



July 29, 2019

VIA EMAIL

Ms. Yasmin Guevara
New York State Department of Environmental Conservation - Region 8
Division of Solid and Hazardous Materials
6274 East Avon-Lima Road
Avon, New York 14414

**RE: Hakes C&D, Campbell N.Y.
Hakes C&D Landfill Permit No. 8-4630-00010/00001-0
2019 2nd Quarter Leachate Radionuclide Monitoring Results**

Dear Ms. Guevara:

Enclosed please find a copy of the radionuclide sampling and analysis report for leachate sampling conducted during the second quarter 2019. This report is being submitted as required by the facility Environmental Monitoring Plan. Should you have any questions or require clarification of the enclosed data, please do not hesitate to contact me at 603-545-7125 or at russell.anderson@casella.com.

Sincerely,

CASELLA WASTE SERVICES

A handwritten signature in dark ink, reading "Russell Anderson". The signature is fluid and cursive, with the first name "Russell" being more prominent than the last name "Anderson".

Russell Anderson
Manager of Compliance

cc: Larry Shilling, Casella
Charles Plank, Casella
Theodore Rahon, CoPhysics
Jonathan Brandes, On-Site
Richard Clarkson, NYSDEC
Timothy Rice, NYSDEC
Greg MacLean, NYSDEC

Enclosures



ON-SITE TECHNICAL SERVICES, INC

72 Railroad Avenue
Wellsville, New York 14895

Phone: (585) 593-1824
Fax: (585) 593-7471

July 29, 2019

Mr. Russell Anderson
Casella Waste Systems, Inc.
4376 Manning Ridge Road
Campbell, New York 14870

Re: Hakes C & D Landfill Campbell, New York – 2nd Quarter 2019 Radionuclide Test Results

Dear Russell:

The purpose of this letter is to present results of the leachate radiological sampling conducted at the Hakes C & D Landfill during the second quarter 2019. Leachate sampling and analysis for radionuclides is required as detailed in section 2.6.3 of the April 2015 Environmental Monitoring Plan (EMP). The initial radiological sampling and analysis of each landfill cell and combined leachate was completed in May 2012. Therefore, the sampling required in the second quarter 2019 includes only landfill cells which have received gas well waste. Currently, the cells containing gas well waste includes cells 5 through 8. Leachate from cell 7 drains through cell 4 and cell 8A leachate flows through cell 3. Therefore, second quarter 2019 leachate samples were collected from cells 3, 4, 5, 6 and 8B-D. Samples were collected by On-Site on May 1, 2019 and analyzed by ALS Environmental (ALS) located in Fort Collins, Colorado. ALS Fort Collins is a New York State accredited laboratory. Attached Table 1 displays the current and historic leachate radionuclide results from leachate sampling conducted between the second quarter 2017 and second quarter 2019. Also enclosed are the second quarter 2019 field sampling forms and laboratory analytical report.

If you have any questions regarding the information in this submittal, please call me at 585-593-1824.

Sincerely,

A handwritten signature in blue ink, which appears to read "Jonathan E. Brandes".

Jonathan E. Brandes, P.G.
Senior Geologist

Enclosures

Table 1

Leachate Radionuclide Analytical Results
Second Quarter 2017 through Second Quarter 2019
Hakes C and D Landfill
Campbell, New York

Parameter	Cell 3 Leachate 6/6/2017	Cell 3 Leachate 11/17/2017	Cell 3 Leachate 2/27/2018	Cell 3 Leachate 6/26/2018	Cell 3 Leachate 11/8/2018	Cell 3 Leachate 5/1/2019	Cell 4 Leachate 6/6/2017	Cell 4 Leachate 11/17/2017	Cell 4 Leachate 2/27/2018	Cell 4 Leachate 6/26/2018	Cell 4 Leachate 11/8/2018	Cell 4 Leachate 5/1/2019
Field Parameters												
Field pH (std. units)	6.78	6.91	6.69	6.87	6.81	7.11	6.83	7.14	6.86	7.08	7.1	7.11
ORP (mV)	-323.8	-151.7	30.6	33.7	-138.7	-219.3	2.8	-213.7	11.6	-136.4	-204.8	-156.7
Specific Conductivity (us/cm)	9085	7443	6191	7430	6443	7708	6304	6889	6379	7893	6219	6095
Temperature (deg. C)	21.7	16.8	17	26.9	13.9	14.8	19.7	16.6	18.3	26.4	13	15.2
Turbidity (NTU)	69.2	140	20.6	48.4	76.6	77.1	14.7	42.1	76.1	87	61	77.1
Radionuclide Act + Unc (MDC) pCi/L												
Lead-210, Dissolved (Eichrom)			0.11 ± 0.58 (0.97)		-0.37 ± 0.45 (0.9)	-0.39 ± 0.36 (0.71)			0.52 ± 0.61 (0.98)		-0.37 ± 0.43 (0.88)	-0.42 ± 0.36 (0.71)
Lead-210, Total (Eichrom)			0.62 ± 0.57 (0.9)		0.21 ± 0.49 (0.83)	-0.33 ± 0.36 (0.71)			0.59 ± 0.57 (0.9)		-0.42 ± 0.42 (0.86)	-0.38 ± 0.37 (0.72)
Radium-226, Dissolved (EPA 903.1)	1.75 ± 1.10 (0.473)	2.69 ± 0.78 (0.22)	1.37 ± 0.46 (0.23)	1.18 ± 0.56 (0.44)	1 ± 1.3 (2)	2.1 ± 1.1 (1.1)	2.57 ± 1.30 (0.436)	1.59 ± 0.51 (0.24)	1.36 ± 0.44 (0.11)	2.54 ± 0.95 (0.36)	2.3 ± 1.4 (1.5)	2.8 ± 1.4 (1.1)
Radium-226, Total (EPA 903.1)	2.85 ± 1.53 (0.552)	2.8 ± 0.78 (0.17)	2.67 ± 0.77 (0.18)	1.39 ± 0.57 (0.36)	1.2 ± 1.1 (1.3)	2.9 ± 1.4 (1.3)	2.58 ± 1.51 (1.79)	2.53 ± 0.72 (0.21)	2.16 ± 0.64 (0.21)	2.57 ± 0.91 (0.45)	2.4 ± 1.4 (1.4)	1.31 ± 0.92 (1.15)
Radium-228, Dissolved (EPA 904.0)	3.25 ± 0.960 (1.15)	1.83 ± 0.57 (0.62)	1.11 ± 0.44 (0.65)	1.9 ± 0.68 (0.92)	2.1 ± 1.5 (2.9)	2.67 ± 0.78 (0.8)	3.88 ± 0.957 (0.821)	2.48 ± 0.71 (0.63)	0.71 ± 0.37 (0.64)	2.14 ± 0.73 (0.92)	1.7 ± 1.5 (3.1)	2.11 ± 0.7 (0.9)
Radium-228, Total (EPA 904.0)	3.9 ± 1.30 (1.88)	2.02 ± 0.63 (0.71)	0.75 ± 0.37 (0.65)	4.2 ± 1.1 (0.8)	2.3 ± 1.5 (2.9)	3.3 ± 0.97 (0.96)	2.72 ± 0.892 (1.26)	2.22 ± 0.68 (0.74)	1.7 ± 0.56 (0.71)	2.32 ± 0.76 (0.9)	3.9 ± 2.1 (3.8)	1.52 ± 0.55 (0.78)
Total Uranium, Dissolved (ASTM D5174-97)	0.00359 ± 0.156 (0.385)						0.000711 ± 0.033 (0.385)					
Total Uranium, Dissolved (EPA 908.0)					< (0.0992)	0.29 ± 0.15 (0.13)					0.899 ± 0.243 (0.12)	0.22 ± 0.12 (0.11)
Total Uranium, Dissolved (HASL-300)		0.29 ± 0.19 (0.22)	0.35 ± 0.16 (0.12)	0.27 ± 0.14 (0.14)				0.48 ± 0.18 (0.1)	1.15 ± 0.28 (0.11)	0.73 ± 0.21 (0.11)		
Total Uranium, Total (ASTM D5174-97)	0.00251 ± 0.127 (0.385)						0.000764 ± 0.029 (0.385)					
Total Uranium, Total (EPA 908.0)					< (0.0657)	0.25 ± 0.13 (0.12)					0.86 ± 0.2744 (0.116)	0.29 ± 0.16 (0.15)
Total Uranium, Total (HASL-300)		0.31 ± 0.15 (0.15)	0.37 ± 0.15 (0.12)	0.35 ± 0.15 (0.12)				0.56 ± 0.19 (0.1)	1.14 ± 0.35 (0.18)	0.84 ± 0.25 (0.13)		

Parameter	Cell 5 Leachate 6/6/2017	Cell 5 Leachate 11/17/2017	Cell 5 Leachate 6/26/2018	Cell 5 Leachate 11/8/2018	Cell 5 Leachate 5/1/2019	Cell 6 Leachate 6/6/2017	Cell 6 Leachate 11/17/2017	Cell 6 Leachate 6/26/2018	Cell 6 Leachate 11/8/2018	Cell 6 Leachate 5/1/2019	Cell 8 Leachate 6/6/2017	Cell 8 Leachate 11/17/2017	Cell 8 Leachate 2/27/2018	Cell 8 Leachate 6/26/2018	Cell 8 Leachate 11/8/2018	Cell 8 Leachate 5/1/2019
Field Parameters																
Field pH (std. units)	6.79	6.88	6.88	6.81	6.95	6.84	6.97	6.99	7.03	7.15	6.74	6.62	6.47	6.62	6.51	6.58
ORP (mV)	-205.9	-102.1	-85.2	-142.7	-140.8	-291.7	-239.1	-305.9	-196	-252.6	-257.4	-13.5	10	-208.4	-95.7	-54.4
Specific Conductivity (us/cm)	6221	6278	8030	7890	8522	12178	10151	11169	7566	9445	5306	2286	1577	3300	3718	5416
Temperature (deg. C)	21.9	16.2	28.4	13.2	15.5	24.6	19.2	29.7	14.8	17	22	14	16	28.2	15.6	14.4
Turbidity (NTU)	64.3	41.6	78.8	79.3	49.3	67.4	107	26.3	35.9	35.9	38.4	140	111	> 1000	> 1000	> 1000
Radionuclide Act + Unc (MDC) pCi/L																
Lead-210, Dissolved (Eichrom)				2.42 ± 0.95 (0.89)	-0.43 ± 0.35 (0.69)				-0.31 ± 0.46 (0.91)	0.02 ± 0.4 (0.72)			0.36 ± 0.6 (0.98)		0.53 ± 0.56 (0.87)	0.03 ± 0.4 (0.71)
Lead-210, Total (Eichrom)				-0.25 ± 0.44 (0.87)	-0.26 ± 0.36 (0.69)				-0.32 ± 0.43 (0.85)	1.46 ± 0.64 (0.71)			0.19 ± 0.59 (0.98)		0.01 ± 0.46 (0.84)	-0.12 ± 0.37 (0.69)
Radium-226, Dissolved (EPA 903.1)	0.898 ± 0.933 (1.39)	1.07 ± 0.36 (0.16)	0 ± 0.17 (0.25)	0 ± 0.72 (1.59)	0.83 ± 0.74 (0.99)	2.34 ± 1.21 (1.01)	2.77 ± 0.78 (0.19)	2.4 ± 1.2 (1.1)	1.5 ± 1.4 (2.2)	1.9 ± 0.99 (0.67)	1.51 ± 1.00 (0.455)	0.88 ± 0.31 (0.16)	0.59 ± 0.27 (0.23)	0.16 ± 0.3 (0.52)	1.1 ± 1.4 (2.2)	0.4 ± 0.71 (1.21)
Radium-226, Total (EPA 903.1)	1.35 ± 1.30 (1.87)	1.07 ± 0.36 (0.19)	0.39 ± 0.33 (0.46)	0 ± 0.75 (1.43)	1.27 ± 0.82 (0.72)	2.75 ± 1.80 (1.84)	1.81 ± 0.53 (0.12)	2.11 ± 0.75 (0.3)	2.6 ± 1.4 (1)	2.7 ± 1.3 (0.9)	2.43 ± 2.24 (1.32)	1.38 ± 0.45 (0.18)	0.89 ± 0.34 (0.2)	2.4 ± 0.83 (0.35)	0.28 ± 0.88 (1.67)	0.52 ± 0.62 (0.94)
Radium-228, Dissolved (EPA 904.0)	2.42 ± 0.699 (0.785)	1.85 ± 0.57 (0.61)	0.69 ± 0.46 (0.89)	0.3 ± 1.6 (3.5)	1.05 ± 0.47 (0.78)	2.07 ± 0.649 (0.807)	3.1 ± 0.84 (0.62)	2.28 ± 0.72 (0.82)	1.9 ± 1.6 (3.2)	2.15 ± 0.68 (0.8)	1.65 ± 0.611 (0.89)	1.38 ± 0.51 (0.72)	0.96 ± 0.4 (0.63)	1.68 ± 0.62 (0.87)	2.5 ± 1.6 (3)	0.54 ± 0.42 (0.82)
Radium-228, Total (EPA 904.0)	1.32 ± 0.846 (1.64)	1.07 ± 0.46 (0.75)	0.97 ± 0.49 (0.86)	2.9 ± 1.9 (3.5)	0.97 ± 0.44 (0.74)	2.4 ± 1.04 (1.77)	1.18 ± 0.46 (0.7)	2.64 ± 0.83 (0.9)	4.7 ± 1.9 (3.1)	1.89 ± 0.63 (0.82)	1.77 ± 1.34 (2.7)	1.46 ± 0.54 (0.79)	0.7 ± 0.38 (0.68)	1.71 ± 0.62 (0.85)	0.7 ± 1.3 (2.8)	1.17 ± 0.51 (0.82)
Total Uranium, Dissolved (ASTM D5174-97)	0.000797 ± 0.036 (0.385)					0.00105 ± 0.047 (0.385)					0.000911 ± 0.047 (0.385)					
Total Uranium, Dissolved (EPA 908.0)				< (0.075)	1.31 ± 0.32 (0.17)				0.418 ± 0.158 (0.0902)	0.46 ± 0.18 (0.13)					< (0.0523)	2.65 ± 0.47 (0.13)
Total Uranium, Dissolved (HASL-300)		0.75 ± 0.2 (0.1)	0.51 ± 0.19 (0.13)				0.32 ± 0.13 (0.09)	0.63 ± 0.19 (0.1)				0.59 ± 0.21 (0.16)	0.5 ± 0.2 (0.15)	4.22 ± 0.66 (0.11)		
Total Uranium, Total (ASTM D5174-97)	0.000733 ± 0.034 (0.385)					0.00112 ± 0.039 (0.385)					0.000866 ± 0.046 (0.385)					
Total Uranium, Total (EPA 908.0)				< (0.0897)	1.25 ± 0.31 (0.14)				< (0.0809)	0.41 ± 0.16 (0.12)					< (0.0914)	3.63 ± 0.62 (0.15)
Total Uranium, Total (HASL-300)		0.82 ± 0.26 (0.15)	0.52 ± 0.18 (0.13)				0.25 ± 0.19 (0.23)	0.67 ± 0.2 (0.12)				0.65 ± 0.18 (0.12)	0.52 ± 0.16 (0.06)	7.8 ± 1 (0.2)		

Notes:
Act + Unc (MDC) = Activity ± Uncertainty (Minimum Detectable Concentration)
pCi/L = picocuries per liter
Dissolved - Indicates sample filtered with 0.45 micron filter prior to analysis.
Each of EPA 903.1, EPA 904.0, EPA 908.0, ASTM D5174-97, HASL-300 are laboratory analysis methods.

Groundwater Suppression and Leachate Sampling Field Form

On-Site Technical Services, Inc.

Project: Hakes C&D Landfill, Campbell, New York

Date: 5-1-19

Sampling Location: Cell-3 Sample ID: Cell-0519 Arrival Time: 1100

Weather Conditions:

Temp. 49 °F () Sunny () Partly Cloudy (X) Cloudy () Light Rain () Hvy. Rain () Snow

Wind Conditions: 0-5 mph

Location Type

() Groundwater Suppression (X) Leachate () Secondary Leachate () Surface Water/Sediment () Res. Water
() Other _____

Flow and Depth Information (as appropriate)

Depth: NA Estimated Flow: _____

Comments: Manual Switch activated by Mike & Helper

Field Parameters (as appropriate)

Meter: YSI (sn: 146100804), Hach 2100P (sn: 13309)

Field Parameters tested in: () Submerged Probe (X) Cup
Note: Turbidity measured from a vial grab sample

Time	pH	Conductivity (us/cm)	Turbidity (ntu)	D.O. (mg/L)	Temp. (°C)	ORP (mV)
<u>1120</u>	<u>7.11</u>	<u>7708</u>	<u>77.1</u>	<u>NA</u>	<u>14.8</u>	<u>-219.3</u>

Sample Information

Sample Type: (X) Grab () Composite Sample Location: (X) Discharge Pipe () Pond () Ditch

Location Description/Condition: Riser discharge pipe

Sample Collection Equipment/Method: Ded 5 gal Bucket Sample Time: 1120

Sample Description (clarity/color): Slightly Cloudy Sample Odor (Y) or (N) Explain: _____
with light Amber tint

Other Observations/Comments: _____

Analysis Requested: RAD Number of Containers: 8

Sampling Completion: Time 1138 Date 5-1-19 Samplers K Dye

Groundwater Suppression and Leachate Sampling Field Form

On-Site Technical Services, Inc.

Project: Hakes C&D Landfill, Campbell, New York

Date: 5-1-19

Sampling Location: Cell-4 Sample ID: Cell4-0519 Arrival Time: 1146

Weather Conditions:

Temp. 56° F () Sunny () Partly Cloudy (X) Cloudy () Light Rain () Hvy. Rain () Snow

Wind Conditions: 0-10mph

Location Type

() Groundwater Suppression (X) Leachate () Secondary Leachate () Surface Water/Sediment () Res. Water
() Other _____

Flow and Depth Information (as appropriate)

Depth: NA Estimated Flow: _____

Comments: MANUAL & operated switch by Mike + 1st per

Field Parameters (as appropriate)

Meter: YSI (sn: 142100804), Hach 2100P (sn: 13309)

Field Parameters tested in: () Submerged Probe (X) Cup
Note: Turbidity measured from a vial grab sample

Time	pH	Conductivity (us/cm)	Turbidity (ntu)	D.O. (mg/L)	Temp. (°C)	ORP (mV)
<u>1200</u>	<u>7.11</u>	<u>6095</u>	<u>77.1</u>	<u>NA</u>	<u>15.2</u>	<u>-156.7</u>

Sample Information

Sample Type: (X) Grab () Composite Sample Location: (X) Discharge Pipe () Pond () Ditch

Location Description/Condition: Riser discharge pipe

Sample Collection Equipment/Method: Ded 5 gal Bucket Sample Time: 1200

Sample Description (clarity/color): Slightly Cloudy with light Amber tint Sample Odor (Y) or (N) Explain: Slight leachate odor

Other Observations/Comments: _____

Analysis Requested: RAD Number of Containers: 8

Sampling Completion: Time 1216 Date 5-1-19 Samplers K Dye

Groundwater Suppression and Leachate Sampling Field Form

On-Site Technical Services, Inc.

Project: Hakes C&D Landfill, Campbell, New York

Date: 5-1-19

Sampling Location: Cell-5 Sample ID: Cell5-0519 Arrival Time: 1220

Weather Conditions:

Temp. 59° F () Sunny () Partly Cloudy (X) Cloudy () Light Rain () Hvy. Rain () Snow

Wind Conditions: 0-10 mph

Location Type

() Groundwater Suppression (X) Leachate () Secondary Leachate () Surface Water/Sediment () Res. Water
() Other _____

Flow and Depth Information (as appropriate)

Depth: NA Estimated Flow: _____

Comments: MANUAL Switch operated by Mike + Helper

Field Parameters (as appropriate)

Meter: YSI (sn: 146100804), Hach 2100P (sn: 13309)

Field Parameters tested in: () Submerged Probe (X) Cup
Note: Turbidity measured from a vial grab sample

Time	pH	Conductivity (us/cm)	Turbidity (ntu)	D.O. (mg/L)	Temp. (°C)	ORP (mV)
<u>1235</u>	<u>6.95</u>	<u>8522</u>	<u>49.3</u>	<u>NA</u>	<u>15.5</u>	<u>-140.8</u>

Sample Information

Sample Type: (X) Grab () Composite Sample Location: (X) Discharge Pipe () Pond () Ditch

Location Description/Condition: Riser discharge pipe

Sample Collection Equipment/Method: Ded 5 gal Bucket Sample Time: 1235

Sample Description (clarity/color): Slightly Cloudy Sample Odor (Y) or (N) Explain: light leachate odor
Slight Amber tint

Other Observations/Comments: _____

Analysis Requested: RAD Number of Containers: 8

Sampling Completion: Time 1250 Date 5-1-19 Samplers K D E

Groundwater Suppression and Leachate Sampling Field Form

On-Site Technical Services, Inc.

Project: Hakes C&D Landfill, Campbell, New York

Date: 5-1-19

Sampling Location: Cell-6 Sample ID: Cell6-0519 Arrival Time: 1255

Weather Conditions:

Temp. 57° F () Sunny () Partly Cloudy ☒ Cloudy () Light Rain () Hvy. Rain () Snow

Wind Conditions: 0-10mph

Location Type

() Groundwater Suppression ☒ Leachate () Secondary Leachate () Surface Water/Sediment () Res. Water
() Other _____

Flow and Depth Information (as appropriate)

Depth: NA Estimated Flow: _____

Comments: Manual Switch operated by Mike & Helper

Field Parameters (as appropriate)

Meter: YSI (sn: 146100804), Hach 2100P (sn: 13309)

Field Parameters tested in: () Submerged Probe ☒ Cup

Note: Turbidity measured from a vial grab sample

Time	pH	Conductivity (us/cm)	Turbidity (ntu)	D.O. (mg/L)	Temp. (°C)	ORP (mV)
<u>1310</u>	<u>7.15</u>	<u>9445</u>	<u>35.9</u>	<u>NA</u>	<u>17.0</u>	<u>-252.6</u>

Sample Information

Sample Type: ☒ Grab () Composite Sample Location: ☒ Discharge Pipe () Pond () Ditch

Location Description/Condition: Riser discharge pipe

Sample Collection Equipment/Method: Ded 5gal Bucket Sample Time: 1310

Sample Description (clarity/color): Slightly cloudy with light amber tint Sample Odor (Y) or (N) Explain: leachate odor

Other Observations/Comments: _____

Analysis Requested: RAD Number of Containers: 8

Sampling Completion: Time 1329 Date 5-1-19 Samplers R D E

Groundwater Suppression and Leachate Sampling Field Form

On-Site Technical Services, Inc.

Project: Hakes C&D Landfill, Campbell, New York

Date: 5-1-19

Sampling Location: Cell-8B Sample ID: Cell8B-0519 Arrival Time: 1000

Weather Conditions:

Temp. 49 ° F () Sunny () Partly Cloudy (X) Cloudy () Light Rain () Hvy. Rain () Snow

Wind Conditions: 0-10 mph

Location Type

() Groundwater Suppression (X) Leachate () Secondary Leachate () Surface Water/Sediment () Res. Water
() Other _____

Flow and Depth Information (as appropriate)

Depth: NA Estimated Flow: _____

Comments: Manual Switch Activated by Mike + Helper

Field Parameters (as appropriate)

Meter: YSI (sn: 144100804), Hach 2100P (sn: 13309)

Field Parameters tested in: () Submerged Probe (X) Cup

Note: Turbidity measured from a vial grab sample

Time	pH	Conductivity (us/cm)	Turbidity (ntu)	D.O. (mg/L)	Temp. (°C)	ORP (mV)
<u>1030</u>	<u>6.58</u>	<u>5416</u>	<u>>1000</u>	<u>NA</u>	<u>14.4</u>	<u>-56.4</u>

Sample Information

Sample Type: (X) Grab () Composite Sample Location: (X) Discharge Pipe () Pond () Ditch

Location Description/Condition: Riser Discharge pipe

Sample Collection Equipment/Method: Jed 5 gal Bucket Sample Time: 1030

Sample Description (clarity/color): Cloudy Black Color Sample Odor (Y) or (N) Explain: Leachate odor

Other Observations/Comments: Noticed significant Amount of Solids in Sample mixed in Extra 5 gal Bucket to agitate sample.

Analysis Requested: RAD Number of Containers: 128

Sampling Completion: Time 1053 Date 5-1-19 Samplers K DYE



June 03, 2019

Service Request No:R1903920

Russell Anderson
Casella Waste Systems - Hakes Billing
4 Chenell Drive Suite 200
Concord, NH 03301

Laboratory Results for: Hakes C&D Landfill - Leachate RAD.

Dear Russell,

Enclosed are the results of the sample(s) submitted to our laboratory May 02, 2019
For your reference, these analyses have been assigned our service request number **R1903920**.

All testing was performed according to our laboratory's quality assurance program and met the requirements of the TNI standards except as noted in the case narrative report. Any testing not included in the lab's accreditation is identified on a Non-Certified Analytes report. All results are intended to be considered in their entirety. ALS Environmental is not responsible for use of less than the complete report. Results apply only to the individual samples submitted to the lab for analysis, as listed in the report. The measurement uncertainty of the results included in this report is within that expected when using the prescribed method(s), and represented by Laboratory Control Sample control limits. Any events, such as QC failures or Holding Time exceedances, which may add to the uncertainty are explained in the report narrative or are flagged with qualifiers. The flags are explained in the Report Qualifiers and Definitions page of this report.

Please contact me if you have any questions. My extension is 7472. You may also contact me via email at Janice.Jaeger@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Janice Jaeger
Project Manager

CC: Jon Brandes

ADDRESS

1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623

PHONE +1 585 288 5380 | **FAX** +1 585 288 8475

ALS Group USA, Corp.
dba ALS Environmental



Narrative Documents

ALS Environmental—Rochester Laboratory

1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623

Phone (585) 288-5380 Fax (585) 288-8475

www.alsglobal.com



Client: Casella Waste Systems (Hampden ME)
Project: Hakes C&D Landfill - Leachate RAD.
Sample Matrix: Water

Service Request: R1903920
Date Received: 05/02/2019

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples for the Tier II level requested by the client.

Sample Receipt:

Ten water samples were received for analysis at ALS Environmental on 05/02/2019. Any discrepancies upon initial sample inspection are annotated on the sample receipt and preservation form included within this report. The samples were stored at minimum in accordance with the analytical method requirements.

Subcontracted Analytical Parameters:

One or more samples were subcontracted to another laboratory for testing. The certified analytical report from the subcontractor has been included in its entirety at the end of this report and includes the name and address of the subcontracted laboratory.

Approved by 

Date 06/03/2019



Sample Receipt Information

ALS Environmental—Rochester Laboratory

1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623

Phone (585) 288-5380 Fax (585) 288-8475

www.alsglobal.com



Cooler Receipt and Preservation Check Form

R1903920

5

Casella Waste Systems - Hakes Billing
Hakes C&D Landfill - Leachate RAD.



Project/Client Casella - Hakes Folder Number _____

Cooler received on 5/2/19 by: @

COURIER: ALS UPS FEDEX VELOCITY CLIENT

1	Were Custody seals on outside of cooler?	<u>Y</u> N
2	Custody papers properly completed (ink, signed)?	<u>Y</u> N
3	Did all bottles arrive in good condition (unbroken)?	<u>Y</u> N
4	Circle: <u>Wet Ice</u> Dry Ice Gel packs present?	<u>Y</u> N

5a	Perchlorate samples have required headspace?	Y N <u>NA</u>
5b	Did VOA vials, <u>As</u> or <u>Sulfide</u> have sig* bubbles?	<u>Y</u> <u>NA</u>
6	Where did the bottles originate?	<u>ALS/ROC</u> CLIENT
7	Soil VOA received as: Bulk Encore 5035set	<u>NA</u>

8. Temperature Readings Date: 5/2/19 Time: 0940 ID: IR#7 IR#10 From: Temp Blank Sample Bottle

Observed Temp (°C)	<u>0.8</u>	<u>1.8</u>	<u>3.9</u>	<u>4.2</u>	<u>2.4</u>	<u>3.8</u>	
Correction Factor (°C)	<u>-</u>	<u>+0.3</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>+0.3</u>	
Corrected Temp (°C)	<u>0.8</u>	<u>2.1</u>	<u>4.2</u>	<u>4.5</u>	<u>2.7</u>	<u>4.1</u>	
Temp from: Type of bottle	<u>-</u>	<u>Out tube</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	
Within 0-6°C?	<u>Y</u> N	<u>Y</u> N	<u>Y</u> N	<u>Y</u> N	<u>Y</u> N	<u>Y</u> N	Y N
If <0°C, were samples frozen?	Y N	Y N	Y N	Y N	Y N	Y N	Y N

If out of Temperature, note packing/ice condition: _____ Ice melted Poorly Packed (described below) Same Day Rule
& Client Approval to Run Samples: _____ Standing Approval Client aware at drop-off Client notified by: _____

All samples held in storage location: R002 by @ on 5/2/19 at 0950
5035 samples placed in storage location: _____ by _____ on _____ at _____

Cooler Breakdown/Preservation Check**: Date: 5/2/19 Time: 1020 by: @

- Were all bottle labels complete (i.e. analysis, preservation, etc.)? YES NO
- Did all bottle labels and tags agree with custody papers? YES NO
- Were correct containers used for the tests indicated? YES NO
- Were 5035 vials acceptable (no extra labels, not leaking)? YES NO
- Air Samples: Cassettes / Tubes Intact with MS? Canisters Pressurized Tedlar® Bags Inflated N/A

pH	Lot of test paper	Reagent	Preserved?	Lot Received	Exp	Sample ID Adjusted	Vol. Added	Lot Added	Final pH
≥12		NaOH	Yes No						
≤2		HNO ₃		<u>B2801E</u>	<u>4/70</u>				
≤2		H ₂ SO ₄							
<4		NaHSO ₄							
5-9		For 608pest		No=Notify for 3day					
Residual Chlorine (-)		For CN, Phenol, 625, 608pest, 522		If +, contact PM to add Na ₂ S ₂ O ₃ (625, 608, CN), ascorbic (phenol).					
		Na ₂ S ₂ O ₃							
		ZnAcetate	- -						
		HCl	** **						

**VOAs and 1664 Not to be tested before analysis.
Otherwise, all bottles of all samples with chemical preservatives are checked (not just representatives).

Bottle lot numbers: 032518-2ABT
Explain all Discrepancies/ Other Comments:

CLRES	BULK
DO	FLDT
HPROD	HGFB
HTR	LL3541
PH	<u>SUB</u>
SO3	MARRS
ALS	REV

Labels secondary reviewed by: @
PC Secondary Review: 4/11/19 *significant air bubbles: VOA > 5-6 mm : WC > 1 in. diameter



Miscellaneous Forms

ALS Environmental—Rochester Laboratory

1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623

Phone (585) 288-5380 Fax (585) 288-8475

www.alsglobal.com

REPORT QUALIFIERS AND DEFINITIONS

U	Analyte was analyzed for but not detected. The sample quantitation limit has been corrected for dilution and for percent moisture, unless otherwise noted in the case narrative.	+	Correlation coefficient for MSA is <0.995.
J	Estimated value due to either being a Tentatively Identified Compound (TIC) or that the concentration is between the MRL and the MDL. Concentrations are not verified within the linear range of the calibration. For DoD: concentration >40% difference between two GC columns (pesticides/Aroclors).	N	Inorganics- Matrix spike recovery was outside laboratory limits.
B	Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.	N	Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.
E	Inorganics- Concentration is estimated due to the serial dilution was outside control limits.	S	Concentration has been determined using Method of Standard Additions (MSA).
E	Organics- Concentration has exceeded the calibration range for that specific analysis.	W	Post-Digestion Spike recovery is outside control limits and the sample absorbance is <50% of the spike absorbance.
D	Concentration is a result of a dilution, typically a secondary analysis of the sample due to exceeding the calibration range or that a surrogate has been diluted out of the sample and cannot be assessed.	P	Concentration >40% difference between the two GC columns.
*	Indicates that a quality control parameter has exceeded laboratory limits. Under the öNotesö column of the Form I, this qualifier denotes analysis was performed out of Holding Time.	C	Confirmed by GC/MS
H	Analysis was performed out of hold time for tests that have an öimmediateö hold time criteria.	Q	DoD reports: indicates a pesticide/Aroclor is not confirmed (×100% Difference between two GC columns).
#	Spike was diluted out.	X	See Case Narrative for discussion.
		MRL	Method Reporting Limit. Also known as:
		LOQ	Limit of Quantitation (LOQ) The lowest concentration at which the method analyte may be reliably quantified under the method conditions.
		MDL	Method Detection Limit. A statistical value derived from a study designed to provide the lowest concentration that will be detected 99% of the time. Values between the MDL and MRL are estimated (see J qualifier).
		LOD	Limit of Detection. A value at or above the MDL which has been verified to be detectable.
		ND	Non-Detect. Analyte was not detected at the concentration listed. Same as U qualifier.



Rochester Lab ID # for State Certifications¹

Connecticut ID # PH0556	Maine ID #NY0032	Pennsylvania ID# 68-786
Delaware Approved	New Hampshire ID # 2941	Rhode Island ID # 158
DoD ELAP #65817	New York ID # 10145	Virginia #460167
Florida ID # E87674	North Carolina #676	

¹ Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state or agency requirements. The test results meet requirements of the current NELAP/TNI standards or state or agency requirements, where applicable, except as noted in the case narrative. Since not all analyte/method/matrix combinations are offered for state/NELAC accreditation, this report may contain results which are not accredited. For a specific list of accredited analytes, contact the laboratory or go to <https://www.alsglobal.com/locations/americas/north-america/usa/new-york/rochester-environmental>

ALS Laboratory Group

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.



INORGANIC PREPARATION METHODS

The preparation methods associated with this report are found in these tables unless discussed in the case narrative.

Water/Liquid Matrix

Analytical Method	Preparation Method
200.7	200.2
200.8	200.2
6010C	3005A/3010A
6020A	ILM05.3
9014 Cyanide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Acid Soluble	9030B
9056A Bomb (Halogens)	5050A
9066 Manual Distillation	9065
SM 4500-CN-E Residual Cyanide	SM 4500-CN-G
SM 4500-CN-E WAD Cyanide	SM 4500-CN-I

Solid/Soil/Non-Aqueous Matrix

Analytical Method	Preparation Method
6010C	3050B
6020A	3050B
6010C TCLP (1311) extract	3005A/3010A
6010 SPLP (1312) extract	3005A/3010A
7196A	3060A
7199	3060A
9056A Halogens/Halides	5050
300.0 Anions/ 350.1/ 353.2/ SM 2320B/ SM 5210B/ 9056A Anions	DI extraction

For analytical methods not listed, the preparation method is the same as the analytical method reference.



Subcontracted Analytical Parameters

ALS Environmental—Rochester Laboratory

1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623

Phone (585) 288-5380 Fax (585) 288-8475

www.alsglobal.com



Friday, May 31, 2019

Janice Jaeger
ALS Environmental
1565 Jefferson Rd., Bldg 300
Rochester, NY 14623

Re: ALS Workorder: 1905105
Project Name:
Project Number: R1903920

Dear Ms. Jaeger:

Ten water samples were received from ALS Environmental, on 5/7/2019. The samples were scheduled for the following analyses:

Lead-210
Radium-226
Radium-228
Total Uranium

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Jeff R. Kujawa
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
PJ-LA (DoD ELAP/ISO 170250)	95377
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280



1905105

Radium-228:

The samples were analyzed for the presence of ^{228}Ra by low background gas flow proportional counting of ^{228}Ac , which is the ingrown progeny of ^{228}Ra , according to EPA method 904.0. Samples 1905105-6 through -10 were filtered and preserved prior to analysis.

All acceptance criteria were met.

Radium-226:

The samples were prepared and analyzed according to EPA method 903.1. Samples 1905105-6 through -10 were filtered and preserved prior to analysis.

All acceptance criteria were met.

Total Uranium:

The samples were analyzed for the presence of isotopic and total uranium according to EPA method 908.0. Samples 1905105-6 through -10 were filtered and preserved prior to analysis.

All acceptance criteria were met.

Lead-210:

The samples were analyzed for the presence of ^{210}Pb according to the Eichrom method. Samples 1905105-6 through -10 were filtered and preserved prior to analysis.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1905105

Client Name: ALS Environmental

Client Project Name:

Client Project Number: R1903920

Client PO Number: R1903920

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
Cell 8B-0519	1905105-1		WATER	01-May-19	10:30
Cell 3-0519	1905105-2		WATER	01-May-19	11:20
Cell 4-0519	1905105-3		WATER	01-May-19	12:00
Cell 5-0519	1905105-4		WATER	01-May-19	12:35
Cell 6-05-19	1905105-5		WATER	01-May-19	13:10
Cell 8B-0519 Diss	1905105-6		WATER	01-May-19	10:30
Cell 3-0519 Diss	1905105-7		WATER	01-May-19	11:20
Cell 4-0519 Diss	1905105-8		WATER	01-May-19	12:00
Cell 5-0519 Diss	1905105-9		WATER	01-May-19	12:35
Cell 6-05-19 Diss	1905105-10		WATER	01-May-19	13:10

ALS Environmental Chain of Custody

1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475

ALS Contact: Janice Jaeger

Project Number: R1903920
Project Manager: Janice Jaeger
QAP: LAB QAP

1905105

Lab Code	Sample ID	# of Cont.	Sample			Matrix	Date	Time	Lab ID	Misc Cont	Nat U 908.0	Radium 226 903.1	Radium 228 904.0
			Date	Time	Lab ID								
1 R1903920-001	Cell 8B-0519	4	5/1/19	1030	Fort Collins ALS	Water	5/1/19	1030	Fort Collins ALS	X	X	X	X
2 R1903920-002	Cell 8B-0519 Diss		5/1/19	1030	Fort Collins ALS	Water	5/1/19	1030	Fort Collins ALS	X	X	X	X
3 R1903920-003	Cell 3-0519		5/1/19	1120	Fort Collins ALS	Water	5/1/19	1120	Fort Collins ALS	X	X	X	X
4 R1903920-004	Cell 3-0519 Diss		5/1/19	1120	Fort Collins ALS	Water	5/1/19	1120	Fort Collins ALS	X	X	X	X
5 R1903920-005	Cell 4-0519		5/1/19	1200	Fort Collins ALS	Water	5/1/19	1200	Fort Collins ALS	X	X	X	X
6 R1903920-006	Cell 4-0519 Diss		5/1/19	1200	Fort Collins ALS	Water	5/1/19	1200	Fort Collins ALS	X	X	X	X
7 R1903920-007	Cell 5-0519		5/1/19	1235	Fort Collins ALS	Water	5/1/19	1235	Fort Collins ALS	X	X	X	X
8 R1903920-008	Cell 5-0519 Diss		5/1/19	1235	Fort Collins ALS	Water	5/1/19	1235	Fort Collins ALS	X	X	X	X
9 R1903920-009	Cell 6-0519		5/1/19	1310	Fort Collins ALS	Water	5/1/19	1310	Fort Collins ALS	X	X	X	X
10 R1903920-010	Cell 6-0519 Diss		5/1/19	1310	Fort Collins ALS	Water	5/1/19	1310	Fort Collins ALS	X	X	X	X

need in lab filter

Folder Comments:
Report Total Uranium only - none of the isotopes

Special Instructions/Comments <i>standard add</i>		Turnaround Requirements RUSH (Surcharges Apply) PLEASE CIRCLE WORK DAYS 1 2 3 4 5 <input checked="" type="checkbox"/> STANDARD Requested FAX Date: _____ Requested Report Date: 05/13/19		Report Requirements I. Results Only <input checked="" type="checkbox"/> II. Results + QC Summaries III. Results + QC and Calibration Summaries IV. Data Validation Report with Raw Data PQL/MDL/J <u>N</u> EDD <u>Y</u>		Invoice Information PO# 58R1903920 Bill to	
NPDES		H - Test is On Hold		P - Test is Authorized for Prep Only			

Received By: *Janice Jaeger* 5/6/19 1000 Received By: *Janice Jaeger* 5-7-19 0958 Airbill Number:

ALS Environmental Chain of Custody

1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475

ALS Contact: Janice Jaeger

Project Number: R1903920
 Project Manager: Janice Jaeger
 QAP: LAB QAP

1905105

Special Instructions/Comments NPDES H - Test is On Hold P - Test is Authorized for Prep Only	Turnaround Requirements ___ RUSH (Surcharges Apply) PLEASE CIRCLE WORK DAYS 1 2 3 4 5 ___ STANDARD Requested FAX Date: _____ Requested Report Date: 05/13/19	Report Requirements ___ I. Results Only ___ II. Results + QC Summaries ___ III. Results + QC and Calibration Summaries ___ IV. Data Validation Report with Raw Data PQL/MDL/J N EDD Y	Invoice Information PO# 58R1903920 Bill to
--	---	--	---

Received By: C Jumbly 5-7-19 0955 Airbill Number: _____

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS-Rochester

Workorder No: 1905105

Project Manager: TK

Initials: CD

Date: 5-7-19

1. Are airbills / shipping documents present and/or removable?		DROP OFF	YES	NO			
2. Are custody seals on shipping containers intact?		NONE	YES	NO *			
3. Are custody seals on sample containers intact?		NONE	YES	NO *			
4. Is there a COC (chain-of-custody) present?			YES	NO *			
5. Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)			YES	NO *			
6. Are short-hold samples present?			YES	NO			
7. Are all samples within holding times for the requested analyses?			YES	NO *			
8. Were all sample containers received intact? (not broken or leaking)			YES	NO *			
9. Is there sufficient sample for the requested analyses?			YES	NO *			
10. Are all samples in the proper containers for the requested analyses?			YES	NO *			
11. Are all aqueous samples preserved correctly, if required? (excluding volatiles)		N/A	YES	NO *			
12. Are all aqueous non-preserved samples pH 4-9?		N/A	YES	NO *			
13. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, radon) free of bubbles > 6 mm (1/4 inch) diameter? (i.e. size of green pea)		N/A	YES	NO			
14. Were the samples shipped on ice?			YES	NO			
15. Were cooler temperatures measured at 0.1-6.0°C?	IR gun used*:	#1	#3	#4	RAD ONLY	YES	NO
Cooler #: 1 2 3							
Temperature (°C): Amb Amb Amb							
No. of custody seals on cooler: 1 1 1							
External µR/hr reading: 10 10 10							
Background µR/hr reading: 11							
Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / NA (If no, see Form 008.)							

*** Please provide details here for NO responses to gray boxes above - for 2 thru 5 & 7 thru 12, notify PM & continue w/ login.**

All client bottle ID's vs ALS lab ID's double-checked by:

If applicable, was the client contacted? YES / NO / ~~NA~~ Contact:

Date/Time:

Project Manager Signature / Date:



ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS - Rochester
Project Manager: JK

Workorder No: 1905105
Initials: CDT Date: 5-7-19

Additional Information:

pH	SAMPLE	initial pH	Vol. Added	Final pH
	1905105-1	7	3 ml	< 2
	1905105-2	7	3 ml	< 2
	1905105-3	7	3.5 ml	< 2
	1905105-4	7	3.0 ml	reaction stopped
	1905105-5	6	3.0 ml	reaction

HNO₃ lot no 197345

4 bottles in each sample were checked individually.

If applicable, was the client contacted? YES / NO / NA Contact: _____ Date/Time: _____

Project Manager Signature / Date: _____

1905105

ORIG: ID:ONHA (585) 672-7464
SHIP:
ALJ ENVIRONMENTAL
1535 JEFFERSON RD
EDDG:300 SUITE 360
ROCHESTER, NY 14623
UNITED STATES US

SHIP DATE: 06MAY19
ACTWGT: 50.00 LB
CAD: 0342584/CAFE3211

BILL THIRD PARTY

TO **SAMPLE RECEIVING
ALS LABS-FT. COLLINS
225 COMMERCE DRIVE**

FORT COLLINS CO 80524

(870) 490-1611
INV:
REF:

REF:

DEPT:



FedEx
Express

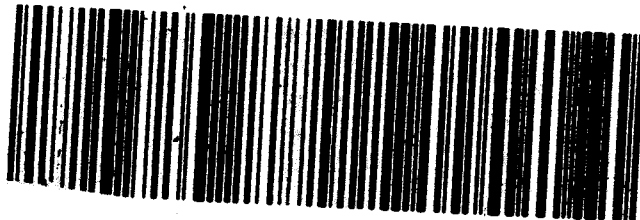


1 of 3
TRK# 4846 1680 5459
0201
MASTER

**TUE - 07 MAY 3:00P
STANDARD OVERNIGHT**

XH FTCA

**80524
CO-US DEN**



7-10

1905105

ORIGIN ID:ONHA (58) 72-7464
SMO
ALS ENVIRONMENTAL
1585 JEFFERSON
BLDG 300 SUITE3
CHESTER, NY
UNITED STATES

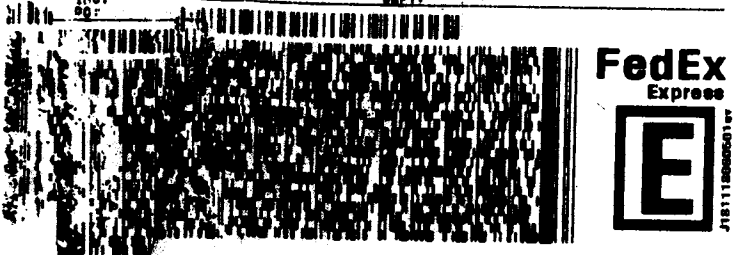
SHIP DATE: 06MAY19
ACTWT: 49.00 LB
CAD: 0342584/CAFE3211

BILL THIRD PARTY

SAMPLE RECEIVING
ALS LAB FT. COLLINS
225 COM
FORT COLLINS CO 80524

10-1
Amb

(970) 490-161
REF: DEPT:



13
1680 5460
0263 1680 5460
0201

TUE - 07 MAY 3:00P
STANDARD OVERNIGHT

FTCA 80524
CO-US DEN



3-6

Client: ALS Environmental

Date: 31-May-19

Project: R1903920

Work Order: 1905105

Sample ID: Cell 8B-0519

Lab ID: 1905105-1

Legal Location:

Matrix: WATER

Collection Date: 5/1/2019 10:30

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	-0.12 (+/- 0.37)	U	0.69	pCi/l	NA	5/15/2019 15:05
Carr: LEAD	89.3		40-110	%REC	DL = NA	5/15/2019 15:05
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.52 (+/- 0.62)	U	0.94	pCi/l	NA	5/31/2019 11:08
Carr: BARIUM	93.5		40-110	%REC	DL = NA	5/31/2019 11:08
Radium-228 Analysis by GFPC						
Ra-228	1.17 (+/- 0.51)		0.82	pCi/l	NA	5/23/2019 10:26
Carr: BARIUM	83.4		40-110	%REC	DL = NA	5/23/2019 10:26
Total Uranium by Alpha Spectroscopy						
Tracer: U-232	60.4		30-110	%REC	DL = NA	5/29/2019 13:13
U-234	1.94 (+/- 0.46)		0.13	pCi/l	NA	5/29/2019 13:13
U-235	0.074 (+/- 0.073)	U	0.088	pCi/l	NA	5/29/2019 13:13
U-238	1.62 (+/- 0.4)		0.09	pCi/l	NA	5/29/2019 13:13
URANIUM, TOTAL	3.63 (+/- 0.62)		0.15	pCi/l	NA	5/29/2019 13:13

Client: ALS Environmental

Date: 31-May-19

Project: R1903920

Work Order: 1905105

Sample ID: Cell 3-0519

Lab ID: 1905105-2

Legal Location:

Matrix: WATER

Collection Date: 5/1/2019 11:20

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	-0.33 (+/- 0.36)	U	0.71	pCi/l	NA	5/15/2019 16:17
Carr: LEAD	87.6		40-110	%REC	DL = NA	5/15/2019 16:17
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	2.9 (+/- 1.4)	M3	1.3	pCi/l	NA	5/31/2019 11:08
Carr: BARIUM	89		40-110	%REC	DL = NA	5/31/2019 11:08
Radium-228 Analysis by GFPC						
Ra-228	3.3 (+/- 0.97)		0.96	pCi/l	NA	5/23/2019 10:26
Carr: BARIUM	70.4		40-110	%REC	DL = NA	5/23/2019 10:26
Total Uranium by Alpha Spectroscopy						
Tracer: U-232	66.7		30-110	%REC	DL = NA	5/29/2019 13:13
U-234	0.102 (+/- 0.077)		0.082	pCi/l	NA	5/29/2019 13:13
U-235	0.014 (+/- 0.053)	U	0.039	pCi/l	NA	5/29/2019 13:13
U-238	0.138 (+/- 0.094)		0.11	pCi/l	NA	5/29/2019 13:13
URANIUM, TOTAL	0.25 (+/- 0.13)		0.12	pCi/l	NA	5/29/2019 13:13

Client: ALS Environmental

Date: 31-May-19

Project: R1903920

Work Order: 1905105

Sample ID: Cell 4-0519

Lab ID: 1905105-3

Legal Location:

Matrix: WATER

Collection Date: 5/1/2019 12:00

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	-0.38 (+/- 0.37)	U	0.72	pCi/l	NA	5/15/2019 17:28
Carr: LEAD	85.9		40-110	%REC	DL = NA	5/15/2019 17:28
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	1.31 (+/- 0.92)	M3	1.15	pCi/l	NA	5/31/2019 11:08
Carr: BARIUM	93.2		40-110	%REC	DL = NA	5/31/2019 11:08
Radium-228 Analysis by GFPC						
Ra-228	1.52 (+/- 0.55)		0.78	pCi/l	NA	5/23/2019 10:26
Carr: BARIUM	87.8		40-110	%REC	DL = NA	5/23/2019 10:26
Total Uranium by Alpha Spectroscopy						
Tracer: U-232	53		30-110	%REC	DL = NA	5/29/2019 13:13
U-234	0.18 (+/- 0.12)		0.13	pCi/l	NA	5/29/2019 13:13
U-235	0.005 (+/- 0.065)	U	0.118	pCi/l	NA	5/29/2019 13:13
U-238	0.105 (+/- 0.082)		0.041	pCi/l	NA	5/29/2019 13:13
URANIUM, TOTAL	0.29 (+/- 0.16)		0.15	pCi/l	NA	5/29/2019 13:13

Client: ALS Environmental

Date: 31-May-19

Project: R1903920

Work Order: 1905105

Sample ID: Cell 5-0519

Lab ID: 1905105-4

Legal Location:

Matrix: WATER

Collection Date: 5/1/2019 12:35

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	-0.26 (+/- 0.36)	U	0.69	pCi/l	NA	5/15/2019 18:38
Carr: LEAD	88.2		40-110	%REC	DL = NA	5/15/2019 18:38
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	1.27 (+/- 0.82)		0.72	pCi/l	NA	5/31/2019 11:08
Carr: BARIUM	91		40-110	%REC	DL = NA	5/31/2019 11:08
Radium-228 Analysis by GFPC						
Ra-228	0.97 (+/- 0.44)		0.74	pCi/l	NA	5/23/2019 10:26
Carr: BARIUM	94		40-110	%REC	DL = NA	5/23/2019 10:26
Total Uranium by Alpha Spectroscopy						
Tracer: U-232	60.1		30-110	%REC	DL = NA	5/29/2019 13:13
U-234	0.8 (+/- 0.25)		0.1	pCi/l	NA	5/29/2019 13:13
U-235	0.01 (+/- 0.058)	U	0.087	pCi/l	NA	5/29/2019 13:13
U-238	0.44 (+/- 0.17)		0.1	pCi/l	NA	5/29/2019 13:13
URANIUM, TOTAL	1.25 (+/- 0.31)		0.14	pCi/l	NA	5/29/2019 13:13

Client: ALS Environmental

Date: 31-May-19

Project: R1903920

Work Order: 1905105

Sample ID: Cell 6-05-19

Lab ID: 1905105-5

Legal Location:

Matrix: WATER

Collection Date: 5/1/2019 13:10

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	1.46 (+/- 0.64)		SOP 704		Prep Date: 5/10/2019	PrepBy: JXH
			0.71	pCi/l	NA	5/15/2019 19:48
Carr: LEAD	87.3		40-110	%REC	DL = NA	5/15/2019 19:48
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	2.7 (+/- 1.3)		SOP 783		Prep Date: 5/22/2019	PrepBy: JXH
			0.9	pCi/l	NA	5/31/2019 11:08
Carr: BARIUM	87.1		40-110	%REC	DL = NA	5/31/2019 11:08
Radium-228 Analysis by GFPC						
Ra-228	1.89 (+/- 0.63)		SOP 724		Prep Date: 5/16/2019	PrepBy: RGS
			0.82	pCi/l	NA	5/23/2019 10:26
Carr: BARIUM	89.8		40-110	%REC	DL = NA	5/23/2019 10:26
Total Uranium by Alpha Spectroscopy						
Tracer: U-232	66.4		SOP 714		Prep Date: 5/23/2019	PrepBy: TRS
			30-110	%REC	DL = NA	5/29/2019 13:13
U-234	0.18 (+/- 0.1)		0.09	pCi/l	NA	5/29/2019 13:13
U-235	0.029 (+/- 0.053)	U	0.039	pCi/l	NA	5/29/2019 13:13
U-238	0.2 (+/- 0.11)		0.1	pCi/l	NA	5/29/2019 13:13
URANIUM, TOTAL	0.41 (+/- 0.16)		0.12	pCi/l	NA	5/29/2019 13:13

Client: ALS Environmental
Project: R1903920
Sample ID: Cell 8B-0519 Diss
Legal Location:
Collection Date: 5/1/2019 10:30

Date: 31-May-19
Work Order: 1905105
Lab ID: 1905105-6
Matrix: WATER
Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Dissolved Lead-210 by Liquid Scintillation						
			SOP 704		Prep Date: 5/10/2019	PrepBy: JXH
Pb-210	0.03 (+/- 0.4)	U	0.71	pCi/l	NA	5/15/2019 20:59
Carr: LEAD	86.6		40-110	%REC	DL = NA	5/15/2019 20:59
Dissolved Radium-226 by Radon Emanation - Method 903.						
			SOP 783		Prep Date: 5/22/2019	PrepBy: JXH
Ra-226	0.4 (+/- 0.71)	U,M	1.21	pCi/l	NA	5/31/2019 11:08
Carr: BARIUM	92.7		40-110	%REC	DL = NA	5/31/2019 11:08
Dissolved Radium-228 Analysis by GFPC						
			SOP 724		Prep Date: 5/16/2019	PrepBy: RGS
Ra-228	0.54 (+/- 0.42)	U	0.82	pCi/l	NA	5/23/2019 10:26
Carr: BARIUM	91.2		40-110	%REC	DL = NA	5/23/2019 10:26
Dissolved Total Uranium by Alpha Spectroscopy						
			SOP 714		Prep Date: 5/23/2019	PrepBy: TRS
Tracer: U-232	67.9		30-110	%REC	DL = NA	5/29/2019 13:13
U-234	1.37 (+/- 0.34)		0.07	pCi/l	NA	5/29/2019 13:13
U-235	0.055 (+/- 0.065)	U	0.105	pCi/l	NA	5/29/2019 13:13
U-238	1.23 (+/- 0.32)		0.1	pCi/l	NA	5/29/2019 13:13
URANIUM, TOTAL	2.65 (+/- 0.47)		0.13	pCi/l	NA	5/29/2019 13:13

Client: ALS Environmental

Date: 31-May-19

Project: R1903920

Work Order: 1905105

Sample ID: Cell 3-0519 Diss

Lab ID: 1905105-7

Legal Location:

Matrix: WATER

Collection Date: 5/1/2019 11:20

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Dissolved Lead-210 by Liquid Scintillation						
			SOP 704		Prep Date: 5/10/2019	PrepBy: JXH
Pb-210	-0.39 (+/- 0.36)	U	0.71	pCi/l	NA	5/15/2019 22:09
Carr: LEAD	87.3		40-110	%REC	DL = NA	5/15/2019 22:09
Dissolved Radium-226 by Radon Emanation - Method 903.						
			SOP 783		Prep Date: 5/22/2019	PrepBy: JXH
Ra-226	2.1 (+/- 1.1)	M3	1.1	pCi/l	NA	5/31/2019 11:08
Carr: BARIUM	89.9		40-110	%REC	DL = NA	5/31/2019 11:08
Dissolved Radium-228 Analysis by GFPC						
			SOP 724		Prep Date: 5/16/2019	PrepBy: RGS
Ra-228	2.67 (+/- 0.78)		0.8	pCi/l	NA	5/23/2019 10:26
Carr: BARIUM	87		40-110	%REC	DL = NA	5/23/2019 10:26
Dissolved Total Uranium by Alpha Spectroscopy						
			SOP 714		Prep Date: 5/23/2019	PrepBy: TRS
Tracer: U-232	57.6		30-110	%REC	DL = NA	5/29/2019 13:13
U-234	0.21 (+/- 0.12)		0.1	pCi/l	NA	5/29/2019 13:13
U-235	-0.012 (+/- 0.06)	U	0.108	pCi/l	NA	5/29/2019 13:13
U-238	0.092 (+/- 0.075)		0.076	pCi/l	NA	5/29/2019 13:13
URANIUM, TOTAL	0.29 (+/- 0.15)		0.13	pCi/l	NA	5/29/2019 13:13

Client: ALS Environmental

Date: 31-May-19

Project: R1903920

Work Order: 1905105

Sample ID: Cell 4-0519 Diss

Lab ID: 1905105-8

Legal Location:

Matrix: WATER

Collection Date: 5/1/2019 12:00

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Dissolved Lead-210 by Liquid Scintillation						
			SOP 704		Prep Date: 5/10/2019	PrepBy: JXH
Pb-210	-0.42 (+/- 0.36)	U	0.71	pCi/l	NA	5/16/2019 00:29
Carr: LEAD	87.6		40-110	%REC	DL = NA	5/16/2019 00:29
Dissolved Radium-226 by Radon Emanation - Method 903.						
			SOP 783		Prep Date: 5/22/2019	PrepBy: JXH
Ra-226	2.8 (+/- 1.4)	M3	1.1	pCi/l	NA	5/31/2019 11:08
Carr: BARIUM	88.6		40-110	%REC	DL = NA	5/31/2019 11:08
Dissolved Radium-228 Analysis by GFPC						
			SOP 724		Prep Date: 5/16/2019	PrepBy: RGS
Ra-228	2.11 (+/- 0.7)		0.9	pCi/l	NA	5/23/2019 10:26
Carr: BARIUM	80		40-110	%REC	DL = NA	5/23/2019 10:26
Dissolved Total Uranium by Alpha Spectroscopy						
			SOP 714		Prep Date: 5/23/2019	PrepBy: TRS
Tracer: U-232	56.9		30-110	%REC	DL = NA	5/29/2019 13:13
U-234	0.111 (+/- 0.084)		0.089	pCi/l	NA	5/29/2019 13:13
U-235	0.052 (+/- 0.066)	U	0.105	pCi/l	NA	5/29/2019 13:13
U-238	0.054 (+/- 0.054)		0.036	pCi/l	NA	5/29/2019 13:13
URANIUM, TOTAL	0.22 (+/- 0.12)		0.11	pCi/l	NA	5/29/2019 13:13

Client: ALS Environmental

Date: 31-May-19

Project: R1903920

Work Order: 1905105

Sample ID: Cell 5-0519 Diss

Lab ID: 1905105-9

Legal Location:

Matrix: WATER

Collection Date: 5/1/2019 12:35

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Dissolved Lead-210 by Liquid Scintillation						
Pb-210	-0.43 (+/- 0.35)	U	0.69	pCi/l	NA	5/16/2019 01:39
Carr: LEAD	90		40-110	%REC	DL = NA	5/16/2019 01:39
Dissolved Radium-226 by Radon Emanation - Method 903.						
Ra-226	0.83 (+/- 0.74)	U	0.99	pCi/l	NA	5/31/2019 11:08
Carr: BARIUM	93.7		40-110	%REC	DL = NA	5/31/2019 11:08
Dissolved Radium-228 Analysis by GFPC						
Ra-228	1.05 (+/- 0.47)		0.78	pCi/l	NA	5/23/2019 10:26
Carr: BARIUM	92.3		40-110	%REC	DL = NA	5/23/2019 10:26
Dissolved Total Uranium by Alpha Spectroscopy						
Tracer: U-232	55.4		30-110	%REC	DL = NA	5/29/2019 13:13
U-234	0.78 (+/- 0.25)		0.13	pCi/l	NA	5/29/2019 13:13
U-235	0.005 (+/- 0.06)	U	0.109	pCi/l	NA	5/29/2019 13:13
U-238	0.53 (+/- 0.2)		0.1	pCi/l	NA	5/29/2019 13:13
URANIUM, TOTAL	1.31 (+/- 0.32)		0.17	pCi/l	NA	5/29/2019 13:13

Client: ALS Environmental

Date: 31-May-19

Project: R1903920

Work Order: 1905105

Sample ID: Cell 6-05-19 Diss

Lab ID: 1905105-10

Legal Location:

Matrix: WATER

Collection Date: 5/1/2019 13:10

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Dissolved Lead-210 by Liquid Scintillation						
			SOP 704		Prep Date: 5/10/2019	PrepBy: JXH
Pb-210	0.02 (+/- 0.4)	U	0.72	pCi/l	NA	5/16/2019 02:49
Carr: LEAD	85.8		40-110	%REC	DL = NA	5/16/2019 02:49
Dissolved Radium-226 by Radon Emanation - Method 903.						
			SOP 783		Prep Date: 5/22/2019	PrepBy: JXH
Ra-226	1.9 (+/- 0.99)		0.67	pCi/l	NA	5/31/2019 11:25
Carr: BARIUM	89.5		40-110	%REC	DL = NA	5/31/2019 11:25
Dissolved Radium-228 Analysis by GFPC						
			SOP 724		Prep Date: 5/16/2019	PrepBy: RGS
Ra-228	2.15 (+/- 0.68)		0.8	pCi/l	NA	5/23/2019 10:26
Carr: BARIUM	87.5		40-110	%REC	DL = NA	5/23/2019 10:26
Dissolved Total Uranium by Alpha Spectroscopy						
			SOP 714		Prep Date: 5/23/2019	PrepBy: TRS
Tracer: U-232	55.8		30-110	%REC	DL = NA	5/29/2019 13:13
U-234	0.21 (+/- 0.12)		0.11	pCi/l	NA	5/29/2019 13:13
U-235	0.021 (+/- 0.061)	U	0.11	pCi/l	NA	5/29/2019 13:13
U-238	0.23 (+/- 0.12)		0.08	pCi/l	NA	5/29/2019 13:13
URANIUM, TOTAL	0.46 (+/- 0.18)		0.13	pCi/l	NA	5/29/2019 13:13

Client: ALS Environmental

Date: 31-May-19

Project: R1903920

Work Order: 1905105

Sample ID: Cell 6-05-19 Diss

Lab ID: 1905105-10

Legal Location:

Matrix: WATER

Collection Date: 5/1/2019 13:10

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
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Explanation of Qualifiers**Radiochemistry:**

- "Report Limit" is the MDC

U or ND - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

G - Sample density differs by more than 15% of LCS density.

D - DER is greater than Control Limit

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).

U or ND - Indicates that the compound was analyzed for but not detected.

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

* - Duplicate analysis (relative percent difference) not within control limits.

S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.

B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.

E - Analyte concentration exceeds the upper level of the calibration range.

J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).

A - A tentatively identified compound is a suspected aldol-condensation product.

X - The analyte was diluted below an accurate quantitation level.

* - The spike recovery is equal to or outside the control criteria used.

+ - The relative percent difference (RPD) equals or exceeds the control criteria.

G - A pattern resembling gasoline was detected in this sample.

D - A pattern resembling diesel was detected in this sample.

M - A pattern resembling motor oil was detected in this sample.

C - A pattern resembling crude oil was detected in this sample.

4 - A pattern resembling JP-4 was detected in this sample.

5 - A pattern resembling JP-5 was detected in this sample.

H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.

L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.

Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:

- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

ALS -- Fort Collins

Date: 5/31/2019 2:35:

Client: ALS Environmental

QC BATCH REPORT

Work Order: 1905105

Project: R1903920

Batch ID: RE190522-2-1

Instrument ID Alpha Scin

Method: Radium-226 by Radon Emanation

LCS	Sample ID: RE190522-2			Units: pCi/l			Analysis Date: 5/31/2019 11:25					
Client ID:	Run ID: RE190522-2A				Prep Date: 5/22/2019		DF: NA					
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual	
Ra-226	55 (+/- 14)	0	47.86		115	67-120					P	
Carr: BARIUM	15390		15810		97.4	40-110						

LCSD	Sample ID: RE190522-2			Units: pCi/l			Analysis Date: 5/31/2019 11:25					
Client ID:	Run ID: RE190522-2A				Prep Date: 5/22/2019		DF: NA					
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual	
Ra-226	46 (+/- 12)	1	47.86		96.1	67-120		55	0.5	2.1	P	
Carr: BARIUM	15360		15810		97.2	40-110		15390				

MB	Sample ID: RE190522-2			Units: pCi/l			Analysis Date: 5/31/2019 11:25					
Client ID:	Run ID: RE190522-2A				Prep Date: 5/22/2019		DF: NA					
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual	
Ra-226	0 (+/- 0.33)	0.64									U	
Carr: BARIUM	15180		15810		96	40-110						

The following samples were analyzed in this batch:

1905105-1	1905105-2	1905105-3
1905105-4	1905105-5	

Client: ALS Environmental
 Work Order: 1905105
 Project: R1903920

QC BATCH REPORT

Batch ID: **as190523-3-2** Instrument ID **AlphaSpec2** Method: **Total Uranium by Alpha Spectro**

DUP	Sample ID: 1905105-4			Units: pCi/l			Analysis Date: 5/29/2019 13:13				
Client ID: Cell 5-0519			Run ID: UAS190523-3UT			Prep Date: 5/23/2019			DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
U-234	0.98 (+/- 0.27)	0.09						0.8	0.5	2.1	
U-235	0.029 (+/- 0.053)	0.039						0.01	0.2	2.1	U
U-238	0.69 (+/- 0.22)	0.09						0.44	0.9	2.1	
URANIUM, TOTAL	1.7 (+/- 0.35)	0.12						1.25	1.9	2.1	
Tracer: U-232	6	0.1	9.183		65.7	30-110		5.52			

LCS	Sample ID: as190523-3			Units: pCi/l		Analysis Date: 5/30/2019 07:17					
Client ID:	Run ID: UAS190523-3UT					Prep Date: 5/23/2019			DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
U-234	4.45 (+/- 0.78)	0.03	4.22		106	82-122					P
U-235	0.191 (+/- 0.075)	0.044	0.2017		94.8						
U-238	4.81 (+/- 0.84)	0.04	4.382		110	78-126					P
URANIUM, TOTAL	9.4 (+/- 1.1)	0.1	8.804		107	82-122					P
Tracer: U-232	3.41	0.06	4.592		74.2	30-110					

MB	Sample ID: as190523-3				Units: pCi/l		Analysis Date: 5/30/2019 07:17				
Client ID:	Run ID: UAS190523-3UT				Prep Date: 5/23/2019			DF: NA			
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
U-234	-0.011 (+/- 0.027)	0.074									U
U-235	0.005 (+/- 0.032)	0.047									U
U-238	-0.003 (+/- 0.027)	0.04									U
URANIUM, TOTAL	-0.008 (+/- 0.049)	0.081									U
Tracer: U-232	2.37	0.04	4.592		51.6	30-110					

The following samples were analyzed in this batch:

1905105-1	1905105-2	1905105-3
1905105-4		

Client: ALS Environmental
Work Order: 1905105
Project: R1903920

QC BATCH REPORT

Batch ID: **RA190516-1-1** Instrument ID **LB4100-C** Method: **Radium-228 Analysis by GFPC**

LCS		Sample ID: RA190516-1			Units: pCi/l		Analysis Date: 5/23/2019 10:26				
Client ID:		Run ID: RA190516-1A			Prep Date: 5/16/2019			DF: NA			
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-228	14.3 (+/- 3.4)	0.8	14.39		99.3	70-130					P
Carr: BARIUM	31560		33690		93.7	40-110					

LCSD	Sample ID: RA190516-1				Units: pCi/l		Analysis Date: 5/23/2019 10:26				
Client ID:		Run ID: RA190516-1A				Prep Date: 5/16/2019			DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-228	15.5 (+/- 3.7)	0.8	14.39		108	70-130		14.3	0.2	2.1	P
Carr: BARIUM	30770		33690		91.3	40-110		31560			

MB		Sample ID: RA190516-1				Units: pCi/l		Analysis Date: 5/23/2019 10:26			
Client ID:		Run ID: RA190516-1A				Prep Date: 5/16/2019		DF: NA			
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-228	-0.15 (+/- 0.35)	0.8									U
Carr: BARIUM	30810		33690		91.5	40-110					

The following samples were analyzed in this batch:

1905105-1	1905105-2	1905105-3
1905105-4	1905105-5	1905105-6
1905105-7	1905105-8	1905105-9
1905105-10		

Client: ALS Environmental
Work Order: 1905105
Project: R1903920

QC BATCH REPORT

Batch ID: **PB190508-1-1** Instrument ID **LIQSCINT** Method: **Lead-210 by Liquid Scintillation**

LCS	Sample ID: PB190508-1				Units: ug		Analysis Date: 5/16/2019 05:09				
Client ID:		Run ID: PB190508-1A				Prep Date: 5/10/2019			DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Carr: LEAD	632.6		833.6		75.9	40-110					
Pb-210	41 (+/- 9.9)	0.4	40.27		102	75-125					P

LCSD	Sample ID: PB190508-1				Units: ug		Analysis Date: 5/16/2019 06:19				
Client ID:	Run ID: PB190508-1A				Prep Date: 5/10/2019			DF: NA			
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Carr: LEAD	620.8		839.4		74	40-110		632.6			
Pb-210	40.7 (+/- 9.9)	0.4	40.27		101	75-125		41	0.02	2.1	P

MB	Sample ID: PB190508-1				Units: ug		Analysis Date: 5/16/2019 03:59				
Client ID:		Run ID: PB190508-1A				Prep Date: 5/10/2019			DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Carr: LEAD	639.3		832.1		76.8	40-110					
Pb-210	-0.21 (+/- 0.21)	0.4									U

The following samples were analyzed in this batch:

1905105-1	1905105-2	1905105-3
1905105-4	1905105-5	