Element Materials Technology Lafayette
2417 W. Pinhook Road
Lafayette, LA 70508-3344
TEL: (337) 235-0483 FAX: (337) 233-6540
Website: www.element.com

October 22, 2014

Duane Piranio
Arabie Environmental
P O Box 928
Lake Charles, LA 70602
TEL: (337) 263-1596
FAX

RE: Moore/11301 Order No.: 14100080

Dear Duane Piranio:

Element Materials Technology Lafayette, LLC received 5 sample(s) on 10/2/2014 for the analyses presented in the following report.

In accordance with your instructions Element Lafayette conducted the analysis shown on the following pages on samples submitted by your company. The results related only to the items tested. Unless otherwise noted, all analyses were conducted using EPA approved methodologies and all test results meet all requirements of TNI. All relevant sampling information is on the attached Chain-of-Custody form.

All soil data, except for 29-B, are on a wet-weight basis unless otherwise indicated in the units field as –dry.

LELAP Certification No.: 01997. A scope of accredited parameters is available upon request. A "#" by the test method or analyte indicates this parameter is outside the scope of accreditation.

Estimated uncertainty is available upon request. This report shall not be reproduced except in full, without the written approval of the laboratory.

If you have any questions regarding these test results, please feel free to call.

Annie Reedy
Manager, Analytical Services
2417 W. Pinhook Road
Lafayette, LA 70508-3344

Element Materials Technology Lafayette
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Case Narrative

WO#: **14100080**
Date: **10/22/2014**

CLIENT: Arabie Environmental
Project: Moore/11301

Unless specified by the client, a duplicate or MS/MSD, wherever applicable, is randomly selected and analyzed from each analytical batch provided sample volume is sufficient. The sample chosen for duplicate or MS/MSD may or may not be a sample submitted in this workorder. A method blank and/or a lab control sample (LCS)/lab control sample duplicate (LCSD), wherever applicable, are processed as a quality control check for each analytical batch. When the matrix QC data is not available due to insufficient sample volume or when the results indicate possible matrix effect, the validity of the batch is determined by the method blank and LCS/LCSD.

The results of the laboratory internal quality control data are provided in the QC Summary Report section of the report for your review. Laboratory-related QC exceptions that may impact the validity of data are discussed in the case narrative. Sample-related QC exceptions are flagged either in the results page(s) or in the QC report page(s). End users should consider QC exceptions when evaluating sample data against data quality objectives.

The Radium 226 & 228 analysis was subcontracted to ARS International, LLC. Their report is attached in its entirety.

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Sample Log-In Check List

Client Name: **ARABIE_ENV** Work Order Number: **14100080** RcptNo: **1**

Logged by:	**Heather Delay**	**10/2/2014 12:30:00 PM**	Heather DeLay
Completed By:	**Heather Delay**	**10/2/2014 1:56:44 PM**	Heather DeLay
Reviewed By:	**Caitlin Duplantis**	**10/6/2014 10:30:45 AM**	Caitlin Duplantis

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Element		

Log In

3.	Coolers are present?	Yes ☑	No ☐	NA ☐
4.	Shipping container/cooler in good condition?	Yes ☑	No ☐	
	Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
	No. Seal Date:	Signed By:		
5.	Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐
6.	Were all samples received at a temperature of >0° C to 6.0°C	Yes ☑	No ☐	NA ☐
7.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
8.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
9.	Are samples (except VOA and ONG) properly preserved?	Yes ☑	No ☐	
10.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
11.	Is the headspace in the VOA vials less than 1/4 inch or 6 mm?	Yes ☐	No ☐	No VOA Vials ☑
12.	Were any sample containers received broken?	Yes ☐	No ☑	
13.	Does paperwork match bottle labels? (Note discrepancies on chain of custody)	Yes ☑	No ☐	
14.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
15.	Is it clear what analyses were requested?	Yes ☑	No ☐	
16.	Were all holding times able to be met? (If no, notify customer for authorization.)	Yes ☑	No ☐	

Special Handling (if applicable)

17.	Was client notified of all discrepancies with this order?	Yes ☐	No ☐	NA ☑

Person Notified: Date

By Whom: Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding:

Client Instructions:

18. Additional remarks:

Cooler Information

Cooler No	Temp ºC	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	3.1	Good	Not Present			

2609 North River Road, Port Allen, Louisiana 70767

(800) 401-4277 -- FAX (225) 381-2996

ARS International, LLC

Laboratory Analysis Report

ARS1-14-02706

Prepared for:

Element Materials Technology- Lafayette

Annie Reedy
2417 W. Pinhook Rd
Lafayette, LA 70508

karen.james@element.com; caitlin.duplantis@element.com
annie.reedy@element.com; rhonda.david@element.com; misty.simpson@element.com

Phone: 337-235-0483
Fax: 337-233-6540

Project Manager Review

Management Review

Contact Person: Questions regarding this analytical report should be addressed to:

Project Manager

ProjectManagers@amrad.com

Phone: 225.381.2991
Fax: 225.381.2996

LELAP Cert# 01949

2609 North River Road, Port Allen, Louisiana 70767
1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group:	ARS1-14-02706	**Request or PO Number:**	Verbal Rhonda
Client Sample ID:	M-MW02	**ARS Sample ID:**	ARS1-14-02706-001
Sample Collection Date:	10/01/14	**Date Received:**	10/07/14
Sample Matrix:	Aqueous	**Report Date:**	10/22/14

Analysis Description	Analysis Results	CSU +/- 2 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
RA-226	0.959	0.320	0.304	0.132		pCi/L	ARS-010/EPA 903.0/904.0	10/20/14 08:20	JPB	131%
RA-228	0.705	0.783	1.289	0.601	U	pCi/L	ARS-010/EPA 903.0/904.0	10/13/14 14:46	JPB	120%

NOTES: Chemical recoveries are elevated due to high amounts of solids dissolved in sample matrix

Project Manager Review

LELAP Certificate# 01949

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ARS Sample Delivery Group:	ARS1-14-02706	**Request or PO Number:**	Verbal Rhonda
Client Sample ID:	FD	**ARS Sample ID:**	ARS1-14-02706-002
Sample Collection Date:	10/01/14	**Date Received:**	10/07/14
Sample Matrix:	Aqueous	**Report Date:**	10/22/14

Analysis Description	Analysis Results	CSU +/- 2 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
RA-226	0.616	0.242	0.244	0.103		pCi/L	ARS-010/EPA 903.0/904.0	10/20/14 08:20	JPB	131%
RA-228	0.604	0.781	1.304	0.607	U	pCi/L	ARS-010/EPA 903.0/904.0	10/13/14 14:46	JPB	117%

NOTES: Chemical recoveries are elevated due to high amounts of solids dissolved in sample matrix

Project Manager Review

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ARS Sample Delivery Group:	ARS1-14-02706	**Request or PO Number:**	Verbal Rhonda
Client Sample ID:	Equipment Blank	**ARS Sample ID:**	ARS1-14-02706-003
Sample Collection Date:	10/01/14	**Date Received:**	10/07/14
Sample Matrix:	Aqueous	**Report Date:**	10/22/14

Analysis Description	Analysis Results	CSU +/- 2 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
RA-226	0.287	0.177	0.231	0.095		pCi/L	ARS-010/EPA 903.0/904.0	10/20/14 08:20	JPB	129%
RA-228	0.208	0.775	1.366	0.635	U	pCi/L	ARS-010/EPA 903.0/904.0	10/13/14 14:46	JPB	102%

NOTES: Chemical recoveries are elevated due to high amounts of solids dissolved in sample matrix

Project Manager Review

LELAP Certificate# 01949

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1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group:	ARS1-14-02706	**Request or PO Number:**	Verbal Rhonda
Client Sample ID:	M-MW01	**ARS Sample ID:**	ARS1-14-02706-004
Sample Collection Date:	10/01/14	**Date Received:**	10/07/14
Sample Matrix:	Aqueous	**Report Date:**	10/22/14

Analysis Description	Analysis Results	CSU +/- 2 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
RA-226	0.712	0.248	0.203	0.082		pCi/L	ARS-010/EPA 903.0/904.0	10/20/14 08:20	JPB	132%
RA-228	2.755	1.112	1.441	0.667		pCi/L	ARS-010/EPA 903.0/904.0	10/13/14 14:46	JPB	98%

NOTES: Chemical recoveries are elevated due to high amounts of solids dissolved in sample matrix

Project Manager Review

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ARS Sample Delivery Group:	ARS1-14-02706	**Request or PO Number:**	Verbal Rhonda
Client Sample ID:	M-MW03	**ARS Sample ID:**	ARS1-14-02706-005
Sample Collection Date:	10/01/14	**Date Received:**	10/07/14
Sample Matrix:	Aqueous	**Report Date:**	10/22/14

Analysis Description	Analysis Results	CSU +/- 2 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
RA-226	0.734	0.252	0.212	0.087		pCi/L	ARS-010/EPA 903.0/904.0	10/20/14 08:20	JPB	130%
RA-228	0.988	0.957	1.555	0.728	U	pCi/L	ARS-010/EPA 903.0/904.0	10/13/14 14:46	JPB	96%

NOTES: Chemical recoveries are elevated due to high amounts of solids dissolved in sample matrix

Project Manager Review

LELAP Certificate# 01949

ARS INTERNATIONAL

QC Results per Analytical Batch

Analytical Batch	ARS1-B14-02446
SDG	ARS1-14-02706
Analysis	Radium-228/226 (Water)
Analysis Test Method	ARS-010/Gas Proportional Counter
Analysis Code	GPC-A-057
Report Units	pCi/L

Acceptable QC Performance Ranges

QC Sample Type	Performance Items and Ranges		
Laboratory Control Sample	Recovery (%):	> 75	< 125
Matrix Spike	Recovery (%):	> 60	< 140
Duplicate	Replicate Error Ratio (RER):		< 1
	Duplicate Error Ratio (DER):		< 3
	Relative Percent Difference (RPD %):		≤ 25

Laboratory Control Sample

Analysis Date: 10/20/14 08:20, 10/13/14 14:46 — Analysis Technician: AMRAD\JBYRD, AMRAD\JBYRD

Analysis Batch Sample ID	QC Type	Analyte	Results	CSU (2s)	Expected Value	LCS Rec (%)	MDC
ARS1-B14-02446-01	LCS	RA-226	36.9	5.9	29.7	124	0.14
ARS1-B14-02446-01	LCS	RA-228	34.3	5.7	36.0	95	0.87

Duplicate RER/DER/RPD

Analysis Date: 10/20/14 08:20, 10/13/14 14:46 — Analysis Technician: AMRAD\JBYRD, AMRAD\JBYRD

Analyte	Result LCS	CSU LCS (2s)	Results LCSD	CSU LCSD (2s)	RER	DER	RPD
RA-226	36.9	5.9	41.8	6.7	0.39	1.08	12.5
RA-228	34.3	5.7	33.8	5.6	0.04	0.12	1.5

Method Blank

Analysis Date: 10/20/14 08:20, 10/13/14 14:46 — Analysis Technician: AMRAD\JBYRD, AMRAD\JBYRD

Analysis Batch Sample ID	QC Type	Analyte	Results	CSU (2s)	MDC	Qual
ARS1-B14-02446-03	MBL	RA-226	0.151	0.097	0.13	
ARS1-B14-02446-03	MBL	RA-228	-0.12	0.37	0.68	U

LELAP Certificate# 01949

ARS INTERNATIONAL
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1 (800) 401-4277 • Fax (225) 381-2996

Notes:

Comments:

1.0) Soil and Sludge analysis are reported on a wet basis or an as received basis unless otherwise indicated.

2.0) Data in this report are within the limits of uncertainty specified in the reference method unless otherwise specified.

3.0) Modified analysis procedures are procedures that are modified to meet the certain specifications. An example may be the use of a water method to analyze a solid matrix due to the lack of an officially recognized procedure for the analysis of the solid matrix. Modified analyses are indicated by the subsequent addition of "m" to the procedure number (i.e. 900.0M).

4.0) Derived Air Concentrations and Effluent Release Concentrations are obtained from 10 CFR 20 Appendix B.

5.0) **Total activity** is actually total gamma activity and is determined utilizing the prominent gamma emitters from the naturally occurring radioactive decay chains and other prominent radioactive nuclides. Total activity may be lower than the actual total activity due to the extent of secular equilibrium achieved in the various decay chains at the time of analysis. The total activity is not representative of nuclides that emit solely alpha or beta particles.

6.0) Ra-228 is determined via secular equilibrium with its daughter, Actinium 228 (Gamma Spectroscopy only).

7.0) U-238 is determined via secular equilibrium with its daughter, Thorium 234 (Gamma Spectroscopy only).

8.0) All gamma spectroscopy was performed utilizing high purity germanium detectors (**HPGe**).

9.0) ARS makes every attempt to match sample density to calibrated density; however, in some cases, it is not practical or possible to do so and data results may be affected (Gamma Spectroscopy only).

10.0) Gamma spectroscopy results are calculated values based on the **ORTEC**® GammaVision ENV32 Analysis Engine.

11.0) ACLASS DOD and ISO 17025 certification applies only to the following analytes and methods: Gross Alpha and Gross Beta (EPA 900, SM7110B&C, SW846 9310); Radium 226 (EPA 903, EPA 903.1, SM 7500 Ra-B, SW846 9315); Radium 228 (EPA 904, SM 7500 Ra-B SW846 9320); Iodine-131(EPA 901.1); Uranium by ICPMS (EPA 200.8); Strontium 89/90 (EPA 905, Eichrom SRW01, HASL 300 Sr-03-RC); Tritium (EPA 906, EPA 906M); Gamma Emitters (EPA 901.1, SM7120B, HASL 300 Ga-01-R); Americium-241, Curium 242/244, Plutonium 239/240 and 241, Thorium 228/230/232, Uranium 234/233 and 238 (Eichrom ACW03 VBS); Lead 210 (HASL 300 Pb-01-RC, Eichrom OTW01); Polonium 210 (HASL 300 Po-01-RC, HASL 300 Po-02-RC); Technetium-99 (Eichrom TCW02, Eichrom TCS01M).

Method References:

1.0) **EPA 600/4-80-032**; Prescribed Procedures for the Measurements of Radioactivity in Drinking Water, August 1980.

2.0) Standard Methods for Examination of Water and Waste Water, 18th, 1992.

3.0) **EPA SW-846**; Test Methods for Evaluating Solid Waste, Third Edition, (9/86). (Updated through 1995).

4.0) **EPA 600/4/79-020**; Methods for Chemical Analysis of Water and Waste, March 1983.

5.0) **HASL 300**

6.0) **ARS-040**; An LCSD is not reported with this process. The criteria for the LCS/LCSD analysis for reproducibility have not been established for Low Level Tritium analysis. A prepared standard for Low Level Tritium has not been developed. As a result, the standard we use is based on the dilution of a verified conventional tritium standard. The volume required for Low Level Tritium analysis, in addition to the lack of an available Low Level Tritium standard, introduce variability into the LCS/LCSD analysis that does not represent the actual sample analysis. The preferred measure for reproducibility is to run a duplicate analysis of a sample.

Definitions:

1.0)	**ND**	Not detected above the detection limit (non-detect).
2.0)	**MDC**	(Minimum Detectable Concentration) minimum concentration of the analyte that ARS can detect utilizing the specific analysis
3.0)	**MBL**	Method Blank
4.0)	**DO**	Duplicate Original
5.0)	**DUP**	Method Duplicate
6.0)	**MS/MSD**	Matrix Spike/Matrix Spike Duplicate
7.0)	**S**	Spike
8.0)	**RS**	Reference Spike
9.0)	***SC**	Subcontracted out to another qualified laboratory
10.0)	**NR**	Not Referenced
11.0)	**N/A**	Not Applicable
13.0)	**U**	Activity is below the MDC
14.0)	**LCS/LCSD**	Laboratory Control Standard/Laboratory Control Standard Duplicate
15.0)	**DLC**	Decision Level Concentration (ANSI N42.23) or critical level

Notes: ARS International assumes no liability for the use or interpretation of any analytical results provided other than the cost of the analysis itself. Reproduction of this report in less than full requires the written consent of the client.

LELAP Cert# 01949 ***NELAP Cert# E87558***

element™ materials technology

CHAIN OF CUSTODY RECORD

Omega COCID 3085 | PAGE: 1 | OF: 1

ADDRESS
Element Materials Technology
Lafayette
2417 W. Pinhook Road
Lafayette, LA 70508-3344
TEL: (337) 235-0483
FAX: (337) 233-6540
Website: www.element.com

SUB CONTRATOR: **ARS** COMPANY: **ARS**

ADDRESS: **2609 River Road**

CITY, STATE, ZIP: **Port Allen, LA 70767**

PHONE: **(225) 381-2991** FAX:

ACCOUNT #: EMAIL:

SPECIAL INSTRUCTIONS / COMMENTS:

For comparision to drinking water stds.

Fraction 001A requires ms/msd

ITEM #	SAMPLE ID	CLIENT SAMPLE ID	BOTTLE TYPE	MATRIX	DATE COLLECTED	NUMBER OF CONTAINERS	COMMENTS: Methanol Preserved Weights HOT Sample Notation, Additional Sample Description.
1	14100080-001A	M-MW02	1GPU	Aqueous	10/1/2014 9:20:00 AM	3	
	RAD226_228_W						
2	14100080-002A	FD	1GPU	Aqueous	10/1/2014 9:20:00 AM	1	
	RAD226_228_W						
3	14100080-003A	Equipment Blank (	1GPU	Aqueous	10/1/2014 11:05:00 AM	1	
	RAD226_228_W						
4	14100080-004A	M-MW01	1GPU	Aqueous	10/1/2014 12:00:00 PM	1	
	RAD226_228_W						
5	14100080-005A	M-MW03	1GPU	Aqueous	10/1/2014 1:55:00 PM	1	
	RAD226_228_W						

Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Amy Jason	10-6-14	1436		10-6-14	1470
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
	10-7-14	0930		10-7-14	0830

TAT: Standard ☑ **RUSH** Next BD ☐ 2nd BD ☐ 3rd BD ☐

Note: RUSH requests will incur surcharges!

REPORT TRANSMITTAL DESIRED:

☐ HARDCOPY (extra cost) ☐ FAX ☐ EMAIL ☐ ONLINE

FOR LAB USE ONLY

Temp of samples _____ °C Attempt to Cool ? _____

Comments: _____

element

Chain of Custody

Laboratory Number: 14100080

Page 1 of 1

Client Information:	Billing Information:	PO Number:	Project Name/Number:
Company Name: Arabie Env. Solutions			Project / 11701
Contact Name: D. Pirnie		Quote Number:	
Address: P.O. Box 926	Same		Sampler's Signature
		Required QC Level	
City, State Zip: Lake Charles, LA 70602			
Phone Number: (337) 436-5248 Ext:	Ext:	Bill Monthly ☐Yes ☐No	Shipping Method: UPS / FedEx / Airborne DHL / Element / Hand / Mail
Fax Number:			
E-mail Address:			

Matrix Code

DW = Drinking Water
WW = Waste Water
GW = Ground Water
AQ = Aqueous
OT = Other
SL = Sludge SOL = Solid
O = Oil SO = Soil
F = Food SW = Swab
NG = Natural Gas
NGL = Natural Gas Liquid
PW = Produced Water
CF = Completion Fluid

Which Regulations Apply:
☐RCRA ☐Drinking Water
☐POTW ☐Distribution
☐NPDES ☐Special
☐USDA/FDA ☒State 24B
☐RECAP/RISC ☐Other

Turn Time
☒Standard
RUSH
☐1 Day
☐2 Day
☐Other
(Rush turn times will incur a surcharge and must be pre-approved by lab.)

Sample ID/Description	Collection Information: Date	Time	Grab / Composite	Matrix	Container: Quantity	Container: Type P=Plastic, G=Glass, V=Vial	Pres.: HCl, HNO_3, H_2SO_4, NaOH, $Na_2S_2O_3$	Requested Tests: Radium 226+228	Comments
M-MW02	10-1-14	9:20	G	GW	1	P	None	X	
FD	"	"	"	"	1	P	"	X	
MS	"	"	"	"	1	P	"	X	
MSD	"	"	"	"	1	P	"	X	
Equipment Blank (EB)	"	11:05	"	W	1	P	"	X	
M-MW01	"	12:00	"	GW	1	P	"	X	
M-MW03	"	13:55	"	"	1	P	"	X	

	Relinquished by	Date/Time	Received by	Date/Time
1		10-2-14 940	John Hebert	10/2/14 940
2	John Hebert	10/2/14 1230		10/3/14 13:30
3				

Field Notes:

Received at lab on ice? ☑Yes ☐No Temp: 3.1 °C

All samples submitted to Element Materials Technology for analysis are accepted on a custodial basis only. Ownership of the material remains with the client submitting the samples. Element Materials Technology reserves the right to return unused sample portions.

9301 Innovation Drive, Suite 115, Daleville, IN 47334-0569 USA, P 765-378-4103, F 765-378-4109
629 Washington St. Suite 300, Columbus, IN 47201-6231 USA, P 812-375-0531, F 812-375-0731
2121 East Washington Boulevard, Fort Wayne, IN 46803-1328 USA, P 260-471-7000, F 260-471-7777
560 South Zimmer Road, Warsaw, IN 46580-2368 USA, P 574-267-3305, F 574-269-6569
3371 Cleveland Road, Suite 100A, South Bend, IN 46628-9780 USA, P 574-277-0707, F 574-273-5699
2417 W. Pinhook Rd, Lafayette, LA 70508-3344 USA, P 337-235-8483, F 337-233-6540