

Division of Oil and Gas Resources Management Radiation Safety Section



Interoffice Memorandum

TO:

Richard J. Simmers, Chief

THROUGH:

Scott Kell, Assistant Chief

FROM:

Chuck McCracken, Manager, Radiation Safety Section

DATE:

July 26, 2017

RE:

ASSESSMENT OF RA226 & RA228 RADIOACTIVITY IN AQUASALINA

As requested, an analytical assessment of the radioactive content of Nature's Own Source / AquaSalina and the vertical well brine associated with its production was initiated on May 24, 2017. During the month of June 2017, Radiation Safety Section (RSS) staff partnered with Environmental Safety Section staff to collect 14 samples from 6 locations in Ohio. All samples were sent to PACE Radiological Analytical Laboratory with the last of the analytical results being received back from PACE on July 5, 2017.

The attached radiological survey report no. 2017-044 details the RSS radiological assessment process and the results achieved. Based on the findings in this assessment, the following recommendations are being made for your consideration:

- 1. Advise Nature's Own Source/AquaSalina that our assessment finds that they are producing TENORM however, we require additional details about their production process to be absolutely certain. (NOTE: We may need to collect additional pre and post samples)
- 2. Advise Nature's Own Source/AquaSalina that the average radioactivity in AquaSalina <u>exceeds</u> the 40 CFR 141.66 Drinking Water limits for combined Ra-226 and Ra-228 by a factor of 300, thus <u>human consumption of any amount of AquaSalina is highly discouraged.</u>
- 3. Advise Nature's Own Source/AquaSalina that the radioactivity in AquaSalina <u>exceeds</u> State of Ohio discharge to the environment limits for Ra-226 and Ra-228 as delineated in Ohio Administrative Code 3701:1-38-12, Appendix C, Table II, Effluent Concentrations.
- 4. DOGRM should continue to analyze the radioactive concentrations in vertical formation brine to create an Ohio specific data set that can be used to further assess impacts to humans and the environment from the use of vertical brine from the oil and gas industry for dust suppression and road stability.

cf: Eric Vendel, Legal Counsel



DIVISION OF OIL & GAS RESOURCES MANAGEMENT, RADIATION SAFETY SECTION



RADIOLOGICAL ASSESSMENT SPECIAL REPORT

Report No:

2017-044

Permit No(s):

Chief's Order 2004-82

Location(s):

Nature's Own Source/AquaSalina

246 North Cleveland Avenue Mogadore,

OH 44260

Nature's Own Source/AquaSalina

2850 W. 3rd Street Cleveland, OH 44113

Counties:

Guernsey, Summit, Tuscarawas, Cuyahoga

Date(s):

June 2, 2017, June 5, 2017, June 12, 2017,

June 15, 2017 and June 21, 2017

Inspector:

Robert Laidy

Date: 07/20/2017

Robert Leidy

Senior Health Physicist

Inspector:

Paul Carder

Date: 07/26/2017

Paul Carder

Senior Health Physicist

Supervisor:

Date: 07/26/2017

Chuck McCracken Section Manager

1.0 Purpose

At the request of the Chief, Division of Oil & Gas, an analytical assessment of the radioactive content of Nature's Own Source / AquaSalina and the vertical well brine associated with its production was conducted.

2.0 Scope of Action / Sampling Methodology

May 24, 2017

Two Ohio Department of Natural Resources, Division of Oil & Gas Resources Management (DOGRM) staffs were assigned to go to Nature's Own Source /AquaSalina facility located at 246 North Cleveland Avenue, Mogadore, OH 44260 to collect pre and post-production samples of their liquid deicer, AquaSalina. Upon arrival staff was met by Stephanie Moore. The property owner, Jeff Moore, spoke to staff by phone and requested that they communicate directly with Mr. Dave Mansbery, the owner of Nature's Own Source/AquaSalina. Staff spoke with Mr. Mansbery, who was attending an Ohio DOT trade show. Mr. Mansbery said that AquaSalina is out of season and not currently in production but there is product on site. Mr. Mansbery offered to make arrangements for a qualified individual to be onsite to assist DOGRM staff by providing access and collecting split samples of AquaSalina. Staff suggested to Mr. Mansbery that he coordinate a return visit to the Mogadore facility with DOGRM Management. No samples were collected this day.

June 2, 2017

A DOGRM Columbus office staff member collected two 1-liter samples from a container of AquaSalina that was in storage at the DOGRM Environmental Analytical Laboratory located at 325 N. 7th St., Cambridge, Ohio 43725. Each sample was preserved with HNO3. A chain of custody was created and the samples were delivered to the Pace Analytical Laboratories Service Center located at 4860 Blazer Pkwy, Dublin, OH 43017.

June 2, 2017

A DOGRM Uniontown office staff member was assigned to go to Hartville Hardware located at 1315 Edison St., NW, Hartville, OH 44632. Staff purchased a 1.74 gallon container of AquaSalina at this location. Staff then went to Lowe's Home Center located at 940 Interstate Parkway, Akron, OH 44312 and at 12:20 pm, purchased a 2.11 gallon container of AquaSalina. Two 1-liter samples were collected from each of the 2 containers of AquaSalina. Each sample was preserved with HNO3. A chain of custody was created and the samples were delivered to the Pace Analytical Laboratories Service Center located at 4860 Blazer Pkwy, Dublin, OH 43017.

June 12, 2017

Two DOGRM staff members were assigned to go to the ODOT Tuscarawas County Garage located at 384 Stonecreek Road SE, New Philadelphia, 44663 to collect samples of brine that was made by adding halite salt to tap water. Two 1-liter samples were collected and each sample was preserved with HNO3. A chain of custody was created and the samples were delivered to the Pace Analytical Laboratories Service Center located at 4860 Blazer Pkwy, Dublin, OH 43017.

June 12, 2017

Two DOGRM staff members were met in Mogadore by representatives for Nature's Own

Source/AquaSalina, Larry Gibler, Jim Hogue and Precision Analytical staffer, Jeremy Bratnick. Samples were collected by DOGRM and Precision Analytical of pre and post-production liquid. Each DOGRM sample was preserved with HNO3 and tamperproof seals were placed on the sample containers. A chain of custody was created and the DOGRM samples were delivered to the Pace Analytical Laboratories Service Center located at 4860 Blazer Pkwy, Dublin, OH 43017.

DOGRM staffs were then directed to the Nature's Own Source/AquaSalina's Cuyahoga County facility located at 7033 Mill Road, Brecksville, OH 44141 to collect additional samples. Upon arrival staff was told that the location was a corporate office only and AquaSalina was not produced there. Staff was told that the Cuyahoga County production facility is located on the Arcelormittal Steel Mill property located at 2850 W. 3rd St., Cleveland OH. Staff was then informed that DOGRM's legal department needed to contact Nature's Own Source/AquaSalina's lawyer, Scott Doran, to discuss obtaining samples. No samples were collected.

June 15, 2017

Two DOGRM staff members were met at the Nature's Own Source/AquaSalina production facility on the Arcelormittal Steel Mill property by company representatives, Larry Gibler, Jim Hogue and Precision Analytical staffer, Jeremy Bratnick. Samples were collected by DOGRM and Precision Analytical of pre and post-production liquid. Each DOGRM sample was preserved with HNO3 and tamperproof seals were placed on the sample containers. A chain of custody was created and the DOGRM samples were delivered to the Pace Analytical Laboratories Service Center located at 4860 Blazer Pkwy, Dublin, OH 43017.

June 21, 2017

DOGRM staff returned to the ODOT Tuscarawas County Garage to collect samples of the raw water used to create the brine mixture sampled on June 12, 2017. Each sample was preserved with HNO3. A chain of custody was created and the samples were delivered to the Pace Analytical Laboratories Service Center located at 4860 Blazer Pkwy, Dublin, OH 43017.

3.0 **Observations / Analytical Results**

| Sample Collec | ction Location | Collection Date | Ra226 Results (pCi/l)* | Ra228 Results (pCi/l)* | Combined Results (pCi/l)* |
|-----------------|----------------|--------------------|---------------------------|------------------------|------------------------------|
| Lowes – Cantor | [purchase] | 6/2/17 | 1,059 ± 136 | 604 ± 111 | 1,663 ± 247 |
| Hartville Hardw | are [purchase] | 6/2/17 | 1,158 ± 144 | 1,333 ± 241 | 2,491 ± 384 |
| ODNR Cambridg | ge Lab | 6/2/17 | 791 ± 41.8 | 604 ± 25.7 | 1,395 ± 67.5 |
| AquaS Mogado | re - PRE | 6/12/17 | 925 ± 116 | 373 ± 69.8 | 1,298 ± 185.8 |
| | - POST | 6/12/17 | 1,010 ± 126 | 432 ± 80.1 | 1,442 ± 206.1 |
| AquaS Cleve | - PRE (1) | 6/15/17 | 595 ± 772 | 568 ± 127 | 1,163 ± 899 |
| | - POST (1) | 6/15/17 | 949 ± 478 | 734 ± 129 | 1,683 ± 607 |
| | - PRE (2) | 6/15/17 | 501 ± 462 | 387 ± 75 | 888 ± 537 |
| | - POST (2) | 6/15/17 | 997 ± 545 | 713 ± 102 | 1,710 ± 647 |
| ODOT tap wate | r - PRE | 6/21/17 | 1.90 ± 0.8 | 0.922 ± 0.4 | 2.8 ± 1.2 |
| ODOT mixture | - POST | 6/12/17 | 2.77 ± 1.58 | 5.78 ± 7.67 | 8.55 ± 9.27 |

^{*} Analytical laboratory results reports are attached.

4.1 Findings, Discussions & Conclusions

Findings

- All post-samples collected in this study were found to be increased in radioactivity activity from their respective pre-samples.
- There was an 11% increase in combined radium Ra226/Ra228 concentration between the pre and post-samples collected from the Nature's Own Source/AquaSalina Mogadore production facility.
- There was a 45% increase in combined radium Ra226/Ra228 concentration between the pre

 (1) and post (1) samples collected from the Nature's Own Source/AquaSalina Cleveland production facility.
- There was a 92% increase in combined radium Ra226/Ra228 concentration between the pre
 (2) and post (2) samples collected from the Nature's Own Source/AquaSalina Cleveland production facility.
- The combined radium Ra226/Ra228 concentration in the Nature's Own Source/AquaSalina container purchased from Hartville Hardware was the highest identified in this study at 2,491 pCi/l.
- The combined radium Ra226/Ra228 concentration in all samples of post-production AquaSalina (except the Hartville Hardware container sample) averaged within 10% of each other at 1,578.6 pCi/l.
- There are no production dates, lot numbers or other unique identifiers on the purchased containers of Nature's Own Source/AquaSalina.

Discussions

- Formation brine is Naturally Occurring Radioactive Material (NORM). Technologically Enhanced NORM (TENORM) is NORM that has been increased in radioactivity by or as a result of human activity¹. It would appear that Nature's Own Source/AquaSalina is producing TENORM however, without additional batch processing information from them, it cannot be determined with 100% certainty that the sampled pre-production brine has been increased in radioactivity due to the AquaSalina production processes.
- The USEPA National Primary Drinking Water Regulation, 40 CFR 141.66 limits combined Ra-226 and Ra-228 in drinking water to 5.0 pCi/l.
- The State of Ohio discharge to the environment limits for Ra-226 and Ra-228, as delineated in Ohio Administrative Code 3701:1-38-12, Appendix C, Table II, Effluent Concentrations, are 60 pCi/I for each (120 pCi/I for combined Ra226 & Ra228 and the unity rule applies).

- The Pennsylvania Department of Environmental Protection (PADEP) TENORM Study Report, Revision 1, dated May 2016 assessed radiation exposure to humans from road spreading of conventional (vertical) well brine.
 - The assessment was based on surface soil samples taken from roads where brine spreading is known to have occurred. The specific radioactive concentration of the brine that was spread on these roads was not considered in the assessment.
 - The estimated total dose to a recreationist was modeled to be 0.441 mrem/yr, which is well below PADEP's 100 mrem/yr public exposure regulatory limit.
 - The report concluded that while limited potential was found for radiation exposure to recreationist using roads treated with brine from conventional (vertical) gas wells, further study of radiological environmental impacts from the use of brine from the oil and gas industry for dust suppression and road stabilization should be conducted.
 - Other states in our region of the U.S. that allow road spreading of vertical oil and gas well brine include Michigan, Illinois, Pennsylvania and West Virginia.

Conclusions

- Analytical results suggests that Nature's Own Source/AquaSalina is producing TENORM however, without additional batch processing information, it cannot be determined with 100% certainty that the sampled pre-production brine has been increased in radioactivity due to the AquaSalina production processes.
- All sample results (except the DOT tap water) **exceed** the USEPA 40 CFR 141.66 Drinking Water limits of combined Ra-226 and Ra-228 at less than or equal to 5.0 pCi/l.
- None of the sampled liquids (except DOT tap water) in this assessment are meant for human consumption.
- All sample results (except the DOT samples) exceed State of Ohio discharge to the environment limits for Ra-226 and Ra-228 as delineated in Ohio Administrative Code 3701:1-38-12, Appendix C, Table II, Effluent Concentrations.
 - These liquid effluent concentration limits were originally codified by the U.S. Nuclear Regulatory Commission to limit public radiation exposure to 50 millirem per year from ingestion of radioactive material discharged into rivers, streams and other bodies of water by companies and facilities licensed to possess and handle radioactive materials.
 - None of the sampled liquids (except DOT tap water) in this assessment are meant for human consumption.
- Using the assumptions and findings in the PADEP study, RSS evaluated the post-processing sample results from this assessment and determined that it is unlikely that radiation exposure to Ohioans from road spreading of vertical brine would exceed the 100 mrem/yr public dose limit.

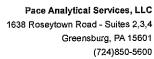
5.1 Recommendations

- Advise Nature's Own Source/AquaSalina that our assessment finds that they are producing TENORM however, we require additional details about their production process to be absolutely certain. (NOTE: We may need to collect additional pre and post samples)
- 2. Advise Nature's Own Source/AquaSalina that the average radioactivity in AquaSalina <u>exceeds</u> the 40 CFR 141.66 Safe Drinking Water limits for combined Ra-226 and Ra-228 by a factor of 300, thus <u>human consumption of any amount of AquaSalina is highly discouraged.</u>
- 3. Advise Nature's Own Source/AquaSalina that the radioactivity in AquaSalina <u>exceeds</u> State of Ohio discharge to the environment limits for Ra-226 and Ra-228 as delineated in Ohio Administrative Code 3701:1-38-12, Appendix C, Table II, Effluent Concentrations.
- 4. DOGRM should continue to analyze the radioactive concentrations in vertical formation brine to create an Ohio specific data set that can be used to further assess impacts to humans and the environment from the use of brine from the oil and gas industry for dust suppression and road stabilization.

ATTACHMENT 1

Radiological Analytical Results for:

ODNR Cambridge Lab





June 19, 2017

Ms. Michelle Taylor Microbac Laboratories, Inc. 158 Starlite Drive Marietta, OH 45750

RE: Project: Aqua

Pace Project No.: 30220752

Dear Ms. Taylor:

Enclosed are the analytical results for sample(s) received by the laboratory on June 06, 2017. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Robbin Robl robbin.robl@pacelabs.com (724)850-5613

Robert & Robe

Project Manager

Enclosures







CERTIFICATIONS

Project:

Aqua

Pace Project No.:

30220752

Pennsylvania Certification IDs

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601

L-A-B DOD-ELAP Accreditation #: L2417

Alabama Certification #: 41590 Arizona Certification #: AZ0734

Arkansas Certification

California Certification #: 04222CA

Colorado Certification

Connecticut Certification #: PH-0694

Delaware Certification

Florida/TNI Certification #: E87683

Georgia Certification #: C040

Guarn Certification Hawaii Certification Idaho Certification

Illinois Certification Indiana Certification

Iowa Certification #: 391

Kansas/TNI Certification #: E-10358 Kentucky Certification #: 90133

Louisiana DHH/TNI Certification #: LA140008

Louisiana DEQ/TNI Certification #: 4086 Maine Certification #: PA00091

Maryland Certification #: 308

Massachusetts Certification #: M-PA1457

Michigan/PADEP Certification Missouri Certification #: 235

Montana Certification #: Cert 0082 Nebraska Certification #: NE-05-29-14

Nevada Certification #: PA014572015-1 New Hampshire/TNI Certification #: 2976

New Jersey/TNI Certification #: PA 051

New Mexico Certification #: PA01457

New York/TNI Certification #: 10888

North Carolina Certification #: 42706 North Dakota Certification #: R-190

Oregon/TNI Certification #: PA200002

Pennsylvania/TNI Certification #: 65-00282

Puerto Rico Certification #: PA01457

Rhode Island Certification #: 65-00282

South Dakota Certification

Tennessee Certification #: TN2867

Texas/TNI Certification #: T104704188-14-8

Utah/TNI Certification #: PA014572015-5

USDA Soil Permit #: P330-14-00213

Vermont Dept. of Health: ID# VT-0282

Virgin Island/PADEP Certification

Virginia/VELAP Certification #: 460198

Washington Certification #: C868

West Virginia DEP Certification #: 143 West Virginia DHHR Certification #: 9964C

Wisconsin Certification

Wyoming Certification #: 8TMS-L

REPORT OF LABORATORY ANALYSIS





SAMPLE SUMMARY

Project:

Aqua

Pace Project No.:

30220752

| Lab ID | Sample ID | Matrix | Date Collected | Date Received |
|-------------|------------|--------|----------------|----------------|
| 30220752001 | Aqua-1-226 | Water | 06/02/17 12:00 | 06/06/17 10:15 |
| 30220752002 | Aqua-2-228 | Water | 06/02/17 12:00 | 06/06/17 10:15 |



SAMPLE ANALYTE COUNT

Project:

Aqua

Pace Project No.:

30220752

| Lab ID | Sample ID | Method | Analysts | Analytes Reported |
|-------------|------------|-----------|----------|----------------------|
| 30220752001 | Aqua-1-226 | EPA 903.1 | WRR | 1 |
| 30220752002 | Aqua-2-228 | EPA 904.0 | JLW | 1 |





PROJECT NARRATIVE

Project:

Aqua

Pace Project No.:

30220752

Method: El

EPA 903.1

Description: 903.1 Radium 226

Client:

Microbac Laboratories, Inc.-OH

Date:

June 19, 2017

General Information:

1 sample was analyzed for EPA 903.1. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time

The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:

All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

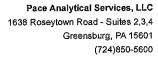
Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:





PROJECT NARRATIVE

Project:

Aqua

Pace Project No.:

30220752

Method: EPA

EPA 904.0

Description: 904.0 Radium 228

Client:

Microbac Laboratories, Inc.-OH

Date:

June 19, 2017

General Information:

1 sample was analyzed for EPA 904.0. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:

All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Analyte Comments:

QC Batch: 261657

1c: During the ingrowthing process, part of the MB was lost, and the resulting chemical yield is below 10% and the associated MB MDC is greater than 1.0 pCi/L. Individual sample results are not impacted by the elevated MDC or low MB yield.

- BLANK (Lab ID: 1288491)
 - Radium-228

This data package has been reviewed for quality and completeness and is approved for release.



ANALYTICAL RESULTS - RADIOCHEMISTRY

Project:

Aqua

Pace Project No.:

30220752

Sample: Aqua-1-226

Lab ID: 30220752001

Collected: 06/02/17 12:00

Received: 06/06/17 10:15

Matrix: Water

PWS:

Parameters

Method

Site ID:

Sample Type: Act ± Unc (MDC) Carr Trac

Units

Analyzed

CAS No.

Qual

Radium-226

EPA 903.1

791 ± 41.8 (6.84)

pCi/L

06/19/17 10:12 13982-63-3

Sample: Aqua-2-228

Lab ID: 30220752002

Sample Type:

Collected: 06/02/17 12:00 Received: 06/06/17 10:15

Matrix: Water

PWS: Parameters Site ID: Method

Act ± Unc (MDC) Carr Trac

Units

Analyzed

CAS No.

Qual

Radium-228

EPA 904.0

604 ± 25.7 (11.8)

pCi/L

06/19/17 10:30 15262-20-1

C:82% T:74%

C:NA T:92%





QUALITY CONTROL - RADIOCHEMISTRY

Project:

Aqua

Pace Project No.:

30220752

QC Batch:

261657

Analysis Method:

EPA 904.0

QC Batch Method:

EPA 904.0

Analysis Description:

904.0 Radium 228

Associated Lab Samples:

30220752002

Matrix: Water

METHOD BLANK: 1288491

Associated Lab Samples:

30220752002

Parameter

Act ± Unc (MDC) Carr Trac

Units

Analyzed

Qualifiers

Radium-228

0.246 ± 3.98 (9.19) C:78% T:7%

pCi/L

06/19/17 10:30 1c

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





QUALITY CONTROL - RADIOCHEMISTRY

Project:

Aqua

Pace Project No.:

30220752

QC Batch:

261516

Analysis Method:

EPA 903.1

QC Batch Method:

EPA 903.1

Analysis Description:

903.1 Radium-226

Associated Lab Samples:

30220752001

30220752001

METHOD BLANK: 1287919

Matrix: Water

Associated Lab Samples:

Parameter

Act ± Unc (MDC) Carr Trac

Units

Analyzed

Qualifiers

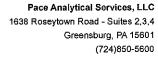
Radium-226

0.0622 ± 0.284 (0.578) C:NA T:91%

pCi/L

06/19/17 10:12

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





QUALIFIERS

Project:

Aqua

Pace Project No .:

30220752

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Act - Activity

Unc - Uncertainty: SDWA = 1.96 sigma count uncertainty, all other matrices = Expanded Uncertainty (95% confidence interval). Gamma Spec = Expanded Uncertainty (95.4% Confidence Interval)

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

Date: 06/19/2017 03:32 PM

During the ingrowthing process, part of the MB was lost, and the resulting chemical yield is below 10% and the associated MB MDC is greater than 1.0 pCi/L. Individual sample results are not impacted by the elevated MDC or low MB yield.

COC No. A.43160

158 Starlite Drive

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| Relinquished by: (Signature) | Date (4.5.17) | Time | Received for Laboratory by: (Signature) | J. J. S. | Date | Date C.L.I.T. | | <u>, </u> | Remarks | | ٠ | |
| 1 | | (4%) | on one | | 4 | 3 | | | | | | |

and Waster (W), Soil (S), Solid Waster (SD), Unkinown (X) and United (SD), Unkinown (X) and United (SD), Unkinown (X) and Soil (S), Soild Waster (SD), Unkinown (X) and Soil (S), Soil (S), Soild Waster (SD), Unkinown (X) and Soil (S), Soil (S)

SMANAGE SERVICE AND A STRING

| Sample Condit | ion Upon Rece | ipt F | rittsb | urgi | ו | | |
|-----------------------------------|-------------------------------|-------------|-----------------|-----------|-------------------------|------------------------------|---|
| Face Analytical | lient Name: | ŃΛ | | - 62 | * C' | Project# | 302207 |
| í | llent Name. | | 1101 | ی رز ن | | 1 10,000 # | |
| Courier: Fed Ex UI | Ps □ usps □ Clier 04394289 | nt 🗆 3 | Comm | nercial | Pace Other | | D. C. |
| Custody Seal on Cooler/Bo | x Present: | | no | Seals | intact: yes | no | 1 |
| Thermometer Used | N/A | Туре | of Ice: | Wet | Blue None | | |
| Cooler Temperature Oi | oserved Temp | /A _ | ° C | Corre | ection Factor | °C Final Ten | ıp <u>:</u> |
| Temp should be above freezing | to 6°C | | | | | Date and Initia | la of porcon avamining |
| | | | | · | - | contents: | ls of person examining |
| Comments: | | Yes | No | N/A | | | |
| Chain of Custody Present: | | | - | | 1. | | |
| Chain of Custody Filled Out: | | \geq | - | <u> </u> | 2. | - | |
| Chain of Custody Relinquish | ed: | $\geq \leq$ | | | 3. | | |
| Sampler Name & Signature | on COC: | \geq | <u>[</u> | ļ | 4. | | |
| Sample Labels match CÓC: | ٠. | \geq | | <u>l</u> | 5. | - | |
| -Includes date/time/ID | Matrix: 📐 | 7 | | ~ | | | |
| Samples Arrived within Hold | Time: | $\geq \leq$ | | | 6. | | |
| Short Hold Time Analysis (| <72hr remaining); | | X | | 7. | | |
| Rush Turn Around Time Re | | | \geq | | 8. | | |
| Sufficient Volume: | | \times | | | 9. | | |
| Correct Containers Used: | | X | | | 10. | | |
| -Pace Containers Used: | | X | | l | | | |
| Containers Intact: | | \times | | | 11. | | |
| Orthophosphate field filtered | | | \times | PHP | 12. | <u></u> - | |
| Organic Samples checked | for dechlorination: | | | \times | 13. | | |
| Filtered volume received for | | - | | \geq | 14. | | |
| All containers have been checke | ed for preservation. | X | | | 15. | | |
| All containers needing preservati | | | | | PH < | 2 | |
| , | | | | | initial when A14 | Date/time of preservation | |
| exceptions: VOA, coliform, | 100, 0&G, Priendics | | | | Lot#of added | precorran | |
| | | , | | _ | preservative | | |
| Headspace in VOA Vials (>6 | Smm): | | | \propto | 16. | | |
| Trip Blank Present: | | | <u>><</u> | | 17. | | |
| Trip Blank Custody Seals Pre | esent | | ļ | X | | | |
| Rad Aqueous Samples Scr | eened > 0.5 mrem/hr | | \times | | Initial when completed: | Date: 6-6 | -17 |
| Client Notification/ Resolut | ion: | | | | | | |
| Person Contacted: | | | | Date/i | Гіте: | Contacted | Ву: |
| Comments/ Resolution: | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Residence and the second second and the second seco

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. cut of hold, incorrect preservative, out of temp, incorrect containers)

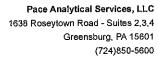
*PM review is documented electronically in LIMS. When the Project Manager closes the SRF Review schedule in LIMS. The review is in the Status section of the Workorder Edit Screen.

ATTACHMENT

Radiological Analytical Results for:

Lowes – Canton [purchase]

Hartville Hardware [purchase]





June 19, 2017

Ms. Michelle Taylor Microbac Laboratories, Inc. 158 Starlite Drive Marietta, OH 45750

RE: Project: 2017-Aqua-NE

Pace Project No.: 30220748

Dear Ms. Taylor:

Enclosed are the analytical results for sample(s) received by the laboratory on June 06, 2017. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Robbin Robl robbin.robl@pacelabs.com (724)850-5613

Robert & Love

Project Manager

Enclosures







CERTIFICATIONS

Project:

2017-Aqua-NE

Pace Project No.:

30220748

Pennsylvania Certification IDs

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601

L-A-B DOD-ELAP Accreditation #: L2417

Alabama Certification #: 41590 Arizona Certification #: AZ0734

Connecticut Certification #: PH-0694

Delaware Certification

Guam Certification Hawaii Certification

Kansas/TNI Certification #: E-10358

Louisiana DHH/TNI Certification #: LA140008

Louisiana DEQ/TNI Certification #: 4086

Massachusetts Certification #: M-PA1457

Arkansas Certification

California Certification #: 04222CA

Colorado Certification

Florida/TNI Certification #: E87683 Georgia Certification #: C040

Idaho Certification Illinois Certification Indiana Certification Iowa Certification #: 391

Kentucky Certification #: 90133

Maine Certification #: PA00091 Maryland Certification #: 308

Michigan/PADEP Certification Missouri Certification #: 235

Nebraska Certification #: NE-05-29-14 Nevada Certification #: PA014572015-1 New Hampshire/TNI Certification #: 2976 New Jersey/TNI Certification #: PA 051 New Mexico Certification #: PA01457 New York/TNI Certification #: 10888

Montana Certification #: Cert 0082

North Carolina Certification #: 42706 North Dakota Certification #: R-190 Oregon/TNI Certification #: PA200002 Pennsylvania/TNI Certification #: 65-00282

Puerto Rico Certification #: PA01457 Rhode Island Certification #: 65-00282

South Dakota Certification

Tennessee Certification #: TN2867

Texas/TNI Certification #: T104704188-14-8 Utah/TNI Certification #: PA014572015-5 USDA Soil Permit #: P330-14-00213 Vermont Dept. of Health: ID# VT-0282 Virgin Island/PADEP Certification Virginia/VELAP Certification #: 460198

Washington Certification #: C868 West Virginia DEP Certification #: 143 West Virginia DHHR Certification #: 9964C

Wisconsin Certification

Wyoming Certification #: 8TMS-L





SAMPLE SUMMARY

Project:

2017-Aqua-NE

Pace Project No.: 30220748

| Lab ID | Sample ID | Matrix | Date Collected | Date Received |
|-------------|-----------|--------|----------------|----------------|
| 30220748001 | Lowes-1 | Water | 06/05/17 08:00 | 06/06/17 10:15 |
| 30220748002 | Lowes-2 | Water | 06/05/17 08:02 | 06/06/17 10:15 |
| 30220748003 | HH-1 | Water | 06/05/17 08:04 | 06/06/17 10:15 |
| 30220748004 | HH-2 | Water | 06/05/17 08:06 | 06/06/17 10:15 |





SAMPLE ANALYTE COUNT

Project:

2017-Aqua-NE

Pace Project No.: 30220748

| Lab ID | Sample ID | Method | Analysts | Analytes Reported |
|-------------|-----------|-----------|----------|----------------------|
| 30220748001 | Lowes-1 | EPA 903.1 | WRR | 1 |
| 30220748002 | Lowes-2 | EPA 904.0 | JLW | 1 |
| 30220748003 | HH-1 | EPA 903.1 | WRR | 1 |
| 30220748004 | HH-2 | EPA 904.0 | JLW | · 1 |





PROJECT NARRATIVE

Project:

2017-Aqua-NE

Pace Project No.:

30220748

Method: EPA 903.1

Description: 903.1 Radium 226

Client:

Microbac Laboratories, Inc.-OH

Date:

June 19, 2017

General Information:

2 samples were analyzed for EPA 903.1. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time

The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank

All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

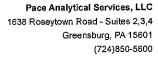
Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:





PROJECT NARRATIVE

Project:

2017-Aqua-NE

Pace Project No.:

30220748

Method: EPA

EPA 904.0

Description: 904.0 Radium 228

Client:

Microbac Laboratories, Inc.-OH

Date:

June 19, 2017

General Information:

2 samples were analyzed for EPA 904.0. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time

The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank

All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Analyte Comments:

QC Batch: 261657

1c: During the ingrowthing process, part of the MB was lost, and the resulting chemical yield is below 10% and the associated MB MDC is greater than 1.0 pCi/L. Individual sample results are not impacted by the elevated MDC or low MB yield.

- BLANK (Lab ID: 1288491)
 - Radium-228

This data package has been reviewed for quality and completeness and is approved for release.



ANALYTICAL RESULTS - RADIOCHEMISTRY

Project:

2017-Aqua-NE

Pace Project No.:

30220748

Sample: Lowes-1

Lab ID: 30220748001

Collected: 06/05/17 08:00

Sample Type:

Received: 06/06/17 10:15

Matrix: Water

PWS:

Parameters

Method

Site ID:

Act ± Unc (MDC) Carr Trac

Units

Analyzed

CAS No.

Qual

Radium-226

EPA 903.1

1,059 ± 136 (11.7) C:NA T:71%

pCi/L

06/19/17 10:12 13982-63-3

Sample: Lowes-2

Lab ID: 30220748002

Collected: 06/05/17 08:02 Received: 06/06/17 10:15 Matrix: Water

PWS:

Site ID:

Sample Type:

Parameters

Method

Act ± Unc (MDC) Carr Trac

Units

pCi/L

Analyzed

CAS No. Qual

Radium-228

EPA 904.0

604 ± 111 (11.1) C:67% T:90%

pCi/L

06/19/17 10:30 15262-20-1

Sample: HH-1

Lab ID: 30220748003

Collected: 06/05/17 08:04

Received: 06/06/17 10:15

Sample Type:

Parameters

Site ID:

Act ± Unc (MDC) Carr Trac

Units

CAS No.

Radium-226

PWS:

Method EPA 903.1

1.158 ± 144 (7.11) C:NA T:95%

Analyzed

Qual 06/19/17 10:12 13982-63-3

Lab ID: 30220748004

Collected: 06/05/17 08:06

Received: 06/06/17 10:15

Matrix: Water

Sample: HH-2 PWS:

Site ID:

EPA 904.0

Sample Type:

Parameters

Method

Act ± Unc (MDC) Carr Trac 1,333 ± 241 (14.8)

Units pCi/L

Analyzed 06/19/17 10:30 15262-20-1

CAS No. Qual

Radium-228

C:75% T:65%

REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Pace Analytical Services, LLC.





QUALITY CONTROL - RADIOCHEMISTRY

Project:

2017-Agua-NE

Pace Project No.:

30220748

QC Batch:

261657

Analysis Method:

EPA 904.0

QC Batch Method:

EPA 904.0

Analysis Description:

904.0 Radium 228

Associated Lab Samples:

METHOD BLANK: 1288491

30220748002, 30220748004

Matrix: Water

Associated Lab Samples:

30220748002, 30220748004

Parameter

Act ± Unc (MDC) Carr Trac

Units

Analyzed

Qualifiers

Radium-228

0.246 ± 3.98 (9.19) C:78% T:7%

pCi/L

06/19/17 10:30 1c

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





QUALITY CONTROL - RADIOCHEMISTRY

Project:

2017-Aqua-NE

Pace Project No.:

30220748

QC Batch:

261516

Analysis Method:

EPA 903.1

QC Batch Method:

EPA 903.1

Analysis Description:

903.1 Radium-226

Associated Lab Samples:

30220748001, 30220748003

Matrix: Water

Associated Lab Samples:

METHOD BLANK: 1287919

WGUIA.

30220748001, 30220748003

Parameter

Act ± Unc (MDC) Carr Trac

Units

Analyzed

Qualifiers

Radium-226

0.0622 ± 0.284 (0.578) C:NA T:91%

pCi/L

06/19/17 10:12

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





QUALIFIERS

Project:

2017-Agua-NE

Pace Project No.:

30220748

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Act - Activity

Unc - Uncertainty: SDWA = 1.96 sigma count uncertainty, all other matrices = Expanded Uncertainty (95% confidence interval). Gamma Spec = Expanded Uncertainty (95.4% Confidence Interval)

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

Date: 06/19/2017 03:31 PM

During the ingrowthing process, part of the MB was lost, and the resulting chemical yield is below 10% and the associated MB MDC is greater than 1.0 pCi/L. Individual sample results are not impacted by the elevated MDC or low MB yield.

COC No. A 43160

158 Starlite Drive

Marietta, OH'45750

(I) MICROBAC. CHAIN-OF-CUSTODY: RECORD

Toll Free: 800-373-4071 Phone: 740-373-4071

ADDITIONAL REQUIREMENTS 003 Moner DAS Driena Oraco WO#:30220748 Received by: (Signature) (BBU BAJ) # JATOT PCP/ Cate SUNTRUPOSITI EONH Remarks: 1.109 AP3 855-6 YnJeimadoolban ~ 0.00e Aq3 8ss-af (yeQ-12 & TO yeb-2) mt.100 Aq3 822-6 <u>√</u> '9-228 EPA 901.1m (21-day ingrowth) Time (5-day Quick Turn) £-226 EPA 901.1 49-9 Refinguished by: (Signalura) Ra-226 EPA 903,1 ~ Redon Emanation Vitaliochemistry 49-226 EPA 903.0 (yeb 12 & TO yeb2) m 1.100 A43 355-69 Ra-226 EPA 901.1 m (21 day ingrowth) Ra-226 EPA 901.1 m (Sday Quick Turn) pjoj Received for Laboratory by: (Signature) BREMINTNOO TO REBMINN Received by: (Signature) エンワイン・この十分と対と Matrix 1,5 3 3 3 State of Ohio-DNR-Division of Oil & Gas į 614-265-6672 ر ده ده (a) (b) Time 7.00 alli. Contact Phone #. Signature. Location: 4-5-17 C: - S -6-5-17 C-X-7 C-S-1 グントワ Date Date Oale ele Ш d,51Ð Project 10: 2017 - April - M روسة. Sampler (print):
Robert Cerr Chuck McCracken Refinquished by: (Signature) 2 + L Turn Around Requirements: 1-23mo7 LOWES -(Signature) Santple LD. No. Relinquished by: HH Company Name: Project Contact: 1 1

*Water (W), Soil (S), Solid Waste (SD), ⊍∩known (X)

Page

Page 11 of 12

| Sample Cond | ition Upon Rece | ipt F | ittst | ourg | h | | |
|--|---|-------------|-----------------|------------------|---------------------|---|---|
| Page Analytical | Client Name: | | \ <u>,c</u> (| وطع | 2.(| Project # 30 2 2 0 7 4 | - |
| Courier: Fed Ex [] Tracking #: 72 7 8 Custody Seal on Cooler/I | UPS ☐ USPS ☐ Clier 3 0 4 3 9 4 2 8 5 Box Present: ∰ yes | nt | Comn - no | nercial Seals | Pace Other _ | no | |
| The amount of the ord | N/A | Type | of Ice | : Wel | t Blue None | | |
| Cooler Temperature | Observed Temp | 1 | ° C | Corr | ection Factor | °C Final Temp: °C | |
| Temp should be above freezing | ng to 6°C | · | - | | | | 7 |
| • | | | | | _ | Date and initials of person examining contents: | ĺ |
| Comments: | | Yes | No | N/A | | | 1 |
| Chain of Custody Present: | | | <u> </u> | <u> </u> | 1. | | 1 |
| Chain of Custody Filled Ou | it: | \geq | - | ļ | 2. | | 1 |
| Chain of Custody Relinquis | shed: | \geq | ļ | | 3. | | |
| Sampler Name & Signature | e on COC: | \geq | <u> </u> | ļ <u>.</u> | 4. | | 1 |
| Sample Labels match COC |): | | | <u> </u> | 5. | : | |
| -includes date/tlme/ID | Matrix: 🔼 | <u> </u> | I- | - | | | |
| Samples Arrived within Hol | ld Time: | $\geq \leq$ | | | 6. | | ĺ |
| Short Hold Time Analysis | (<72hr remaining): | | \geq | <u> </u> | 7. | | |
| Rush Turn Around Time I | Requested: | | | <u> </u> | 8. | | 1 |
| Sufficient Volume: | <u> </u> | \geq | <u> </u> | <u> </u> | 9. | | 1 |
| Correct Containers Used: | | X, | | | 10. | | |
| -Pace Containers Used: | | \geq | ļ | ļ <u> </u> | | | |
| Containers Intact: | | $\geq \leq$ | | 117.00.00 | 11. | | |
| Orthophosphate field filtere | ď | | $\geq \leq$ | | 12 | | - |
| Organic Samples checke | | | | \geq | 13. | | |
| iltered volume received fo | r Dissolved tests | ٠ | | $\geq \leq$ | 14 | | |
| Il containers have been chec | ked for preservation. | \leq | | | 15. PH < | () | |
| all containers needing preserve compliance with EPA recomme | ation are found to be in endation. | \times | <i>,</i> | | <i>ΥΠ</i> ~ | | |
| • | | | | | Initial When /// | Date/time of preservation | |
| exceptions: VOA, coliform | , 100, O&G, Phenoics | | | | Lot#of added | | |
| | | | | | preservative | | ĺ |
| leadspace in VOA Vials (> | >6mm): | | | | 16. | | ĺ |
| rip Blank Present: | | | 25 | | 17. | | |
| rip Blank Custody Seals P | resent | | | | Initial when /// | | İ |
| Rad Aqueous Samples So | creened > 0.5 mrem/hr | | \geq | ·, | completed: | Date: 6 - 6 - / | 1 |
| lient Notification/ Resolt | ution: | | | | | | |
| Person Contacted: | | | | Date/ | Time: | Contacted By: | |
| Comments/ Resolution: _ | | | | | | | |
| | | | | | | | |
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| | | | | | | in aronoris | |
| A check in this bo | x indicates that addit | tional | infor | matio | n nas peen stored i | III erebores | |

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers)

*PM review is documented electronically in LIMS. When the Project Manager closes the SRF Review schedule in LIMS. The review is in the Status section of the Workorder Edit Screen.

ATTACHMENT 3

Radiological Analytical Results for:

| AquaSalina / Mogadore | - PRE |
|-------------------------|------------|
| | - POST |
| AquaSalina / Cleveland | - PRE (1) |
| | - POST (1) |
| | - PRE (2) |
| | - POST (2) |
| ODOT salt mixture brine | - POST |





June 30, 2017

Ms. Michelle Taylor Microbac Laboratories, Inc. 158 Starlite Drive Marietta, OH 45750

RE: Project: 2017-AQUA-MOG

Pace Project No.: 30221492

Dear Ms. Taylor:

Enclosed are the analytical results for sample(s) received by the laboratory between June 14, 2017 and June 16, 2017. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

Revision 1 - This report replaces the June 30, 2017 report. This report has been reissued to include the additional COC and SCUR. Please replace the original report with the revised report enclosed. RLR 6/30/17

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Robbin Robl

robbin.robl@pacelabs.com (724)850-5613

Robert & Robe

Project Manager

Enclosures







CERTIFICATIONS

Project:

2017-AQUA-MOG

Pace Project No.:

30221492

Pennsylvania Certification IDs

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601

L-A-B DOD-ELAP Accreditation #: L2417

Alabama Certification #: 41590 Arizona Certification #: AZ0734

Arkansas Certification

California Certification #: 04222CA

Colorado Certification

Connecticut Certification #: PH-0694

Delaware Certification

Florida/TNI Certification #: E87683

Georgia Certification #: C040

Guam Certification Hawaii Certification Idaho Certification Illinois Certification Indiana Certification

Iowa Certification #: 391

Kansas/TNI Certification #: E-10358 Kentucky Certification #: 90133

Louisiana DHH/TNI Certification #: LA140008 Louisiana DEQ/TNI Certification #: 4086

Maine Certification #: PA00091 Maryland Certification #: 308

Massachusetts Certification #: M-PA1457

Michigan/PADEP Certification Missouri Certification #: 235

Montana Certification #: Cert 0082 Nebraska Certification #: NE-05-29-14

Nevada Certification #: PA014572015-1 New Hampshire/TNI Certification #: 2976

New Jersey/TNI Certification #: PA 051 New Mexico Certification #: PA01457

New York/TNI Certification #: 10888

North Carolina Certification #: 42706

North Dakota Certification #: R-190

Oregon/TNI Certification #: PA200002 Pennsylvania/TNI Certification #: 65-00282

Puerto Rico Certification #: PA01457

Rhode Island Certification #: 65-00282

South Dakota Certification

Tennessee Certification #: TN2867

Texas/TNI Certification #: T104704188-14-8 Utah/TNI Certification #: PA014572015-5 USDA Soil Permit #: P330-14-00213 Vermont Dept. of Health: ID# VT-0282

Virgin Island/PADEP Certification Virginia/VELAP Certification #: 460198

Washington Certification #: C868 West Virginia DEP Certification #: 143 West Virginia DHHR Certification #: 9964C

Wisconsin Certification

Wyoming Certification #: 8TMS-L

REPORT OF LABORATORY ANALYSIS





SAMPLE SUMMARY

Project:

2017-AQUA-MOG

Pace Project No.:

30221492

| Lab ID | Sample ID | Matrix | Date Collected | Date Received |
|-------------|----------------|--------|----------------|----------------|
| 30221492001 | ODOT-01 | | 06/12/17 09:35 | 06/14/17 11:50 |
| 30221492002 | ODOT-02 | Water | 06/12/17 09:38 | 06/14/17 11:50 |
| 30221492003 | AS-MOG PRE 01 | Water | 06/12/17 12:07 | 06/14/17 11:50 |
| 30221492004 | AS-MOG POST 01 | Water | 06/12/17 12:30 | 06/14/17 11:50 |
| 30221492005 | AS-CLE-PRE-01 | Water | 06/15/17 10:24 | 06/16/17 10:15 |
| 30221492006 | AS-CLE-PRE-02 | Water | 06/15/17 10:22 | 06/16/17 10:15 |
| 30221492007 | AS-CLE-POST-01 | Water | 06/15/17 10:56 | 06/16/17 10:15 |
| 30221492008 | AS-CLE-POST-02 | Water | 06/15/17 10:56 | 06/16/17 10:15 |





SAMPLE ANALYTE COUNT

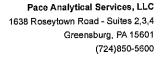
Project:

2017-AQUA-MOG

Pace Project No.:

30221492

| Lab ID | Sample ID | Method | Analysts | Analytes Reported |
|-------------|----------------|-----------|----------|----------------------|
| 30221492001 | ODOT-01 | EPA 903.1 | WRR | 1 |
| 30221492002 | ODOT-02 | EPA 904.0 | JLW | 1 |
| 30221492003 | AS-MOG PRE 01 | EPA 903.1 | WRR | 1 |
| | | EPA 904.0 | JLW | 1 |
| 30221492004 | AS-MOG POST 01 | EPA 904.0 | JLW | 1 |
| 30221492005 | AS-CLE-PRE-01 | EPA 901.1 | MAH | 2 |
| 30221492006 | AS-CLE-PRE-02 | EPA 901.1 | MAH | 2 |
| 30221492007 | AS-CLE-POST-01 | EPA 901.1 | MAH | 2 |
| 30221492008 | AS-CLE-POST-02 | EPA 901.1 | MAH | 2 |





Project:

2017-AQUA-MOG

Pace Project No.:

30221492

Method: EPA

EPA 901.1

Description: 901.1 Gamma Spec

Client:

Microbac Laboratories, Inc.-OH

Date:

June 30, 2017

General Information:

4 samples were analyzed for EPA 901.1. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:

All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

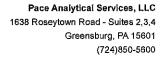
Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:





Project:

2017-AQUA-MOG

Pace Project No.:

30221492

Method:

EPA 903.1

Description: 903.1 Radium 226

Client:

Microbac Laboratories, Inc.-OH

Date:

June 30, 2017

General Information:

2 samples were analyzed for EPA 903.1. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:

All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

All percent recoveries and relative percent differences (RPDs) were within acceptance-criteria with any exceptions noted below.

Additional Comments:





Project:

2017-AQUA-MOG

Pace Project No.:

30221492

Method:

EPA 904.0

Description: 904.0 Radium 228

Client:

Microbac Laboratories, Inc.-OH

Date:

June 30, 2017

General Information:

3 samples were analyzed for EPA 904.0. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.



ANALYTICAL RESULTS - RADIOCHEMISTRY

Project:

2017-AQUA-MOG

Pace Project No.:

30221492

Sample: ODOT-01

Lab ID: 30221492001

Collected: 06/12/17 09:35

Received: 06/14/17 11:50

Matrix: Water

PWS:

Site ID:

Sample Type:

Parameters

Method

Act ± Unc (MDC) Carr Trac

Units pCi/L

Analyzed 06/20/17 10:46 13982-63-3

CAS No. Qual

Radium-226

EPA 903.1

2.77 ± 1.58 (1.45) C:NA T:87%

C:74% T:83%

PWS:

Lab ID: 30221492002

Collected: 06/12/17 09:38 Sample Type:

Received: 06/14/17 11:50 Matrix: Water

Site ID:

Analyzed

CAS No.

Qual

Qual

Qual

Radium-228

Sample: ODOT-02

Method EPA 904.0

Act ± Unc (MDC) Carr Trac 5.78 ± 7.69 (16.5)

Units pCi/L

06/26/17 12:22 15262-20-1

Lab ID: 30221492003

Collected: 06/12/17 12:07

PWS:

Sample: AS-MOG PRE 01

Parameters

Site ID:

Sample Type:

Act ± Unc (MDC) Carr Trac

Received: 06/14/17 11:50

Comments: . Low volume

Method Parameters EPA 903.1 Radium-226

925 ± 116 (10.7) C:NA T:91%

Units pCi/L

Analyzed CAS No. 13982-63-3 06/21/17 11:35

Radium-228

EPA 904.0

373 ± 69.8 (15.0) C:75% T:91%

pCi/L

06/26/17 12:22 15262-20-1

Matrix: Water

Sample: AS-MOG POST 01

PWS:

Lab ID: 30221492004 Site ID:

Collected: 06/12/17 12:30

Act ± Unc (MDC) Carr Trac

Sample Type:

Comments: . Low Volume

Parameters Method EPA 904.0 Radium-228

432 ± 80.1 (13.2) C:75% T:94% 1,010 ± 126 (1.61) Units pCi/L

CAS No. Analyzed 06/26/17 12:22 15262-20-1

Radium-226

EPA 903.1

C:NA T:99%

06/21/17 11:49 13982-63-3 pCi/L

Sample: AS-CLE-PRE-01 PWS:

Parameters

Site ID: Comments: • Low Volume

Lab ID: 30221492005 Collected: 06/15/17 10:24

C:NA T:NA

Sample Type:

Received: 06/16/17 10:15

Received: 06/14/17 11:50

CAS No.

Qual

Radium-226

Radium-228

EPA 901.1 EPA 901.1

Method

595,260 ± 772,180 (927,900) C:NA T:NA 568.050 ± 127.440 (123.800)

Act ± Unc (MDC) Carr Trac

pCi/L pCi/L

Units

06/29/17 10:05 15262-20-1

06/29/17 10:05 13982-63-3

Analyzed

REPORT OF LABORATORY ANALYSIS



ANALYTICAL RESULTS - RADIOCHEMISTRY

Project:

2017-AQUA-MOG

Pace Project No.:

30221492

Sample: AS-CLE-PRE-02

Comments: • Low Volume

Lab ID: 30221492006

Sife ID:

Collected: 06/15/17 10:22

Received: 06/16/17 10:15

PWS:

Parameters

Method EPA 901.1

Act ± Unc (MDC) Carr Trac 501.820 ± 462.880 (552.800) C:NA T:NA

Units pCi/L

Analyzed 06/29/17 16:41 13982-63-3 Qual

Qual

Radium-226 Radium-228

EPA 901.1

387.340 ± 75.616 (64.860) C:NA T:NA

Sample Type:

pCi/L

06/29/17 16:41 15262-20-1

Sample: AS-CLE-POST-01

PWS:

Lab ID: 30221492007

Matrix: Water Received: 06/16/17 10:15

Comments: • Low Volume

Site ID:

Sample Type:

Collected: 06/15/17 10:56

Parameters Method Radium-226 EPA 901.1

Act ± Unc (MDC) Carr Trac 949.330 ± 478.650 (561.700) C:NA T:NA

Analyzed pCi/L

Qual CAS No. 06/29/17 12:07 13982-63-3

CAS No.

Radium-228

EPA 901.1

734.080 ± 129.300 (78.340) C:NA T:NA

pCi/L

Units

06/29/17 12:07 15262-20-1

Sample: AS-CLE-POST-02

PWS:

Lab ID: 30221492008 Site ID:

Method

Sample Type:

Collected: 06/15/17 10:56 Received: 06/16/17 10:15 Matrix: Water

Comments: • Low Volume

Parameters

EPA 901.1 Radium-226

Act ± Unc (MDC) Carr Trac 997.670 ± 545.050 (593.800)

Units Analyzed pCi/L pCi/L

CAS No. 06/29/17 16:42 13982-63-3

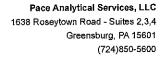
Radium-228

EPA 901.1

C:NA T:NA 713.780 ± 102.920 (84.890) C:NA T:NA

06/29/17 16:42 15262-20-1

REPORT OF LABORATORY ANALYSIS





Project:

2017-AQUA-MOG

Pace Project No.:

30221492

QC Batch:

261943

Analysis Method:

EPA 903.1

QC Batch Method:

EPA 903.1

Analysis Description:

903.1 Radium-226

Associated Lab Samples:

30221492001

30221492001

Matrix: Water

Associated Lab Samples:

METHOD BLANK: 1289742

Parameter

Act ± Unc (MDC) Carr Trac

Units

Analyzed

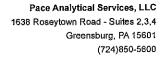
Qualifiers

Radium-226

0.473 ± 0.491 (0.732) C:NA T:92%

pCi/L

06/20/17 10:15





Project:

2017-AQUA-MOG

Pace Project No.:

30221492

QC Batch:

263462

Analysis Method:

EPA 901.1

QC Batch Method:

EPA 901.1

Analysis Description:

901.1 Gamma Spec

Associated Lab Samples:

30221492005, 30221492006, 30221492007, 30221492008

METHOD BLANK: 1297752

Matrix: Water

Associated Lab Samples:

30221492005, 30221492006, 30221492007, 30221492008

| Parameter | Act ± Unc (MDC) Carr Trac | Units | Analyzed | Qualifiers |
|------------|-------------------------------------|-------|----------------|------------|
| Radium-226 | 0.000 ± 102.870 (219.900) C:NA T:NA | pCi/L | 06/28/17 12:48 | |
| Radium-228 | 0.000 ± 6.503 (37.220) C:NA T:NA | pCi/L | 06/28/17 12:48 | |





Project:

2017-AQUA-MOG

Pace Project No.:

30221492

QC Batch:

261944

Analysis Method:

EPA 903.1

QC Batch Method:

EPA 903.1

Analysis Description:

Matrix: Water

903.1 Radium-226

Associated Lab Samples:

30221492003, 30221492004

METHOD BLANK: 1289743

5. 00221102000, 00221102001

Associated Lab Samples: 30

30221492003, 30221492004

Parameter

Act ± Unc (MDC) Carr Trac

Units

Analyzed

Qualifiers

Radium-226

 0.0653 ± 0.339 (0.703) C:NA T:97%

pCi/L

06/21/17 11:16





Project:

2017-AQUA-MOG

Pace Project No.:

30221492

QC Batch:

261946

Analysis Method:

EPA 904.0

QC Batch Method:

EPA 904.0 Analysis Description:

904.0 Radium 228

Associated Lab Samples:

30221492002, 30221492003, 30221492004

METHOD BLANK: 1289745

Matrix: Water

Associated Lab Samples:

30221492002, 30221492003, 30221492004

Parameter

Act ± Unc (MDC) Carr Trac

Units

Analyzed

Qualifiers

Radium-228

-0.107 ± 0.318 (0.773) C:75% T:79%

pCi/L

06/26/17 12:12





QUALIFIERS

Project:

2017-AQUA-MOG

Pace Project No.:

30221492

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Act - Activity

Date: 06/30/2017 02:44 PM

Unc - Uncertainty: SDWA = 1.96 sigma count uncertainty, all other matrices = Expanded Uncertainty (95% confidence interval). Gamma Spec = Expanded Uncertainty (95.4% Confidence Interval)

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

58 Startte Drive Marletta, OH 45750

COC No. A 43160

CHAIN-OF-CUSTODY. RECORD

@ MICROBAC.

Toll FX_302

- Log

ADDITIONAL REQUIREMENTS Morec DAS 00 1 from Samps Inanks Delete 228 GOI PLUBY. (BBU-BAJ) # JATOT PRESERVATIVE FONH 1.106 A43 8SS-8 PASS EPA 904.0 " Rediochemistry (yeC-12 & TO yeb-2) m1.108 A93 825-8 S C 18-228 EPA 901.1m (21-day ingrowth) ta-228 EPA 901.1m (5-day Quick Turn) Hedroquished by: (Signatura) & Dush 14-226 EPA 901.1 E. (177770) to:226 EPA 903.2 ~ Radon Emanation Yntalmetholbss / Bate Ra-226 EPA 901.1 m (Sday QT & 21 day) Ra-226 EPA 901.1 m (21 day ingrowth) Received for Laboratory by (Signalfing) Ra-226 EPA 901.1 m (5day Quick Turn) BIOH NÚMBJER OF CÓNTAINERS MOSA DORE/IUSSARRUAS , Services Received by: 3 Š Ž Ž State of Ohio-DNR-Division of Oil & Gas-614-265-6672 54:35 09136 12:00 12:30 Contact/Phone#: Time 13:18 Standard Location: 10H --412.2017 G-11-2017 6-12-2017 6-12-1017 5,5 **2**5. Date Date ڻ 2017 - AQUA GRIÐ ტობტ Chuck McCracken AKE SLASCOCK Turn Around Requirements: AS-MOG78F.O AS MOG PORTO! FDAY RUSH Char-02 ODOT-0 Ŝample LD. No: Relinquished by: (Signature) Company Name: Project Confact Sampler (print): Project ID:

Water (W), Soil (S), Solid Waste (SD), Uninown (X)

Page.

| Sample Condition Upon | Receipt | Pitts | burg | jh | | |
|---|--------------------|------------|--|--|---|-----------------------|
| PsceAnalytical Client Nam | ie: | Mi | CYO | DENC | Project # 30 2 2 1 | 1492 |
| Courier: Fed Ex UPS USPS [Tracking #: 727 & CU36 |] Client [년50억 |] Com | mercia | al Pace Other | | EH. |
| Custody Seal on Cooler/Box Present: | ⊿yes 🔲 | no | Sea | ls intact: yes | no no | |
| Thermometer Used | Тур | e of Ice | : We | et Blue (None | | |
| Cooler Temperature Observed Temp Temp should be above freezing to 6°C | <u> </u> | _ °c | Cor | rection Factor: N/ | Date and Initials of person examonterits: 1997 (2014) | ° C |
| Comments: | Ye | s No | N/A | 4 | contents: <u>KSN 01141</u> | <u> </u> |
| Chain of Custody Present: | | | | 1 | | |
| Chain of Custody Filled Out: | | 1_ | ļ | 2. | | |
| Chain of Custody Relinquished: | - Andrews | | | 3. | | |
| Sampler Name & Signature on COC; | / | | | 4, | · | |
| Sample Labels match COC: | - Carried | 1 | | 5. | | |
| -Includes date/time/ID Matri | x:_W } | | | ` | | |
| Samples Arrived within Hold Time: | | 1 | | 6. | | |
| Short Hold Time Analysis (<72hr remainin | ıg): | | | 7. | | |
| Rush Turn Around Time Requested: | | / | | 8. | | |
| Sufficient Volume: | | 1 | | 9. Law voiom | e, Samples 6034 cou | i have one IL |
| Correct Containers Used: | | | | 10. | | |
| -Pace Containers Used: | - | 1 | | | | |
| Containers Intact: | and a | 1 | | 11. | | |
| Orthophosphate field filtered | | | | 12. | | |
| Organic Samples checked for dechlorina | tion: | | | 13. | | |
| Filtered volume received for Dissolved tests | - | | | 14. | | |
| All containers have been checked for preservation | . James | 1 | | 15. | | |
| All containers needing preservation are found to be compliance with EPA recommendation. | in | | | | | |
| exceptions: VOA, coliform, TOC, O&G, Pher | rolics | | _ | Initial when completed to the Lot # of added | Date/time of preservation | |
| | | <u>,</u> - | | preservative | | |
| Headspace in VOA Vials (>6mm): | | | AND THE PARTY OF | 16. | | |
| Trip Blank Present: | | | Name of Street, or other party of the street, or other party of th | 17. | | |
| Trip Blank Custody Seals Present | | | C. TARRESTON . | 1247 ml do m. m | | |
| Rad Aqueous Samples Screened > 0.5 mre | m/hr | ATTER A. | | Initial when completed: | Date: 6//4/17 | |
| Client Notification/ Resolution: | | | | | | 20 116810 11168601111 |
| Person Contacted: | | | Date/T | ime: | Contacted By: | |
| Comments/ Resolution: | | | | • • | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers)

A check in this box indicates that additional information has been stored in ereports.

*PM review is documented electronically in LIMS. When the Project Manager closes the SRF Review schedule in LIMS. The review is in the Status section of the Workorder Edit Screen.

COC No. A 43160

158 Starlite Drive Marietta, OH 45750

(MICROBAC. CHAIN-OF-CUSTODY RECORD

Phone: 740-373-4071

30221492 pue Toll Free: 800-373-4071

ADDITIONAL RECUIREMENTS X Other DAS ARCEE DAKERA 0 (∃BU-8AJ) # JATOT Received by: (Signature) Page HMO3 Time 9-228 EPA 901.1 では海 23.76 23.76 e-228 EPA 904.0 ~ Radiochemistry ACE 6.15-17 Mass -228 EPA 901.1m (5-day QT & 21-Day) 14:26 ta-228 EPA 901.1m (21-day Ingrowth) 9-228 EPA 901.1m (5-day Quick Turn) 1.106 A93 355-69 a-226 EPA 903.1 ~ Radon Emanation Refinguished by: (Signature) 6-15-17 , gagjocpemistry Ra-226 EPA 901.1 m (5day QT & 21 day) Respecter (rtworgni yeb £S) m £.£09 Aq3 əSS-68 3a-226 EPA 901.1 m (5day Quick Turn) (Signature) A. S. S. S. P. Pace NUMBER OF CONTAINERS Matrix. Received for Lab 习 3 3 3 Received by (Signature) State of Ohio-DNR-Division of Oil & Gas Location:
AS CLEVELAND 614-265-6672 Time 16.77 Confact Phone #: Table *Water (W), Soil (S), Solid Waste (SD), Unknown (X) C-12-2017 6-15-2017 6-15-2017 6-15-2017 2017 - AQUA - CLE 4/5/19 Date **ds1**0 ძლბე Chuck McCracken Turn Around Requirements: 5-DAY ROSH AS CLE. POST. OZ AS. CLE. PRE. 02 Chrosell AS-CLE- PRE-OI AS. CLE. POST. 01 Sample 1,D. No. Company Name: Project Contact: Sampler (print): Relinquished b Project ID: (Signature)

Page 17 of 18

- 168 (40 MIC)

spec collaint

olecieved by:

Management of the control of the con

| Sample Condition Upon Rec | eipt | Pitts | bur | gh . | |
|--|--|--|------------------|---|--------------------------|
| Pace Analytical Client Name: | <u>, N</u> | ارده | س أ ر | Project # 30 221492 Ruce Other Wildin | EH. |
| Courier: Fed Ex UPS USPS Clic Tracking #: 7278 0439 40 | ent [023 | Com | merci | al Pace Other Wildin | ı |
| Custody Seal on Cooler/Box Present: Yes | | no | Sea | als intact: Ayes 🔲 no | |
| Thermometer Used ULA | Туре | of Ice | e: W | et Blue None | |
| Cooler Temperature Observed Temp | - | ° C | Cor | rection Factor: °C Final Temp: - °C | |
| Temp should be above freezing to 6°C | | _ | | | 9 |
| | | | | Date and Initials of person examining contents: 74 (0110117 | , |
| Comments: | Yes | No | N/ | 4 | |
| Chain of Custody Present: | | ļ | <u> </u> | 1. | |
| Chain of Custody Filled Out: | \ <u>\</u> | | - | 2, | |
| Chain of Custody Relinquished: | | | - | 3. | |
| Sampler Name & Signature on COC: | | V | <u> </u> | 4. | 71. 1.1. 1 |
| Sample Labels match COC: | -myter | | | D. View and the second | ZH leliel.7 |
| -Includes date/time/ID Matrix: | WI | , 1 | | no time on coc, time on both | es are: Pre 01 - 1024 |
| Samples Arrived within Hold Time: | | | | 16. | Pieoz-1027 |
| Short Hold Time Analysis (<72hr remaining): | ļ | V | | 17. | Posto1-1056 |
| Rush Turn Around Time Requested: | / | | 10 C | 5 day Ziskon | • |
| Sufficient Volume: | V | | | 9. | Postoz-1056 |
| Correct Containers Used: | | | | 10. | |
| -Pace Containers Used: | | \ | | | |
| Containers Intact: | W | | | 11. | |
| Orthophosphate field filtered | | | | 12. | |
| Organic Samples checked for dechlorination: | | | ./ | 13. | |
| Filtered volume received for Dissolved tests | - | | / | 14. | |
| All containers have been checked for preservation. | ~ | | | 15. | |
| All containers needing preservation are found to be in compliance with EPA recommendation. | ✓ | | | 15. (+ 6 7 | • |
| TOO OLD The Street | | | | Initial when Date/firme of completed As preservation | |
| exceptions: VOA, coliform, TOC, O&G, Phenolics | | | | completed CVS preservation | |
| | | - , | | preservative | |
| Headspace in VOA Vials (>6mm): | | | | 16. | |
| Trip Blank Present: | | | | 17. | |
| Trip Blank Custody Seals Present | | | سرر | | |
| Rad Aqueous Samples Screened > 0.5 mrem/hr | | / | | Initial when completed: CH Date: CEILEIT | |
| Client Netification/ Resolution: | | | | | |
| Person Contacted: | | I | Date/T | ime: Contacted By: | • |
| Comments/ Resolution: | | | · - | | • |
| | | | | | |
| | | | | | • |
| | | | | | · |
| A check in this box indicates that additi | | | | the bear of and for any | |
| - venecy in this pay lithroates fluit soull | onal II | nom | auor | i nas peen stored in ereports. | ' ' |

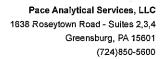
TOTAL CONTROL OF THE
Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers)

*PM review is documented electronically in LIMS. When the Project Manager closes the SRF Review schedule in LIMS. The review is in the Status section of the Workorder Edit Screen.

ATTACHMENT

Radiological Analytical Results for:

ODOT tap water - PRE





July 05, 2017

Ms. Michelle Taylor Microbac Laboratories, Inc. 158 Starlite Drive Marietta, OH 45750

RE: Project: 2017-AQUA SAUNA-TUSC

Pace Project No.: 30222632

Dear Ms. Taylor:

Enclosed are the analytical results for sample(s) received by the laboratory on June 26, 2017. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Robbin Robl
robbin.robl@pacelabs.com

Robert & Robe

(724)850-5613 Project Manager

Enclosures







CERTIFICATIONS

Project:

2017-AQUA SAUNA-TUSC

Pace Project No.:

30222632

Pennsylvania Certification IDs

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601

L-A-B DOD-ELAP Accreditation #: L2417

Alabama Certification #: 41590 Arizona Certification #: AZ0734

Arkansas Certification

California Certification #: 04222CA

Colorado Certification

Connecticut Certification #: PH-0694

Delaware Certification

Florida/TNI Certification #: E87683 Georgia Certification #: C040

Guam Certification Hawaii Certification Idaho Certification Illinois Certification Indiana Certification

Indiana Certification
Iowa Certification #: 391

Kansas/TNI Certification #: E-10358

Kentucky Certification #: 90133

Louisiana DHH/TNI Certification #: LA140008 Louisiana DEQ/TNI Certification #: 4086

Maine Certification #: PA00091

Maryland Certification #: 308

Massachusetts Certification #: M-PA1457

Michigan/PADEP Certification Missouri Certification #: 235 Montana Certification #: Cert 0082

Nebraska Certification #: NE-05-29-14 Nevada Certification #: PA014572015-1 New Hampshire/TNI Certification #: 2976

New Jersey/TNI Certification #: PA 051 New Mexico Certification #: PA01457

New York/TNI Certification #: 10888

North Carolina Certification #: 42706 North Dakota Certification #: R-190

Oregon/TNI Certification #: PA200002

Pennsylvania/TNI Certification #: 65-00282 Puerto Rico Certification #: PA01457

Rhode Island Certification #: 65-00282 South Dakota Certification

Tennessee Certification #: TN2867

Texas/TNI Certification #: T104704188-14-8

Utah/TNI Certification #: PA014572015-5

USDA Soil Permit #: P330-14-00213 Vermont Dept. of Health: ID# VT-0282

Vermont Dept. of Health: ID# VT-0282 Virgin Island/PADEP Certification

Virginia/VELAP Certification #: 460198

Washington Certification #: C868

West Virginia DEP Certification #: 143

West Virginia DHHR Certification #: 9964C

Wisconsin Certification

Wyoming Certification #: 8TMS-L

REPORT OF LABORATORY ANALYSIS

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SAMPLE SUMMARY

Project:

2017-AQUA SAUNA-TUSC

Pace Project No.:

30222632

Lab ID

Sample ID

Matrix

Date Collected

Date Received

30222632001

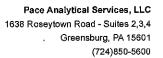
DOTTUSC RAW-01,02

Water

06/21/17 12:52

06/26/17 09:20

REPORT OF LABORATORY ANALYSIS





SAMPLE ANALYTE COUNT

Project:

2017-AQUA SAUNA-TUSC

Pace Project No.: 30222632

| Lab ID | Sample ID | Method | Analysts | Analytes Reported |
|-------------|-------------------|-----------|----------|----------------------|
| 30222632001 | DOTTUSC RAW-01,02 | EPA 903.1 | WRR | 1 |
| | | EPA 904.0 | JLW | 1 |

REPORT OF LABORATORY ANALYSIS





Project:

2017-AQUA SAUNA-TUSC

Pace Project No.:

30222632

Method:

EPA 903.1

Description: 903.1 Radium 226

Client:

Microbac Laboratories, Inc.-OH

Date:

July 05, 2017

General Information:

1 sample was analyzed for EPA 903.1. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time

The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:

All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:





Project:

2017-AQUA SAUNA-TUSC

Pace Project No.:

30222632

Method:

EPA 904.0 Description: 904.0 Radium 228

Client:

Microbac Laboratories, Inc.-OH

Date:

July 05, 2017

General Information:

1 sample was analyzed for EPA 904.0. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:

All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.





ANALYTICAL RESULTS - RADIOCHEMISTRY

Project:

PWS:

2017-AQUA SAUNA-TUSC

Pace Project No.:

30222632

Sample: DOTTUSC RAW-01,02

Parameters

Lab ID: 30222632001

Method

Collected: 06/21/17 12:52

Site ID:

Sample Type:

Act ± Unc (MDC) Carr Trac 1.90 ± 0.805 (0.559)

Analyzed 07/03/17 13:27 13982-63-3

CAS No.

Matrix: Water

Qual

Radium-226 Radium-228 EPA 903.1 EPA 904.0

C:NA T:86% 0.922 ± 0.421 (0.696)C:73% T:84%

pÇi/L pCi/L

Units

Received: 06/26/17 09:20

07/03/17 13:13 15262-20-1

REPORT OF LABORATORY ANALYSIS





Project:

2017-AQUA SAUNA-TUSC

Pace Project No.:

30222632

QC Batch:

263234

Analysis Method:

EPA 903.1

QC Batch Method:

EPA 903.1

Analysis Description:

903.1 Radium-226

Associated Lab Samples:

30222632001

METHOD BLANK: 1296756

Matrix: Water

Associated Lab Samples:

30222632001

Parameter

Act ± Unc (MDC) Carr Trac

Units

Analyzed

Qualifiers

Radium-226

0.000 ± 0.337 (0.686) C:NA T:90%

pCi/L

07/03/17 12:35

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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Project:

2017-AQUA SAUNA-TUSC

Pace Project No.:

30222632

QC Batch:

263247

Analysis Method:

EPA 904.0

QC Batch Method:

EPA 904.0

Analysis Description:

904.0 Radium 228

Associated Lab Samples:

30222632001

Matrix: Water

METHOD BLANK: 1296776

IVICA

Associated Lab Samples: 30222632001

Parameter

Act ± Unc (MDC) Carr Trac

Units

Analyzed

Qualifiers

Radium-228

 0.376 ± 0.338 (0.687) C:80% T:84%

pCi/L

07/03/17 13:10

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALIFIERS

Project:

2017-AQUA SAUNA-TUSC

Pace Project No.:

30222632

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Act - Activity

Date: 07/05/2017 01:24 PM

Unc - Uncertainty: SDWA = 1.96 sigma count uncertainty, all other matrices = Expanded Uncertainty (95% confidence interval). Gamma Spec = Expanded Uncertainty (95.4% Confidence Interval)

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

COC No. A 43160

1.58 Starlite Drive Marietta, OH 45750

@ MICROBAC. CHAIN-OF-CUSTODY RECORD

Phone: 740-373-4071

Toll Fire: 800-373-4071

| Company Name: State of O | State of Ohio-DNR-Division of Oil & G | & Gas | 10.21 | (կչտ | ίγ | | <u></u> | | 73 | | Program | |
|--|---------------------------------------|---|----------------------------------|--|------------------|---|-----------|-------------------|-------|-----------------------------|---|--------|
| Chuck McCracken | 614-265-6672 | 572 | | vorgni | izimei | | | | | | | |
| Turn Around Requirements: | Location: DOTTUSC ZAV | 34 | | Yeb £ | adłoch | | | | | | | |
| Project iD: 1200 & S | SAUMA - TUSE | | | S) m í. | Ы~ C | | | pey ~ | 862E | | Arcee DAS | |
| <u>7</u> | 75 | ` | | 106 A9 |).£09 A | t.106 A | | 0°\$06 v | 7.1 | | <u>'</u> | |
| Sample 1,D. No. | Grab Oate | Matrix* | NUMBER Hald | Ra-226 E Ra-226 E | 19-226 EP | 9-558 Eb | 9-228 EP/ | 43 822-e | оин | | ADDITIONAL RECUIREMENTS | |
| DOTTUSC RAW-01 | X 6-217017 12:52 | ┡ | | | i C | 4 | | B | | | | - |
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| | | | | | | 30222632 | 632 | | | | | |
| Refinanished by: | Figure Time | Jonaine High | | D C |] | | Н | | Ť | | | T |
| (Signature) | 25.5 | (Signatore) | | (Signature) | | | | age of the second | 10:08 | Received by: (Signature) | "X-K | |
| Refinquished by: (Storature) | Date Time (12)b | Received for Laboratory by (Signature) $\int \int \int S \int S ds$ | 5 | PAC 6- | Carte 6-23-17 | <u> -</u> | 14.50 | Remarks |] | | | |
| B Water (W), Soit (S), Solid Waste (SD), Unknown (Q) | (Sp), Unknown (A) | : #6 pm 71 | 70 | ag Ovi Sha | 3 | Dolar Distal by D. O. city . 1Pare 6-33-1 | 1826 | 6-23-1 | 128 | Page | | 1 |
| of Relinguished by | -1-56. | | • | | 702 | 2-1 | I VI | The second | 1 / | | 526-17 0920 | 0 |
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| | | | | | | | | | | | | |

| Sample Condition Upon Re | ceipt | 1- EEC: | Suui | au 🤼 | 0 2 2 2 5 3 4 - |
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| Pace Anniydical Client Name: | | M_i | <u>``</u> | abac | Project# |
| Courier: Fed Ex UPS USPS C Tracking #: 7270 0439 | lient [|] Con | nmerci | al 🗌 Pace Other | |
| Custody Seal on Cooler/Box Present: ye | s /K | no | Se | als intact: yes | no no |
| Thermometer Used | Typ | e of lo | e: W | | |
| Cooler Temperature Observed Temp | 1/4 | • 0 | | rrection Factor: | *C Final Temp; C |
| Temp should be above freezing to 6°C | <u> </u> | _ | - | • | |
| | | | | | Date and Initials of person examining contents: |
| Comments: | Ye | B No | > N/. | 4 | |
| Chain of Custody Present; | | 1 | 4 | 1. | |
| Chain of Custody Filled Out: | \supseteq | <u> </u> | | 2. | |
| Chain of Custody Relinquished: | | 1_ | <u> </u> | 3. | |
| Sampler Name & Signature on COC: | _ >< | | | 4, | |
| Sample Labels match COC: | \geq | 1 | _ | 5. | |
| -Includes date/time/ID Maidx: ᠘ | 4 | 7 | | | |
| Samples Arrived within Hold Time: | $ \Sigma $ | | | 6. | |
| Short Hold Time Analysis (<72hr remaining); | | $\downarrow \geq$ | 4_ | 7. | |
| Rush Turn Around Time Requested: | X | | | 8. | |
| Sufficient Volume: | \geq | | | 9. | |
| Correct Containers Used: | \geq | | | 10. | |
| -Pace Containers Used: | \geq | <u>[</u> | | | |
| Containers intact: | \leq | | <u> </u> | 11. | |
| Orthophosphale field filtered | | \geq | | 12. | |
| Organic Samples checked for dechlorination: | | | $ \times $ | 13. | |
| Illered volume received for Dissolved tests | <u> : </u> | | $\perp \geq$ | 14. | |
| li containers have been checked for preservation. | × | | Ľ | 15. 01/ | -) |
| all containers needing preservation are found to be in ompliance with EPA recommendation. | 1/2 | | | ptt 2 | attern. |
| ompianca with CPA recommendation. | نـــنا | <u> </u> | J | Initial when | Date/time of |
| xceptions: VOA, coliform, TOC, O&G, Phenolics | | | | completed | preservation |
| | | | | Lot # of added preservative | |
| eadspace in VOA Vials (>6mm): | | | X | 16. | |
| ip Blank Present: | | \times | | 17. | |
| lp Blank Custody Seals Present | | | \searrow | , | |
| ad Aqueous Samples Screened > 0.5 mrem/hr | | $\overline{\mathbf{X}}$ | | Initial when completed: | Date: 6-26-17 |
| lient Notification/ Resolution: | | | | 0011730004. 7 | |
| Person Confacted: | | | Date/T | īme! | Contacted By: |
| Comments/ Resolution: | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | *************************************** | | | |
| \square A check in this box indicates that addit | | | _ | | |

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a way, Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers)

*PM review is documented electronically in LIMS. When the Project Manager closes the SRF Review schedule in LIMS. The review is in the Status section of the Workorder Edit Screen.

15.0 4 5 Worklist Smp#: Operator ID: ALS Bottle#: . <u>21</u> Chrom Revision: 2.2 25-Apr-2017 13:27:22 * 1,4-Dichlorobenzene-d4(9.913) 5.0000 MSV 8260B ICAL UXC4766[MS SCAN Chro]: Total TestAmerica Canton | TestAmeri 240-80850-1 (867.8)(nu2) enesnedoroulfornor8-4-8 * Chlorobenzene-d5(7.684) Lab Sample ID: Instrument ID: Dil. Factor: Limit Group: (Ete.a)enertieorolriostieT 4-Methyl-2-pentanone (MIBK)(6.272) (875.8)(mu2) 8b-eneuloT & 240-80850-A-1 1.JG-098/ODOT BRINE TANK 5.000 mL (YSO.2)eneznachoronii. \$ 1.2-Dichloroethane-d4 (Surn) (4.755) \$ Dibromofluoromethane (Surr)(4.470) 18-Jun-2017 22:53:30 2-Butanone (MEK)(4.090)+ 6,4 Report Date: 19-Jun-2017 08:32:15 8260_15 Column: DB-624 (0.18 mm) (rea.S.) enotecA Injection Date: Purge Vol: Data File: Client ID: Lims ID: Method: g 횬 (000001X) Y

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| ,5 | | • | 18.0 |
| John J | / | | 17.0 |
| ę. | | | 16.0 |
| | 23 | \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ | 15.0 |
| ator ID: ist Smp#: | 3otfle#: | . Perylene-d12(14.336) | 14.0 |
| Opera | ALS E | | 13.0 |
| , | | . Chrysene-d12(12.556) | 12.0 |
| | <u>+</u> | +(088.11)+1b-lyneriqueT & | 11.0 |
| 27.D 50-1 | 70C IC/ | DI-I-DORIAL BURGIERI (N.091)+ | |
| 706160 4HP9 40-808 | 0000 SS 827 | NESC DI JOTP GESTING CO. | - 10 g |
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| 170616-(ment ID Sample II | actor. Group: | (SOE 8)(TRUE) Introduction 12: C 2 | 8.0 |
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| ata X4 | · • | (\$38.6)+b-enesnedorolrio-1-,f * | |
| ChromD 30 30 IE TAN | | \$ Phenol-d5(6.069) | 9 9 |
| Canton\\ 7 18:44:: E-1-A OT BRIN | | | 200 |
| ChromNA 5-Jun-201 10-80850- | .0 ul 270 _9 0.18 mm) | | 4.0 |
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| | ChromNA\Canton\ChromData\A4HP9\20170616-66038.b\706166027.D ChromNA\Canton\ChromData\A4HP9\20170616-66038.b\706166027.D Date: 16-Jun-2017 18:44:30 Instrument ID: A4HP9 Operator ID: 001710 240-80850-E-1-A Lab Sample ID: 240-80850-1 Worklist Smp#: 27 ChromOffice Institute Instrument ID: 240-80850-1 ChromOffice Institute Instit | ### Section Comparison Comp | 15-base 15-b |

Chrom Revision: 2.2 25-Apr-2017 13:27:22 TestAmerica Canton | TestAmerica Canton | WchromNAlCanton/ChromData/A3UX15/20170618-66102.b/UXC4767.D Report Date: 19-Jun-2017 08:32:17 Data File:

Instrument ID: 18-Jun-2017 23:15:30

Lab Sample ID: UG:099/PRE-TREATMENT TANK 5.000 mL

240-80852-8-3

Injection Date:

Purge Vol:

Client 1D: Lims ID:

240-80852-3

Limit Group: Dil. Factor:

33,3300

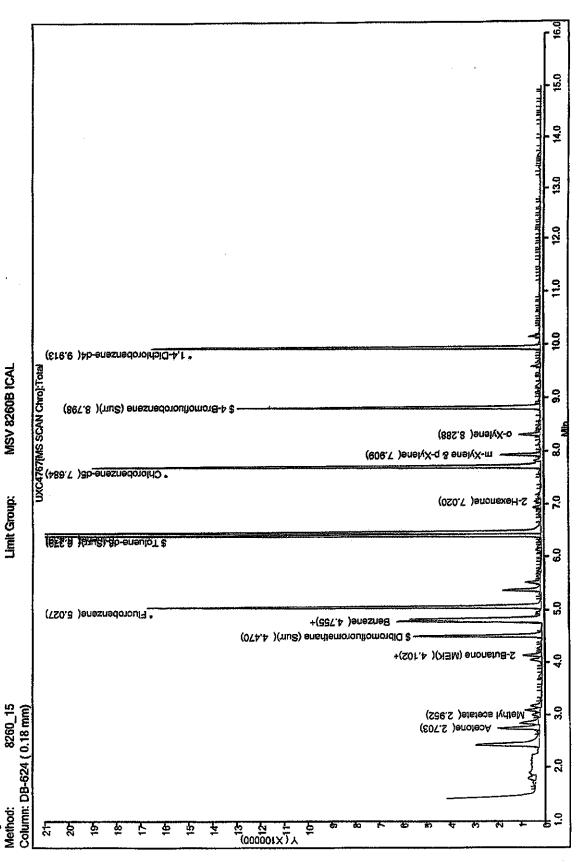
MSV 8260B ICAL

Operator ID: Worklist Smp#:

8

ALS Bottle#:

8



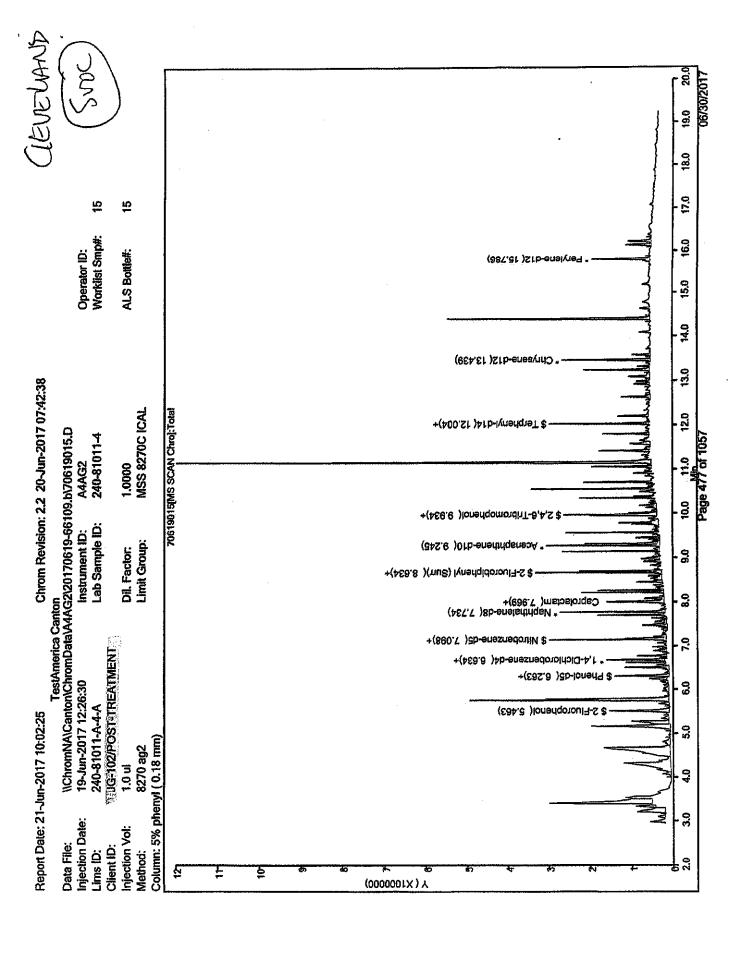
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| | Operator ID: Worklist Smp#: | ALS Bottle#: | Perylene-d12(14,340) |
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| | | | - Chrysene Grantyl 25/3/1) phinalate(12.431) |
| | 9 - | CAL | |
| | ChromNA\Canton\ChromData\A4HP9\20170616-66038.b\70616026.D 16-Jun-2017 18:19:30 | 1.0000 MSS 8270C ICAL | +(766.8)0rb-enarhirdenach +(766.8)0rb-enarhirdenach -(768.8)0rb-enarhird |
| | F-66038. D: ID: | | +(766.8)01b-enerthridenesta. |
| | 9/20170516-66 Instrument ID: Lab Sample ID: | Dil, Factor: Limit Group: | |
| ica Canton | ataVAHPC | | +(75898-)e-lioneriq s + (75898-)e-lioneriq s |
| estAmer | ChromD 30 | | |
| j | A\Cantoni 117 18:19: 2-A-1-A RE:TREA | (u | (5.299) |
| | \\Chrom\A\Canton\ChromData\A4\\\16-\un-2017 18:19:30\\240-80852-A-1-A\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\ | Injection Vol: 1.0 ul Method: 8270_9 Column: 5% phenyl (0.18 mm) | |
| | .: Date: | Voľ: 5% pheny | |
| | Data File: Injection Date: Lims ID: Client ID: | Injection Vol: Method: Column: 5% | |

16.0 15.0 14.0 2 13.0 Worklist Smp#: Operator ID: ALS Bottle#: 12.0 10.0 Chrom Revision: 2.2 25-Apr-2017 13:27:22 Chlorobenzene-d4(9.925)

Chlorobenzene-d4(9.925) (\$26.6)+b-enasmedoroldald-4,1 * MSV 8260B ICAL TestAmerica Canton | TestAmerica Canton | IChromNAICantonIChromDatalA3UX15120170618-66102.b/UXC4768.D 240-80852-6 +(867.8)(riu8) eneznedoroullomor8-4 \$ 14,2900 80 Lab Sample ID: Instrument ID: Limit Group: Dil. Factor: +(875.8)(nu2) 8b-eneuloT & 0 0.0 JG-100/POST TREATMENT (TS0.5)enesnedonouP.* +(A2T,A)(TICALIONOSThane-d4 (Surr)(4,754)+ (074.4)(11u2) ensritemotouflomordiQ \$ 18-Jun-2017 23:37:30 2-Butanone (MEK)(4.102)+ 4.0 Report Date: 19-Jun-2017 08:32:18 240-80852-A-6 5.000 mL Method: 8260_15 Column: DB-624 (0.18 mm) 3.0 2.0 Injection Date: Purge Vol: Data File: Client ID: Lims ID: (000001X) Y ᅙ 쥰 ₽ 듄

| Mostrate | 170 |
|--|--|
| 710 | 16.0 |
| | |
| Operator ID: Worklist Smp#: ALS Botte#: | 5 O Themplane d12(14.339) |
| op Ne | 13.0 |
| 0 | 150 mg 2 mg |
| Chrom Revision: 2.2 25-Apr-2017 13:27:22 9:20170616-66038.b/70616025.D nstrument ID: A4HP9 -ab Sample ID: 240-80852-4 Dil. Factor: 1:0000 -imit Group: MSS 8270C ICAL | 10 10 10 10 10 10 10 10 10 10 10 10 10 1 |
| 25-Apr-2017 13:5 by70616025.D A4HP9 240-80852-4 1.0000 MSS 8270C ICAL | + (866.8)01b-eneritridence + 2.5 (86.8)0.1b-eneritridence + |
| n: 2.2 3038.b 2: 2 1 | \$\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\ |
| Chrom Revision 920170616-68 nstrument ID: Lab Sample ID: Oil. Factor: Limit Group: | +(#08.7)meiosloideo +(086.8)(mu8) lynehdidoiou)=4.\$ \$ |
| Chro nton IHP9/20 Instr Lab Dil. f | +(164.7)8b-ənəlerliriqeV |
| -2017 13:14:30 Chrom Revision: 2.2 25-Apr-2017 TestAmerica Canton Nation Nation Chrom Patch Canton TestAmerica Canton Nation Nat | +(1S1.8)-to-formarka + + + + + + + + + + + + + + + + |
| 4:30 Test Canton/Ch 7 17:54:30 A-4-A ST_TREAT | 0 5.183) |
| Report Date: 18-Jun-2017 13:14:30 TestAmerica Data File: NChromNANCanton/ChromData Injection Date: 16-Jun-2017 17:54:30 Lims ID: 240-80852-A-4-A Client ID: \\\ \\\ \\\\\\\\\\\\\\\\\\\\\\\\\\\ | August Au |
| e: 18-Ju ate: ol: % pheny | |
| Report Date: 1 Data File: Injection Date: Lims ID: Client ID: Injection Vol: Method: Column: 5% pi | (0000001X)Y |

15.0 14.0 13.0 Worklist Smp#: Operator ID: ALS Bottleft: (0+9.11)anesnadoroldoinT-4,S,F <u>0</u> 000 Chrom Revision: 2.2 20-Jun-2017 07:42:38 (049.9)4b-enesmedonolidoid-4,1 MSV 8260B ICAL UXJ3666[MS SCAN Chro]: Total TestAmerica Canton NChromNA\Canton\ChromData\A3UX11\20170623-66291.b\UXJ3666.D 23-Jun-2017 19:40:30 Instrument ID: A3UX11 9.0 240-81011-3 Page 345 of 1057 \$ 4-Bromofluorobenzene (Sur)(8.816)+ 6.6700 (Y05.8)anelyX-o 8.0 (SSST,)enesnedlyrtt (N.940) * Chlorobenzene-d5(7.704) Lab Sample ID: Instrument ID: Limit Group: (T10.7)enonexeH-S Dil. Factor: (944.6)aneuletes a journ) sh-aneuloT 2 I-Methyl-2-pentanona (MIBK)(6,284) 6.0 Methylcyclohexane(5.479)+ JG-101/PRE-TREATMENT 5.0 +(140.8)aneznedoroui3 (\tau_h)) snezne8 (\tau_h) (\tau_h) (\tau_h) 4b ensateonoldsic - \tau_h \tau_h) +(ET4.4)(nue) ensitemonoullomondiO \$ +(260.4)(XEM) enonstu8-S 4.0 Report Date: 26-Jun-2017 07:40:49 240-81011-B-3 5.000 mL Method: 8260_11 Column: DB-624 (0.18 mm) 3.0 Methyl acetate(2.959)+ Acetone(2.698) 2,0 Injection Date: Purge Vol: Data File: Client ID: Lims ID: 9 (×10000go) ₩ ₩ ₩ ₩ 2 2 8



Gas Chromatographs of pre-treatment and post-treatment of brine tanks of Duck Creek Energy and ODOT tank containing AquaSalina

The Division of Oil and Gas Resources Management (DOGRM) sampled the pre-treatment and post-treatment brine tanks at Duck Creek Energy's Cleveland and Mogadore facilities. In addition, DOGRM sampled a tank containing AquaSalina delivered to an ODOT facility. The samples were provided to TestAmerica for gas chromatography (GC) analysis. In these samples, GC analysis was used to determine if volatile organic compounds (VOC) and semi-volatile organic compounds (SVOC) were present in the brine sampled. Each peak or mound on an analysis represents the presence of VOC or SVOC as indicated on the analysis. Note that a mound indicates that multiple VOCs and SVOCs are present in the mound, but the analysis/equipment was unable to separate the VOCS or SVOCs into individual peaks. If VOCs or SVOCs were not present in the brine, no peaks would appear on an analysis. The table below is a summary GC analysis of the tanks sampled.

| TankSample | Volatile Organic Compounds | Semî-Volatile Organic Compounds |
|--------------------------|----------------------------|------------------------------------|
| Pre-Treatment Cleveland | ✓ | ✓ |
| Post-Treatment Cleveland | ✓ | ✓ |
| Pre-Treatment Mogadore | ✓ | ✓ |
| Post-Treatment Mogadore | ✓ | ✓ |
| ODOT tank of AquaSalina | ✓ | √ |

^{*}The DOGRM did not use the GC analysis to substantiate the peaks identified in the analysis. Rather, it was used to determine if VOCs and SVOCs were present in the tanks sampled.