnesium	4.38		0.115	1.00	1	07/01/2023 00:17	WG2082140

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Calculated Results

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Hardness (calculated) as CaCO3	66.6		0.118	2.50	1	07/05/2023 23:38	WG2084204

¹ Cp

² Tc

Wet Chemistry by Method 2320 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Alkalinity	88.0		8.45	20.0	1	06/29/2023 09:40	WG2085645

³ Ss

⁴ Cn

Sample Narrative:

L1627473-02 WG2085645: Endpoint pH 4.5 Headspace

⁵ Sr

⁶ Qc

Metals (ICP) by Method 200.7

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Calcium	20.5		0.0473	1.00	1	07/05/2023 23:38	WG2084204
Magnesium	3.76		0.115	1.00	1	07/05/2023 23:38	WG2084204

⁷ Gl

⁸ Al

⁹ Sc

OUTFALL X12 SAMPLE 3

Collected date/time: 06/23/23 07:50

SAMPLE RESULTS - 03

L1627473

Calculated Results

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Hardness (calculated) as CaCO3	65.6		0.118	2.50	1	07/05/2023 23:41	WG2084204

¹ Cp

² Tc

Wet Chemistry by Method 2320 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Alkalinity	95.0		8.45	20.0	1	06/29/2023 09:44	WG2085645

³ Ss

⁴ Cn

Sample Narrative:

L1627473-03 WG2085645: Endpoint pH 4.5 Headspace

⁵ Sr

⁶ Qc

Metals (ICP) by Method 200.7

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Calcium	20.4		0.0473	1.00	1	07/05/2023 23:41	WG2084204
Magnesium	3.57		0.115	1.00	1	07/05/2023 23:41	WG2084204

⁷ Gl

⁸ Al

⁹ Sc

Method Blank (MB)

(MB) R3942920-2 06/29/23 08:31

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Alkalinity	U		8.45	20.0

Sample Narrative:

BLANK: Endpoint pH 4.5

L1628421-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1628421-03 06/29/23 08:53 • (DUP) R3942920-3 06/29/23 08:55

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Alkalinity	12.1	12.6	1	3.52	U	20

Sample Narrative:

OS: Endpoint pH 4.5 Headspace
 DUP: Endpoint pH 4.5

L1628485-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1628485-04 06/29/23 10:22 • (DUP) R3942920-4 06/29/23 10:27

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Alkalinity	69.6	70.0	1	0.569		20

Sample Narrative:

OS: Endpoint pH 4.5 Headspace
 DUP: Endpoint pH 4.5

Laboratory Control Sample (LCS)

(LCS) R3942920-1 06/29/23 08:25

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Alkalinity	100	107	107	90.0-110	

Sample Narrative:

LCS: Endpoint pH 4.5



Method Blank (MB)

(MB) R3943800-1 06/30/23 23:40

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/l		mg/l	mg/l
Calcium	U		0.0473	1.00
Magnesium	U		0.115	1.00

Laboratory Control Sample (LCS)

(LCS) R3943800-2 06/30/23 23:43

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	mg/l	mg/l	%	%	
Calcium	10.0	11.4	114	85.0-115	
Magnesium	10.0	11.2	112	85.0-115	

L1625208-03 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1625208-03 06/30/23 23:46 • (MS) R3943800-4 06/30/23 23:51 • (MSD) R3943800-5 06/30/23 23:53

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	mg/l	%	%		%			%	%
Calcium	10.0	97.6	102	108	45.5	104	1	70.0-130	V		5.57	20
Magnesium	10.0	42.8	50.1	53.5	72.7	107	1	70.0-130			6.55	20

L1627474-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1627474-01 06/30/23 23:56 • (MS) R3943800-6 06/30/23 23:58 • (MSD) R3943800-7 07/01/23 00:01

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/l		mg/l	mg/l	%	%		%			%	%
Calcium	10.0		44.2	45.2	87.0	97.6	1	70.0-130			2.35	20
Magnesium	10.0		23.3	23.9	97.5	103	1	70.0-130			2.18	20

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Method Blank (MB)

(MB) R3945105-1 07/05/23 22:29

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/l		mg/l	mg/l
Calcium	U		0.0473	1.00
Magnesium	U		0.115	1.00

Laboratory Control Sample (LCS)

(LCS) R3945105-2 07/05/23 22:32

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	mg/l	mg/l	%	%	
Calcium	10.0	9.83	98.3	85.0-115	
Magnesium	10.0	10.1	101	85.0-115	

L1628379-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1628379-01 07/05/23 22:34 • (MS) R3945105-4 07/05/23 22:40 • (MSD) R3945105-5 07/05/23 22:42

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	mg/l	%	%		%			%	%
Calcium	10.0	23.0	32.6	31.7	95.4	87.1	1	70.0-130			2.55	20
Magnesium	10.0	4.86	14.9	14.6	101	96.9	1	70.0-130			2.56	20

L1627515-03 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1627515-03 07/05/23 22:45 • (MS) R3945105-6 07/05/23 22:47 • (MSD) R3945105-7 07/05/23 22:50

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	mg/l	%	%		%			%	%
Calcium	10.0	42.3	53.8	54.3	115	120	1	70.0-130			0.862	20
Magnesium	10.0	9.83	20.3	20.4	105	106	1	70.0-130			0.618	20

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

GLOSSARY OF TERMS

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.

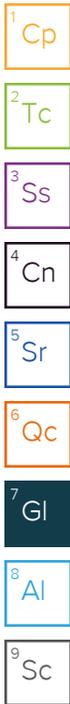
Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
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, the sample preparation volume or weight values differ from the standard, 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.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
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.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
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

J	The identification of the analyte is acceptable; the reported value is an estimate.
V	The sample concentration is too high to evaluate accurate spike recoveries.



ACCREDITATIONS & LOCATIONS

Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN000032021-1
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico ¹	TN00003
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina ¹	DW21704
Georgia	NELAP	North Carolina ³	41
Georgia ¹	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky ^{1,6}	KY90010	South Carolina	84004002
Kentucky ²	16	South Dakota	n/a
Louisiana	AI30792	Tennessee ^{1,4}	2006
Louisiana	LA018	Texas	T104704245-20-18
Maine	TN00003	Texas ⁵	LAB0152
Maryland	324	Utah	TN000032021-11
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	110033
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	998093910
Montana	CERT0086	Wyoming	A2LA
A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 ⁵	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

¹ Drinking Water ² Underground Storage Tanks ³ Aquatic Toxicity ⁴ Chemical/Microbiological ⁵ Mold ⁶ Wastewater n/a Accreditation not applicable

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

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

