



February 28, 2019

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 2018 4th Quarter Leachate Radionuclide Monitoring Results

Dear Ms. Guevara:

Enclosed please find a copy of the radionuclide sampling and analysis report for leachate and leachate tank sediment sampling conducted during the fourth quarter 2018. 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** 

Russell Anderson

Manager of Compliance

cc: Larry Shilling, Casella (electronic)

Jonathan Brandes, On-Site Technical Services (electronic)

Richard Clarkson, NYSDEC (electronic) Timothy Rice, NYSDEC (electronic) Greg MacLean, NYSDEC (electronic)

Daniel Maeso, NYSDEC (electronic)

**Enclosures** 

Wellsville, New York 14895

February 27, 2019

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

Re: Hakes C & D Landfill Campbell, New York - 4th Quarter 2018 Radionuclide Test Results

Dear Russell:

The purpose of this letter is to present results of the leachate and leachate tank sediment radiological sampling conducted at the Hakes C & D Landfill during the fourth quarter 2018 with historic results for comparison. Leachate sampling and analysis for radionuclides is required as detailed in section 2.6.3 of the April 2015 Environmental Monitoring Plan (EMP) with approved NYSDEC revisions. On September 11, 2018, NYSDEC approved discontinuing leachate sample analysis by method EPA 901.1, as is consistent with revised solid waste regulations.

Phone: (585) 593-1824

Fax: (585) 593-7471

The initial Hakes leachate radiological sampling and analysis of each landfill cell and combined leachate was completed in May 2012. Therefore, the sampling required in the fourth quarter 2018 includes only landfill cells which have received gas well waste. Currently, the cells containing gas well waste includes cells 3 through 8. Leachate from cell 7 drains through cell 4 and cell 8A leachate flows through cell 3. Therefore, fourth quarter 2018 leachate samples were collected from cells 3, 4, 5, 6 and 8B. Samples were collected by On-Site on November 8, 2018 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 field parameter data and radionuclide results from leachate sampling conducted during 2017 and 2018, which encompasses the last five samplings.

Additionally the annual leachate tank sediment sample was collected on December 20, 2018 as part of annual leachate tank cleaning. Attached Table 2 presents the leachate tank sediment radionuclide results from 2014 through 2018, which includes the last five samplings.

Also enclosed are the fourth quarter 2018 field sampling forms and laboratory analytical reports.

Mr. Anderson February 27, 2019 Page 2

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

Sincerely,

Jonathan E. Brandes, P.G.

Senior Geologist

Enclosures

## Leachate Radionuclide Results 2017-2018 (Last 5 Samplings) Hakes C and D Landfill Campbell, New York

Davamatar	Cell 3 Leachate	Cell 3 Leachate	Cell 3 Leachate	Cell 3 Leachate	Cell 3 Leachate
Parameter	6/6/2017	11/17/2017	2/27/2018	6/26/2018	11/8/2018
Field Parameters					
Field pH (std. units)	6.78	6.91	6.69	6.87	6.81
ORP (mV)	-323.8	-151.7	30.6	33.7	-138.7
Specific Conductivity (us/cm)	9085	7443	6191	7430	6443
Temperature (deg. C)	21.7	16.8	17	26.9	13.9
Turbidity (NTU)	69.2	140	20.6	48.4	76.6
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)
Radionuclide Act + Unc (MDC) pCi/L					
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)
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)
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)
Total Uranium, Dissolved (ASTM D5174-97)	0.00359 ± 0.156 (0.385)				
Total Uranium, Dissolved (EPA 908.0)					< (0.0992)
Total Uranium, Dissolved (HASL-300)		0.29 ± 0.19 (0.22)	0.35 ± 0.16 (0.12)	0.27 ± 0.14 (0.14)	
Total Uranium, Total (ASTM D5174-97)	0.00251 ± 0.127 (0.385)				
Total Uranium, Total (EPA 908.0)					< (0.0657)
Total Uranium, Total (HASL-300)		0.31 ± 0.15 (0.15)	0.37 ± 0.15 (0.12)	0.35 ± 0.15 (0.12)	

#### Notes:

Act + Unc (MDC) = Activity <u>+</u> Uncertainty (Minimum Detectable Concentration)

pCi/L = picocuries per liter

Dissolved - Indicates sample filtered with 0.45 micron filter prior to analysis.

## Leachate Radionuclide Results 2017-2018 (Last 5 Samplings) Hakes C and D Landfill Campbell, New York

Parameter	Cell 4 Leachate	Cell 4 Leachate	Cell 4 Leachate	Cell 4 Leachate	Cell 4 Leachate
Parameter	6/6/2017	11/17/2017	2/27/2018	6/26/2018	11/8/2018
Field Parameters					
Field pH (std. units)	6.83	7.14	6.86	7.08	7.1
ORP (mV)	2.8	-213.7	11.6	-136.4	-204.8
Specific Conductivity (us/cm)	6304	6889	6379	7893	6219
Temperature (deg. C)	19.7	16.6	18.3	26.4	13
Turbidity (NTU)	14.7	42.1	76.1	87	61
Radium-226, Dissolved (EPA 903.1)	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)
Radionuclide Act + Unc (MDC) pCi/L	-	-	-		
Radium-226, Total (EPA 903.1)	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)
Radium-228, Dissolved (EPA 904.0)	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)
Radium-228, Total (EPA 904.0)	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)
Total Uranium, Dissolved (ASTM D5174-97)	0.000711 ± 0.033 (0.385)				
Total Uranium, Dissolved (EPA 908.0)					0.899 ± 0.243 (0.12)
Total Uranium, Dissolved (HASL-300)		0.48 ± 0.18 (0.1)	1.15 ± 0.28 (0.11)	0.73 ± 0.21 (0.11)	
Total Uranium, Total (ASTM D5174-97)	0.000764 ± 0.029 (0.385)				
Total Uranium, Total (EPA 908.0)					0.86 ± 0.2744 (0.116)
Total Uranium, Total (HASL-300)		0.56 ± 0.19 (0.1)	1.14 ± 0.35 (0.18)	0.84 ± 0.25 (0.13)	

#### Notes:

Act + Unc (MDC) = Activity  $\pm$  Uncertainty (Minimum Detectable Concentration)

pCi/L = picocuries per liter

Dissolved - Indicates sample filtered with 0.45 micron filter prior to analysis.

## Leachate Radionuclide Results 2017-2018 (Last 5 Samplings) Hakes C and D Landfill Campbell, New York

Parameter	Cell 5 Leachate	Cell 5 Leachate	Cell 5 Leachate	Cell 5 Leachate	
raiailletei	6/6/2017	11/17/2017	6/26/2018	11/8/2018	
Field Parameters					
Field pH (std. units)	6.79	6.88	6.88	6.81	
ORP (mV)	-205.9	-102.1	-85.2	-142.7	
Specific Conductivity (us/cm)	6221	6278	8030	7890	
Temperature (deg. C)	21.9	16.2	28.4	13.2	
Turbidity (NTU)	64.3	41.6	78.8	79.3	
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)	
Radionuclide Act + Unc (MDC) pCi/L	0.000 + 0.032 (4.30)	1 07 + 0 26 (0 16)	0 + 0 17 (0 25)	0 + 0 72 /1 50)	
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)	
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)	
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)	
Total Uranium, Dissolved (ASTM D5174-97)	0.000797 ± 0.036 (0.385)				
Total Uranium, Dissolved (EPA 908.0)				< (0.075)	
Total Uranium, Dissolved (HASL-300)		0.75 ± 0.2 (0.1)	0.51 ± 0.19 (0.13)		
Total Uranium, Total (ASTM D5174-97)	0.000733 ± 0.034 (0.385)				
Total Uranium, Total (EPA 908.0)				< (0.0897)	
Total Uranium, Total (HASL-300)		0.82 ± 0.26 (0.15)	0.52 ± 0.18 (0.13)		

#### Notes:

pCi/L = picocuries per liter

 $\label{lem:discovery_problem} \textbf{Dissolved-Indicates sample filtered with 0.45 micron filter prior to analysis.}$ 

Table 1

## Leachate Radionuclide Results 2017-2018 (Last 5 Samplings) Hakes C and D Landfill Campbell, New York

Parameter	Cell 6 Leachate 6/6/2017	Cell 6 Leachate 11/17/2017	Cell 6 Leachate 6/26/2018	Cell 6 Leachate 11/8/2018
Field Parameters				
Field pH (std. units)	6.84	6.97	6.99	7.03
ORP (mV)	-291.7	-239.1	-305.9	-196
Specific Conductivity (us/cm)	12178	10151	11169	7566
Temperature (deg. C)	24.6	19.2	29.7	14.8
Turbidity (NTU)	67.4	107	26.3	35.9
Radionuclide Act + Unc (MDC) pCi/L Radium-226, Dissolved (EPA 903.1)	2.34 ± 1.21 (1.01)	2.77 ± 0.78 (0.19)	2.4 ± 1.2 (1.1)	1.5 ± 1.4 (2.2)
Radium-226, Dissolved (EPA 903.1)	2.34 ± 1.21 (1.01)	2.77 ± 0.78 (0.19)	2.4 ± 1.2 (1.1)	1.5 ± 1.4 (2.2)
Radium-226, Total (EPA 903.1)	2.75 ± 1.80 (1.84)	1.81 ± 0.53 (0.12)	2.11 ± 0.75 (0.3)	2.6 ± 1.4 (1)
Radium-228, Dissolved (EPA 904.0)	2.07 ± 0.649 (0.807)	3.1 ± 0.84 (0.62)	2.28 ± 0.72 (0.82)	1.9 ± 1.6 (3.2)
Radium-228, Total (EPA 904.0)	2.4 ± 1.04 (1.77)	1.18 ± 0.46 (0.7)	2.64 ± 0.83 (0.9)	4.7 ± 1.9 (3.1)
Total Uranium, Dissolved (ASTM D5174-97)	0.00105 ± 0.047 (0.385)			
Total Uranium, Dissolved (EPA 908.0)				0.418 ± 0.158 (0.0902)
Total Uranium, Dissolved (HASL-300)		0.32 ± 0.13 (0.09)	0.63 ± 0.19 (0.1)	
Total Uranium, Total (ASTM D5174-97)	0.00112 ± 0.039 (0.385)			
Total Uranium, Total (EPA 908.0)				< (0.0809)
Total Uranium, Total (HASL-300)		0.25 ± 0.19 (0.23)	0.67 ± 0.2 (0.12)	

#### Notes:

Act + Unc (MDC) = Activity <u>+</u> Uncertainty (Minimum Detectable Concentration)

pCi/L = picocuries per liter

Dissolved - Indicates sample filtered with 0.45 micron filter prior to analysis.

## Leachate Radionuclide Results 2017-2018 (Last 5 Samplings) Hakes C and D Landfill Campbell, New York

Parameter	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
Field Parameters					
Field pH (std. units)	6.74	6.62	6.47	6.62	6.51
ORP (mV)	-257.4	-13.5	10	-208.4	-95.7
Specific Conductivity (us/cm)	5306	2286	1577	3300	3718
Temperature (deg. C)	22	14	16	28.2	15.6
Turbidity (NTU)	38.4	140	111	> 1000	> 1000
Radium-226, Dissolved (EPA 903.1)	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)
Radionuclide Act + Unc (MDC) pCi/L Radium-226 Dissolved (FPA 903.1)	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)
Radium-226, Total (EPA 903.1)	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)
Radium-228, Dissolved (EPA 904.0)	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)
Radium-228, Total (EPA 904.0)	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)
Total Uranium, Dissolved (ASTM D5174-97)	0.000911 ± 0.047 (0.385)				
Total Uranium, Dissolved (EPA 908.0)					< (0.0523)
Total Uranium, Dissolved (HASL-300)		0.59 ± 0.21 (0.16)	0.5 ± 0.2 (0.15)	4.22 ± 0.66 (0.11)	
Total Uranium, Total (ASTM D5174-97)	0.000866 ± 0.046 (0.385)				
Total Uranium, Total (EPA 908.0)					< (0.0914)
Total Uranium, Total (HASL-300)		0.65 ± 0.18 (0.12)	0.52 ± 0.16 (0.06)	7.8 ± 1 (0.2)	

#### Notes:

Act + Unc (MDC) = Activity  $\pm$  Uncertainty (Minimum Detectable Concentration)

pCi/L = picocuries per liter

Dissolved - Indicates sample filtered with 0.45 micron filter prior to analysis.

# Leachate Tank Sediment Radionuclide Analytical Results 2014 Through 2018 Hakes C and D Landfill Painted Post, New York

Radionuclide Act + Unc (MDC) pCi/g	Leachate Tank Sediment	Leachate Tank	Leachate Tank	Leachate Tank	Leachate Tank
Radionuclide Act + Onc (IVIDC) pci/g	10/22/2014	Sediment 9/24/2015	Sediment 8/24/2016	Sediment 8/25/2017	Sediment 12/20/2018
Radium-226 (EPA 901.1)	2.118 ± 0.468 (0.323)	1.817 ± 0.337 (0.269)	1.773 ± 0.370 (0.227)	1.883 ± 0.372 (0.326)	
Radium-226, Dissolved (EPA 903.1)					0.48 ± 0.21 (0.19)
Radium-228, Total (EPA 901.1)	1.839 ± 0.584 (0.997)	2.208 ± 0.473 (0.35)	2.454 ± 0.539 (0.342)	2.153 ± 0.527 (0.452)	2.08 ± 0.85 (1.55)
Total Uranium, Total (EPA 908.0)					2.33 ± 0.521 (0.191)
Uranium-234 (HSL-300)	0.076 ± 0.193 (0.443)	0.656 ± 0.202 (0.107)	1 ± 0.234 (0.084)	1.05 ± 0.294 (0.089)	
Uranium-235 (HSL-300)	-0.011 ± 0.161 (0.224)	0.035 ± 0.056 (0.103)	0.047 ± 0.050 (0.073)	0.02 ± 0.070 (0.053)	
Uranium-238 (HSL-300)	0.243 ± 0.211 (0.314)	0.578 ± 0.187 (0.099)	0.962 ± 0.226 (0.056)	0.787 ± 0.246 (0.089)	

#### Notes:

Act + Unc (MDC) = Activity <u>+</u> Uncertainty (Minimum Detectable Concentration)
pCi/g = picocuries per gram

Project: Hakes C&D Landfill, Campbell, New York	Date: 1/8/8
Sampling Location: <u>Ce//-3</u> Sample ID: <u>Ce//3-///8</u>	Arrival Time: <u>085</u> /
Weather Conditions:	
Temp. 4// °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)	
Comments: Hakes Employee Filled Ded Bucket	
Field Parameters (as appropriate)	
Meter: YSI (sn: /7)/08273 ), Hach 2100P (sn: /24//	)
Field Parameters tested in: ( ) Submerged Probe (x) Note: Turbidity measured from a vial grab sample	Cup
Time pH Conductivity Turbidity D.O.  (us/cm) (ntu) (mg/L)  7616 11A	Temp. ORP (°C) (mV)
Sample Information	
Sample Type: () Grab () Composite Sample Location: (X) Discharge Location Description/Condition: (2)   Riser pipe	Pipe ( ) Pond ( ) Ditch
Sample Collection Equipment/Method: Ded Bucket	Sample Time: 09/0
Sample Description (clarity\color): <u>lightly Classy</u> Sample Odor (Y) or (N) Explication (Clarity\color): <u>lightly Classy</u> Sample Odor (Y) or (N) Explication	ain: leachate, adur
Other Observations/Comments:	
Analysis Requested: RAD Num Sampling Completion: Time 0919 Date 1/-8-/8 Samplers K Dy E	nber of Containers:
The state of the s	

Project: Hakes C&D Landfill, Campb	ell, New York	Date! 8-/8
Sampling Location: <u>Cell-4</u>	Sample ID: <u></u>	Arrival Time: 092
	Weather Conditions:	
Temp. <u>L//</u> ° F() Sunny () Part	ly Cloudy ( ) Light	Rain ( ) Hvy. Rain ( ) Snow
	ons: 0-10 mph	
	Location Type	
( ) Groundwater Suppression 💢 Leacha	ate ( ) Secondary Leachate ( ) Su	rface Water/Sediment ( ) Res. Water
(	) Other	
Flow an	d Depth Information (as approp	riate)
	/A Estimated Flow:	
Comments: Hakes Employee Fil	hed Ded 5 gal Bucket	<i>F</i>
Fie	eld Parameters (as appropriate)	
Meter: YSI (sn:/7D/	08273 ), Hach 2100P (sn: /	12410
Field Parame Note: Tur	ters tested in: ( ) Submerged Pro bidity measured from a vial grab s	be ( Cup sample
Time pH Conduction (us/o	ctivity Turbidity D.O. (mg/L)	Temp. ORP (°C) (mV) /3.0 -204.8
	Sample Information	2:
Sample Type: ( ) Grab ( ) Com Location Description/Condition:	posite Sample Location: (x) Disc	charge Pipe ( ) Pond ( ) Ditch
Sample Collection Equipment/Method: Ded Sample Description (clarity\color): Slightly of light An	Sgal Rucket  Cloudy Sample Odor (Y) or (N	Sample Time: 0930
Other Observations/Comments:		
Analysis Requested: RAD		Number of Containers:8
Sampling Completion: Time <u>0944</u> Date	11-8-18 Samplers K 1)-6	

Sampling Location: Ce//-5 Sample ID: Ce//5-Seo Arrival Time: 0948  Weather Conditions:  Temp. 4/ ° F ( ) Sunny ( ) Partly Cloudy ( ) Light Rain ( ) Hvy. Rain ( ) Snow  Wind Conditions: Conghi
Weather Conditions:  Temp. 4// °F() Sunny () Partly Cloudy () Light Rain () Hvy. Rain () Snow  Wind Conditions:
Wind Conditions:
The state of the s
( ) Groundwater Suppression ( Leachate ( ) Secondary Leachate ( ) Surface Water/Sediment ( ) Res. Water
( ) Contains Capping of the contains ( ) Canada Training ( ) The contains
( ) Other
Flow and Depth Information (as appropriate)
Depth:Estimated Flow:
Depth: NA Estimated Flow: NA  Comments: Hakes Employee Filled Ded 5 gal Buket
Field Parameters (as appropriate)
Meter: YSI (sn:/70/08273 ), Hach 2100P (sn: /24/0)
Field Parameters tested in: ( ) Submerged Probe (X) Cup Note: Turbidity measured from a vial grab sample
Time pH Conductivity Turbidity D.O. Temp. ORP $(us/cm)$ $(ntu)$ $(mg/L)$ $(°C)$ $(mV)$ $79.3$ $NA$ $3.2$ $-142.7$
Sample Information 7.
Sample Type: (x) Grab ( ) Composite Sample Location: (x) Discharge Pipe ( ) Pond ( ) Ditch Location Description/Condition: (a) Sign Pipe
Sample Collection Equipment/Method: Ded 5 gal Rucket Sample Time: 1000
Sample Collection Equipment/Method: Ded 5 gal Bucket  Sample Description (clarity\color): Iightly Classey Sample Odor (Y) or (N) Explain: Ieachad Color  With Med Gray/Black fint  Other Observations/Comments:
Other Observations/Comments:
Analysis Requested: RADNumber of Containers:8
Sampling Completion: Time 10/8 Date 8-18 Samplers KD45

Project: Hakes C&D Landfill, Campbell, New	<u>York</u>	Date: 11-8-18
Sampling Location: <u>Ce//- 6</u> Samp	le ID: <u>Ce//6-///8</u> Arriv	al Time: <u>1026</u>
Wea	ther Conditions:	
Temp. <u>4//</u> ° F()Sunny ()Partly Cloudy Wind Conditions:	(X) Cloudy (), Light Rain () Hvy	. Rain ()Snow
L	ocation Type	
()Groundwater Suppression (※ Leachate()Se	condary Leachate ( ) Surface Water/Se	diment()Res. Water
( ) Other		
Plow and Depth  Depth: NA  Comments: Hakes Employee Filled	Information (as appropriate) _Estimated Flow: Ded Sgal Backet	
Field Paran	neters (as appropriate)	
Meter: YSI (sn: /7D/08273	), Hach 2100P (sn: /24/0	_)
Field Parameters teste Note: Turbidity me	d in: ( ) Submerged Probe 💢) Cup asured from a vial grab sample	
Time pH Conductivity 7 1040 7, 03 7566		ORP -19610
San	ple Information	
Sample Type: M Grab ( ) Composite S Location Description/Condition: Cell 6 RiseC		Pond ( ) Ditch
Sample Collection Equipment/Method: <u>Ded Sgal</u>	Bucket Samp	ole Time: 1040
Sample Description (clarity\color): Slightly Clave Med Blace	Sample Odor (Y)) or (N) Explain: Lead	chate oder
Other Observations/Comments:		
Analysis Requested: RAD	Number of Co	ontainers:
Analysis Requested: RAD Sampling Completion: Time 1/03 Date 1/-84	Samplers KDye	

Project: Hakes C&D Landfill, Campbell, New York	Date: 1/-8-18
Sampling Location: Cell-8B Sample ID: Cell8B - 11/1	8Arrival Time:
Weather Conditions:	
Temp. () Sunny () Partly Cloudy () Cloudy () Light Ra	ain () Hvy. Rain () Snow
Wind Conditions: 0-5mph	
Location Type	
( ) Groundwater Suppression (x) Leachate ( ) Secondary Leachate ( ) Surfa	ace Water/Sediment ( ) Res. Water
( ) Other	
Flow and Depth Information (as appropria	
Depth: NA Estimated Flow:  Comments: Buckets Filled by Hakes Employee	
Comments: DUCKETS FILE & BY MERES EM HOUSE	
Field Parameters (as appropriate)	
Meter: YSI (sn: /7D/08273 ), Hach 2100P (sn: /6	24/0)
Field Parameters tested in: ( ) Submerged Probe Note: Turbidity measured from a vial grab sar	Cup
Time pH Conductivity Turbidity D.O.	Temp. ORP
0815 6.51 32/8 74.0 MA	15:6 -95:7
M >1000	
Sample Information /2.	
Sample Type: (X) Grab ( ) Composite Sample Location: (X) Discharge	arge Pipe ( ) Pond ( ) Ditch
Location Description/Condition: Cell & Riser pipe	
, 1	
Sample Collection Equipment/Method: Direct Grab	Sample Time: <u>0 8/5</u>
Sample Description (clarity\color): Lightly clardy Sample Odor (Y) or (N) I	Explain: /Pachale odur
Sample Collection Equipment Wellow. Sample Odor (Y) or (N) Is sample Description (clarity\color): I ghtly cloudy Sample Odor (Y) or (N) I light Gray f: nt -7 Black  Other Observations/Comments: As the After the 1st couple	0211124 6. 1
Other Observations/Comments: The the Hotel the 1st Couple	of Bottles The Sangle
got Black	
Analysis Requested: RAD	Number of Containers:
Sampling Completion: Time 0834 Date 8-18 Samplers K Dye	<del>-</del>

Project: <u>Hakes C&amp;</u>	D Landfill, Campbell, N	<u>ew York</u>		D	ate: 1d-20-18
Sampling Location: <u>Nor</u>	th leachate Tank sa	mple ID: Nort	H TANKSED.	<u> 1218</u> Arriva	I Time:/300
	W	eather Condi	tions:		
Temp. <del>⊈2</del> ° F	( ) Sunny ( ) Partly Clo	udy ( ) Cloud	ly ( ) Light Ra	ain () Hvy.	Rain () Snow
	Wind Conditions: _				
		Location Ty	pe		
( ) Groundwater Sup	pression ( ) Leachate ( )	Secondary Le	achate 💢) Surfa	ice Water/Sed	iment ( ) Res. Water
	( ) Oth	er			
	Flow and Dep	th Informatio	n (as appropria	ite)	
	Depth:				
Comments:		-,		,,	
	Field Pa	rameters (as	annronriate)		
		•	,		
M	eter: YSI (sn:	), Hach	n 2100P <u>(sn:</u>		
	Field Parameters to Note: Turbidity				
Time			D.O.		ORP
1340	(us/cm)	(ntu)	(mg/L)	(°C)	(mV)
	S	ample Inform	ation		wall 1
Sample Type	e: ( ) Composite			arge Pipe ( ) P	Pond (X) Ditch TAn
Location Description/Cond	dition: North bachak	Tank.			
	nent/Method: <u>Z. H. Dia pe</u>				le Time: <u>/340</u>
Sample Description (clarit	y\color): WetBlack	Sample (	Odor(Y)or (N) E	Explain: Jeach	hale over
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Other Observations/Comr	nents:				
Analysis Daniel D	17			Normalia = = = = = = = = = = = = = = = = = = =	7
Analysis Requested:	1253 Data 122	M/ Samalar	K Dye		ntainers:
Sampling Completion: Tin	ie / Jo - Date / A A	Samplers	1) Lye	J. OLANG	K)



Service Request No:R1810912

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 November 08, 2018 For your reference, these analyses have been assigned our service request number **R1810912**.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAP standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, 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) for analysis of these samples, and represented by Laboratory Control Sample control limits. Any events, such as QC failures, which may add to the uncertainty are explained in the report narrative.

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

Camanas

CC: Jon Brandes



### **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) Service Request: R1810912

Project: Hakes C&D Landfill - Leachate RAD. Date Received: 11/08/2018

Sample Matrix: Water

#### **CASE NARRATIVE**

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables, including results of QC samples analyzed from this delivery group. Analytical procedures performed by the lab are validated in accordance with NELAC standards. Any parameters that are not included in the lab's NELAC accreditation are identified on a "Non-Certified Analytes" report in the Miscellaneous Forms Section of this report. Individual analytical results requiring further explanation are flagged with qualifiers and/or discussed below. The flags are explained in the Report Qualifiers and Definitions page in the Miscellaneous Forms section of this report.

#### **Sample Receipt:**

Ten water samples were received for analysis at ALS Environmental on 11/08/2018. Any discrepancies noted upon initial sample inspection are noted on the cooler receipt and preservation form included in this data package. The samples were received in good condition and consistent with the accompanying chain of custody form. Samples are refrigerated at 0 to 6°C upon receipt at the lab except for aqueous samples designated for metals analyses, which are stored at room temperature. If any samples were received for the analysis of pH, chlorine residual, sulfite, dissolved oxygen, or ferrous iron, the samples were analyzed past their holding time expiration since these analyses are required to be analyzed within 15 minutes of sampling. The sample extract(s) required cleanup with TBA (Tetrabutylammonium sulfate) to reduce analytical interference from sulfur.

The sample extract(s) required cleanup with TBA (Tetrabutylammonium sulfate) to reduce analytical interference from sulfur. Endrin aldehyde is degraded by TBA cleanup, resulting in low LCS recoveries, and a likely low bias in the associated samples.

#### **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.

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Approved by		Date	01/24/2019	

Clarica W took



## 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 Client: Casella Waste Systems (Hampden ME)

Project: Hakes C&D Landfill - Leachate RAD.

#### **SAMPLE CROSS-REFERENCE**

SAMPLE #	CLIENT SAMPLE ID	<u>DATE</u>	TIME
R1810912-001	Cell8B-1118	11/8/2018	0815
R1810912-002	Cell8B-1118 Diss	11/8/2018	0815
R1810912-003	Cell3-1118	11/8/2018	0910
R1810912-004	Cell3-1118 Diss	11/8/2018	0910
R1810912-005	Cell4-1118	11/8/2018	0930
R1810912-006	Cell4-1118 Diss	11/8/2018	0930
R1810912-007	Cell5-1118	11/8/2018	1000
R1810912-008	Cell5-1118 Diss	11/8/2018	1000
R1810912-009	Cell6-1118	11/8/2018	1040
R1810912-010	Cell6-1118 Diss	11/8/2018	1040

<b>A</b>	Client:	Cas	sella	ı/On	-Site	9							C	H	A	N	0	f	C	Ų S	3 T	0	D	Υ			Page of
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### Cooler Receipt and Preservation Check Form

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Project/Clie					Folde	er Number_	. <u></u>							
Cooler receiv	ed on 11/8/	18	by: <u>\$</u>	In_	-	COURIER:	ALS	UPS	FEDEX	VELO	CITY (	LIENT	·- ·- ·-	
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2 Custody	papers prope	rly completed (in	k, sign	ed)?	P N	5b Did V	<del>OA</del> via	ls, Alk,	or Sulfide	have sig'	* bubble	s? (3	N NA	<b>6</b> 6
3 Did all b	ottles arrive in	good condition	(unbrol	ken)?	Y N	6 When	e did the	e bottles	originate	?	AL&/RC	C CI	LIENT	
4 Circle:	Wette Dr	lce Gel packs	pres	sent?	SP N	7 Soil	VOA rec	eived a	s: Bu	lk End	core 5	035set	<del>MA</del>	
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		Cassettes / Tubes					1		Tedlar® I			dded	Fina	1
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### 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.
- 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/Arclors).
- B Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.
- E Inorganics- Concentration is estimated due to the serial dilution was outside control limits.
- E Organics- Concentration has exceeded the calibration range for that specific analysis.
- 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.
- \* Indicates that a quality control parameter has exceeded laboratory limits. Under the "Notes" column of the Form I, this qualifier denotes analysis was performed out of Holding Time.
- H Analysis was performed out of hold time for tests that have an "immediate" hold time criteria.
- # Spike was diluted out.

- + Correlation coefficient for MSA is <0.995.
- N Inorganics- Matrix spike recovery was outside laboratory limits.
- N Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.
- S Concentration has been determined using Method of Standard Additions (MSA).
- W Post-Digestion Spike recovery is outside control limits and the sample absorbance is <50% of the spike absorbance.
- P Concentration >40% difference between the two GC columns.
- C Confirmed by GC/MS
- Q DoD reports: indicates a pesticide/Aroclor is not confirmed (≥100% Difference between two GC columns).
- 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 Certifications<sup>1</sup>

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	

<sup>&</sup>lt;sup>1</sup> 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 <a href="https://www.alsglobal.com/locations/americas/north-america/usa/new-york/rochester-environmental">https://www.alsglobal.com/locations/americas/north-america/usa/new-york/rochester-environmental</a>

### **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	9030B
Soluble	
9056A Bomb (Halogens)	5050A
9066 Manual Distillation	9065
SM 4500-CN-E Residual	SM 4500-CN-G
Cyanide	
SM 4500-CN-E WAD Cyanide	SM 4500-CN-I

#### Solid/Soil/Non-Aqueous Matrix

Analytical Method	Preparation Method
60106	
6010C	3050B
6020A	3050B
6010C TCLP (1311)	3005A/3010A
extract	
6010 SPLP (1312) extract	3005A/3010A
7196A	3060A
7199	3060A
9056A Halogens/Halides	5050
300.0 Anions/ 350.1/	DI extraction
353.2/ SM 2320B/ SM	
5210B/ 9056A Anions	

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



Ft. Collins, Colorado LIMS Version: 6.889 Page 1 of 1

Monday, December 31, 2018

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

Re: ALS Workorder: 1811487

Project Name:

Project Number: R1810912

Dear Ms. Jaeger:

Ten water samples were received from ALS Environmental, on 11/28/2018. The samples were scheduled for the following analyses:

Radium-226 Radium-228

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,

A& 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 Environme	ntal – Fort Collins
7.20 =	
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

14 of 59 2 of 25



### 1811487

#### Radium-228:

The samples were analyzed for the presence of <sup>228</sup>Ra by low background gas flow proportional counting of <sup>228</sup>Ac, which is the ingrown progeny of <sup>228</sup>Ra, according to EPA method 904.0. 1811487-2, -4, -6, -8, and -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 1811487-2, -4, -6, -8, and -10 were filtered and preserved prior to analysis.

All acceptance criteria were met.

### **ALS -- Fort Collins**

### Sample Number(s) Cross-Reference Table

**OrderNum:** 1811487

Client Name: ALS Environmental

**Client Project Name:** 

Client Project Number: R1810912 Client PO Number: R1810912

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
Cell8B-1118	1811487-1		WATER	08-Nov-18	8:15
Cell8B-1118 Diss	1811487-2		WATER	08-Nov-18	8:15
Cell3-1118	1811487-3		WATER	08-Nov-18	9:10
Cell3-1118 Diss	1811487-4		WATER	08-Nov-18	9:10
Cell4-1118	1811487-5		WATER	08-Nov-18	9:30
Cell4-1118 Diss	1811487-6		WATER	08-Nov-18	9:30
Cell5-1118	1811487-7		WATER	08-Nov-18	10:00
Cell5-1118 Diss	1811487-8		WATER	08-Nov-18	10:00
Cell6-1118	1811487-9		WATER	08-Nov-18	10:40
Cell6-1118 Diss	1811487-10		WATER	08-Nov-18	10:40

ALS Environmental Chain of Custody 1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475

ALS Contact: Janice Jaeger

(8/11/8)

R1810912 Project Number:

Project Manager:	Janice Jaeger								
QAP:	LAB QAP			•			822 muibi 1.E09	822 muibi 0.406	
				Sample	ā		ßЯ	ВЯ	
Lab Code	Sample ID	# of Cont.	Matrix	Date	Time	Lab ID			
199-216918HB	Cell8B-1118		Water	11/8/18	0815	Fort Collins ALS	Х	×	
R1810912-002	Cell8B-1118 Diss 2		Water	11/8/18	0815	Fort Collins ALS	Х	х	
S00-31601818	Cell3-1118 }		Water	11/8/18	0160	Fort Collins ALS	Х	Х	
R1210912-084	Cell3-1118 Diss		Water	11/8/18	0160	Fort Collins ALS	×	X	
CBO-E16018172	Cell4-1118 S		Water	11/8/18	0630	Fort Collins ALS	X	X	
87810912-808	Cell4-1118 Diss		Water	11/8/18	0630	Fort Collins ALS	X	X	
R4810912-009	Cell5-1118		Water	11/8/18	1000	Fort Collins ALS	x	Х	
ह्य है। क्राउट <del>क्र</del>	Cell5-1118 Diss		Water	11/8/18	1000	Fort Collins ALS	×	Х	
<b>-600-21601360</b> 5	Cell6-1118 9		Water	11/8/18	1040	Fort Collins ALS	×	Х	
R1810912-010-	Cell6-1118 Diss		Water	11/8/18	1040	Fort Collins ALS	×	X	

need in lab filter for dussolved

Report Total Uanium only - none of the isotopes

Folder Comments:

Special Instructions/Comments		Turnaround Requirements	Report Requirements	Invoice Information
Stal DDD		RUSH (Surcharges Apply)	I. Results Only	
		PLEASE CIRCLE WORK DAYS	Au. Kesuits + (AC Summaries	PO#
		1 2 3 4 5	III. Results + QC and Calibration Summaries	58R1810912
NPDES		STANDARD	IV. Data Validation Report with Raw Data	
		Requested FAX Date:	PQL/MDL/J N	Bill to
H - Test is On Hold	P - Test is Authorized for Prep Only	Requested Report Date: 12/04/18	$\frac{\chi}{\chi}$	
B. Retinguished By:	mln (120/18/ 1435 Received By	KELI-JEAN SMITH	Airbill Number:	

ALS Environmental Chain of Custody 1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475

R1810912 Project Number:

Janice Jaeger Project Manager: QAP:

LAB QAP

ALS Contact: Janice Jaeger

Page 2 Invoice Information · 58R1810912 Bill to ₩ III. Results + QC and Calibration Summaries N. Data Validation Report with Raw Data | Airbill Number: [1.2] Report Requirements II. Results + QC Summaries z × I. Results Only PQL/MDL/J EDD KELI-JEAN SMITH PLEASE CIRCLE WORK DAYS Requested Report Date: 12/04/18 **Turnaround Requirements** RUSH (Surcharges Apply) Requested FAX Date: STANDARD Received By: P - Test is Authorized for Prep Only Special Instructions/Comments H - Test is On Hold Retinquished By: NPDES

18 of 59

ALS Environmental Chain of Custody 1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475

ALS Contact: Janice Jaeger

R1810912 Project Number: Project QAP:

Project Manager:	K1810912 Janice Jaeger I A D O A D						9:	8	
:	145 (AT				٠.		SS muibs 1.E06	SS muibs 0,406	
	-			Sample	=		ĸ	В	
Lab Code	Sample ID.	# of Cont.	Matrix	Date	Time	Lab ID			··.
R1810912-001	-8111-G8119D		Water	11/8/18	\$180	Fort Collins ALS	×	×	•
R1810912-0027 Cell8B-1118	Cell8B-1118 Diss		Water	.11/8/18	0815	Fort Collins ALS	×	<b>.</b> × .	
-R1810912-003	-Cell3 1118-		Water	11/8/18	0160	Fort Collins ALS	×	×	· . •
R1810912-0047	Cell3-1118 Diss		Water	11/8/18	0160	Fort Collins ALS	×	×	· .
R1818912-805	Coll4 1118-		Water	11/8/18	0830	Fort Collins ALS	×	×	
R1810912-006	Cell4-1118 Diss		Water	11/8/18	0630	Fort Collins ALS	×	×	
R1810913-007	Cells 1118		Water	11/8/18	1000	Fort Collins ALS	×	×	
<b>-800 21001818</b> 1	Cell5-1118 Diss		Water	11/8/18	1000	Fort Collins ALS	×	×	· · .
600 C16013199	- Cell6-1118		Water	11/8/18	1040	Fort Collins ALS	X	×	
R1810912-010 Cell6-1118	Cell6-1118 Diss		Water	11/8/18	1040	Fort Collins ALS	×	×	

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

58R1810912 III. Results + QC and Calibration Summaries IV. Data Validation Report with Raw Data II. Results + QC Summaries 리뉘 L Results Only PQL/MDL/J EDD PLEASE CIRCLE WORK DAYS Requested Report Date: 12/04/18 Turnaround Requirements RUSH (Surcharges Apply) Requested FAX Date: STANDARD P - Test is Authorized for Prep Only Special Instructions/Comments H - Test is On Hold NPDES

Airbill Number.

KELI-JEAN SMITH

Received By:

11.38.18 DASO

Page 1

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### ALS Environmental - Fort Collins CONDITION OF SAMPLE UPON RECEIPT FORM

(ALS) A1 ( D) / / / / / / / / / / / / / / / / / /			
Client: $\frac{1}{1}$ $\frac{1}{1$			
Project Manager: Initials: Date: Value Date:			
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			
Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)			
6 Are short-hold samples present?  YES NO			
7. Are all samples within holding times for the requested analyses?			
8 Were all sample containers received intact? (not broken or leaking)			
9 Is there sufficient sample for the requested analyses? (YES) NO			
10. Are all samples in the proper containers for the requested analyses?			
Are all aqueous samples preserved correctly, if required? (excluding volatiles)  N/A  YES			
12 Are all aqueous non-preserved samples pH 4-9?  N/A  N/A  NO			
Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) free of bubbles > 6 mm (1/4 inch) diameter? (i.e. size of green pea)			
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 #: 2 3			
Temperature (°C): Amb Amb ———————————————————————————————			
No. of custody seals on cooler:			
DOT Survey/ Acceptance External µR/hr reading: 9 10 10			
Background µR/hr reading:			
Were external μR/hr readings ≤ two times background and within DOT acceptance criteria YES /NO / NA (If no, see Form 008.)			
Additional Information: Please provide details here for any NO responses to gray-shaded boxes above, or any other issues noted:  Sumple have 3 bottles or useful. All other sumple have 3 bottles or useful.  Sumple to have 3 bottles or useful.  Sumple to have 3 bottles or useful.  All client bottle ID's vs ALS lab ID's double-checked by:  All client bottle ID's vs ALS lab ID's double-checked by:			
If applicable, was the client contacted? YES / NO (N) Contact: Date/Time:			
Project Manager Signature / Date:			
Form 201r26.xls *IR Gun #1, VWR SN 170560549 (06/29/2018) *IR Gun #3, VWR SN 170647571 *IR Gun #4, Oakton, SN 2372220101-0002  Page 1 of8 of 25			

181/487





1811487

ORIGIN ID:RKWA SAMPLE RECEIVING TELEDYNE BROWN

(865) 934-0382 ENGINEERING

KNOXVILLE, TN 37931 LINITED STATES US SHIP DATE: 26NOV18 ACTWGT: 44.20 LB CAD: 2882248/INET4040

BILL SENDER

TO ALS

225 COMMERS DRIVE

10-1 AMB

FORT COLLINS CO 80524

(585) 288-538

REF: 967554812

Fedex.
Express

TRK# 7.738 0323 3091

WED - 28 NOV 4:30P

8052

co-us DE

TI FTCA

(003) ¥34-U38 EIVING ROWN ENGINEERING (LANE

TO ALS

225 COMMERCE DR

FORT COLLINS CO 80524 (585) 288-5380 REF. 967555

A

00:31

SHIP DATE: 28NOV18 67.11 ACTWGT: 3.00 LB 67.11 CAD: 2882248/NET40 7/1/9

**BILL SENDER** 

TRK# 7738 2342 6774

THU - 29 NOV 3:00P STANDARD OVERNIGHT

> 80524 co-us DEN



Sample le Bottle 3

#### **SAMPLE SUMMARY REPORT**

Client: ALS Environmental Date: 31-Dec-18

 Project:
 R1810912
 Work Order:
 1811487

 Sample ID:
 Cell8B-1118
 Lab ID:
 1811487-1

 Legal Location:
 Matrix:
 WATER

Collection Date: 11/8/2018 08:15 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation -	Method 903.1	SOF	783	Prep	Date: 12/3/2018	PrepBy: <b>JXH</b>
Ra-226	0.28 (+/- 0.88)	U,M	1.67	pCi/l	NA	12/11/2018 11:09
Carr: BARIUM	94.2		40-110	%REC	DL = NA	12/11/2018 11:09
Radium-228 Analysis by GFPC		SOF	724	Prep	Date: 12/6/2018	PrepBy: <b>MLB</b>
Ra-228	0.7 (+/- 1.3)	Y1,U,M	2.8	pCi/l	NA	12/17/2018 11:22
Carr: BARIUM	104	Y1	40-110	%REC	DL = NA	12/17/2018 11:22

#### **SAMPLE SUMMARY REPORT**

 Client:
 ALS Environmental
 Date: 31-Dec-18

 Project:
 R1810912
 Work Order: 1811487

 Sample ID:
 Cell8B-1118 Diss
 Lab ID: 1811487-2

Sample ID: Cell8B-1118 Diss Lab ID: 1811487-2
Legal Location: Matrix: WATER

Collection Date: 11/8/2018 08:15 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Dissolved Radium-226 by F	Radon Emanation - Method	903. SOF	783	Prep	Date: <b>12/3/2018</b>	PrepBy: <b>JXH</b>
Ra-226	1.1 (+/- 1.4)	U,M	2.2	pCi/l	NA	12/11/2018 11:09
Carr: BARIUM	89.1		40-110	%REC	DL = NA	12/11/2018 11:09
Dissolved Radium-228 Ana	llysis by GFPC	SOF	724	Prep	Date: <b>12/21/2018</b>	PrepBy: <b>MLB</b>
Ra-228	2.5 (+/- 1.6)	U,M	3	pCi/l	NA	12/28/2018 11:22
Carr: BARIUM	85.2		40-110	%REC	DL = NA	12/28/2018 11:22

#### **SAMPLE SUMMARY REPORT**

 Client:
 ALS Environmental
 Date: 31-Dec-18

 Project:
 R1810912
 Work Order: 1811487

 Project:
 R1810912
 Work Order:
 1811487

 Sample ID:
 Cell3-1118
 Lab ID:
 1811487-3

 Legal Location:
 Matrix:
 WATER

Collection Date: 11/8/2018 09:10 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation	- Method 903.1	SOI	P 783	Prep	Date: <b>12/3/2018</b>	PrepBy: <b>JXH</b>
Ra-226	1.2 (+/- 1.1)	U,M	1.3	pCi/l	NA	12/11/2018 11:09
Carr: BARIUM	91.8		40-110	%REC	DL = NA	12/11/2018 11:09
Radium-228 Analysis by GFPC		SOI	P 724	Prep	Date: <b>12/6/2018</b>	PrepBy: <b>MLB</b>
Ra-228	2.3 (+/- 1.5)	U,M	2.9	pCi/l	NA	12/17/2018 11:22
Carr: BARIUM	95.3		40-110	%REC	DL = NA	12/17/2018 11:22

#### **SAMPLE SUMMARY REPORT**

 Client:
 ALS Environmental
 Date: 31-Dec-18

 Project:
 R1810912
 Work Order: 1811487

Sample ID: Cell3-1118 Diss Lab ID: 1811487-4
Legal Location: Matrix: WATER

Collection Date: 11/8/2018 09:10 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Dissolved Radium-226 by F	Radon Emanation - Method	903. SOI	P 783	Prep	Date: 12/3/2018	PrepBy: <b>JXH</b>
Ra-226	1 (+/- 1.3)	U,M	2	pCi/l	NA	12/11/2018 11:09
Carr: BARIUM	91.8		40-110	%REC	DL = NA	12/11/2018 11:09
Dissolved Radium-228 Ana	llysis by GFPC	SOI	P 724	Prep	Date: 12/21/2018	PrepBy: <b>MLB</b>
Ra-228	2.1 (+/- 1.5)	U,M	2.9	pCi/l	NA	12/28/2018 11:22
Carr: BARIUM	87.6		40-110	%REC	DL = NA	12/28/2018 11:22

#### **SAMPLE SUMMARY REPORT**

Client: ALS Environmental Date: 31-Dec-18

 Project:
 R1810912
 Work Order:
 1811487

 Sample ID:
 Cell4-1118
 Lab ID:
 1811487-5

 Legal Location:
 Matrix:
 WATER

Collection Date: 11/8/2018 09:30 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanati	on - Method 903.1	so	P 783	Prep	Date: <b>12/3/2018</b>	PrepBy: <b>JXH</b>
Ra-226	2.4 (+/- 1.4)	M3	1.4	pCi/l	NA	12/11/2018 11:09
Carr: BARIUM	92.9		40-110	%REC	DL = NA	12/11/2018 11:09
Radium-228 Analysis by GFPC		so	P 724	Prep	Date: 12/6/2018	PrepBy: <b>MLB</b>
Ra-228	3.9 (+/- 2.1)	M3	3.8	pCi/l	NA	12/17/2018 11:22
Carr: BARIUM	82.2		40-110	%REC	DL = NA	12/17/2018 11:22

#### **SAMPLE SUMMARY REPORT**

Client: ALS Environmental Date: 31-Dec-18

 Project:
 R1810912
 Work Order:
 1811487

 Sample ID:
 Cell4-1118 Diss
 Lab ID:
 1811487-6

 Legal Location:
 Matrix:
 WATER

Collection Date: 11/8/2018 09:30 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Dissolved Radium-226 by I	Radon Emanation - Method	903. SO	P 783	Prep	Date: 12/3/2018	PrepBy: <b>JXH</b>
Ra-226	2.3 (+/- 1.4)	M3	1.5	pCi/l	NA	12/11/2018 11:09
Carr: BARIUM	90.9		40-110	%REC	DL = NA	12/11/2018 11:09
Dissolved Radium-228 Ana	alysis by GFPC	SO	P 724	Prep	Date: 12/21/2018	PrepBy: <b>MLB</b>
Ra-228	1.7 (+/- 1.5)	U,M	3.1	pCi/l	NA	12/28/2018 11:22
Carr: BARIUM	83.9		40-110	%REC	DL = NA	12/28/2018 11:22

#### SAMPLE SUMMARY REPORT

 Client:
 ALS Environmental
 Date: 31-Dec-18

 Project:
 R1810912
 Work Order: 1811487

 Sample ID:
 Cell5-1118
 Lab ID: 1811487-7

Legal Location: Matrix: WATER

Collection Date: 11/8/2018 10:00 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation	n - Method 903.1	SO	P 783	Prep	Date: <b>12/3/2018</b>	PrepBy: <b>JXH</b>
Ra-226	0 (+/- 0.75)	U,M	1.43	pCi/l	NA	12/11/2018 11:09
Carr: BARIUM	90		40-110	%REC	DL = NA	12/11/2018 11:09
Radium-228 Analysis by GFPC		SO	P 724	Prep	Date: <b>12/6/2018</b>	PrepBy: <b>MLB</b>
Ra-228	2.9 (+/- 1.9)	U,M	3.5	pCi/l	NA	12/17/2018 11:22
Carr: BARIUM	83.5		40-110	%REC	DL = NA	12/17/2018 11:22

#### **SAMPLE SUMMARY REPORT**

 Client:
 ALS Environmental
 Date: 31-Dec-18

 Project:
 R1810912
 Work Order: 1811487

Sample ID: Cell5-1118 Diss Lab ID: 1811487-8
Legal Location: Matrix: WATER

Collection Date: 11/8/2018 10:00 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Dissolved Radium-226 by F	Radon Emanation - Method	903. SO	P 783	Prep	Date: 12/3/2018	PrepBy: <b>JXH</b>
Ra-226	0 (+/- 0.72)	U,M	1.59	pCi/l	NA	12/11/2018 11:09
Carr: BARIUM	91.1		40-110	%REC	DL = NA	12/11/2018 11:09
Dissolved Radium-228 Ana	lysis by GFPC	SO	P 724	Prep	Date: 12/21/2018	PrepBy: <b>MLB</b>
Ra-228	0.3 (+/- 1.6)	U,M	3.5	pCi/l	NA	12/28/2018 11:22
Carr: BARIUM	76.2		40-110	%REC	DL = NA	12/28/2018 11:22

#### **SAMPLE SUMMARY REPORT**

Client: ALS Environmental Date: 31-Dec-18

 Project:
 R1810912
 Work Order:
 1811487

 Sample ID:
 Cell6-1118
 Lab ID:
 1811487-9

 Legal Location:
 Matrix:
 WATER

Collection Date: 11/8/2018 10:40 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation	n - Method 903.1	SO	P 783	Prep	Date: <b>12/3/2018</b>	PrepBy: <b>JXH</b>
Ra-226	2.6 (+/- 1.4)		1	pCi/l	NA	12/11/2018 11:40
Carr: BARIUM	93.8		40-110	%REC	DL = NA	12/11/2018 11:40
Radium-228 Analysis by GFPC		SO	P 724	Prep	Date: <b>12/6/2018</b>	PrepBy: <b>MLB</b>
Ra-228	4.7 (+/- 1.9)	M3	3.1	pCi/l	NA	12/17/2018 11:22
Carr: BARIUM	80.9		40-110	%REC	DL = NA	12/17/2018 11:22

#### **SAMPLE SUMMARY REPORT**

Client: ALS Environmental Date: 31-Dec-18

 Project:
 R1810912
 Work Order:
 1811487

 Sample ID:
 Cell6-1118 Diss
 Lab ID:
 1811487-10

 Legal Location:
 Matrix:
 WATER

Collection Date: 11/8/2018 10:40 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Dissolved Radium-226 by F	Radon Emanation - Method	903. SOI	P 783	Prep	Date: <b>12/3/2018</b>	PrepBy: <b>JXH</b>
Ra-226	1.5 (+/- 1.4)	U,M	2.2	pCi/l	NA	12/11/2018 11:40
Carr: BARIUM	92.8		40-110	%REC	DL = NA	12/11/2018 11:40
Dissolved Radium-228 Ana	lysis by GFPC	SOI	P 724	Prep	Date: 12/21/2018	PrepBy: <b>MLB</b>
Ra-228	1.9 (+/- 1.6)	U,M	3.2	pCi/l	NA	12/28/2018 11:22
Carr: BARIUM	87.9		40-110	%REC	DL = NA	12/28/2018 11:22

#### SAMPLE SUMMARY REPORT

**Date:** 31-Dec-18 Client: ALS Environmental

**Project:** R1810912 **Work Order:** 1811487

Cell6-1118 Diss **Lab ID:** 1811487-10 Sample ID: **Legal Location:** Matrix: WATER

**Collection Date:** 11/8/2018 10:40 **Percent Moisture:** 

Report Dilution Analyses Result **Qual** Limit Units **Date Analyzed Factor** 

#### **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

Client: ALS Environmental

**Work Order:** 1811487 **Project:** R1810912

**Date:** 12/31/2018 1:55

#### QC BATCH REPORT

Batch ID: R	RE181201-1-1	Instrument ID Alp	oha Scin		Method: F	Radium-226	by Rado	on Emanation				
LCS	Sample ID: RE181201-	-1			Ų	Jnits: <b>pCi/l</b>		Analys	is Date:	12/11/20	018 11:40	)
Client ID:		Run II	D: <b>RE181201</b> -	1A			F	Prep Date: <b>12/3</b>	/2018	DF:	: NA	
Analyte		Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226		57 (+/- 14)	0	47.87		118	67-120					Р
Carr: BARII	UM	15090		16210		93.1	40-110					
LCSD	Sample ID: RE181201-	-1			ι	Jnits: <b>pCi/l</b>		Analys	is Date:	12/18/20	18 12:1	5
Client ID:		Run II	D: <b>RE181201</b> -	1A			F	Prep Date: <b>12/3</b>	/2018	DF:	: NA	
Analyte		Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226		43 (+/- 11)	0	47.87		89.3	67-120		5	7 0.8	2.1	Р
Carr: BARII	UM	15550		16210		95.9	40-110		1509	0		
МВ	Sample ID: RE181201-	-1			Ĺ	Jnits: <b>pCi/l</b>		Analys	is Date:	12/11/20	018 11:40	)
Client ID:		Run II	D: <b>RE181201</b> -	1A			F	Prep Date: <b>12/3</b>	/2018	DF	: NA	
Analyte		Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226		0.28 (+/- 0.23)	0.3									U
Carr: BARII	UM	15260		16210		94.2	40-110					
The follow	wing samples were analy	zed in this batch:	18114 18114 18114	187-4	18114 18114 18114	87-5	181	1487-3 1487-6 1487-9				

Client: ALS Environmental

**Work Order:** 1811487 **Project:** R1810912

#### QC BATCH REPORT

Batch ID: R	RA181206-1-1	Ins	trument ID LB	4100-C		Method: R	adium-228	3 Analysis	by GFPC				
LCS	Sample ID:	RA181206-1				Uı	nits: <b>pCi/l</b>		Analys	is Date:	12/17/20	18 11:1:	3
Client ID:			Run II	D: <b>RA181206</b> -	1A			F	Prep Date: <b>12/6</b>	/2018	DF:	NA	
Analyte			Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qua
Ra-228			8.3 (+/- 2.3)	1.4	8.567		97	70-130					P,M
Carr: BARII	UM		28410		30410		93.4	40-110					
LCSD	Sample ID:	RA181206-1				Uı	nits: <b>pCi/l</b>		Analys	is Date:	12/17/20	18 11:1:	3
Client ID:			Run II	): <b>RA181206</b> -	1A			F	Prep Date: <b>12/6</b>	/2018	DF:	NA	
Analyte			Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qua
Ra-228			9.5 (+/- 2.6)	1.5	8.567		111	70-130		8.	3 0.3	2.1	P,M
Carr: BARII	UM		28890		30410		95	40-110		2841	0		
МВ	Sample ID:	RA181206-1				Uı	nits: <b>pCi/l</b>		Analys	is Date:	12/17/20	18 11:22	2
Client ID:			Run II	D: <b>RA181206</b> -	1A			F	Prep Date: <b>12/6</b>	/2018	DF:	NA	
Analyte			Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qua
Ra-228			0.49 (+/- 0.33)	0.63									U
Carr: BARII	UM		29170		30410		95.9	40-110					
The follow	wing samples	were analyzed	in this batch:	18114 18114		181148 181148		181	1487-5				

QC Page: 2 of 3

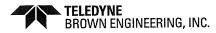
Client: ALS Environmental

**Work Order:** 1811487 **Project:** R1810912

#### QC BATCH REPORT

Batch ID: <b>F</b>	RA181221-1-1 Ins	strument ID LB	4100-A		Method: Ra	adium-228	3 Analysis	by GFPC				
DUP	Sample ID: <b>1812137-4</b>				Ur	nits: <b>pCi/l</b>		Analys	is Date: 1	2/28/20	18 11:39	)
Client ID: B	BPSI-TT-MW303I2-20181207	Run II	D: <b>RA181221-</b>	1A			Р	rep Date: <b>12/2</b>	1/2018	DF:	NA	
Analyte		Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qua
Ra-228		0.66 (+/- 0.47)	0.91						0.4	0.4	2.1	U
Carr: BARI	UM	28710		33400		86	40-110		28540			
LCS	Sample ID: <b>RA181221-1</b>				Ur	nits: <b>pCi/l</b>		Analys	is Date: 1	2/28/20	18 11:30	)
Client ID:		Run II	D: <b>RA181221</b> -	1A			Р	rep Date: <b>12/2</b>	1/2018	DF:	NA	
Analyte		Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qua
Ra-228		8.8 (+/- 2.5)	1.7	8.536		103	70-130					P,M
Carr: BARI	UM	29480		33390		88.3	40-110					
МВ	Sample ID: <b>RA181221-1</b>				Ur	nits: <b>pCi/l</b>		Analys	is Date: 1	2/28/20	18 11:39	)
Client ID:		Run II	D: <b>RA181221-</b>	1A			Р	rep Date: <b>12/2</b>	1/2018	DF:	NA	
Analyte		Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qua
Ra-228		0.33 (+/- 0.42)	0.89									U
Carr: BARI	UM	28690		33390		85.9	40-110					
The follow	wing samples were analyzed	in this batch:	18114 18114		181213 181148			487-4 487-10				

QC Page: 3 of 3



A Teledyne Technologies Company 2508 Quality Lane Knoxville, TN 37931-3133 865-690-6819

Janice Jaeger
ALS Global - Rochester Laboratory
1565 Jefferson road
Bldg 300, Suite 360
Rochester, NY 14623

#### Report of Analysis/Certificate of Conformance

01/23/2019

LIMS #:

L80225

Project ID#:

AL003-3EREG-18

Received:

11/20/2018

Delivery Date:

12/18/2018

P.O.#:

R1810912

Release #:

SDG#:

This is to certify that Teledyne Brown Engineering - Environmental Services located at 2508 Quality Lane, Knoxville, Tennessee, 37931, has analyzed, tested and documented samples, as received by the laboratory, as specified in the applicable purchase order.

This also certifies that requirements of applicable codes, standards and specifications have been fully met and that any quality assurance documentation which verified conformance to the purchase order is on file and may be examined upon request.

I hereby certify that the above statements are true and correct.

Keith Jeter

Operations Manager

Cross Reference Table

Client ID	Laboratory ID	Station ID (if applicable)
CELL8B-1118 - TOTAL	L80225-1	
CELL8B-1118 - DISS	L80225-2	
CELL3-1118 - TOTAL	L80225-3	
CELL3-1118 - DISS	L80225-4	
CELL4-1118 - TOTAL	L80225-5	
CELL4-1118 - DISS	L80225-6	
CELL5-1118 - TOTAL	L80225-7	
CELL5-1118 - DISS	L80225-8	

A Teledyne Technologies Company 2508 Quality Lane Knoxville, TN 37931-3133 865-690-6819

#### Cross Reference Table

Client ID	Laboratory ID	Station ID (if applicable)
CELL6-1118 - TOTAL	L80225-9	
CELL6-1118 - DISS	L80225-10	

#### Method Reference Numbers

Matrix	Analysis	Method Reference
WO	U-235 (AS)	EPA 908.0 Mod.
WO	U-238 (AS)	EPA 908.0 Mod.
WO	U-234 (AS)	EPA 908.0 Mod.

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TELEDYNE BROWN ENGINEERING, INC.

A Teledyne Technologies Company

L80225

ALS Global - Rochester Laboratory

AL003-3EREG-18

Collect Start: 11/08/2018 08:15

Matrix: Volume:

Water

(WO)

Flag Values  $\Box$  $\supset$ Units Count sec sec sec Count Time 00009 00009 00009 12/12/18 12/12/18 12/12/18 12/12/18 Count Date % Moisture: Reference Aliquot Units mJ 딥 ם Aliquot Volume Receive Date: 11/20/2018 200 200 200 Run Collect Stop: Units pCi/l pCi/l pCi/L pCi/l 5.23E-02 2.81E-02 9.14E-02 9.14E-02 MDC Uncertainty 2 Sigma Activity Conc ٧ ٧ ٧ Sample ID: CELL8B-1118 - TOTAL SOP# 032-89 2001 2001 2001 L80225-1 LIMS Number: Station: Description: U-233/234 (AS) Radionuclide U-235 (AS) U-238 (AS) TOTAL-U

Collect Start: 11/08/2018 08:15

Receive Date: 11/20/2018 Collect Stop:

Water Matrix: Volume:

(WO)

Description:

Sample ID: CELL8B-1118 - DISS

Comment:

Station:

% Moisture:

Count Count	Date Time Units Flag Values	3/18 0 1	0 01/01	12/12/10 86/100 sec [1]	00+00	00770		12/18 86400 sec []	00+00		
	Date D	1701	1771	1771	1/71	70,	177	101	171		
	Units				ш		Ш		m		
4 lignot	Volume				200		200		200		
	##		_		_				_		
	Units		1/1:/14	דיויטן	1/:04	pCI/1	1/:04	pont	1/:04	pCI/1	
	MDC		CO 370 03	20-AC7.C	20 27 0	2.34 E-02	CO TOO C	70-T60.7	00 0100	3.43E-04	
	Activity Uncertainty	0									
	Activity			<b>V</b>		V		<b>v</b>		<b>V</b>	
7	#dOS	:		032-89		2001		2001		2001	
LIMS Number: L80225-2	40 er	Naugincinae		70 T ∧ <b>6</b> I I		TT 222/224 (AS)	(CA) +C)(CC)-O	11,235 (AS)	(au) (cz-0	TT 228 (AC)	(cm) 057-0

Comment:

No = Peak not identified in gamma spectrum

Yes = Peak identified in gamma spectrum

\*\*\*\* Unless otherwise noted, the analytical results reported are related only to the samples tested in the condition they are received by the laboratory.

MDC - Minimum Detectable Concentration

Compound/Analyte not detected (< MDC) or less than 3 sigma Activity concentration exceeds MDC and 3 sigma; peak identified(gamma only) Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma Activity concentration exceeds customer reporting value MDC exceeds customer technical specification High recovery Low recovery Flag Values U = ii U\* High Spec

Bolded text indicates reportable value.

TBE-ROA002

Page 3 of 7

A Teledyne Technologies Company 2508 Quality Lane Knoxville, TN 37931-3133 865-690-6819

Janice Jaeger
ALS Global - Rochester Laboratory
1565 Jefferson road
Bldg 300, Suite 360
Rochester, NY 14623

#### Report of Analysis/Certificate of Conformance

01/23/2019

LIMS #:

L80225

Project ID#:

AL003-3EREG-18

Received:

11/20/2018

Delivery Date:

12/18/2018

P.O.#:

R1810912

Release #:

SDG#:

This is to certify that Teledyne Brown Engineering - Environmental Services located at 2508 Quality Lane, Knoxville, Tennessee, 37931, has analyzed, tested and documented samples, as received by the laboratory, as specified in the applicable purchase order.

This also certifies that requirements of applicable codes, standards and specifications have been fully met and that any quality assurance documentation which verified conformance to the purchase order is on file and may be examined upon request.

I hereby certify that the above statements are true and correct.

Keith Jeter Operations Manager

Cross Reference Table

	Crobb region	
Client ID	Laboratory ID	Station ID (if applicable)
CELL8B-1118 - TOTAL	L80225-1	
CELL8B-1118 - DISS	L80225-2	
CELL3-1118 - TOTAL	L80225-3	
CELL3-1118 - DISS	L80225-4	
CELL4-1118 - TOTAL	L80225-5	
CELL4-1118 - DISS	L80225-6	
CELL5-1118 - TOTAL	L80225-7	
CELL5-1118 - DISS	L80225-8	

A Teledyne Technologies Company 2508 Quality Lane Knoxville, TN 37931-3133 865-690-6819

#### Cross Reference Table

Ī	Client ID	Laboratory ID	Station ID (if applicable)	
	CELL6-1118 - TOTAL	L80225-9		
	CELL6-1118 - DISS	L80225-10		

#### Method Reference Numbers

Matrix	Analysis	Method Reference
WO	U-235 (AS)	EPA 908.0 Mod.
WO	U-238 (AS)	EPA 908.0 Mod.
WO	U-234 (AS)	EPA 908.0 Mod.

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TELEDYNE BROWN ENGINEERING, INC.

A Teledyne Technologies Company

## L80225

ALS Global - Rochester Laboratory

AL003-3EREG-18

(WO) Flag Values  $\supset$  $\Box$ Units Count sec sec sec Count 00009 Time 00009 00009 0 Water 12/12/18 (2/12/18 12/12/18 12/12/18 Count Date Matrix: Volume: % Moisture: Reference Date Aliguot Units m ml m Collect Start: 11/08/2018 08:15 Volume Aliquot Receive Date: 11/20/2018 200 200 200 Run # Collect Stop: Units pCi/L pCi/l pCi/l pCi/l 2.81E-02 9.14E-02 5.23E-02 9.14E-02 MDC Uncertainty 2 Sigma Activity Conc ٧ ٧ ٧ CELL8B-1118 - TOTAL SOP# 032-89 2001 2001 2001 L80225-1 Sample ID: LIMS Number: Description: Station J-233/234 (AS) Radionuclide J-235 (AS) J-238 (AS) rotal-u

Collect Start: 11/08/2018 08:15 Collect Stop: **CELL8B-1118 - DISS** Sample ID: Station: Comment:

Description:

Comment:

Receive Date: 11/20/2018

Volume: % Moisture:

(WO)

Water

Matrix:

Flag Values Units Count sec sec sec Count Time 86400 86400 86400 0 12/13/18 12/13/18 12/13/18 12/13/18 Count Date Reference Date Aliquot Units 豆 ם E, Aliquot Volume 200 200 200 Run # Units pCi/L pCi/l pCi/l pCi/l 2.34E-02 2.89E-02 5.23E-02 5.23E-02 MDC Uncertainty 2 Sigma Activity Conc V ٧ ٧ 032-89 SOP# 2001 2001 2001 L80225-2 LIMS Number: Radionuclide J-233/234 (AS) J-238 (AS) J-235 (AS) OTA L

No = Peak not identified in gamma spectrum

Yes = Peak identified in gamma spectrum

\*\*\*\* Unless otherwise noted, the analytical results reported are related only to the samples tested in the condition they are received by the laboratory.

MDC - Minimum Detectable Concentration

Flag Values

TELEDYNE BROWN ENGINEERING, INC.

A Teledyne Technologies Company

(MO)

### L80225

ALS Global - Rochester Laboratory

AL003-3EREG-18

Janice Jaeger

Matrix: Water Volume: Collect Start: 11/08/2018 09:10 Collect Stop: CELL3-1118 - TOTAL Sample ID:

Flag Values  $\supset$ Units Count sec sec sec Count 00009 00009 00009 Time 12/12/18 12/12/18 12/12/18 12/12/18 Count Date % Moisture: Reference Date Aliquot Units 급급 ᇤ Volume Aliquot Receive Date: 11/20/2018 200 200 200 Run # Units pCi/l pCi/l pCi/l 6.57E-02 4.65E-02 3.09E-02 6.57E-02 MDC Uncertainty 2 Sigma Activity Conc ٧ ٧ ٧ SOP# 032-89 2001 2001 2001 L80225-3 LIMS Number: Description: Station U-233/234 (AS) Radionuclide J-235 (AS) J-238 (AS) TOTAL-U

Collect Start: 11/08/2018 09:10

CELL3-1118 - DISS

Sample ID:

Comment:

Station

Description:

Receive Date: 11/20/2018 Collect Stop:

Volume: % Moisture:

(WO)

Water

Matrix:

L80225-4 LIMS Number:

	Flag Values			_							
	H	I	)	1	<u> </u>	11	<b>D</b>	11			
Count	Units			000	202		Sec	000	200		
4	Time		>	00000	00000	0000	00000	00000	00000		
•	Date	10//10//0	17/17/10	01/01/01	17/17/18	07,07,07	12/17/18	10/10/10	17/17/10		
J. C.	Reference Date										
,	Aliquot Units			•	H		딥	-	ם		
	Aliquot Volume				200		200		200		
	Run #						_				
	Units		pCi/L	1	pCi/i	r i i	nCi/l	11124	pCi/l	1	
	MDC		9.92F02		8 03E-02		9 92 F-02	TO THE C.	9.83E-02		
	Activity Uncertainty Conc 2 Sigma										
	Activity Conc		~	,	\	/	\	,	\ \   \	,	
	#dos		03 20	70-700	2001	7007	2001	7007	2001	7007	
LIMIO IMPROSI:	Radjonuclide	of	5 HCH	101 <b>6</b> -0	TT 000 (00 TT	(U-233/234 (AS)	TT 00 0 / 1 0)	U-235 (AS)	TT 220 (A C)	U-230 (A3)	Comment:

No = Peak not identified in gamma spectrum Yes = Peak identified in gamma spectrum \*\*\*\* Unless otherwise noted, the analytical results reported are related only to the samples tested in the condition they are received by the laboratory.

MDC - Minimum Detectable Concentration

High recovery

Activity concentration exceeds customer reporting value MDC exceeds customer technical specification il

Low recovery U\* High Spec

TELEDYNE BROWN ENGINEERING, INC.

A Teledyne Technologies Company

L80225

ALS Global - Rochester Laboratory

AL003-3EREG-18

Janice Jaeger

(WO) Flag Values Spec + + Count Units sec sec sec Count Time 00009 00009 00009 Water 01/10/19 01/10/19 01/10/19 01/10/19 Date Count Matrix: Volume: % Moisture: Reference Aliquot Units Collect Start: 11/08/2018 09:30 Aliquot Volume Receive Date: 11/20/2018 Ŋ Run  $\mathbb{R}^{1}$  $\mathbb{R}$  $\mathbb{F}$ Collect Stop: Units pCi/L pCi/l pCi/l pCi/l 1.16E-01 MDC Uncertainty 2.74E-01 1.96E-01 2 Sigma 1.92E-01 4.42E-01 Activity 4.18E-01 Conc 8.60E-01 CELL4-1118 - TOTAL SOP# 032-89 2001 2001 2001 L80225-5 Sample ID: LIMS Number: Station: Description: U-233/234 (AS) Radionuclide J-235 (AS) J-238 (AS) TOTAL-U

Collect Start: 11/08/2018 09:30

Receive Date: 11/20/2018 Collect Stop:

CELL4-1118 - DISS

Sample ID:

Comment:

Station:

Description:

Comment:

Water Matrix: Volume: % Moisture:

(WO)

LIMS Number: L80225-6	P			and the second s	Annual Control of the				T. C	Count	Count	Count		
Radionclide	SOP#	Activity Conc	Activity Uncertainty Conc 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Date	Time	Units	Flag Values	
f			)							01,01,00				
5		-	10 110		1/!					01/10/19	>		+	
11.01.01	032-89		2.43E-01		T/ICA					01/01/10	0000	000	1	
101/101		1	To the contract of the contrac		7:7:	10				01/10/19	00000	Sec	  -	
TT 222/224 (AS)	2001	5.82E-01	1.95E-01		pCI/1	7				0 21 0 21	0000		11	
(CX) +C7/CC7-0				2000	1,:01	1				01/10/19	00009	sec		
TT 225 (AC)	2001	٧		8.80E-02	pCI/1	7					0000		-	l l
(CA) (C7-0)	1001				::0	ç				01/10/19	00009	Sec	+	
TT 238 (AC)	2001	3.17E-01	3.17E-01 1.45E-01		pC1/1	X								1
(00) 007-0														

No = Peak not identified in gamma spectrum

Yes = Peak identified in gamma spectrum

\*\*\*\* Unless otherwise noted, the analytical results reported are related only to the samples tested in the condition they are received by the laboratory.

MDC - Minimum Detectable Concentration

Flag Values

Compound/Analyte not detected (< MDC) or less than 3 sigma Activity concentration exceeds MDC and 3 sigma; peak identified(gamma only) Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma

Activity concentration exceeds customer reporting value MDC exceeds customer technical specification

Low recovery U\* High Spec

High recovery

Bolded text indicates reportable value.

TBE-ROA002

TELEDYNE BROWN ENGINEERING, INC.

A Teledyne Technologies Company

ALS Global - Rochester Laboratory

AL003-3EREG-18

Janice Jaeger

0										1	100		(OW)
Sample ID: CELL	S-1118 - TC	OTAL			Collect St	tart: 11/0	Collect Start: 11/08/2018 10:00	0		Matrix: water	iei		
Station:					Collect Stop:	top:			> 2	olume.			
Description:					Receive Date: 11/20/2018	ate: 11/2	20/2018		% IMIC	% Moisture:			
LIMS Number: L80225-7	5-7											1	
J. 1:	#dOS	Activity	Activity Uncertainty	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count	Count	Flag Values
Radioliucine	500	Collic	7 Sigina			:				01/01/01			11
TOTAT 11	032-89	\ \   \		8.97E-02	pCi/L					12/13/18	0		0
101AL-0	2007			2 30F-02	nCi/l		200	ᄪ		12/13/18	86400	sec	n
U-233/234 (AS)	7007	/		70.700	r and		000			12/13/18	86400	Jes	
II-235 (AS)	2001	<b>V</b>		8.97E-02	pCi/l		700	E		01/01/71	20100	3	);
(Cxx) Cca 0	1000	\		2 30E 02	L/i_u		200	mi		12/13/18	86400	sec	
U-238 (AS)	7007	/		4.30L-04	pont	_							

Collect Start: 11/08/2018 10:00 Collect Stop: CELL5-1118 - DISS

Sample ID:

Comment:

Description: Station:

Receive Date: 11/20/2018

Volume: % Moisture:

(WO)

Water

Matrix:

Alic Vol Run # Units pCi/l pCi/L pCi/l pCi/l 3.52E-02 7.50E-02 7.50E-02 7.50E-02 MDC Uncertainty 2 Sigma Activity V ٧ ٧ SOP# 032-89 2001 2001 2001 L80225-8 LIMS Number: Radonuclide J-233/234 (AS) J-235 (AS) J-238 (AS) TOTAG-U

Comment:

Count Units		sec	sec	sec
Count Time	0	00009	00009	00009
Count Date	12/12/18	12/12/18	12/12/18	12/12/18
Reference Date				
Aliquot Units		lm	Tu	ml
Aliquot Volume		200	200	200

Flag Values

D  $\Box$  $\Box$  No = Peak not identified in gamma spectrum

Yes = Peak identified in gamma spectrum

\*\*\*\* Unless otherwise noted, the analytical results reported are related only to the samples tested in the condition they are received by the laboratory.

MDC - Minimum Detectable Concentration

Page 6 of 7

Compound/Analyte not detected (< MDC) or less than 3 sigma
Activity concentration exceeds MDC and 3 sigma, peak identified(gamma only)
Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma
Activity concentration exceeds customer reporting value
MDC exceeds customer technical specification

U\* High Spec

High recovery Low recovery

TELEDYNE BROWN ENGINEERING, INC.

A Teledyne Technologies Company

### L80225

ALS Global - Rochester Laboratory

AL003-3EREG-18

Janice Jaeger

(WO) Flag Values  $\Box$ Units Count sec sec sec 00009 Count 00009 00009 Time Water 01/10/19 01/10/10 01/10/19 01/10/19 Count Date Matrix: Volume: % Moisture: Reference Date Aliguot Units Collect Start: 11/08/2018 10:40 Volume Aliquot Receive Date: 11/20/2018 Run #  $\mathbb{R}^{1}$  $\mathbb{R}^{1}$  $\mathbb{R}$ Collect Stop: Units pCi/L pCi/l pCi/l pCi/l 6.61E-02 3.10E-02 8.09E-02 8.09E-02 MDC Uncertainty 2 Sigma Activity Conc ٧ ٧ V CELL6-1118 - TOTAL SOP# 032-89 2001 2001 2001 L80225-9 Sample ID: LIMS Number: Station Description: J-233/234 (AS) Radionuclide J-235 (AS) J-238 (AS) TOTAL-U

Collect Start: 11/08/2018 10:40 Receive Date: 11/20/2018 Collect Stop:

CELL6-1118 - DISS

Sample ID:

Comment:

Station

Description:

Comment:

(WO)

Water

Matrix:

Volume: % Moisture:

Flag Values + þ + Units Count sec sec sec Time 00009 Count 00009 00009 01/10/19 01/10/19 01/10/19 01/10/19 Count Date Reference Date Aliquot Units Aliquot Volume Run  $\mathbb{R}$  $\mathbb{R}^{1}$  $\mathbb{R}^{1}$ Units pCi/l pCi/l pCi/L pCi/l 9.02E-02 MDC Uncertainty 2 Sigma 1.58E-01 1.19E-01 1.04E-01 1.73E-01 Activity 4.18E-01 2.45E-01 Conc SOP# 032-89 2001 2001 2001 L80225-10 LIMS Number: Radionuclide J-233/234 (AS) J-235 (AS) J-238 (AS) TOTAG-U

No = Peak not identified in gamma spectrum

\*\*\*\* Unless otherwise noted, the analytical results reported are related only to the samples tested in the condition they Yes = Peak identified in gamma spectrum are received by the laboratory.

MDC - Minimum Detectable Concentration

Page 7 of 7

Compound/Analyte not detected (< MDC) or less than 3 sigma Activity concentration exceeds MDC and 3 sigma; peak identified(gamma only) Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma

Activity concentration exceeds customer reporting value MDC exceeds customer technical specification

Low recovery

High recovery U\* High Spec L L

## QC Summary Report for L80225 AL003-3EREG-18

01/23/2019 09:41

U-238

TELEDYNE BROWN ENGINEERING Everywhereyoulook

	P/F P		<u>P/F</u> P			<u>P/F</u> P		
	<u>Qualifier</u> U		Oualifier +			<u>Qualifier</u> +		
			<b>Range</b> 70-130			Range <30		
			Spike Recovery 75.1			<u>RPD</u> 7.1		
	Units pCi/Total		Units pCi/Total			Units pCi/Total		
ummary	Blank Result < 1.345E-02	ımmary	LCS Result 4.537E+00		ummary	LCSD Recovery 80.6		
<b>lethod Blank Summary</b>		LCS Sample Summary			CSD Sample Summary	LCSD Result 4.867E+00		
N			Spike Value 6.04E+00			Spike Value 6.04E+00		
	Matrix   Count Date/Time   WO   12/04/2018 16:06		Matrix         Count Date/Time           WO         12/04/2018 16:06			Matrix         Count Date/Time           WO         12/04/2018 16:06		
	Matrix WO		Matrix WO			Matrix WO		
	Radionuclide U-238 (AS)		Radionuclide U-238 (AS)	238U-091808 6.04E+00 1.00E+00		Radionuclide U-238 (AS)	238U-091808 6.04E+00 1.00E+00	
	TBE Sample ID Radionuclide WG29626-1 U-238 (AS)		TBE Sample ID Radionuclide WG29626-2 U-238 (AS)	Spike ID: Spike Conc: Spike Vol:	- J	TBE \$\frac{A}{2} mple ID Radionuclide WG2\frac{Q}{2}6-3 U-238 (AS)	Spike ID: Spike Conc: Spike Vol:	

Page 1

Positive Result

Compound/analyte was analyzed, peak not identified and/or not detected above MDC <5 times the MDC are not evaluated
Nuclide not detected
Spiking level < 5 times activity

Pass Fail

# QC Summary Report for

BROWN ENGINEERING
Everywhereyoulook

AL003-3EREG-18

01/23/2019 09:41

Associated Samples for

CELL8B-1118 - TOTAL WG29626 Client ID Sample # L80225-1

CELL3-1118 - TOTAL CELL3-1118 - DISS

CELL8B-1118 - DISS

L80225-2 L80225-3 L80225-4 L80225-7

CELL5-1118 - TOTAL

CELL5-1118 - DISS

L80225-8

U-238

Compound/analyte was analyzed, peak not identified and/or not detected above MDC  $\,<\!5$  times the MDC are not evaluated Positive Result

Nuclide not detected Spiking level < 5 times activity

Pass Fail Not evaluated

49 of 59

# ALS Environmental Chain of Custody

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

1800335

ALS Contact: Janice Jaeger

R1810912 Project Number:

Project Manager:

Uat U 0.806 × × × × × × × × × TeledyneBrownEng TeledyneBrownEng TeledyneBrownEng TeledyneBrownEng TeledyneBrownEng TeledyneBrownEng TeledyneBrownEng TeledyneBrownEng TeledyneBrownEng TeledyneBrownEng Lab ID 1040 Time 0630 1000 1040 0815 0815 0160 0160 0660 1000 Sample 11/8/18 11/8/18 11/8/18 11/8/18 11/8/18 11/8/18 11/8/18 11/8/18 11/8/18 11/8/18 Date Matrix Water Water Water Water Water Water Water Water Water # of Cont. Cell8B-1118 Diss Cell6-1118 Diss Cell5-1118 Diss Cell3-1118 Diss Cell4-1118 Diss Janice Jaeger Cell8B-1118 LAB QAP Cell6-1118 Sample ID Cell3-1118 Cell4-1118 Cell5-1118 800-8160 818 5 RIS10912-00 R4810912-010 R1810912-001 R1810912-005 R1810917-0006 R1810912-409 R1810912-002 R1810912-003 R1810912-004 Lab Code QAP:

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

need in 60 tiller for ollssolved

Special Instructions/Comment

P - Test is Authorized for Prep Only H - Test is On Hold

NPDES

Received By:

11/20/18/1435

Relinquished By: AND WINE

Airbill Number:

z

PQL/MDL/J EDD

Requested Report Date: 12/04/18

Requested FAX Date: KSTANDARD

Invoice Information 58R1810912 PO# II. Results + QC and Calibration Summaries IV. Data Validation Report with Raw Data Report Requirements

XII. Results + QC Summaries

PLEASE CIRCLE WORK DAYS

I. Results Only

**Turnaround Requirements** RUSH (Surcharges Apply)

#### Page 2

Airbill Number:

Received By:

Relinquished By:

1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475 ALS Environmental Chain of Custody

ALS Contact: Janice Jaeger

Janice Jaeger R1810912 Project Manager: Project Number:

LAB QAP QAP:

Invoice Information 58R1810912 · <u>B</u> III. Results + QC and Calibration Summaries IV. Data Validation Report with Raw Data Report Requirements II. Results + QC Summaries zI. Results Only PQL/MDL/J EDD PLEASE CIRCLE WORK DAYS Requested Report Date: 12/04/18 **Turnaround Requirements** RUSH (Surcharges Apply) Requested FAX Date: STANDARD

P - Test is Authorized for Prep Only Special Instructions/Comments H - Test is On Hold NPDES

51 of 59

ALS Group USA, Corp. www.alsglobal.com An ALS Limited Company

Comments:

52 of 59

11/28/18 16:19

#### Teledyne Brown Engineering Sample Receipt Verification/Variance Report

SR #: SR59602

Client: ALS GLOBAL

Project #: AL003-3EREG-18

LIMS #L80225

Initiated By: RCHARLES

Init Date: 11/28/18 Receive Date: 11/28/18

#### Notification of Variance

Person Notified:

Contacted By:

Notify Date: Notify Method: Notify Comment:

#### Client Response

Person Responding:

Response Date: Response Method:

Response Comment

Cı	riteria	Yes No NA	Comment
1	Shipping container custody seals present and intact.	NA NA	
2	Sample container custody seals present and intact.	NA	
3	Sample containers received in good condition.	Y	

Y

Y

Y

5	All	samples	listed	on	chain	of	custody	Y	
	rece	eived.							
6	Samp	ole conta	ainer l	abel	s pres	sent	and	Y	

4 Chain of custody received with samples.

- 7 Information on container labels correspond with chain of custody.
- 8 Sample(s) properly preserved.
- 9 Sample(s) appropriate container(s). Y

#### For Hazardous Materials Only:

10 Other. (Describe) NA

- 11 Paperwork shows TBE and shippers name, NA address and phone number.
- 12 Paperwork shows sample quantity NA information.

## Raw Data Sheet (rawdata) 01/23/19 10:46

Work Order: L80225

TBE-RDS03

Customer: ALS GLOBAL
Project: AL003-3EREG-18

Analysis: U-234		Project:	AL003-3EREG-18	ω1							Decay &	ঙ
Sample ID Run Analysis Client ID #	Reference Date/Time	Volume/ Scavenge Aliquot Date/Time	Milking Date/Time	Mount Weight Recovery	Count De Date/Time	Detector Total ID Count	Ø	Sample dt C	Bkg Counts	Bkg dt	Eff. Ingrowth Factor	An
T80225-1 II-234 (AS)				0 51.92	12-12-18	51	1	00009	0	172800	.2279	KMM
r 0 0		200			16:02			ഗ		w		
CELL8B-1118 - TOTAL		ml										
1.90E-02	Error: 3.81E-02	MDC: 2.81E-02	pCi/l	L80225-1	U-233/234 (AS)							
100305-7				0 45.13	12-13-18	59		86400	0	172800	.2186	KMM
# 0 V - 0		200			16:33			w		ß		
CELL8B-1118 - DISS		m										
Activity: 1.59E-02 Err	Error: 3.18E-02	MDC: 2.34E-02	pCi/l	L80225-2	U-233/234 (AS)							
T80205-3 II-234 (AS)				0 57.94	12-12-18	55	П	00009	1.01	172800	.2297	KMM
)		200			16:02			Ø		ത		
CELL3-1118 - TOTAL		ml										
Activity: 1.11E-02 Err	Error: 3.58E-02	MDC: 4.65E-02	pCi/l	L80225-3	U-233/234 (AS)							,
10000E-1				0 48.21	12-12-18	. 56	2	00009	1.99	172800	.2261	KIMM
2		200			16:02			ഗ		w		
CELH3-1118 - DISS		ml										
O Activity: 2.70E-02 Err	Error: 6.19E-02	MDC: 8.03E-02	pci/l	L80225-4	U-233/234 (AS)							
T,80225-5 R1 U-234 (AS)				0 58.53	01-10-19	63	28	00009	66.6	172800	.2261	
		.2			15:46			ഗ		ഗ		
CELL4-1118 - TOTAL		п										
Activity: 4.18E-01 Er	Error: 1.96E-01	MDC: 1.48E-01	pci/l	L80225-5	U-233/234 (AS)							
T,80225-6 R1 U-234 (AS)				0 87.19	01-10-19	64	53	00009	8.99	172800	.2212	
					15:46			ഗ		ω.		
CELL4-1118 - DISS												
Activity: 5.82E-01 Er	Error: 1.95E-01	MDC: 9.62E-02	pci/1	L80225-6	U-233/234 (AS)						1	
T,80225-7 U-234 (AS)				0 46.03	12-13-18	09	0	86400	0	172800	.2183	KMM
		200	-		16:34			ഗ		ഗ		
CELL5-1118 - TOTAL		mJ										
Activity: .00E+00 Er	Error: .00E+00	MDC: 2.30E-02	pci/1	L80225-7	U-233/234 (AS)							

# Raw Data Sheet (rawdata) 01/23/19 10:46

Customer:

L80225

Work Order:

TBE-RDS03

U-234

AL003-3EREG-18 ALS GLOBAL

KMM KMM 172800 .2098 172800 .2183 .2252 172800 .2102 86400 ß ഗ 1.99 66. 4 0 00009 86400 00009 00009 ß ß ß ഗ 22 10 0 99 65 09 62 U-233/234 (AS) U-233/234 (AS) U-233/234 (AS) 01-10-19 01-10-19 12-13-18 12-12-18 15:47 16:34 16:03 46.03 90.32 51.77 62.98 L80225-10 L80225-8 L80225-9 0 0 pci/1 pci/1 pci/1 6.61E-02 6.53E-02 7.50至-02 200 ml 200 m MDC: MDC: MDC: Error: 1.12E-01 Error: 1.19E-01 Error: 6.10E-02 U-234 (AS) U-234 (AS) R1 U-234 (AS) R1 U-234 (AS) CELUG-1118 - DISS G Acquity: 2.45E-01 G Activity: 2.52E-02 Activity: 1.58E-01 CELL6-1118 - TOTAL CELL5-1118 - TOTAL CELL5-1118 - DISS L80225-10 L80225-9 L80225-7 L80225-8

# Raw Data Sheet (rawdata) 01/23/19 10:46

L80225 U-235 Work Order: Analysis:

TBE-RDS03

Customer: ALS GLOBAL

Project: AL003-3EREG-18

Analysis: U-235			Pr	Project: 2	AL003-3EREG-18	œΊ								
Sample ID Run Analysis	ysis	Reference Date/Time	Volume/ Aliquot	Scavenge Date/Time	e Milking me Date/Time	Mount Weight Recovery	Count Date/Time	Detector Total ID Count	w	Sample dt (	Bkg Counts	Bkg dt	Eff. Ingrowth Factor	An
ΠT		2000	7				0	- L	09	80000	1 99	172800	.2279	KMM
L80225-1 U-235	5 (AS)		200			0 51.92	12-12-18 16:02	n O	•	o 0	) •	Σ ω		
m	, ( ) ( ) (	00+400		9.14E-02	pCi/1	L80225-1	U-235 (AS)							
Activity: .00E+00	: 101.17	ļ	ļ	ļ			17_13_18	o u	C	86400	0	172800	.2186	KMM
L80225-2 U-235	5 (AS)		200			0 45.13	16:33	)	)	, w	ı	w		
CELL8B-1118 - DISS			ml											
Activity: .00E+00	Error:	.00E+00	MDC: 2.8	2.89瓦-02	pci/l	L80225-2	U-235 (AS)	1				172800	7000	KIMIM
L80225-3 U-23	U-235 (AS)		200			0 57.94	12-12-18 16:02	5	>	00009 8	Þ	1 / 2 8 0 0		
1		C C C	ml MDC: 30	3 09E-02	pCi/l	L80225-3	U-235 (AS)							
Activity: .00E+00		00.4900	i			0 48.21	12-12-18	56	0	00009	1.99	172800	.2261	KMM
L80225-4 U-235	(5 (AS)		200							w		w		
CEL <b>G</b> -1118 - DISS			덛		!	ь В ССОО Н	11_035 (48)							
Ac <mark>&amp;</mark> vity: -1.77E-02	02 Error:	2.51E-02	MDC: 9.9	9.92瓦-02	pci/l		0-20					170000	2261	
2 L80 <u>\$6</u> 5-5 R1 U-235	35 (AS)		.2			0 58.53	01-10-19	က		00009 8	4	2 S		
CELL4-1118 - TOTAL	.03 HT	5.138-02	1 MDC: 1.	1.16E-01	pci/1	L80225-5	U-235 (AS)							
		1			4	0 87.19	01-10-19	64	0	00009	5.01	172800	0 .2212	
L80225-6 R1 U-235 (AS)	35 (AS)					)				w		ഗ		
CELL4-1118 - DISS				;		3 - 7 C C O B T	II-235 (AS)							
Activity: -2.51E-02	-02 Error:	2.28E-02	MDC: 8.	8.86压-02	рст/т	١,		80	c	86400	2	172800	0 .2183	KMM
L80225-7 U-235	35 (AS)		200			0 46.03			o	ο • Ω		ത		
CELL5-1118 - TOTAL		2.748-02	ml MDC: 8.	8.97压-02	pci/1	L80225-7	U-235 (AS)							
	- 13		-			0 51.77	7 12-12-18	62	0	00009	0	86400	,2252	KMM
L80225-8 U-235	35 (AS)		200							w		w		
CELL5-1118 - DISS			ml											

## Raw Data Sheet (rawdata) 01/23/19 10:46

AL003-3EREG-18 Customer: ALS GLOBAL

Work Order: 180225 U-235

TBE-RDS03

L80225-8	U-235 (AS)	(AS)		200	0		0 51.7	51.77 12-12-18 16:03	62	0	s 00009	0	86400 .2252 S	.2252	KIMM
CELL5-1118 - DISS	- DISS			ml	г.		1	L							
Activity:	Activity: .00E+00 Error: .00E+00	Error:	.00E+00	MDC:	MDC: 3.52E-02 pCi/l	pci/l	T80ZZ2-8	U-Z35 (AS)						000	
L80225-9	R1 U-235 (AS)	(AS)					0 62.9	62.98 01-10-19 15:47	65	7	00009 S	0	172800 .2102 S	.2102	
CELL6-1118 - TOTAL	ELL6-1118 - TOTAL		Rrror: 5.99E-02 MDC: 3.10E-02 pCi/l	MDC:	3.10瓦-02	pCi/1	L80225-9	U-235 (AS)							
L80225-10	R1 U-235 (AS)	ن ا				1	0 90.3	90.32 01-10-19 15:47	99	0	00009	5.01	60000 5.01 172800 .2098 s	.2098	
CELL6-1118 - DISS	ELLG-1118 - DISS Activity: -2.55E-02 Error: 2.32E-02	2 Error:	2.32E-02	MDC:	9.02E-02 pCi/l	pci/1	L80225-10	U-235 (AS)							
	l														

## Raw Data Sheet (rawdata) 01/23/19 10:46

L80225 U-238 Work Order: Analysis:

TBE-RDS03

Customer: ALS GLOBAL

Project: AL003-3EREG-18

Analysis: U-238		Pro	Project: AL	AL003-3EREG-18	ω							Decay &	
Sample ID Run Analysis	Reference Date/Time	Volume/ SAliquot I	Scavenge Date/Time	Milking Date/Time	Mount Weight Recovery	Count Date/Time	Detector 7 ID (	Total	Sample	Bkg Counts	Bkg dt	Eff. Ingrowth Factor	Analy
i H						7		1 25	00003	10	172800	2279	KIMIM
L80225-1 U-238 (AS)		200			0 51.92	12-12-18 16:02	7.0	 	8	∃ • •	ν 2 α		
CET.L.8B-1118 - TOTAL		Ţw											
,	3.81E-02	MDC: 5.23	5.23E-02 pC	pci/1	L80225-1	U-238 (AS)							
					0 45.13	12-13-18	59	0	86400		172800	.2186	KMM
L80225-2 U-238 (AS)		200				16:33			ω		w		
CELL8B-1118 - DISS		Tu											
Activity: -7.93E-03 Error:	1.59E-02	MDC: 5.23	5.23E-02 p(	pCi/l	L80225-2	U-238 (AS)					1		7
(AR) 850-11 2 2 (AR)					0 57.94	12-12-18	55	0	00009	1.99	172800	1677.	NIMIN
		200				16:02			w		ഗ		
CELL3-1118 - TOTAL		mJ											
Activity: -1.18E-02 Error:	1.67E-02	MDC: 6.57	6.57E-02 p	pci/1	L80225-3	U-238 (AS)							1000
					0 48.21	12-12-18	56	2	00009	ო	172800	.2261	KMM
		200				16:02			ഗ		ഗ		
CEL 3-1118 - DISS		ml											
AcQuity: 1.98E-02 Error:	6.35E-02	MDC: 9.8	9.83E-02 p	pci/l	L80225-4	U-238 (AS)						Į	
(24) 850-11 19 3 300-1					0 58.53	01-10-19	63	27	00009	m	172800	0 .2261	
007		.2				15:46			ഗ		യ		
CELL4-1118 - TOTAL		П			1								
Activity: 4.42E-01 Error:	1.92E-01	MDC: 8.1	8.10E-02 p	pci/1	L80225-5	U-238 (AS)					1		
L80225-6 R1 U-238 (AS)					0 87.19	01-10-19	64	32	00009	14	172800 s	7777	
CELL4-1118 - DISS													
Activity: 3.17E-01 Error:	1.45E-01	MDC: 1.2	1.20E-01 p	pci/l	L80225-6	U-238 (AS)					1		2000
T80225-7 II-238 (AS)					0 46.03	12-13-18	09	m	86400	0	1/2800	0.2183	NMM
0		200				16:34			ഗ		ഗ		
CELL5-1118 - TOTAL		T'ur											
Activity: 4.67E-02 Error:	5.45E-02	MDC: 2.3	2.30E-02 F	pci/l	L80225-7	ן כי					0000	0000	KMM
T,80225-8 U-238 (AS)					0 51.77	12	62	o	90009	2	80400		T-TT-TVI
		200				16:03			'n		מ		
CELL5-1118 - DISS		mŢ											

## Raw Data Sheet (rawdata) 01/23/19 10:46

AL003-3EREG-18 Customer: ALS GLOBAL

L80225 U-238

Work Order: TBE-RDS03

KMM					
.2252		.2102		.2098	
86400 .2252 s		172800 .2102 s		172800 .2098 S	
• 6		m		7	
s 8		00009		00009	
69.		4		17	
62		65		99	
12-12-18 16:03	U-238 (AS)	62.98 01-10-19 15:47	U-238 (AS)	90.32 01-10-19 15:47	U-238 (AS)
0 51.77	L80225-8	0 62.98	L80225-9	90.32	L80225-10
	180		L8(		Ľ8
	pCi/1		pci/1		pci/1
·	7.50压-02		Error: 7.15E-02 MDC: 8.09E-02 pCi/l		Error: 1.04E-01 MDC: 8.64E-02 pCi/l
200	ml MDC:		MDC:		MDC:
	Rror. 00E+00		7.15E-02		1.04E-01
AS)	요 나	(AS)	Error:	(AS)	
U-238 (AS)	- DISS	R1 U-238 (AS)	ELL6-1118 - TOTAL Activity: 5.03E-02	R1 U-238 (AS)	ELL6-1118 - DISS Activity: 1.73E-01
L80225-8	CELL5-1118 - DISS	L80225-9	CELL6-1118 - TOTAL Activity: 5.03E-0	L80225-10	CELL6-1118 - DISS Activity: 1.73E-



Service Request No:R1812382

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

Laboratory Results for: Hakes C&D Landfill - Tank SED RAD

Dear Russell,

Enclosed are the results of the sample(s) submitted to our laboratory December 21, 2018 For your reference, these analyses have been assigned our service request number **R1812382**.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAP standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, 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) for analysis of these samples, and represented by Laboratory Control Sample control limits. Any events, such as QC failures, which may add to the uncertainty are explained in the report narrative.

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

Camanesto

CC: Jon Brandes



#### **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) Service Request: R1812382

Project: Hakes C&D Landfill - Tank SED RAD Date Received: 12/21/2018

Sample Matrix: Soil

#### **CASE NARRATIVE**

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier IV, validation deliverables including all summary forms and associated raw data. Analytical procedures performed by the lab are validated in accordance with NELAC standards. Any parameters that are not included in the lab's NELAC accreditation are identified on a "Non-Certified Analytes" report in the Miscellaneous Forms Section of this report. Individual analytical results requiring further explanation are flagged with qualifiers and/or discussed below. The flags are explained in the Report Qualifiers and Definitions page in the Miscellaneous Forms section of this report.

#### **Sample Receipt:**

One soil sample was received for analysis at ALS Environmental on 12/21/2018. Any discrepancies noted upon initial sample inspection are noted on the cooler receipt and preservation form included in this data package. The sample was received in good condition and consistent with the accompanying chain of custody form. Samples are refrigerated at 0 to 6°C upon receipt at the lab except for aqueous samples designated for metals analyses, which are stored at room temperature. If any sample was received for the analysis of pH, chlorine residual, sulfite, dissolved oxygen, or ferrous iron, the samples were analyzed past their holding time expiration since these analyses are required to be analyzed within 15 minutes of sampling.

#### **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.

	and armosty			
Approved by		Date	02/04/2019	

Clarica W took



#### 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

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<b>A</b>	Client:			/On-									С	H	ΑI	N	0	f	CI	J S	T (	0 0	Y			Page of
ALS				nning Post,				d			Proj	ect.	-	На	akes	s C8	&D	Lan	dfill	- Ta	ınk S	SED	RAI	D		Method of Shipment
ALS-Environmental 1565 Jefferson Rd, Bldg 300, Suite 360	Project Manager			nder				ranc	les	<del></del>	Tele		ne No -593-					Email	:	jor	nb@o	n-site	hs.co	m		TED EX
Rochester, NY 14623 585.288.5380																										Special Detection Limit/Reporting
		$\Box$	$\vdash$	M	atrix		Pr	SV.					$\Box$						Т						П	
Sample I.D.	Lab Sample No.	No. of Containers	Soil	Water	Air	Other	Yes	No	Sampling Date	Sampling Time	Ra-226 (903.1), Ra-228 (904.0)	Total: Uranium (908.0)														PDF to Lance and On- Site, and EDD to On-Site.
North TANK SED-1218		2	X				8	X_	12-20-18	1340	X	Х						.	$\dashv$			_	_	-		0 1221.8
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#### oler Receipt and Preservation Check Form

R1812382	5
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Labels secondary reviewed by:

PC Secondary Review: \*significant air bubbles: VOA > 5-6 mm : WC > 1 in. diameter 6 of 33 P:\INTRANET\QAQC\Forms Controlled\Cooler Receipt r16.doc 3/12/18



#### 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.
- 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/Arclors).
- B Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.
- E Inorganics- Concentration is estimated due to the serial dilution was outside control limits.
- E Organics- Concentration has exceeded the calibration range for that specific analysis.
- 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.
- \* Indicates that a quality control parameter has exceeded laboratory limits. Under the "Notes" column of the Form I, this qualifier denotes analysis was performed out of Holding Time.
- H Analysis was performed out of hold time for tests that have an "immediate" hold time criteria.
- # Spike was diluted out.

- + Correlation coefficient for MSA is <0.995.
- N Inorganics- Matrix spike recovery was outside laboratory limits.
- N Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.
- S Concentration has been determined using Method of Standard Additions (MSA).
- W Post-Digestion Spike recovery is outside control limits and the sample absorbance is <50% of the spike absorbance.
- P Concentration >40% difference between the two GC columns.
- C Confirmed by GC/MS
- Q DoD reports: indicates a pesticide/Aroclor is not confirmed (≥100% Difference between two GC columns).
- 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 Certifications<sup>1</sup>

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	

<sup>&</sup>lt;sup>1</sup> 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 <a href="https://www.alsglobal.com/locations/americas/north-america/usa/new-york/rochester-environmental">https://www.alsglobal.com/locations/americas/north-america/usa/new-york/rochester-environmental</a>

#### **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

POL 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	9030B
Soluble	
9056A Bomb (Halogens)	5050A
9066 Manual Distillation	9065
SM 4500-CN-E Residual	SM 4500-CN-G
Cyanide	
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)	3005A/3010A
extract	
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



Ft. Collins, Colorado LIMS Version: 6.892 Page 1 of 1

Wednesday, January 23, 2019

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

Re: ALS Workorder: 1812379

Project Name:

Project Number: R1812382

Dear Ms. Jaeger:

One soil sample was received from ALS Environmental, on 12/28/2018. The sample was scheduled for the following analyses:

Gamma Spectroscopy

Radium-226

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,

Á∕LS 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 Environme	ntal – Fort Collins
, tes environme	
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

13 of 33 **2 of 12** 



#### 1812379

#### **Gamma Spectroscopy:**

The sample was analyzed for the presence of gamma emitting radionuclides according to EPA method 901.1.

The Co-60 recovery in the associated laboratory control sample GS190108-1LCS is above the upper control limit of 115% at 116%. Results are submitted with project manager approval.

Activity concentrations above the calculated MDC are reported in some instances where minimum nuclide identification criteria are not met. Such tentative identifications result when the software attempts to calculate net activity concentrations for analytes where either one or both of the following criteria are not satisfied: the 'diagnostic' peak for a nuclide must be identified above the critical level, or the minimum library peak abundance must be attained. Nuclides not meeting these requirements have been flagged with a "TI" qualifier.

In cases where there are no peaks found in the peak search routine, the software performs a net quantification. This indicates that nuclides are not detected or supported at any level above the reported MDC. Consequently, these nuclides are flagged with an "NQ" qualifier on the final reports. Please refer to the Technical Bulletin Addendum at the end of this report.

All remaining acceptance criteria were met.

#### Radium-226:

The sample was prepared and analyzed according to EPA method 903.1.

All acceptance criteria were met.

#### Sample Number(s) Cross-Reference Table

**OrderNum:** 1812379

Client Name: ALS Environmental

**Client Project Name:** 

Client Project Number: R1812382 Client PO Number: R1812382

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
North Tank Sed-1218	1812379-1		SOIL	20-Dec-18	13:40

Page 1

ALS Environmental Chain of Custody 1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 385-288-5380 • FAX 585-288-8475

ALS Contact: Janice Jaeger

18/2379

R1812382 Project Number:

Janice Jaeger Project Manager:

QAP:

LAB QAP

North Tank Sed-1218

KIST2382-001 Lab Code

Sample ID

Gamma Spec 1.109 × Fort Collins ALS Lab ID 1340 Sample 12/20/18 Matrix Soil # of Cont.

Fottler Comments: Gathma Spec list - Rad 226 & 228 & &

Special Instructions/Comments	Turnaround Requirements	Report Requirements	Invoice Information
standard EDD	RUSH (Surcharges Apply)	I. Results Only  # II Results + OC Summaries	
	PLEASE CIRCLE WORK DAYS 1 2 3 4 5	III. Results + QC and Calibration Summaries	PO# 58R1812382
NPDES	X STANDARD	IV. Data Validation Report with Raw Data	
	Requested FAX Date:	PQL/MDL/J N	Bill to
H - Test is On Hold P - Test is Authorized for Prep Only	Requested Report Date: 01/04/19	$\overline{X}$	
S. Received By: A WM 12/27/18/1752 Received By:	MELI-JEKN SMITH	Ajrbill Number:	



#### **ALS Environmental - Fort Collins** CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS NY Workorder No: /2	81237	79	
Project Manager: Initials: 9 D	Oate: 12 2	8.18	
Are airbills / shipping documents present and/or removable?	DROP OFF	(YES)	NO
Are custody seals on shipping containers intact?	NONE	YES	NO
Are custody seals on sample containers intact?	NONE	YES	NO
Is there a COC (chain-of-custody) present?		YES	NO
Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of c matrix, requested analyses, etc.)	ontainers,	YES	NO
Are short-hold samples present?		YES	(NO
Are all samples within holding times for the requested analyses?		YES	) NO
Were all sample containers received intact? (not broken or leaking)		YES	NO
Is there sufficient sample for the requested analyses?		YES	NO
Are all samples in the proper containers for the requested analyses?		YES	NO
Are all aqueous samples preserved correctly, if required? (excluding volatiles)	N/A)	YES	NO
Are all aqueous non-preserved samples pH 4-9?	N/A)	YES	NO
Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) fre of bubbles > 6 mm (1/4 inch) diameter? (i.e. size of green pea)	e NA	YES	NO
Were the samples shipped on ice?		YES	NO
Were cooler temperatures measured at 0.1-6.0°C? IR gun used* #1 #3 #4	RAD ONLY	YES	NO
Cooler #:			
Temperature ( $^{\circ}$ C): $\mathcal{L}$			
No. of custody seals on cooler:			
Acceptance   External µR/hr reading:/			
Background μR/hr reading:/O			
Were external μR/hr readings ≤ two times background and within DOT acceptance criteria? YES NO / NA (If no	o, see Form 008.)	1	
dditional Information: Please provide details here for any NO responses to gray-shaded boxes above, or a	any other issues	noted:	
All client bottle ID's vs ALS lab ID' applicable, was the client contacted? YES / NO S Contact:	's double-ch		
roject Manager Signature / Date:			
Form 201r26.xls *IR Gun #1, VWR SN 170560549			/

(06/29/2018)

\*IR Gun #3, VWR SN 170647571 \*IR Gun #4, Oaktop, SN 3372220101-0002

ORIGIN ID:ONHA (585) 672-7464 SMO ALS ENVIRONMENTAL 1565 JEFFERSON RD BLDG 300 SUITE 360 ROCHESTER, NY 14623 UNITED STATES US

SHIP DATE: 27DEC18 ACTWGT: 11.25 LB CAD: 0342584/CAFE3211

BILL THIRD PARTY

SAMPLE RECEIVING ALS LABS-FT. COLLINS 225 COMMERCE DRIVE



FORT COLLINS CO 80524

(970) 490 - 1511 DEPT:



**FedEx** Express

TRK# 4150 9194 1713

FRI - 28 DEC 3:00P STANDARD OVERNIGHT

XH FTCA 1.6 C 80524
CO - US DEN



18 of 33 7 of 12

#### **SAMPLE SUMMARY REPORT**

Client: ALS Environmental Date: 25-Jan-19

 Project:
 R1812382
 Work Order:
 1812379

 Sample ID:
 North Tank Sed-1218
 Lab ID:
 1812379-1

Legal Location: Matrix: SOIL

Collection Date: 12/20/2018 13:40 Percent Moisture:

Analyses	Result	I Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Gamma Spectroscopy Results		SOP 71	3	Prep	Date: 1/8/2019	PrepBy: <b>MRL</b>
Ra-228	2.08 (+/- 0.85)	G	1.55	pCi/g	NA	1/9/2019 07:57
Dissolved Radium-226 by Radon En	nanation - Method 903	3. SOP 78	3	Prep	Date: 1/10/2019	PrepBy: <b>JXH</b>
Ra-226	0.48 (+/- 0.21)		0.19	pCi/g	NA	1/21/2019 12:18

#### SAMPLE SUMMARY REPORT

Date: 25-Jan-19 **Client:** ALS Environmental

**Project:** R1812382 Work Order: 1812379

Sample ID: North Tank Sed-1218 Lab ID: 1812379-1

**Legal Location:** Matrix: SOIL

Percent Moisture: **Collection Date:** 12/20/2018 13:40

Report Dilution Result Limit Units **Date Analyzed** Analyses **Qual** Factor

#### **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

#### **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

Client: ALS Environmental

**Work Order:** 1812379 **Project:** R1812382

**Date:** 1/25/2019 3:54:5

#### QC BATCH REPORT

Batch ID: R	<b>E190110-1-2</b> In	nstrument ID AIp	oha Scin		Method: Ra	adium-226	by Rado	n Emanation				
LCS	Sample ID: <b>RE190110-1</b>				Ur	nits: <b>pCi/g</b>		Analysi	s Date:	1/21/201	19 12:58	
Client ID:		Run II	D: <b>RE190110</b> -	1A			Pr	ep Date: <b>1/10</b>	/2019	DF	: NA	
Analyte		Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226		17.7 (+/- 3.3)	0.1	23.93		73.8	57-126					Р
МВ	Sample ID: <b>RE190110-1</b>				Ur	nits: <b>pCi/g</b>		Analysi	s Date:	1/21/201	19 12:58	
Client ID:		Run II	D: <b>RE190110</b> -	1A			Pr	ep Date: <b>1/10</b>	/2019	DF	: NA	
Analyte		Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226		-0.051 (+/- 0.09)	0.223									U

The following samples were analyzed in this batch:

1812379-1

Client: ALS Environmental

**Work Order:** 1812379 **Project:** R1812382

#### QC BATCH REPORT

DUP	Sample ID: 1812379-1				Ur	nits: <b>pCi/g</b>		Analysi	s Date:	1/9/2019	9 08:32	
Client ID: N	lorth Tank Sed-1218	Run II	D: <b>GS190108</b> -	1 <b>A</b>			Pr	ep Date: <b>1/8/2</b>	2019	DF	: NA	
Analyte		Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qua
Ra-228		1.8 (+/- 1)	1.2						2.0	3 0.2		G,T
LCS	Sample ID: <b>GS190108-1</b>				Ur	nits: <b>pCi/g</b>		Analysi	s Date:	1/9/2019	9 09:07	
Client ID:		Run II	D: <b>GS190108</b> -	1 <b>A</b>			Pr	ep Date: <b>1/8/2</b>	2019	DF	: NA	
Analyte		Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qua
Am-241		1060 (+/- 130)	20	1010		105	85-115					Р
Co-60		460 (+/- 54)	1	397.7		116	85-115					Н
Cs-137		398 (+/- 47)	2	382		104	85-115					P,M
МВ	Sample ID: <b>GS190108-1</b>				Ur	nits: <b>pCi/g</b>		Analysi	s Date:	1/9/2019	9 08:32	
Client ID:		Run II	D: <b>GS190108</b> -	1A			Pr	ep Date: <b>1/8/2</b>	2019	DF	: NA	
Analyte		Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qua
Ra-228		0.04 (+/- 0.36)	0.69									U

QC Page: 2 of 2

#### TECHNICAL BULLETIN ADDENDUM

The library used for analysis defines the gamma emission(s) to be used for analysis of each nuclide. If multiple gamma emissions are used for quantification, then a 'NET' quantification emission (or peak) must be defined in the library. This designation provides for the calculation of nuclide activity concentrations and detection limits in the case of non-presence of the nuclide. When the nuclide is not present, or the software is unable to resolve a peak at the library defined 'NET' energy, the software evaluates the 'NET' region of interest ('NET' peak energy +/- 2 keV) by performing a summation of the net counts above the background level. This 'NET' quantification can result in net negative, zero, or positive activity results, and is highly dependent on the spectral distribution in the region of interest of the 'NET' peak. In cases where only the 'NET' peak is found, and the software performs a net quantification, the nuclide result will be flagged with an 'NQ' qualifier on the final reports. This indicates that the nuclide is not detected or supported at any level above the reported MDC. Results are submitted without further qualification.

All nuclides specified in the library of analysis for gamma spectroscopy are evaluated for positive <u>OR</u> tentative identification on the following criteria:

- The individual abundances for the gamma emissions specified for each nuclide are summed to obtain a total nuclide abundance.
- From the total nuclide abundance, a positive identification criterion is set as 75% of this total nuclide abundance.
- For all nuclide peaks that are not net quantified, those peak abundances are summed. The total non-net quantified peak sum is compared to the calculated 75% abundance criterion. If this sum is greater than the 75% criterion, the nuclide is considered to be positively identified at the reported concentration. If the sum is less than the 75% criterion, the nuclide is tentatively identified at the reported concentration. These results will be flagged with a 'TI' qualifier on the final reports to indicate that the 75% abundance criterion was not met.

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A Teledyne Technologies Company 2508 Quality Lane Knoxville, TN 37931-3133 865-690-6819

Janice Jaeger
ALS Global - Rochester Laboratory
1565 Jefferson road
Bldg 300, Suite 360
Rochester, NY 14623

#### Report of Analysis/Certificate of Conformance

02/01/2019

LIMS #:

L80615

Project ID#:
Received:

AL003-3EREG-18

- -

12/28/2018

Delivery Date:

01/25/2019

P.O.#:

R1812382

Release #:

SDG#:

This is to certify that Teledyne Brown Engineering - Environmental Services located at 2508 Quality Lane, Knoxville, Tennessee, 37931, has analyzed, tested and documented samples, as received by the laboratory, as specified in the applicable purchase order.

This also certifies that requirements of applicable codes, standards and specifications have been fully met and that any quality assurance documentation which verified conformance to the purchase order is on file and may be examined upon request.

I hereby certify that the above statements are true and correct.

Keith Jeter

**Operations Manager** 

Cross Reference Table

Client ID	Laboratory ID	Station ID (if applicable)
NORTH TANK SED-1218	L80615-1	

#### Method Reference Numbers

Matrix	Analysis	Method Reference
S	U-238 (AS)	EPA 908.0 Mod.
S	U-234 (AS)	EPA 908.0 Mod.
S	U-235 (AS)	EPA 908.0 Mod.

This report shall not be reproduced or distributed except in its entirety.

## Report of Analysis 02/01/19 13:28

TELEDYNE BROWN ENGINEERING, INC.

A Teledyne Technologies Company

### L80615

ALS Global - Rochester Laboratory

AL003-3EREG-18

S

Soil

Matrix:

73.6 % Moisture: Volume: Collect Start: 12/20/2018 13:40 Receive Date: 12/28/2018 Collect Stop: NORTH TANK SED-1218 LIMS Number: L80615-1 Sample ID: Station: Description:

LIMIN INMINIOR. ESSET	•					The second secon		, ,,,	2 6	+ ******	Comme	Count		
Radionuclide	#dos	Activity Conc	Activity Uncertainty Conc 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Kererence Date	Count	Time	Units	Flag Values	
			,							01/10/10	00009	740	+	
MOMAT II	022 00	027 90 3 23E+00 5 71E-01	5.21E-01		pCi/g					01/10/12	00000	330	-	Т
IOIAL-0	027-02	A.33.E. 00	70 777		0	1		-		01/10/10	00009	Jes	+	_
1000000000	2001	0 36F 01	3.25F.01		υCi/g		.205	g dry		01/10/12	00000	200		Т
U-233/234 (AS)	7007	7.300-01			2			-		01/10/10	60000	SPC		_
TI OUE (AC)	2001	~		3.52E-02	pCi/g		.205	g dry		01/10/12	00000	336		T
(CA) (AS)	7007	,					300	2 deri		01/10/10	00009	Sec	+	_
11-238 (AS)	2001	1.35E+00	1.35E+00 4.02E-01		pC1/g		C07:	g ury		77/01/10				7
0-230 (1XB)														
Comment:														]

No = Peak not identified in gamma spectrum

Yes = Peak identified in gamma spectrum

\*\*\*\* Unless otherwise noted, the analytical results reported are related only to the samples tested in the condition they are received by the laboratory.

MDC - Minimum Detectable Concentration

Page 3 of 3

Flag Values U =

Compound/Analyte not detected (< MDC) or less than 3 sigma Activity concentration exceeds MDC and 3 sigma; peak identified(gamma only)
Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma

Activity concentration exceeds customer reporting value MDC exceeds customer technical specification

Low recovery + U\* High Spec

Bolded text indicates reportable value. High recovery

TBE-ROA002

## QC Summary Report for L80615 AL003-3EREG-18

02/01/2019 13:57

Everywhereyoulook

			Met	lethod Blank Summary	mmary					
TBE Sample ID Radionuclide WG29927-1 U-238 (AS)	Radionuclide U-238 (AS)	Matrix         Count Date/Time           WO         01/10/2019 15:43			Blank Result <4.123E-02	Units pCi/Total			<u>Qualifier</u> U	<u>P/F</u> P
			TC	LCS Sample Summary	nmary					
TBE Sample ID Radionuclide WG29927-2 U-238 (AS)	Radionuclide U-238 (AS)	Matrix Count Date/Time WO 01/10/2019 15:43	Spike Value 6.04E+00		LCS Result 4.972E+00	Units pCi/Total	Spike Recovery 82.3	<u>Range</u> 70-130	Oualifier +	P/F P
Spike ID: Spike Conc:	238U-091808 6.04E+00									
Spire voi.	1.00E+00		IC	CSD Sample Summary	ımmary					
TBE Sample ID Radionuclide WG29927-3 U-238 (AS)	Radionuclide U-238 (AS)	Matrix Count Date/Time WO 01/10/2019 15:43	Spike Value 6.04E+00	LCSD Result 4.823E+00	LCSD Recovery 79.9	Units pCi/Total	<b>RPD</b> 3.0	Range <30	Oualifier +	<u>P/F</u> P
W G29921-2 Spike ID: Spike Conc: Spike Vol:	238U-091808 6.04E+00 1.00E+00				٧					
U-2 Associated Samples for	U-238 amples for	WG29927								

Client ID
NORTH TANK SED-1218 Sample # L80615-1

Page 1

Positive Result

Compound/analyte was analyzed, peak not identified and/or not detected above MDC < 5 times the MDC are not evaluated
Nuclide not detected
Spiking level < 5 times activity

<sup>\*</sup> \* \* \* \*

Pass Fail

# ALS Environmental Chain of Custody

ALS Contact: Janice Jaeger

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

R1812382 Project Number:

Janice Jaeger Project Manager:

QAP:

LAB QAP

Sample ID

Lab Code

RJ812382-091

Fodder Comments: Gamna Spec-list - Rad 226 & 228 C

Uat U 0.806 × TeledyneBrownEng Lab ID Time 1340 Sample 12/20/18 Date Matrix Soil # of Cont. North Tank Sed-1218

Invoice Information 58R1812382 Bill to P0# III. Results + QC and Calibration Summaries IV. Data Validation Report with Raw Data Report Requirements II. Results + QC Summaries z >I. Results Only PQL/MDL/J EDD PLEASE CIRCLE WORK DAYS Requested Report Date: 01/04/19 Turnaround Requirements RUSH (Surcharges Apply) Requested FAX Date: KTANDARD NPDES REPORTE OS TOTAL CHEMIUM P - Test is Authorized for Prep Only Special Instructions/Comments H - Test is On Hold

Received By: Aenn 2521/81/+2/21

Shit Man

Relinquished By:

Airbill Number:

Comments:

12/28/18 16:33

#### Teledyne Brown Engineering Sample Receipt Verification/Variance Report

SR #: SR59980

Client: ALS GLOBAL

Project #: AL003-3EREG-18

LIMS #L80615

Initiated By: KNOXLAB

Init Date: 12/28/18 Receive Date: 12/28/18

#### Notification of Variance

Person Notified:

Contacted By:

Notify Date: Notify Method: Notify Comment:

#### Client Response

Person Responding:

Response Date: Response Method:

Response Comment

Cı	riteria	Yes No NA	Comment
1	Shipping container custody seals present and intact.	NA ·	
2	Sample container custody seals present and intact.	NA	
3	Sample containers received in good condition.	Y	
4	Chain of custody received with samples.	Y	
5	All samples listed on chain of custody received.	Y	
6	Sample container labels present and legible.	Y	
7	Information on container labels correspond with chain of custody.	Y	
8	Sample(s) properly preserved.	Y	
9	Sample(s) appropriate container(s).	Y	
For H	azardous Materials Only:		
10	Other. (Describe)	NA	
11	Paperwork shows TBE and shippers name, address and phone number.	NA	
12	Paperwork shows sample quantity information.	NA	

TBE-RDS03

Decav &	An	KMM	
Dec	Eff. Ingr Fac	.1876	
	Bkg dt	17280( S	
	Detector Total Sample Bkg ID Counts dt Counts	60000 12.99 172800 .1876 S S	
	Sample dt		
	Total	53	
	Detector ID	71	
	Mount Count D Weight Recovery Date/Time	0 60.71 01-10-19 15:45	U-233/234 (AS)
	t Recovery	60.71	L80615-1
118	Mount e Weigh	0	L806
Project: AL003-3EREG-18	Volume/ Scavenge Milking Mount Aliquot Date/Time Date/Time Weight		pCi/g
Customer: Project: 2	Volume/ Scavenge Aliquot Date/Time		g dry MDC: 1.91E-01 pCi/g
Cust	.ume/ iquot	205	g dry c: 1.91
	te Vol	'	
	Reference Date/Time		Error: 3.25E-01
	i. S	AS)	
L80615 U-234	un Analys:	U-234 (AS)	ED-1218
Work Order: Analysis:	Sample ID Run Analysis	L80615-1	NORTH TANK SED-1218 Activity: 9.36E-01

## Raw Data Sheet (rawdata) 02/01/19 13:57

TBE-RDS03

Mork Order: L80615 Analysis: U-235 Sample ID Run Analysis Client ID # L80615-1 U-235 (AS)		Reference V Date/Time P	Cus Pr Olume/ Aliquot .205 q dry	Customer: ALS GLOBAL Project: AL003-3EREG-18  Reference Volume/ Scavenge Milking M Date/Time Aliquot Date/Time Date/Time A  .205 q dry	ALS GLO AL003-3 ie Mill me Date	NG Time	lou 	overy E	Count Count	Detector ID 71	Total Counts 2	Sample åt 60000 S	Detector Total Sample Bkg Bkg Eff. In ID Counts dt 172800 1876	Bkg dt dt 172	Decay & Jeff. Ingrowth Factor Analy 800 .1876 KMM	Analy
	Error: 6.79E-02 MDC: 3.52E-02 pCi/g	-02 MD	C: 3:	52E-02	pCi/g		L80615-1	P	U-235 (AS)							

L80615
Order:
Work

U-238 Analysis:

Reference Date/Time Run Analysis Sample ID Client ID

Project: AL003-3EREG-18

Customer: ALS GLOBAL

Volume/ Scavenge Milking Mount Count Aliquot Date/Time Date/Time Weight Recovery Date/Time

U-238 (AS) L80615-1

Bkg Counts

Decay & Eff. Ingrowth Factor Analy

Bkg dt

KMM

.1876

172800

Sample dt

Detector Total ID Counts 71

73

60.71 01-10-19

15:45

ß

8.99

ß

00009

pCi/g

g dry .205

U-238 (AS)

L80615-1

Activity: 1.35E+00 NORTH TANK SED-1218

33 of 33

MDC: 1.59E-01 Error: 4.02E-01