# EXHIBIT M

August 29, 2017

Mr. Mark Domagala
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, Painted Post N.Y.**
**Hakes C&D Landfill Permit No. 8-4630-00010/00001-0**
**2017 2nd Quarter Radionuclide Monitoring Results**

Dear Mr. Domagala:

Enclosed please find a copy of the radionuclide sampling and analysis report for leachate sampling conducted during the second quarter 2017. 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 814-335-5183 or at lance.stevens@casella.com.

Sincerely,

**CASELLA WASTE SERVICES**

Lance Stevens
Environmental Manager

cc: Robert Kras, Casella
Jonathan Brandes, On-Site Technical Services
Yasmin Guevara, NYSDEC
Richard Clarkson, NYSDEC
Timothy Rice, NYSDEC
Greg MacLean, NYSDEC

Enclosures

4376 Manning Ridge Road, Painted Post, NY 14870
Phone: 607.937.6044 Fax: 607.937.6089

ON-SITE TECHNICAL SERVICES, INC
72 Railroad Avenue
Wellsville, New York 14895
Phone: (585) 593-1824
Fax: (585) 593-7471

August 29, 2017

Mr. Lance Stevens
Casella Waste Systems, Inc.
4376 Manning Ridge Road
Painted Post, New York 14870

Re: Hakes C & D Landfill Painted Post, New York – 2nd Quarter-2017-Radionuclide Test Results

Dear Lance:

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

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

Sincerely,

Jonathan E. Brandes, P.G.
Senior Geologist

Enclosures

**Table 1**

**Leachate Radionuclide Analytical Results**
**Second Quarter 2015 through Second Quarter 2017**
**Hakes C and D Landfill**
**Painted Post, New York**

| Parameter | Cell 3 Leachate | | | | |
|---|---|---|---|---|---|
| | 5/7/2015 | 11/11/2015 | 5/4/2016 | 11/18/2016 | 6/6/2017 |
| **Radionuclide Act + Unc (MDC) pCi/L** | | | | | |
| Actinium-228 (EPA 901.1) | 0 ± 7.767 (24.95) | 0 ± 4.384 (21.4) | 0 ± 5.485 (19.92) | 8.262 ± 25.890 (31.97) | 37.525 ± 65.041 (71.44) |
| Actinium-228, Dissolved (EPA 901.1) | 3.133 ± 16.452 (17.65) | 9.101 ± 26.524 (34.5) | 3.116 ± 16.467 (17.66) | 0.255 ± 40.602 (42.85) | 0 ± 10.788 (18.93) |
| Bismuth-212 (EPA 901.1) | 59.801 ± 61.695 (65.04) | 5.033 ± 66.631 (74.22) | 49.256 ± 47.540 (48.41) | 13.73 ± 105.030 (122.1) | 35.408 ± 196.270 (221) |
| Bismuth-212, Dissolved (EPA 901.1) | 30.575 ± 41.997 (71.63) | 0 ± 36.567 (113) | 10.028 ± 64.348 (71.71) | 83.393 ± 130.280 (137.1) | 0 ± 31.352 (64.85) |
| Bismuth-214 (EPA 901.1) | 391.34 ± 48.673 (15.31) | 28.356 ± 9.066 (8.704) | 16.287 ± 8.662 (8.697) | 63.664 ± 19.257 (17.07) | 2162.4 ± 243.650 (42.68) |
| Bismuth-214, Dissolved (EPA 901.1) | 0 ± 6.254 (13.48) | 14.895 ± 13.603 (18.48) | 11.604 ± 7.496 (11.14) | 1320.9 ± 148.240 (23.77) | 64.221 ± 13.485 (10.56) |
| Cesium-134 (EPA 901.1) | 4.086 ± 5.209 (8.05) | 3.052 ± 3.069 (5.64) | 0.916 ± 1.468 (5.868) | 1.439 ± 8.189 (9.31) | 0 ± 5.685 (21.84) |
| Cesium-134, Dissolved (EPA 901.1) | 0 ± 1.159 (5.007) | 5.375 ± 5.540 (6.026) | 1.144 ± 2.503 (4.271) | 0 ± 3.177 (14.32) | 2.105 ± 3.133 (4.385) |
| Cesium-137 (EPA 901.1) | 0 ± 1.553 (7.209) | -0.736 ± 4.737 (5.219) | 0.558 ± 4.040 (4.51) | 0 ± 0.815 (11.2) | 1.637 ± 16.714 (18.72) |
| Cesium-137, Dissolved (EPA 901.1) | 1.498 ± 3.863 (4.246) | 0 ± 0.815 (8.748) | 0 ± 0.609 (5.05) | -8.064 ± 12.680 (13.25) | -2.202 ± 4.723 (4.966) |
| Lead-212 (EPA 901.1) | 75.819 ± 27.500 (14.72) | 1.962 ± 6.949 (8.667) | 14.027 ± 16.916 (9.201) | 0 ± 9.517 (20.59) | 405.46 ± 77.374 (40.77) |
| Lead-212, Dissolved (EPA 901.1) | 0 ± 4.276 (8.743) | 0 ± 8.755 (17.06) | 12.262 ± 16.952 (9.224) | 333.18 ± 72.729 (27.39) | 4.075 ± 5.714 (7.888) |
| Lead-214 (EPA 901.1) | ± 49.31 (16.39) | 14.132 ± 8.782 (11.13) | 24.291 ± 8.950 (9.612) | 77.705 ± 19.834 (17) | 1690.3 ± 193.770 (80.08) |
| Lead-214, Dissolved (EPA 901.1) | 0 ± 5.108 (12.51) | 7.03 ± 18.878 (24.52) | 24.509 ± 17.640 (10.63) | 1403.9 ± 158.710 (32.38) | 48.159 ± 13.024 (11.74) |
| Potassium-40 (EPA 901.1) | 48.42 ± 67.315 (69.57) | 108.09 ± 38.360 (39.08) | 59.436 ± 60.524 (64.51) | 0 ± 74.192 (170.3) | 129.63 ± 218.020 (226.4) |
| Potassium-40, Dissolved (EPA 901.1) | 65.824 ± 33.329 (41.24) | 0 ± 53.073 (153.1) | 122.56 ± 42.315 (43.07) | 104.53 ± 111.900 (115.2) | 163.99 ± 66.366 (54.83) |
| Radium-226 (EPA 901.1) | 0 ± 89.757 (195.1) | 0 ± 68.875 (131.1) | 31.779 ± 97.378 (122.7) | 133.98 ± 155.690 (187.1) | 132.62 ± 384.790 (469.5) |
| Radium-226 (EPA 903.1) | 3.42 ± 2.15 (0.926) | 1.43 ± 1.03 (1.26) | 1.66 ± 0.976 (0.966) | 1.12 ± 0.616 (0.549) | 2.85 ± 1.53 (0.552) |
| Radium-226, Dissolved (EPA 901.1) | 0 ± 60.574 (139.9) | 0 ± 102.540 (200.3) | 0 ± 62.447 (143.8) | 0 ± 245.640 (379.7) | 19.146 ± 84.796 (108.7) |
| Radium-226, Dissolved (EPA 903.1) | 0.678 ± 0.778 (0.46) | 1.29 ± 0.935 (1.14) | 0.442 ± 0.580 (0.966) | 0.937 ± 0.952 (1.44) | 1.75 ± 1.10 (0.473) |
| Radium-228 (EPA 901.1) | 0 ± 7.767 (24.95) | 0 ± 4.384 (21.4) | 0 ± 5.485 (19.92) | 8.262 ± 25.890 (31.97) | 37.525 ± 65.041 (71.44) |
| Radium-228 (EPA 904.0) | 2.1 ± 1.01 (1.78) | 1.38 ± 0.591 (0.948) | 1.4 ± 0.555 (0.862) | 1.35 ± 0.519 (0.795) | 3.9 ± 1.30 (1.88) |
| Radium-228, Dissolved (EPA 901.1) | 3.133 ± 16.452 (17.65) | 9.101 ± 26.524 (34.5) | 3.116 ± 16.467 (17.66) | 0.255 ± 40.602 (42.85) | 0 ± 10.788 (18.93) |
| Radium-228, Dissolved (EPA 904.0) | 0.669 ± 0.466 (0.895) | 1.33 ± 0.526 (0.815) | 0.985 ± 0.458 (0.78) | 1.15 ± 0.499 (0.832) | 3.25 ± 0.960 (1.15) |
| Thallium-208 (EPA 901.1) | 4.588 ± 4.703 (7.916) | 0 ± 2.884 (5.473) | 3.538 ± 4.124 (4.767) | 0 ± 2.436 (11.34) | 0 ± 10.451 (24.02) |
| Thallium-208, Dissolved (EPA 901.1) | 1.148 ± 3.810 (4.521) | 0 ± 4.078 (10.77) | 3.126 ± 5.628 (5.521) | 0 ± 12.981 (13.52) | 2.794 ± 4.492 (4.558) |
| Thorium-232 (EPA 901.1) | 3092.4 ± 9641.800 (11800) | 0 ± 3404.400 (9737) | 1817.5 ± 7939.800 (9788) | 4200.7 ± 4129.300 (4907) | 3973.6 ± 10832.000 (13060) |
| Thorium-232, Dissolved (EPA 901.1) | 0 ± 4602.400 (9295) | 2903.2 ± 3952.500 (4780) | 1475.1 ± 7430.700 (9194) | 4032.8 ± 19159.000 (23230) | 3383 ± 7122.000 (8586) |
| Thorium-234 (EPA 901.1) | 0 ± 174.990 (667.4) | 0 ± 187.440 (536.1) | 152.1 ± 424.640 (536) | 20.553 ± 256.350 (325.1) | 119.93 ± 619.240 (752.3) |
| Thorium-234, Dissolved (EPA 901.1) | 97.813 ± 371.640 (474.1) | 37.85 ± 230.230 (293.8) | 93.454 ± 384.710 (488.8) | 78.446 ± 1038.900 (1298) | 62.96 ± 78.827 (488.5) |
| Total Uranium (ASTM D5174-97) | | | | 0.000995 ± 0.048 (0.385) | 0.00251 ± 0.127 (0.385) |
| Total Uranium (EPA 908.0) | 0.492 ± 0.354 (0.559) | 2.09 ± 0.708 (0.709) | 1.41 ± 0.607 (0.886) | | |
| Total Uranium, Dissolved (ASTM D5174-97) | | | | 0.00109 ± 0.047 (0.385) | 0.00359 ± 0.156 (0.385) |
| Total Uranium, Dissolved (EPA 908.0) | 0.453 ± 0.390 (0.638) | 1.36 ± 0.658 (0.922) | 1.76 ± 0.549 (0.543) | | |
| Uranium-235 (EPA 901.1) | 0 ± 26.904 (65.25) | | | | |
| Uranium-235, Dissolved (EPA 901.1) | 0 ± 18.781 (40.22) | | | | |
| Uranium-238 (EPA 901.1) | 0 ± 90.328 (192.5) | | | | |
| Uranium-238, Dissolved (EPA 901.1) | 0 ± 52.151 (131.1) | | | | |

**Notes:**

Act + Unc (MDC) = Activity ± Uncertainty (Minimum Detectable Concentration)

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

Each of EPA 901.1, EPA 903.1, EPA 904.0 & EPA 908.0 are laboratory analysis methods.

**Table 1**

**Leachate Radionuclide Analytical Results**
**Second Quarter 2015 through Second Quarter 2017**
**Hakes C and D Landfill**
**Painted Post, New York**

| Parameter | Cell 4 Leachate | | | | |
|---|---|---|---|---|---|
| | 5/7/2015 | 11/11/2015 | 5/4/2016 | 11/18/2016 | 6/6/2017 |
| **Radionuclide Act + Unc (MDC) pCi/L** | | | | | |
| Actinium-228 (EPA 901.1) | 5.215 ± 30.714 (39.31) | 12.968 ± 14.548 (16.16) | 2.636 ± 26.970 (36.33) | 35.329 ± 39.446 (43.02) | 8.678 ± 11.881 (18.84) |
| Actinium-228, Dissolved (EPA 901.1) | 0 ± 4.640 (39.33) | 0 ± 17.365 (38.32) | 0 ± 11.596 (22.52) | 0 ± 15.614 (44.33) | 0 ± 26.996 (53.58) |
| Bismuth-212 (EPA 901.1) | 9.62 ± 100.500 (121) | 0 ± 10.427 (74.22) | 0 ± 46.219 (152.9) | 0 ± 56.604 (191.1) | 31.323 ± 45.410 (47.8) |
| Bismuth-212, Dissolved (EPA 901.1) | 30.809 ± 75.290 (90.19) | 20.005 ± 127.980 (149.1) | 0 ± 13.451 (88.26) | 118.28 ± 173.930 (134.3) | 0 ± 72.210 (189.8) |
| Bismuth-214 (EPA 901.1) | 0 ± 7.147 (26.3) | 37.991 ± 10.867 (10.07) | 0 ± 12.030 (25.37) | 1108.6 ± 132.190 (29.22) | 22.837 ± 9.837 (9.001) |
| Bismuth-214, Dissolved (EPA 901.1) | 3.129 ± 18.181 (23.4) | 25.958 ± 18.004 (21.03) | 4.12 ± 10.106 (11.53) | 1013.4 ± 116.970 (27.6) | 2475.4 ± 266.380 (30.1) |
| Cesium-134 (EPA 901.1) | 0 ± 1.671 (11.7) | 3.398 ± 2.537 (5.771) | 4.324 ± 6.376 (7.154) | 0 ± 2.897 (15.61) | 0.5 ± 4.213 (4.603) |
| Cesium-134, Dissolved (EPA 901.1) | -0.853 ± 8.882 (10.27) | 2.813 ± 7.274 (8.353) | 0.885 ± 4.648 (5.224) | 2.466 ± 4.890 (15) | 0 ± 5.572 (13.48) |
| Cesium-137 (EPA 901.1) | 0 ± 1.997 (11.62) | -1.168 ± 4.551 (4.995) | -3.805 ± 11.382 (12.87) | 0 ± 3.051 (16.6) | -0.025 ± 3.741 (4.245) |
| Cesium-137, Dissolved (EPA 901.1) | 0 ± 2.578 (12.87) | 2.643 ± 5.782 (6.649) | 0.355 ± 4.492 (5.05) | -4.314 ± 11.841 (12.52) | 0 ± 2.460 (12.96) |
| Lead-212 (EPA 901.1) | 0 ± 7.818 (17.3) | 2.952 ± 5.243 (8.61) | 1.214 ± 14.507 (18.13) | 298.11 ± 55.113 (32.62) | 1.701 ± 8.079 (9.9) |
| Lead-212, Dissolved (EPA 901.1) | 4.472 ± 13.018 (16.63) | 4.828 ± 12.260 (15.62) | 12.925 ± 12.705 (9.224) | 276.33 ± 79.596 (26.23) | 295.32 ± 41.236 (28.58) |
| Lead-214 (EPA 901.1) | 2.145 ± 14.761 (19.96) | 48.796 ± 12.998 (9.549) | 0 ± 11.346 (22.78) | 1197.5 ± 141.580 (38.89) | 8.983 ± 9.319 (11.85) |
| Lead-214, Dissolved (EPA 901.1) | 0 ± 11.097 (22.99) | 30.886 ± 16.585 (19.84) | 18.684 ± 14.090 (11.07) | 1124.9 ± 128.370 (26.33) | 2549.1 ± 273.010 (30.86) |
| Potassium-40 (EPA 901.1) | 93.499 ± 118.740 (143.1) | 151.28 ± 51.200 (48.24) | 197.9 ± 94.924 (114) | 143.06 ± 166.720 (181.5) | 129.88 ± 46.728 (45.37) |
| Potassium-40, Dissolved (EPA 901.1) | 140.64 ± 84.435 (110.9) | 83.108 ± 132.290 (153.1) | 260.5 ± 66.627 (50.55) | 160.56 ± 97.218 (102.9) | 210.6 ± 135.230 (134.5) |
| Radium-226 (EPA 901.1) | 0 ± 89.553 (193.9) | 91.528 ± 107.210 (128.3) | 0 ± 54.840 (249.5) | 196.74 ± 307.810 (370.4) | 0 ± 69.468 (136.5) |
| Radium-226 (EPA 903.1) | 5.19 ± 2.54 (0.827) | 5.11 ± 1.38 (0.213) | 3.28 ± 1.20 (0.278) | 2.43 ± 0.927 (0.577) | 2.58 ± 1.51 (1.79) |
| Radium-226, Dissolved (EPA 901.1) | 0 ± 102.250 (205.6) | 64.564 ± 155.530 (200.3) | 36.587 ± 98.448 (122.2) | 0 ± 163.030 (334.4) | 0 ± 193.920 (356.4) |
| Radium-226, Dissolved (EPA 903.1) | 1.57 ± 1.04 (0.472) | 4.59 ± 1.97 (1.64) | 0.756 ± 0.493 (0.506) | 0.483 ± 0.490 (0.742) | 2.57 ± 1.30 (0.436) |
| Radium-228 (EPA 901.1) | 5.215 ± 30.714 (39.31) | 12.968 ± 14.548 (16.16) | 2.636 ± 26.970 (36.33) | 35.329 ± 39.446 (43.02) | 8.678 ± 11.881 (18.84) |
| Radium-228 (EPA 904.0) | 3.77 ± 1.17 (1.6) | 5.13 ± 1.27 (1.07) | 3.14 ± 0.847 (0.878) | 2.2 ± 0.750 (1.07) | 2.72 ± 0.892 (1.26) |
| Radium-228, Dissolved (EPA 901.1) | 0 ± 4.640 (39.33) | 0 ± 17.365 (38.32) | 0 ± 11.596 (22.52) | 0 ± 15.614 (44.33) | 0 ± 26.996 (53.58) |
| Radium-228, Dissolved (EPA 904.0) | 1.64 ± 0.630 (0.97) | 5.92 ± 1.35 (0.996) | 3.38 ± 0.867 (0.891) | 2.68 ± 0.751 (0.819) | 3.88 ± 0.957 (0.821) |
| Thallium-208 (EPA 901.1) | 2.827 ± 7.710 (9.576) | 0 ± 2.163 (4.908) | 0 ± 3.268 (14.3) | 0 ± 2.668 (21.1) | 3.167 ± 4.550 (5.039) |
| Thallium-208, Dissolved (EPA 901.1) | 2.444 ± 7.676 (9.584) | 0.577 ± 7.654 (10.11) | 2.226 ± 3.095 (6.335) | 5.178 ± 8.516 (12.66) | 0 ± 6.890 (15.52) |
| Thorium-232 (EPA 901.1) | 1865.2 ± 3676.700 (4514) | 0 ± 3284.900 (9901) | 2822.1 ± 4837.600 (5873) | -1184 ± 9164.700 (11140) | -1264.3 ± 7708.100 (9538) |
| Thorium-232, Dissolved (EPA 901.1) | 4249.3 ± 3656.800 (4303) | 3454.6 ± 4185.800 (5031) | 1659.5 ± 7064.900 (8744) | 2827.7 ± 18288.000 (22220) | -2380.5 ± 8049.000 (9653) |
| Thorium-234 (EPA 901.1) | 0 ± 120.180 (301.3) | 0 ± 127.450 (517) | 0 ± 112.960 (366.1) | 98.264 ± 499.240 (609.5) | 161.6 ± 369.400 (464) |
| Thorium-234, Dissolved (EPA 901.1) | 0 ± 134.510 (329.1) | 69.849 ± 245.530 (310) | 0 ± 221.480 (509.1) | 0 ± 276.650 (1242) | 89.479 ± 439.130 (527.9) |
| Total Uranium (ASTM D5174-97) | | | | 0.000329 ± 0.016 (0.385) | 0.000764 ± 0.029 (0.385) |
| Total Uranium (EPA 908.0) | 0.272 ± 0.337 (0.573) | 1.29 ± 0.587 (0.753) | 0.402 ± 0.314 (0.518) | | |
| Total Uranium, Dissolved (ASTM D5174-97) | | | | 0.000364 ± 0.014 (0.385) | 0.000711 ± 0.033 (0.385) |
| Total Uranium, Dissolved (EPA 908.0) | 0.551 ± 0.360 (0.559) | 1.15 ± 0.544 (0.704) | 0.806 ± 0.368 (0.484) | | |
| Uranium-235 (EPA 901.1) | 0 ± 20.011 (60.11) | | | | |
| Uranium-235, Dissolved (EPA 901.1) | 8.353 ± 44.770 (55.55) | | | | |
| Uranium-238 (EPA 901.1) | 81.058 ± 113.800 (146.5) | | | | |
| Uranium-238, Dissolved (EPA 901.1) | 0 ± 75.222 (172.7) | | | | |

**Notes:**

Act + Unc (MDC) = Activity ± Uncertainty (Minimum Detectable Concentration)

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

Each of EPA 901.1, EPA 903.1, EPA 904.0 & EPA 908.0 are laboratory analysis methods.

**Table 1**

**Leachate Radionuclide Analytical Results**
**Second Quarter 2015 through Second Quarter 2017**
**Hakes C and D Landfill**
**Painted Post, New York**

| Parameter | Cell 5 Leachate | | | | |
|---|---|---|---|---|---|
| | 5/7/2015 | 11/11/2015 | 5/4/2016 | 11/18/2016 | 6/6/2017 |
| **Radionuclide Act + Unc (MDC) pCi/L** | | | | | |
| Actinium-228 (EPA 901.1) | 1.083 ± 12.233 (13.83) | 2.06 ± 13.792 (16.16) | 0 ± 14.673 (46.24) | 0 ± 12.276 (58.75) | 0 ± 7.662 (20.81) |
| Actinium-228, Dissolved (EPA 901.1) | 0 ± 11.397 (27.86) | 5.82 ± 26.105 (34.51) | 11.706 ± 14.674 (15.24) | 0.496 ± 36.150 (38.58) | 11.148 ± 16.458 (16.64) |
| Bismuth-212 (EPA 901.1) | 31.826 ± 39.954 (44.13) | 0 ± 13.461 (74.22) | 0 ± 40.028 (142.4) | 31.06 ± 106.960 (122.1) | 0 ± 30.517 (67.34) |
| Bismuth-212, Dissolved (EPA 901.1) | 14.857 ± 82.718 (90.45) | 0 ± 46.255 (138.3) | 17.473 ± 55.120 (61.64) | 35.101 ± 108.130 (116.3) | 23.217 ± 62.770 (60.75) |
| Bismuth-214 (EPA 901.1) | 7.984 ± 12.612 (14.53) | 49.436 ± 12.938 (10.31) | 0 ± 10.770 (28.05) | 347.44 ± 53.241 (23.93) | 40.987 ± 11.091 (8.763) |
| Bismuth-214, Dissolved (EPA 901.1) | 512.4 ± 60.088 (16.65) | 22.554 ± 13.425 (16.82) | 75.469 ± 14.748 (9.911) | 595.81 ± 71.039 (25.89) | 15.948 ± 9.449 (8.905) |
| Cesium-134 (EPA 901.1) | 1.316 ± 4.284 (4.693) | 1.664 ± 3.820 (4.274) | -0.284 ± 7.800 (9.166) | 0 ± 5.376 (12.68) | 1.467 ± 3.817 (4.083) |
| Cesium-134, Dissolved (EPA 901.1) | 0 ± 2.735 (8.447) | 0.194 ± 8.158 (9.562) | -0.043 ± 4.463 (5.079) | 4.488 ± 7.851 (12.69) | 2.276 ± 4.549 (4.221) |
| Cesium-137 (EPA 901.1) | 0.228 ± 4.257 (4.759) | -1.27 ± 5.364 (5.835) | -3.126 ± 10.186 (11.63) | 0.457 ± 10.815 (12.48) | -0.102 ± 4.476 (4.993) |
| Cesium-137, Dissolved (EPA 901.1) | 1.25 ± 6.216 (6.728) | 2.304 ± 6.721 (7.782) | 0 ± 0.862 (7.693) | 0 ± 4.131 (11.41) | 0.274 ± 4.280 (4.579) |
| Lead-212 (EPA 901.1) | 0 ± 3.950 (9.473) | 0 ± 2.824 (10.1) | 2.944 ± 15.715 (19.37) | 73.833 ± 33.325 (27.92) | 7.976 ± 14.760 (10.29) |
| Lead-212, Dissolved (EPA 901.1) | 97.904 ± 29.589 (16.92) | 0 ± 7.831 (19.9) | 10.932 ± 18.133 (11.31) | 195.89 ± 56.662 (23.86) | 1.188 ± 5.691 (8.065) |
| Lead-214 (EPA 901.1) | 3.255 ± 9.484 (11.43) | 37.508 ± 11.916 (9.768) | 11.896 ± 17.951 (22.21) | 345.25 ± 51.096 (24.26) | 31.945 ± 11.578 (10.13) |
| Lead-214, Dissolved (EPA 901.1) | 581.9 ± 69.012 (18.43) | 14.916 ± 17.730 (21.63) | 75.215 ± 14.380 (9.459) | 713.27 ± 85.748 (25.99) | 8.424 ± 8.783 (9.561) |
| Potassium-40 (EPA 901.1) | 76.459 ± 54.759 (57.36) | 56.529 ± 75.814 (75.48) | 0 ± 69.751 (181.8) | 46.882 ± 159.440 (181.5) | 132.78 ± 49.874 (46.86) |
| Potassium-40, Dissolved (EPA 901.1) | 39.745 ± 91.876 (91.06) | 186.83 ± 109.530 (124) | 150.28 ± 55.673 (53.17) | 82.309 ± 106.210 (108) | 110.43 ± 53.662 (50.04) |
| Radium-226 (EPA 901.1) | 41.083 ± 70.324 (100.6) | 39.43 ± 91.210 (113.3) | 0 ± 139.040 (263) | 133.98 ± 195.550 (236.6) | 18.509 ± 98.768 (124.1) |
| Radium-226 (EPA 903.1) | 3.14 ± 2.08 (0.945) | 0.958 ± 0.712 (0.809) | 1.27 ± 1.18 (1.55) | 1.2 ± 0.724 (0.793) | 1.35 ± 1.30 (1.87) |
| Radium-226, Dissolved (EPA 901.1) | 0 ± 110.680 (218.8) | 10.972 ± 141.870 (188.3) | 97.244 ± 109.150 (128.9) | 0 ± 192.880 (291.8) | 12.579 ± 103.520 (119.4) |
| Radium-226, Dissolved (EPA 903.1) | 2.67 ± 1.20 (0.954) | 2.06 ± 1.15 (1.21) | 2.96 ± 0.968 (0.507) | 2.19 ± 1.30 (1.24) | 0.898 ± 0.933 (1.39) |
| Radium-228 (EPA 901.1) | 1.083 ± 12.233 (13.83) | 2.06 ± 13.792 (16.16) | 0 ± 14.673 (46.24) | 0 ± 12.276 (58.75) | 0 ± 7.662 (20.81) |
| Radium-228 (EPA 904.0) | 1.43 ± 0.925 (1.75) | 1.66 ± 0.629 (0.956) | 2.7 ± 0.770 (0.904) | 1.94 ± 0.648 (0.893) | 1.32 ± 0.846 (1.64) |
| Radium-228, Dissolved (EPA 901.1) | 0 ± 11.397 (27.86) | 5.82 ± 26.105 (34.51) | 11.706 ± 14.674 (15.24) | 0.496 ± 36.150 (38.58) | 11.148 ± 16.458 (16.64) |
| Radium-228, Dissolved (EPA 904.0) | 0.681 ± 0.479 (0.933) | 1.24 ± 0.541 (0.872) | 0.00366 ± 0.308 (0.718) | 2.33 ± 0.710 (0.898) | 2.42 ± 0.699 (0.785) |
| Thallium-208 (EPA 901.1) | 0 ± 2.277 (4.518) | 0 ± 1.102 (5.292) | 0 ± 1.887 (12.82) | 0 ± 6.257 (13) | 0 ± 2.190 (6.381) |
| Thallium-208, Dissolved (EPA 901.1) | 0.499 ± 6.336 (7.213) | 0 ± 5.558 (12.52) | 2.77 ± 3.703 (5.861) | 3.648 ± 8.159 (9.008) | 1.525 ± 4.526 (4.652) |
| Thorium-232 (EPA 901.1) | 2723.6 ± 6705.300 (8284) | 0 ± 3686.200 (9737) | 2741 ± 4616.100 (5607) | -162.19 ± 6157.400 (7585) | -2397 ± 8099.700 (9950) |
| Thorium-232, Dissolved (EPA 901.1) | 0 ± 6564.500 (14200) | 1184 ± 4262.300 (5269) | 6190 ± 7584.700 (9106) | 6861.1 ± 15847.000 (19150) | 4675.1 ± 4366.500 (7076) |
| Thorium-234 (EPA 901.1) | 167.6 ± 357.650 (452.2) | 0 ± 212.310 (559.1) | 4.114 ± 269.030 (341.5) | 15.067 ± 335.640 (418.4) | 0 ± 212.310 (505.7) |
| Thorium-234, Dissolved (EPA 901.1) | 94.097 ± 602.680 (757.1) | 0 ± 142.200 (348.3) | 47.94 ± 441.450 (560.8) | 345.91 ± 860.080 (1070) | 96.497 ± 139.230 (414.4) |
| Total Uranium (ASTM D5174-97) | | | | 0.00052 ± 0.032 (0.385) | 0.000733 ± 0.034 (0.385) |
| Total Uranium (EPA 908.0) | 0.865 ± 0.360 (0.472) | 2.23 ± 0.731 (0.675) | 0.239 ± 0.307 (0.555) | | |
| Total Uranium, Dissolved (ASTM D5174-97) | | | | 0.000518 ± 0.034 (0.385) | 0.000797 ± 0.036 (0.385) |
| Total Uranium, Dissolved (EPA 908.0) | 0.636 ± 0.348 (0.512) | 2.74 ± 0.853 (0.818) | 0.536 ± 0.340 (0.529) | | |
| Uranium-235 (EPA 901.1) | 12.604 ± 27.105 (33.66) | | | | |
| Uranium-235, Dissolved (EPA 901.1) | 24.699 ± 55.125 (66.92) | | | | |
| Uranium-238 (EPA 901.1) | 0 ± 57.889 (128.1) | | | | |
| Uranium-238, Dissolved (EPA 901.1) | 0 ± 99.555 (218) | | | | |

**Notes:**

Act + Unc (MDC) = Activity ± Uncertainty (Minimum Detectable Concentration)

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

Each of EPA 901.1, EPA 903.1, EPA 904.0 & EPA 908.0 are laboratory analysis methods.

**Table 1**

**Leachate Radionuclide Analytical Results**
**Second Quarter 2015 through Second Quarter 2017**
**Hakes C and D Landfill**
**Painted Post, New York**

| Parameter | Cell 6 Leachate | | | | |
|---|---|---|---|---|---|
| | 5/7/2015 | 11/11/2015 | 5/4/2016 | 11/18/2016 | 6/6/2017 |
| **Radionuclide Act + Unc (MDC) pCi/L** | | | | | |
| Actinium-228 (EPA 901.1) | 0 ± 17.356 (39.31) | 11.14 ± 9.835 (11.8) | 17.4 ± 28.767 (36.33) | 0.39 ± 14.166 (17.1) | 3.444 ± 16.759 (18.84) |
| Actinium-228, Dissolved (EPA 901.1) | 2.209 ± 26.309 (35.64) | 9.101 ± 26.524 (34.51) | 8.192 ± 14.364 (15.24) | 0 ± 8.469 (48.02) | 0 ± 15.628 (36.2) |
| Bismuth-212 (EPA 901.1) | 20.202 ± 88.761 (106.9) | 38.732 ± 52.851 (57.12) | 0 ± 32.683 (142.4) | 20.552 ± 57.388 (62.96) | 28.15 ± 56.478 (60.37) |
| Bismuth-212, Dissolved (EPA 901.1) | 21.182 ± 101.920 (121.1) | 22.897 ± 94.957 (113) | 0 ± 33.494 (71.72) | -4.793 ± 137.760 (152) | 0 ± 39.340 (126.7) |
| Bismuth-214 (EPA 901.1) | 17.718 ± 16.357 (20.19) | 17.557 ± 11.768 (12.09) | 74.751 ± 23.569 (22.52) | 5.86 ± 10.909 (11.96) | 8.261 ± 9.579 (12.72) |
| Bismuth-214, Dissolved (EPA 901.1) | 0 ± 9.455 (24.41) | 36.899 ± 16.695 (18.42) | 107.45 ± 17.701 (9.759) | 17.385 ± 25.432 (27.25) | 411.44 ± 51.257 (18.35) |
| Cesium-134 (EPA 901.1) | 3.922 ± 5.602 (6.314) | -2.506 ± 5.363 (5.899) | 2.219 ± 8.990 (10.27) | 0.827 ± 4.805 (5.276) | 0 ± 0.965 (5.21) |
| Cesium-134, Dissolved (EPA 901.1) | 0 ± 2.159 (9.734) | 1.105 ± 7.107 (8.353) | 0.325 ± 0.481 (5.767) | 4.806 ± 4.715 (11.28) | 0 ± 3.379 (9.98) |
| Cesium-137 (EPA 901.1) | 0 ± 4.314 (10.22) | -1.041 ± 5.884 (6.387) | 3.194 ± 8.180 (9.422) | 1.168 ± 4.088 (4.511) | 1.041 ± 3.824 (4.245) |
| Cesium-137, Dissolved (EPA 901.1) | 12.23 ± 4.646 (3.005) | 2.236 ± 5.722 (6.649) | 0 ± 1.927 (5.685) | -5.004 ± 11.852 (12.68) | 0 ± 1.039 (10.47) |
| Lead-212 (EPA 901.1) | 0 ± 8.957 (19.51) | 5.1 ± 6.860 (8.35) | 0 ± 9.036 (22.42) | 0 ± 4.170 (10.73) | 3.325 ± 7.019 (8.608) |
| Lead-212, Dissolved (EPA 901.1) | 0 ± 7.231 (19.23) | 0 ± 8.756 (15.99) | 18.584 ± 16.533 (11.54) | 4.077 ± 15.882 (19.13) | 10.857 ± 9.656 (14.8) |
| Lead-214 (EPA 901.1) | 0.371 ± 18.012 (23.54) | 22.521 ± 8.520 (8.884) | 99.876 ± 26.198 (21.36) | 11.224 ± 10.300 (10.35) | 1.957 ± 8.850 (10.7) |
| Lead-214, Dissolved (EPA 901.1) | 3.229 ± 15.459 (20.61) | 32.969 ± 14.911 (19.87) | 112.21 ± 18.663 (10.9) | 34.098 ± 19.097 (21.01) | 442.99 ± 53.175 (19.81) |
| Potassium-40 (EPA 901.1) | 87.842 ± 118.150 (143.1) | 179.64 ± 47.476 (39.08) | 209.21 ± 96.525 (114) | 133.77 ± 52.140 (53.62) | 216.58 ± 52.598 (40.14) |
| Potassium-40, Dissolved (EPA 901.1) | 133.1 ± 122.860 (143.1) | 134.97 ± 121.320 (139.4) | 194.11 ± 50.952 (43.07) | 204.34 ± 100.750 (109.1) | 266.49 ± 95.889 (93.96) |
| Radium-226 (EPA 901.1) | 192.61 ± 117.300 (148.7) | 25.29 ± 101.430 (125.4) | 0 ± 70.798 (237.6) | 36.26 ± 99.458 (124.1) | 8.462 ± 102.230 (128.4) |
| Radium-226 (EPA 903.1) | 3.5 ± 2.21 (0.948) | 0.984 ± 0.796 (0.985) | 1.83 ± 1.02 (0.977) | 0.675 ± 0.536 (0.696) | 2.75 ± 1.80 (1.84) |
| Radium-226, Dissolved (EPA 901.1) | 31.131 ± 147.760 (193.9) | 0 ± 96.482 (224.9) | 112.13 ± 124.210 (142.8) | 56.923 ± 204.080 (257) | 0 ± 110.140 (207.1) |
| Radium-226, Dissolved (EPA 903.1) | 2.22 ± 1.12 (0.978) | 2.7 ± 0.985 (0.228) | 0.888 ± 0.642 (0.895) | 0.762 ± 0.533 (0.643) | 2.34 ± 1.21 (1.01) |
| Radium-228 (EPA 901.1) | 0 ± 17.356 (39.31) | 11.14 ± 9.835 (11.8) | 17.4 ± 28.767 (36.33) | 0.39 ± 14.166 (17.1) | 3.444 ± 16.759 (18.84) |
| Radium-228 (EPA 904.0) | 1.49 ± 0.817 (1.49) | 2.09 ± 0.652 (0.78) | 3.27 ± 0.866 (0.879) | 0.631 ± 0.409 (0.767) | 2.4 ± 1.04 (1.77) |
| Radium-228, Dissolved (EPA 901.1) | 2.209 ± 26.309 (35.64) | 9.101 ± 26.524 (34.51) | 8.192 ± 14.364 (15.24) | 0 ± 8.469 (48.02) | 0 ± 15.628 (36.2) |
| Radium-228, Dissolved (EPA 904.0) | 1.49 ± 0.524 (0.738) | 1.64 ± 0.596 (0.857) | 0.957 ± 0.482 (0.86) | 1.44 ± 0.569 (0.897) | 2.07 ± 0.649 (0.807) |
| Thallium-208 (EPA 901.1) | 0 ± 4.487 (11.52) | 2.568 ± 3.895 (4.489) | 0 ± 2.882 (12.28) | 4.871 ± 4.898 (4.409) | 0.412 ± 4.491 (5.228) |
| Thallium-208, Dissolved (EPA 901.1) | 0 ± 4.991 (12.65) | 0 ± 3.930 (10.11) | 3.686 ± 6.273 (5.861) | 0 ± 4.822 (12.9) | 0 ± 6.558 (11.15) |
| Thorium-232 (EPA 901.1) | 1297.5 ± 4019.600 (4969) | 0 ± 4097.000 (9228) | 2805.9 ± 4794.100 (5821) | 2355.3 ± 6995.900 (8633) | 3529.6 ± 6603.800 (8070) |
| Thorium-232, Dissolved (EPA 901.1) | 535.22 ± 4031.900 (5031) | 859.6 ± 4436.100 (5497) | 921.92 ± 7622.700 (9453) | 12222 ± 15484.000 (18540) | 2714 ± 4543.300 (5446) |
| Thorium-234 (EPA 901.1) | 72.665 ± 219.270 (277.7) | 87.586 ± 160.400 (486.8) | 0 ± 190.660 (363.4) | 88.555 ± 378.210 (486) | 0 ± 238.760 (515.5) |
| Thorium-234, Dissolved (EPA 901.1) | 0 ± 125.090 (298.1) | 0 ± 112.960 (319.2) | 0 ± 187.510 (551.7) | 198.05 ± 909.930 (1156) | 11.694 ± 258.590 (314.3) |
| Total Uranium (ASTM D5174-97) | | | | 0.00062 ± 0.026 (0.385) | 0.00112 ± 0.039 (0.385) |
| Total Uranium (EPA 908.0) | 0.918 ± 0.383 (0.512) | 2.59 ± 0.805 (0.736) | 0.262 ± 0.325 (0.585) | | |
| Total Uranium, Dissolved (ASTM D5174-97) | | | | 0.000732 ± 0.032 (0.385) | 0.00105 ± 0.047 (0.385) |
| Total Uranium, Dissolved (EPA 908.0) | 1.59 ± 0.515 (0.595) | 0.536 ± 0.602 (1.07) | 0.742 ± 0.450 (0.716) | | |
| Uranium-235 (EPA 901.1) | 0 ± 14.819 (58.33) | | | | |
| Uranium-235, Dissolved (EPA 901.1) | 16.188 ± 41.178 (50.54) | | | | |
| Uranium-238 (EPA 901.1) | 84.974 ± 126.500 (161) | | | | |
| Uranium-238, Dissolved (EPA 901.1) | 0 ± 84.714 (164.4) | | | | |

**Notes:**

Act + Unc (MDC) = Activity ± Uncertainty (Minimum Detectable Concentration)

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

Each of EPA 901.1, EPA 903.1, EPA 904.0 & EPA 908.0 are laboratory analysis methods.

**Table 1**

**Leachate Radionuclide Analytical Results**
**Second Quarter 2015 through Second Quarter 2017**
**Hakes C and D Landfill**
**Painted Post, New York**

| Parameter | Cell 8B Leachate | | |
|---|---|---|---|
| | 11/18/2016 | 5/4/2016 | 6/6/2017 |
| **Radionuclide Act + Unc (MDC) pCi/L** | | | |
| Actinium-228 (EPA 901.1) | 4.586 ± 15.790 (18.22) | 0 ± 15.389 (54.22) | 6.953 ± 102.350 (110.6) |
| Actinium-228, Dissolved (EPA 901.1) | 47.093 ± 73.980 (76.54) | 0.448 ± 34.301 (43.22) | 12.267 ± 9.673 (19.95) |
| Bismuth-212 (EPA 901.1) | 31.518 ± 54.776 (59.23) | 0 ± 73.084 (171.8) | 0 ± 81.230 (391.1) |
| Bismuth-212, Dissolved (EPA 901.1) | 0 ± 142.110 (286) | 23.229 ± 129.950 (152.9) | 0 ± 26.514 (75.19) |
| Bismuth-214 (EPA 901.1) | 10.19 ± 11.736 (12.56) | 0 ± 12.206 (26.3) | 6067.2 ± 653.720 (70.33) |
| Bismuth-214, Dissolved (EPA 901.1) | 3779.3 ± 407.970 (48.82) | 0 ± 9.677 (28.89) | 113.23 ± 18.794 (12.43) |
| Cesium-134 (EPA 901.1) | 0 ± 1.553 (5.413) | -3.016 ± 10.794 (12.16) | 2.72 ± 24.998 (27.3) |
| Cesium-134, Dissolved (EPA 901.1) | 0 ± 7.265 (22.76) | 0.569 ± 9.337 (10.78) | 1.167 ± 5.520 (5.334) |
| Cesium-137 (EPA 901.1) | 0.863 ± 4.064 (4.511) | 7.067 ± 6.059 (6.365) | 0 ± 15.721 (32.75) |
| Cesium-137, Dissolved (EPA 901.1) | 0 ± 5.201 (23.21) | -1.427 ± 10.640 (12.26) | -3.479 ± 5.542 (5.783) |
| Lead-212 (EPA 901.1) | 0 ± 4.168 (9.541) | 2.013 ± 16.195 (19.96) | 1621.7 ± 196.040 (66.02) |
| Lead-212, Dissolved (EPA 901.1) | 1005.6 ± 123.520 (41.77) | 10.6 ± 14.194 (17.14) | 37.763 ± 15.140 (9.644) |
| Lead-214 (EPA 901.1) | 11.641 ± 9.172 (10.6) | 0 ± 9.755 (21) | 6183.9 ± 666.770 (83.91) |
| Lead-214, Dissolved (EPA 901.1) | 3990.1 ± 429.570 (59.09) | 0 ± 11.947 (22.78) | 113.2 ± 16.304 (11.11) |
| Potassium-40 (EPA 901.1) | 17.429 ± 44.542 (53.76) | 0 ± 90.521 (192.2) | 204.12 ± 307.190 (305.2) |
| Potassium-40, Dissolved (EPA 901.1) | 0 ± 121.870 (261.7) | 0 ± 73.330 (192.2) | 153.87 ± 56.967 (51.02) |
| Radium-226 (EPA 901.1) | 0 ± 38.887 (122.7) | 0 ± 102.250 (256.4) | 32.493 ± 635.900 (770) |
| Radium-226 (EPA 903.1) | 0.0769 ± 0.351 (0.208) | 0.211 ± 0.774 (1.27) | 2.43 ± 2.24 (1.32) |
| Radium-226, Dissolved (EPA 901.1) | 254.23 ± 451.840 (540.6) | 0 ± 110.980 (240.1) | 44.007 ± 103.980 (128.6) |
| Radium-226, Dissolved (EPA 903.1) | 0.233 ± 0.355 (0.21) | 1.13 ± 0.622 (0.554) | 1.51 ± 1.00 (0.455) |
| Radium-228 (EPA 901.1) | 4.586 ± 15.790 (18.22) | 0 ± 15.389 (54.22) | 6.953 ± 102.350 (110.6) |
| Radium-228 (EPA 904.0) | 0.27 ± 0.378 (0.801) | 0.732 ± 0.475 (0.905) | 1.77 ± 1.34 (2.7) |
| Radium-228, Dissolved (EPA 901.1) | 47.093 ± 73.980 (76.54) | 0.448 ± 34.301 (43.22) | 12.267 ± 9.673 (19.95) |
| Radium-228, Dissolved (EPA 904.0) | 0.585 ± 0.461 (0.918) | 0.669 ± 0.465 (0.897) | 1.65 ± 0.611 (0.89) |
| Thallium-208 (EPA 901.1) | 0 ± 2.277 (5.75) | 0 ± 5.660 (12.82) | 0 ± 11.613 (37.38) |
| Thallium-208, Dissolved (EPA 901.1) | 0 ± 4.529 (26.23) | 0 ± 4.219 (10.49) | 4.204 ± 4.813 (5.453) |
| Thorium-232 (EPA 901.1) | 0 ± 4624.000 (10330) | -2043.6 ± 5291.000 (6465) | 194.63 ± 17777.000 (21420) |
| Thorium-232, Dissolved (EPA 901.1) | -2891.6 ± 12811.000 (15380) | 1621.9 ± 4696.100 (5768) | -4078.5 ± 8549.500 (10290) |
| Thorium-234 (EPA 901.1) | 161.38 ± 394.500 (501.3) | 0 ± 110.800 (360.7) | 0 ± 607.490 (1214) |
| Thorium-234, Dissolved (EPA 901.1) | 0 ± 451.110 (882.2) | 10.514 ± 271.710 (344.3) | 0 ± 153.520 (569.2) |
| Total Uranium (ASTM D5174-97) | 0.000612 ± 0.026 (0.385) | | 0.000866 ± 0.046 (0.385) |
| Total Uranium (EPA 908.0) | | 0.856 ± 0.445 (0.662) | |
| Total Uranium, Dissolved (ASTM D5174-97) | 0.000649 ± 0.024 (0.385) | | 0.000911 ± 0.047 (0.385) |
| Total Uranium, Dissolved (EPA 908.0) | | 1.48 ± 0.518 (0.588) | |
| Uranium-235 (EPA 901.1) | | | |
| Uranium-235, Dissolved (EPA 901.1) | | | |
| Uranium-238 (EPA 901.1) | | | |
| Uranium-238, Dissolved (EPA 901.1) | | | |

**Notes:**

Act + Unc (MDC) = Activity ± Uncertainty (Minimum Detectable Concentration)

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

Each of EPA 901.1, EPA 903.1, EPA 904.0 & EPA 908.0 are laboratory analysis methods.

# Groundwater Suppression and Leachate Sampling Field Form
## *On-Site Technical Services, Inc.*

**Project:** Hakes C&D Landfill, Painted Post, New York **Date:** 6-6-17

**Sampling Location:** Cell-3 **Sample ID:** Cell3-0617 **Arrival Time:** 1103

**Weather Conditions:**

Temp. 63 ° F ( ) Sunny ( ) Partly Cloudy (X) Cloudy ( ) Light Rain ( ) Hvy. Rain ( ) Snow

Wind Conditions: 0-5mph

**Location Type**

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

( ) Other _____

**Flow and Depth Information (as appropriate)**

Depth: _____ Estimated Flow: _____

Comments: _____

**Field Parameters (as appropriate)**

Meter: YSI (sn: 14J100804), Hach 2100P (sn: 12410)

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

Note: Turbidity measured from a vial grab sample

| Time | pH | Conductivity (us/cm) | Turbidity (ntu) | D.O. (mg/L) | Temp. ( °C ) | ORP (mV) |
|---|---|---|---|---|---|---|
| 1115 | 6.78 | 9085 | 69.2 | NA | 21.7 | -323.8 |
| | | | | | | |

**Sample Information**

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

Location Description/Condition: East Across road from MW-A Riser

Sample Collection Equipment/Method: Ded 5gal Bucket Sample Time: 1115

Sample Description (clarity\color): Slightly Cloudy light Amber Color Sample Odor (Y) or (N) Explain: leachate odor

Other Observations/Comments: _____

Analysis Requested: RAD Number of Containers: 10

Sampling Completion: Time 1137 Date 6-6-17 Samplers KDE

# Groundwater Suppression and Leachate Sampling Field Form
## *On-Site Technical Services, Inc.*

**Project:** Hakes C&D Landfill, Painted Post, New York **Date:** 6-6-17

**Sampling Location:** Cell 4 **Sample ID:** Cell 4-0617 **Arrival Time:** 1019

**Weather Conditions:**

Temp. 63 ° F ( ) Sunny ( ) Partly Cloudy (X) Cloudy ( ) Light Rain ( ) Hvy. Rain ( ) Snow

Wind Conditions: 0-5 mph

**Location Type**

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

( ) Other _____

**Flow and Depth Information (as appropriate)**

Depth: _____ Estimated Flow: _____

Comments: _____

**Field Parameters (as appropriate)**

Meter: YSI (sn: 14L100804 ), Hach 2100P (sn: 13410 )

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

Note: Turbidity measured from a vial grab sample

| Time | pH | Conductivity (us/cm) | Turbidity (ntu) | D.O. (mg/L) | Temp. (°C) | ORP (mV) |
|---|---|---|---|---|---|---|
| 1030 | 6.83 | 6304 | 14.7 | NA | 19.7 | 2.8 |
| | | | | | | |

**Sample Information**

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

Location Description/Condition: West Across Road From MW-6R

Sample Collection Equipment/Method: Ded Sgl Bucket Sample Time: 1030

Sample Description (clarity\color): Clear w/light Amber tint Sample Odor (Y) or (N) Explain: leachate odor

Other Observations/Comments: _____

Analysis Requested: RAD Number of Containers: 10

Sampling Completion: Time 1052 Date 6-6-17 Samplers K Dye

# Groundwater Suppression and Leachate Sampling Field Form
## *On-Site Technical Services, Inc.*

**Project:** Hakes C&D Landfill, Painted Post, New York **Date:** 6-6-17

**Sampling Location:** Cell-5 **Sample ID:** Cell5-0617 **Arrival Time:** 1142

**Weather Conditions:**

Temp. 67 ° F ( ) Sunny (X) Partly Cloudy ( ) Cloudy ( ) Light Rain ( ) Hvy. Rain ( ) Snow

Wind Conditions: 0-5mph

**Location Type**

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

( ) Other _____

**Flow and Depth Information (as appropriate)**

Depth: _____ Estimated Flow: _____

Comments: _____

**Field Parameters (as appropriate)**

Meter: YSI (sn: 14L100804), Hach 2100P (sn: 12410)

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

Note: Turbidity measured from a vial grab sample

| Time | pH | Conductivity (us/cm) | Turbidity (ntu) | D.O. (mg/L) | Temp. (°C) | ORP (mV) |
|---|---|---|---|---|---|---|
| ~~1145~~ 1155 | 6.79 | 6221 | 64.3 | NA | 21.9 | -205.9 |
| | | | | | | |

**Sample Information**

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

Location Description/Condition: Up road North of Cell-4

Sample Collection Equipment/Method: Ded S Bucket Sample Time: 1155

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

Other Observations/Comments: _____

Analysis Requested: RAD Number of Containers: 10

Sampling Completion: Time 1220 Date 6-6-17 Samplers KDyE

# Groundwater Suppression and Leachate Sampling Field Form
## *On-Site Technical Services, Inc.*

**Project:** Hakes C&D Landfill, Painted Post, New York **Date:** 6-6-17

**Sampling Location:** Cell-6 **Sample ID:** Cell6-0617 **Arrival Time:** 1224

**Weather Conditions:**

Temp. 69 ° F ( ) Sunny (X) Partly Cloudy ( ) Cloudy ( ) Light Rain ( ) Hvy. Rain ( ) Snow

Wind Conditions: 0-10mph

**Location Type**

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

( ) Other _____

**Flow and Depth Information (as appropriate)**

Depth: _____ Estimated Flow: _____

Comments: _____

**Field Parameters (as appropriate)**

Meter: YSI (sn: 14L100804), Hach 2100P (sn: 1241O)

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

Note: Turbidity measured from a vial grab sample

| Time | pH | Conductivity (us/cm) | Turbidity (ntu) | D.O. (mg/L) | Temp. ( °C ) | ORP (mV) |
|---|---|---|---|---|---|---|
| 1240 | 6.84 | 12178 | 67.1 | NA | 24.6 | -291.7 |
| | | | | | | |

**Sample Information**

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

Location Description/Condition: Next to GSS-6 Control Panel

Sample Collection Equipment/Method: Ded 5gal Bucket Sample Time: 1240

Sample Description (clarity\color): Cloudy with black tint Sample Odor (Y) or (N) Explain: leachate odor

Other Observations/Comments: _____

Analysis Requested: RAD Number of Containers: 10

Sampling Completion: Time 1308 Date 6-6-17 Samplers KRyE

# Groundwater Suppression and Leachate Sampling Field Form
## *On-Site Technical Services, Inc.*

**Project:** Hakes C&D Landfill, Painted Post, New York **Date:** 6-6-17

**Sampling Location:** Cell-8B **Sample ID:** Cell8B-0617 **Arrival Time:** 0940

**Weather Conditions:**

Temp. 61° F (X) Sunny ( ) Partly Cloudy ( ) Cloudy ( ) Light Rain ( ) Hvy. Rain ( ) Snow

Wind Conditions: 0-5 mph

**Location Type**

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

( ) Other _____

**Flow and Depth Information (as appropriate)**

Depth: NA Estimated Flow: _____

Comments: _____

**Field Parameters (as appropriate)**

Meter: YSI (sn: 14L100804), Hach 2100P (sn: 12410)

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

Note: Turbidity measured from a vial grab sample

| Time | pH | Conductivity (us/cm) | Turbidity (ntu) | D.O. (mg/L) | Temp. (°C) | ORP (mV) |
|---|---|---|---|---|---|---|
| 1000 | 6.74 | 5306 | 38.4 | NA | 22.0 | -257.4 |
| | | | | | | |

**Sample Information**

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

Location Description/Condition: North of MW-J across road

Sample Collection Equipment/Method: Ded 5 gal Bucket Sample Time: 1000

Sample Description (clarity\color): Light Amber tint Sample Odor (Y) or (N) Explain: leachate odor

Other Observations/Comments: _____

Analysis Requested: RAD Number of Containers: 10

Sampling Completion: Time 1015 Date 6-6-17 Samplers KDE

June 29, 2017 Service Request No:R1705111

Mr. Lance Stevens
Casella Waste Systems
4376 Manning Ridge Road
Painted Post, NY 14870

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

Dear Mr.Stevens,

Enclosed are the results of the sample(s) submitted to our laboratory June 07, 2017
For your reference, these analyses have been assigned our service request number **R1705111.**

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

CC: Jon Brandes

ADDRESS 1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
PHONE +1 585 288 5380 | FAX +1 585 288 8475
ALS Group USA, Corp.
dba ALS Environmental

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# Table of Contents

# 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

1565 Jefferson Rd, Building 300, Rochester, NY 14623 | 585-288-5380 | www.alsglobal.com

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

**Service Request:**R1705111
**Date Received:**6/7/17

## 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

Five Water samples were received for analysis at ALS Environmental on 06/07/2017. 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 ≤6°C upon receipt at the lab except for aqueous samples designated for metals analyses, which are stored at room temperature.

**Subcontracted Analytical Parameters:**

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

Approved by _____ Date 6/29/2017

# 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) **Service Request:**R1705111
**Project:** Hakes C&D Landfill - Leachate RAD.

## SAMPLE CROSS-REFERENCE

| SAMPLE # | CLIENT SAMPLE ID | DATE | TIME |
|---|---|---|---|
| R1705111-001 | Cell 8B - 0617 | 6/6/2017 | 1000 |
| R1705111-002 | Cell 8B - 0617 Dissolved | 6/6/2017 | 1000 |
| R1705111-003 | Cell 4 - 0617 | 6/6/2017 | 1030 |
| R1705111-004 | Cell 4 - 0617 Dissolved | 6/6/2017 | 1030 |
| R1705111-005 | Cell 3 - 0617 | 6/6/2017 | 1115 |
| R1705111-006 | Cell 3 - 0617 Dissolved | 6/6/2017 | 1115 |
| R1705111-007 | Cell 5 - 0617 | 6/6/2017 | 1155 |
| R1705111-008 | Cell 5 - 0617 Dissolved | 6/6/2017 | 1155 |
| R1705111-009 | Cell 6 - 0617 | 6/6/2017 | 1240 |
| R1705111-010 | Cell 6 - 0617 Dissolved | 6/6/2017 | 1240 |

# CHAIN of CUSTODY

Page 1 of 1

ALS-Environmental
1565 Jefferson Rd, Bldg 300, Suite 360
Rochester, NY 14623
585.288.5380

Client: **Casella/On-Site**
4376 Manning Ridge Road
Painted Post, NY 14870

Project Manager: **Lance Stevens/Jon Brandes**

Project: **Hakes C&D Landfill - Leachate RAD.**

Telephone No.: 585-593-1824

Email: jonb@on-sitehs.com

Method of Shipment: FED EX

Special Detection Limit/Reporting

PDF to Lance and On-Site, and EDD to On-Site.

| Sample I.D. | Lab Sample No. | No. of Containers | Matrix: Soil | Water | Air | Other | Prsv.: Yes | No | Sampling Date | Sampling Time | Total: Gamma Spec (901.1), Ra-226 (903.1), Ra-228 (904.0) (HNO3). | | Total: Uranium (908.0) (HNO3). | Dissolved: Gamma Spec (901.1), Ra-226 (903.1), Ra-228 (904.0) | | Dissolved: Uranium (908.0) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cell8B-0617 | | 10 | | X | | | X | X | 6-6-17 | 1000 | X | X | X | X | X | X |
| Cell4-0617 | | 10 | | X | | | X | X | 6-6-17 | 1030 | X | X | X | X | X | X |
| Cell3-0617 | | 10 | | X | | | X | X | 6-6-17 | 1115 | X | X | X | X | X | X |
| Cell5-0617 | | 10 | | X | | | X | X | 6-6-17 | 1155 | X | X | X | X | X | X |
| Cell6-0617 | | 10 | | X | | | X | X | 6-6-17 | 1240 | X | X | X | X | X | X |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| **Note: Dissolved analysis requires lab filtering** | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |

REMARKS

Sample Received Intact: Yes No

Temperature received: Ice No ice

| Relinq. by sampler (Sign & Print Name) | Date | Time | Received by (Sign & Print Name) |
|---|---|---|---|
| Kevin Dye / Kevin Dye | 6-6-17 | 1500 | |
| Relinquished by | Date | Time | Received by |
| Relinquished by | Date | Time | Received by |
| Relinquished by | Date | Time | Received by laboratory: Date 6/7/17 Time |

Lab Work No.

R1705111 5
Casella Waste Systems
Hakes C&D Landfill - Leachate RAD.

# Cooler Receipt and Preservation Check Form

R1705111 5
Casella Waste Systems
Hakes C&D Landfill - Leachate RAD.

Project/Client Casella Folder Number R1705111

Cooler received on 6/7/17 by: @

**COURIER:** ALS UPS (FEDEX) VELOCITY CLIENT

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

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

8. Temperature Readings Date: 6/7/17 Time: 0905 ID: (IR#7) IR#8 From: ~~Temp Blank~~ (Sample Bottle)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Observed Temp (°C) | 5.2 | 5.8 | 2.1 | 1.5 | 3.5 | 2.0 | |
| Correction Factor (°C) | – | – | +0.9 | → | → | → | |
| Corrected Temp (°C) | 5.2 | 5.8 | 3.0 | 2.4 | 4.4 | 2.9 | |
| Temp from:Type of bottle | – | – | Cub tube | → | → | → | |
| Within 0-6°C? | (Y) N | (Y) N | (Y) N | (Y) N | (Y) N | (Y) N | Y N |
| If <0°C, were samples frozen? | Y N | Y N | Y N | Y N | Y N | Y N | Y N |

**If out of Temperature, note packing/ice condition:** _____ Ice melted Poorly Packed Same Day Rule

**&Client Approval to Run Samples:** _____ Standing Approval Client aware at drop-off Client notified by: _____

All samples held in storage location: IR-ROC by @ on 6/7/17 at ~~0905~~ 0914
5035 samples placed in storage location: _____ by _____ on _____ at _____

Cooler Breakdown: Date: 6-7-17 Time: 12:35 by: RE

| | | | | |
|---|---|---|---|---|
| 9. | Were all bottle labels complete (*i.e.* analysis, preservation, etc.)? | YES | NO | |
| 10. | Did all bottle labels and tags agree with custody papers? | YES | NO | |
| 11. | Were correct containers used for the tests indicated? | YES | NO | |
| 12. | Were 5035 vials acceptable (no extra labels, not leaking)? | YES | NO | N/A |
| 13. | Air Samples: Cassettes / Tubes Intact | Canisters Pressurized | Tedlar® Bags Inflated | N/A |

| pH | Lot of test paper | Reagent | Preserved? Yes | Preserved? No | Lot Received | Exp | Sample ID | Vol. Added | Lot Added | Final pH |
|---|---|---|---|---|---|---|---|---|---|---|
| ≥12 | | NaOH | | | | | | | | |
| ≤2 | | $HNO_3$ | | | | | | | | |
| ≤2 | | $H_2SO_4$ | | | | | | | | |
| <4 | | $NaHSO_4$ | | | | | | | | |
| Residual Chlorine (-) | | For CN Phenol and 522 | | | If +, contact PM to add $Na_2S_2O_3$ (CN), ascorbic (phenol). | | | | | |
| | | $Na_2S_2O_3$ | - | - | | | | | | |
| | | ZnAcetate | - | - | | | | | | |
| | | HCl | ** | ** | | | | | | |

**Not to be tested before analysis – pH tested and recorded by VOAs on a separate worksheet

Bottle lot numbers: _____

Explain all Discrepancies/ Other Comments:

| | |
|---|---|
| CLRES | BULK |
| DO | FLDT |
| HPROD | HGFB |
| HTR | LL3541 |
| PH | (SUB) |
| SO3 | MARRS |
| ALS | REV |

Labels secondary reviewed by: RE

PC Secondary Review: JMS 6/8/17

*significant air bubbles: VOA > 5-6 mm : WC >1 in. diameter

**ALS Group USA, Corp.**
**dba ALS Environmental**

**Internal Chain of Custody Report**

**Client:** Casella Waste Systems **Service Request:** R1705111
**Project:** Hakes C&D Landfill - Leachate RAD.

| Bottle ID | Methods | Date | Time | Sample Location / User | Disposed On |
|---|---|---|---|---|---|
| **R1705111-001.01** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-001.02** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-001.03** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-001.04** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-001.05** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-002.01** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-002.02** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-002.03** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-002.04** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-002.05** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |

**ALS Group USA, Corp.**
**dba ALS Environmental**

**Internal Chain of Custody Report**

**Client:** Casella Waste Systems **Service Request:** R1705111
**Project:** Hakes C&D Landfill - Leachate RAD.

| Bottle ID | Methods | Date | Time | Sample Location / User | Disposed On |
|---|---|---|---|---|---|
| **R1705111-003.01** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-003.02** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-003.03** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-003.04** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-003.05** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-004.01** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-004.02** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-004.03** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-004.04** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-004.05** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |

**ALS Group USA, Corp.**
**dba ALS Environmental**

**Internal Chain of Custody Report**

**Client:** Casella Waste Systems **Service Request:** R1705111
**Project:** Hakes C&D Landfill - Leachate RAD.

| Bottle ID | Methods | Date | Time | Sample Location / User | Disposed On |
|---|---|---|---|---|---|
| **R1705111-005.01** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-005.02** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-005.03** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-005.04** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-005.05** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-006.01** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-006.02** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-006.03** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-006.04** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-006.05** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |

**ALS Group USA, Corp.**
**dba ALS Environmental**

**Internal Chain of Custody Report**

**Client:** Casella Waste Systems **Service Request:** R1705111
**Project:** Hakes C&D Landfill - Leachate RAD.

| Bottle ID | Methods | Date | Time | Sample Location / User | Disposed On |
|---|---|---|---|---|---|
| **R1705111-007.01** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-007.02** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-007.03** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-007.04** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-007.05** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-008.01** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-008.02** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-008.03** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-008.04** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-008.05** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |

**ALS Group USA, Corp.**
**dba ALS Environmental**

**Internal Chain of Custody Report**

**Client:** Casella Waste Systems **Service Request:** R1705111
**Project:** Hakes C&D Landfill - Leachate RAD.

| Bottle ID | Methods | Date | Time | Sample Location / User | Disposed On |
|---|---|---|---|---|---|
| **R1705111-009.01** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-009.02** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-009.03** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-009.04** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-009.05** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-010.01** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-010.02** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-010.03** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-010.04** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |
| **R1705111-010.05** | | | | | |
| | | 6/7/2017 | 1239 | SMO / GESMERIAN | |
| | | 6/7/2017 | 1240 | SUBBED / GESMERIAN | |

# 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 ñNotesò 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 ñimmediateò 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% (25% for CLP) difference between the two GC columns. |
| C | Confirmed by GC/MS |
| Q | DoD reports: indicates a pesticide/Aroclor is not confirmed (Ó100% Difference between two GC columns). |
| X | See Case Narrative for discussion. |
| MRL<br>LOQ | Method Reporting Limit. Also known as:<br>Limit of Quantitation (LOQ)<br>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. |

ACCREDITED IN ACCORDANCE WITH nelac

**Rochester Lab ID # for State Certifications[1]**

| | | |
|---|---|---|
| Connecticut ID # PH0556 | Maine ID #NY0032 | New Hampshire ID # 294100 A/B |
| Delaware Accredited | Nebraska Accredited | |
| DoD ELAP #65817 | New Jersey ID # NY004 | Pennsylvania ID# 68-786 |
| Florida ID # E87674 | New York ID # 10145 | Rhode Island ID # 158 |
| Illinois ID #200047 | North Carolina #676 | Virginia #460167 |

[1] Analyses were performed according to our laboratoryôs 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 http://www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads/North-America-Downloads

# 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. |

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

**Water/Liquid Matrix**

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

**Solid/Soil/Non-Aqueous Matrix**

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

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

# Subcontracted Analytical Parameters

**ALS Environmental—Rochester Laboratory**
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**Pace Analytical Services, LLC**
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

June 29, 2017

Ms. Janice Jaeger
ALS Environmental Columbia
1565 Jefferson Road
Building 300
Rochester, NY 14623

RE: Project: R1705111
Pace Project No.: 30221031

Dear Ms. Jaeger:
Enclosed are the analytical results for sample(s) received by the laboratory on June 08, 2017. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

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

Sincerely,

Carin A. Ferris

Carin Ferris
carin.ferris@pacelabs.com
724-850-5615
Project Manager

Enclosures

**Pace Analytical Services, LLC**
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(724)850-5600

## CERTIFICATIONS

Project: R1705111
Pace Project No.: 30221031

**Pennsylvania Certification IDs**

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
L-A-B DOD-ELAP Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification
Connecticut Certification #: PH-0694
Delaware Certification
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: 90133
Louisiana DHH/TNI Certification #: LA140008
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: PA00091
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification
Missouri Certification #: 235
Montana Certification #: Cert 0082
Nebraska Certification #: NE-05-29-14
Nevada Certification #: PA014572015-1
New Hampshire/TNI Certification #: 2976
New Jersey/TNI Certification #: PA 051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Oregon/TNI Certification #: PA200002
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: TN2867
Texas/TNI Certification #: T104704188-14-8
Utah/TNI Certification #: PA014572015-5
USDA Soil Permit #: P330-14-00213
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 460198
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Certification
Wyoming Certification #: 8TMS-L

**Pace Analytical Services, LLC**
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(724)850-5600

## SAMPLE SUMMARY

Project: R1705111
Pace Project No.: 30221031

| Lab ID | Sample ID | Matrix | Date Collected | Date Received |
|---|---|---|---|---|
| **30221031001** | **Cell 8B - 0617** | Water | 06/06/17 10:00 | 06/08/17 10:15 |
| **30221031002** | **Cell 8B - 0617 Dissolved** | Water | 06/06/17 10:00 | 06/08/17 10:15 |
| **30221031003** | **Cell 4 - 0617** | Water | 06/06/17 10:30 | 06/08/17 10:15 |
| **30221031004** | **Cell 4 - 0617 Dissolved** | Water | 06/06/17 10:30 | 06/08/17 10:15 |
| **30221031005** | **Cell 3 - 0617** | Water | 06/06/17 11:15 | 06/08/17 10:15 |
| **30221031006** | **Cell 3 - 0617 Dissolved** | Water | 06/06/17 11:15 | 06/08/17 10:15 |
| **30221031007** | **Cell 5 - 0617** | Water | 06/06/17 11:55 | 06/08/17 10:15 |
| **30221031008** | **Cell 5 - 0617 Dissolved** | Water | 06/06/17 11:55 | 06/08/17 10:15 |
| **30221031009** | **Cell 6 - 0617** | Water | 06/06/17 12:40 | 06/08/17 10:15 |
| **30221031010** | **Cell 6 - 0617 Dissolved** | Water | 06/06/17 12:40 | 06/08/17 10:15 |

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## SAMPLE ANALYTE COUNT

Project: R1705111
Pace Project No.: 30221031

| Lab ID | Sample ID | Method | Analysts | Analytes Reported |
|---|---|---|---|---|
| **30221031001** | **Cell 8B - 0617** | EPA 901.1 | MAH | 13 |
| | | EPA 903.1 | WRR | 1 |
| | | EPA 904.0 | VAL | 1 |
| | | ASTM D5174-97 | RMK | 1 |
| **30221031002** | **Cell 8B - 0617 Dissolved** | EPA 901.1 | MAH | 13 |
| | | EPA 903.1 | WRR | 1 |
| | | EPA 904.0 | JLW | 1 |
| | | ASTM D5174-97 | RMK | 1 |
| **30221031003** | **Cell 4 - 0617** | EPA 901.1 | MAH | 13 |
| | | EPA 903.1 | WRR | 1 |
| | | EPA 904.0 | VAL | 1 |
| | | ASTM D5174-97 | RMK | 1 |
| **30221031004** | **Cell 4 - 0617 Dissolved** | EPA 901.1 | MAH | 13 |
| | | EPA 903.1 | WRR | 1 |
| | | EPA 904.0 | JLW | 1 |
| | | ASTM D5174-97 | RMK | 1 |
| **30221031005** | **Cell 3 - 0617** | EPA 901.1 | MAH | 13 |
| | | EPA 903.1 | WRR | 1 |
| | | EPA 904.0 | VAL | 1 |
| | | ASTM D5174-97 | RMK | 1 |
| **30221031006** | **Cell 3 - 0617 Dissolved** | EPA 901.1 | MAH | 13 |
| | | EPA 903.1 | WRR | 1 |
| | | EPA 904.0 | JLW | 1 |
| | | ASTM D5174-97 | RMK | 1 |
| **30221031007** | **Cell 5 - 0617** | EPA 901.1 | MAH | 13 |
| | | EPA 903.1 | WRR | 1 |
| | | EPA 904.0 | VAL | 1 |
| | | ASTM D5174-97 | RMK | 1 |
| **30221031008** | **Cell 5 - 0617 Dissolved** | EPA 901.1 | MAH | 13 |
| | | EPA 903.1 | WRR | 1 |
| | | EPA 904.0 | JLW | 1 |
| | | ASTM D5174-97 | RMK | 1 |
| **30221031009** | **Cell 6 - 0617** | EPA 901.1 | MAH | 13 |
| | | EPA 903.1 | WRR | 1 |
| | | EPA 904.0 | VAL | 1 |
| | | ASTM D5174-97 | RMK | 1 |
| **30221031010** | **Cell 6 - 0617 Dissolved** | EPA 901.1 | MAH | 13 |

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## SAMPLE ANALYTE COUNT

Project: R1705111
Pace Project No.: 30221031

| Lab ID | Sample ID | Method | Analysts | Analytes Reported |
|---|---|---|---|---|
| | | EPA 903.1 | WRR | 1 |
| | | EPA 904.0 | JLW | 1 |
| | | ASTM D5174-97 | RMK | 1 |

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## PROJECT NARRATIVE

Project: R1705111
Pace Project No.: 30221031

**Method:** **EPA 901.1**
**Description:** 901.1 Gamma Spec
**Client:** ALS Environmental Columbia
**Date:** June 29, 2017

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

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

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

**Laboratory Control Spike:**
All laboratory control spike compounds were within QC limits with any exceptions noted below.

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

**Additional Comments:**

**Pace Analytical Services, LLC**
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## PROJECT NARRATIVE

Project: R1705111
Pace Project No.: 30221031

**Method:** **EPA 903.1**
**Description:** 903.1 Radium 226
**Client:** ALS Environmental Columbia
**Date:** June 29, 2017

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

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

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

**Laboratory Control Spike:**
All laboratory control spike compounds were within QC limits with any exceptions noted below.

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

**Additional Comments:**

**Pace Analytical Services, LLC**
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## PROJECT NARRATIVE

Project: R1705111
Pace Project No.: 30221031

**Method:** **EPA 903.1**
**Description:** 903.1 Radium 226, Dissolved
**Client:** ALS Environmental Columbia
**Date:** June 29, 2017

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

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

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

**Laboratory Control Spike:**
All laboratory control spike compounds were within QC limits with any exceptions noted below.

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

**Additional Comments:**

**Pace Analytical Services, LLC**
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## PROJECT NARRATIVE

Project: R1705111
Pace Project No.: 30221031

**Method:** **EPA 904.0**
**Description:** 904.0 Radium 228
**Client:** ALS Environmental Columbia
**Date:** June 29, 2017

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

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

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

**Laboratory Control Spike:**
All laboratory control spike compounds were within QC limits with any exceptions noted below.

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

**Additional Comments:**

**Pace Analytical Services, LLC**
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## PROJECT NARRATIVE

Project: R1705111
Pace Project No.: 30221031

**Method:** **EPA 904.0**
**Description:** 904.0 Radium 228, Dissolved
**Client:** ALS Environmental Columbia
**Date:** June 29, 2017

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

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

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

**Laboratory Control Spike:**
All laboratory control spike compounds were within QC limits with any exceptions noted below.

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

**Additional Comments:**

**Pace Analytical Services, LLC**
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(724)850-5600

## PROJECT NARRATIVE

Project: R1705111
Pace Project No.: 30221031

**Method:** **ASTM D5174-97**
**Description:** D517497 Total Uranium KPA
**Client:** ALS Environmental Columbia
**Date:** June 29, 2017

**General Information:**
10 samples were analyzed for ASTM D5174-97. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

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

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

**Laboratory Control Spike:**
All laboratory control spike compounds were within QC limits with any exceptions noted below.

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

**Additional Comments:**

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

Pace Analytical Services, LLC
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Greensburg, PA 15601
(724)850-5600

## ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: R1705111
Pace Project No.: 30221031

**Sample: Cell 8B - 0617** **Lab ID: 30221031001** Collected: 06/06/17 10:00 Received: 06/08/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • Upon receipt at the laboratory, 12 mls of nitric acid were added to the sample to meet the sample preservation requirement of pH <2 for radiochemistry analysis.

| Parameters | Method | Act ± Unc (MDC) Carr Trac | Units | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|
| Actinium-228 | EPA 901.1 | **6.953 ± 102.350 (110.600) C:NA T:NA** | pCi/L | 06/27/17 16:05 | 14331-83-0 | |
| Bismuth-212 | EPA 901.1 | **0.000 ± 81.230 (391.100) C:NA T:NA** | pCi/L | 06/27/17 16:05 | 14913-49-6 | |
| Bismuth-214 | EPA 901.1 | **6067.200 ± 653.720 (70.330) C:NA T:NA** | pCi/L | 06/27/17 16:05 | 14733-03-0 | |
| Cesium-134 | EPA 901.1 | **2.720 ± 24.998 (27.300) C:NA T:NA** | pCi/L | 06/27/17 16:05 | 13967-70-9 | |
| Cesium-137 | EPA 901.1 | **0.000 ± 15.721 (32.750) C:NA T:NA** | pCi/L | 06/27/17 16:05 | 10045-97-3 | |
| Lead-212 | EPA 901.1 | **1621.700 ± 196.040 (66.020) C:NA T:NA** | pCi/L | 06/27/17 16:05 | 15092-94-1 | |
| Lead-214 | EPA 901.1 | **6183.900 ± 666.770 (83.910) C:NA T:NA** | pCi/L | 06/27/17 16:05 | 15067-28-4 | |
| Potassium-40 | EPA 901.1 | **204.120 ± 307.190 (305.200) C:NA T:NA** | pCi/L | 06/27/17 16:05 | 13966-00-2 | |
| Radium-226 | EPA 901.1 | **32.493 ± 635.900 (770.000) C:NA T:NA** | pCi/L | 06/27/17 16:05 | 13982-63-3 | |
| Radium-228 | EPA 901.1 | **6.953 ± 102.350 (110.600) C:NA T:NA** | pCi/L | 06/27/17 16:05 | 15262-20-1 | |
| Thallium-208 | EPA 901.1 | **0.000 ± 11.613 (37.380) C:NA T:NA** | pCi/L | 06/27/17 16:05 | 14913-50-9 | |
| Thorium-232 | EPA 901.1 | **194.630 ± 17777.000 (21420.000) C:NA T:NA** | pCi/L | 06/27/17 16:05 | 7440-29-1 | |
| Thorium-234 | EPA 901.1 | **0.000 ± 607.490 (1214.000) C:NA T:NA** | pCi/L | 06/27/17 16:05 | 15065-10-8 | |
| Radium-226 | EPA 903.1 | **2.43 ± 2.24 (1.32) C:NA T:30%** | pCi/L | 06/19/17 13:09 | 13982-63-3 | |
| Radium-228 | EPA 904.0 | **1.77 ± 1.34 (2.70) C:69% T:49%** | pCi/L | 06/23/17 15:47 | 15262-20-1 | |
| Total Uranium | ASTM D5174-97 | **0.866 ± 0.046 (0.385) C:NA T:NA** | ug/L | 06/28/17 17:02 | 7440-61-1 | |

**Sample: Cell 8B - 0617 Dissolved** **Lab ID: 30221031002** Collected: 06/06/17 10:00 Received: 06/08/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:

| Parameters | Method | Act ± Unc (MDC) Carr Trac | Units | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|
| Actinium-228 | EPA 901.1 | **12.267 ± 9.673 (19.950) C:NA T:NA** | pCi/L | 06/27/17 17:08 | 14331-83-0 | |
| Bismuth-212 | EPA 901.1 | **0.000 ± 26.514 (75.190) C:NA T:NA** | pCi/L | 06/27/17 17:08 | 14913-49-6 | |
| Bismuth-214 | EPA 901.1 | **113.230 ± 18.794 (12.430) C:NA T:NA** | pCi/L | 06/27/17 17:08 | 14733-03-0 | |
| Cesium-134 | EPA 901.1 | **1.167 ± 5.520 (5.334) C:NA T:NA** | pCi/L | 06/27/17 17:08 | 13967-70-9 | |
| Cesium-137 | EPA 901.1 | **-3.479 ± 5.542 (5.783) C:NA T:NA** | pCi/L | 06/27/17 17:08 | 10045-97-3 | |
| Lead-212 | EPA 901.1 | **37.763 ± 15.140 (9.644) C:NA T:NA** | pCi/L | 06/27/17 17:08 | 15092-94-1 | |
| Lead-214 | EPA 901.1 | **113.200 ± 16.304 (11.110) C:NA T:NA** | pCi/L | 06/27/17 17:08 | 15067-28-4 | |

## REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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## ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: R1705111
Pace Project No.: 30221031

**Sample: Cell 8B - 0617 Dissolved** **Lab ID: 30221031002** Collected: 06/06/17 10:00 Received: 06/08/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:

| Parameters | Method | Act ± Unc (MDC) Carr Trac | Units | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|
| Potassium-40 | EPA 901.1 | **153.870 ± 56.967 (51.020) C:NA T:NA** | pCi/L | 06/27/17 17:08 | 13966-00-2 | |
| Radium-226 | EPA 901.1 | **44.007 ± 103.980 (128.600) C:NA T:NA** | pCi/L | 06/27/17 17:08 | 13982-63-3 | |
| Radium-228 | EPA 901.1 | **12.267 ± 9.673 (19.950) C:NA T:NA** | pCi/L | 06/27/17 17:08 | 15262-20-1 | |
| Thallium-208 | EPA 901.1 | **4.204 ± 4.813 (5.453) C:NA T:NA** | pCi/L | 06/27/17 17:08 | 14913-50-9 | |
| Thorium-232 | EPA 901.1 | **-4078.500 ± 8549.500 (10290.000) C:NA T:NA** | pCi/L | 06/27/17 17:08 | 7440-29-1 | |
| Thorium-234 | EPA 901.1 | **0.000 ± 153.520 (569.200) C:NA T:NA** | pCi/L | 06/27/17 17:08 | 15065-10-8 | |
| Radium-226, Dissolved | EPA 903.1 | **1.51 ± 1.00 (0.455) C:NA T:82%** | pCi/L | 06/21/17 13:36 | 13982-63-3 | |
| Radium-228, Dissolved | EPA 904.0 | **1.65 ± 0.611 (0.890) C:76% T:79%** | pCi/L | 06/21/17 11:25 | 15262-20-1 | |
| Total Uranium | ASTM D5174-97 | **0.911 ± 0.047 (0.385) C:NA T:NA** | ug/L | 06/28/17 17:04 | 7440-61-1 | |

**Sample: Cell 4 - 0617** **Lab ID: 30221031003** Collected: 06/06/17 10:30 Received: 06/08/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • Upon receipt at the laboratory, 12 mls of nitric acid were added to the sample to meet the sample preservation requirement of pH <2 for radiochemistry analysis.

| Parameters | Method | Act ± Unc (MDC) Carr Trac | Units | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|
| Actinium-228 | EPA 901.1 | **8.678 ± 11.881 (18.840) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 14331-83-0 | |
| Bismuth-212 | EPA 901.1 | **31.323 ± 45.410 (47.800) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 14913-49-6 | |
| Bismuth-214 | EPA 901.1 | **22.837 ± 9.837 (9.001) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 14733-03-0 | |
| Cesium-134 | EPA 901.1 | **0.500 ± 4.213 (4.603) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 13967-70-9 | |
| Cesium-137 | EPA 901.1 | **-0.025 ± 3.741 (4.245) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 10045-97-3 | |
| Lead-212 | EPA 901.1 | **1.701 ± 8.079 (9.900) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 15092-94-1 | |
| Lead-214 | EPA 901.1 | **8.983 ± 9.319 (11.850) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 15067-28-4 | |
| Potassium-40 | EPA 901.1 | **129.880 ± 46.728 (45.370) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 13966-00-2 | |
| Radium-226 | EPA 901.1 | **0.000 ± 69.468 (136.500) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 13982-63-3 | |
| Radium-228 | EPA 901.1 | **8.678 ± 11.881 (18.840) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 15262-20-1 | |
| Thallium-208 | EPA 901.1 | **3.167 ± 4.550 (5.039) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 14913-50-9 | |
| Thorium-232 | EPA 901.1 | **-1264.300 ± 7708.100 (9538.000) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 7440-29-1 | |
| Thorium-234 | EPA 901.1 | **161.600 ± 369.400 (464.000) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 15065-10-8 | |

## REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: R1705111
Pace Project No.: 30221031

**Sample: Cell 4 - 0617** **Lab ID: 30221031003** Collected: 06/06/17 10:30 Received: 06/08/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • Upon receipt at the laboratory, 12 mls of nitric acid were added to the sample to meet the sample preservation requirement of pH <2 for radiochemistry analysis.

| Parameters | Method | Act ± Unc (MDC) Carr Trac | Units | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|
| Radium-226 | EPA 903.1 | **2.58 ± 1.51 (1.79) C:NA T:71%** | pCi/L | 06/19/17 13:08 | 13982-63-3 | |
| Radium-228 | EPA 904.0 | **2.72 ± 0.892 (1.26) C:73% T:80%** | pCi/L | 06/23/17 15:47 | 15262-20-1 | |
| Total Uranium | ASTM D5174-97 | **0.764 ± 0.029 (0.385) C:NA T:NA** | ug/L | 06/28/17 17:06 | 7440-61-1 | |

**Sample: Cell 4 - 0617 Dissolved** **Lab ID: 30221031004** Collected: 06/06/17 10:30 Received: 06/08/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:

| Parameters | Method | Act ± Unc (MDC) Carr Trac | Units | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|
| Actinium-228 | EPA 901.1 | **0.000 ± 26.996 (53.580) C:NA T:NA** | pCi/L | 06/27/17 17:09 | 14331-83-0 | |
| Bismuth-212 | EPA 901.1 | **0.000 ± 72.210 (189.800) C:NA T:NA** | pCi/L | 06/27/17 17:09 | 14913-49-6 | |
| Bismuth-214 | EPA 901.1 | **2475.400 ± 266.380 (30.100) C:NA T:NA** | pCi/L | 06/27/17 17:09 | 14733-03-0 | |
| Cesium-134 | EPA 901.1 | **0.000 ± 5.572 (13.480) C:NA T:NA** | pCi/L | 06/27/17 17:09 | 13967-70-9 | |
| Cesium-137 | EPA 901.1 | **0.000 ± 2.460 (12.960) C:NA T:NA** | pCi/L | 06/27/17 17:09 | 10045-97-3 | |
| Lead-212 | EPA 901.1 | **295.320 ± 41.236 (28.580) C:NA T:NA** | pCi/L | 06/27/17 17:09 | 15092-94-1 | |
| Lead-214 | EPA 901.1 | **2549.100 ± 273.010 (30.860) C:NA T:NA** | pCi/L | 06/27/17 17:09 | 15067-28-4 | |
| Potassium-40 | EPA 901.1 | **210.600 ± 135.230 (134.500) C:NA T:NA** | pCi/L | 06/27/17 17:09 | 13966-00-2 | |
| Radium-226 | EPA 901.1 | **0.000 ± 193.920 (356.400) C:NA T:NA** | pCi/L | 06/27/17 17:09 | 13982-63-3 | |
| Radium-228 | EPA 901.1 | **0.000 ± 26.996 (53.580) C:NA T:NA** | pCi/L | 06/27/17 17:09 | 15262-20-1 | |
| Thallium-208 | EPA 901.1 | **0.000 ± 6.890 (15.520) C:NA T:NA** | pCi/L | 06/27/17 17:09 | 14913-50-9 | |
| Thorium-232 | EPA 901.1 | **-2380.500 ± 8049.000 (9653.000) C:NA T:NA** | pCi/L | 06/27/17 17:09 | 7440-29-1 | |
| Thorium-234 | EPA 901.1 | **89.479 ± 439.130 (527.900) C:NA T:NA** | pCi/L | 06/27/17 17:09 | 15065-10-8 | |
| Radium-226, Dissolved | EPA 903.1 | **2.57 ± 1.30 (0.436) C:NA T:92%** | pCi/L | 06/21/17 13:36 | 13982-63-3 | |
| Radium-228, Dissolved | EPA 904.0 | **3.88 ± 0.957 (0.821) C:79% T:82%** | pCi/L | 06/21/17 11:25 | 15262-20-1 | |
| Total Uranium | ASTM D5174-97 | **0.711 ± 0.033 (0.385) C:NA T:NA** | ug/L | 06/28/17 17:08 | 7440-61-1 | |

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## ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: R1705111
Pace Project No.: 30221031

**Sample: Cell 3 - 0617** **Lab ID: 30221031005** Collected: 06/06/17 11:15 Received: 06/08/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • Upon receipt at the laboratory, 12 mls of nitric acid were added to the sample to meet the sample preservation requirement of pH <2 for radiochemistry analysis.

| Parameters | Method | Act ± Unc (MDC) Carr Trac | Units | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|
| Actinium-228 | EPA 901.1 | **37.525 ± 65.041 (71.440) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 14331-83-0 | |
| Bismuth-212 | EPA 901.1 | **35.408 ± 196.270 (221.000) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 14913-49-6 | |
| Bismuth-214 | EPA 901.1 | **2162.400 ± 243.650 (42.680) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 14733-03-0 | |
| Cesium-134 | EPA 901.1 | **0.000 ± 5.685 (21.840) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 13967-70-9 | |
| Cesium-137 | EPA 901.1 | **1.637 ± 16.714 (18.720) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 10045-97-3 | |
| Lead-212 | EPA 901.1 | **405.460 ± 77.374 (40.770) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 15092-94-1 | |
| Lead-214 | EPA 901.1 | **1690.300 ± 193.770 (80.080) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 15067-28-4 | |
| Potassium-40 | EPA 901.1 | **129.630 ± 218.020 (226.400) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 13966-00-2 | |
| Radium-226 | EPA 901.1 | **132.620 ± 384.790 (469.500) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 13982-63-3 | |
| Radium-228 | EPA 901.1 | **37.525 ± 65.041 (71.440) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 15262-20-1 | |
| Thallium-208 | EPA 901.1 | **0.000 ± 10.451 (24.020) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 14913-50-9 | |
| Thorium-232 | EPA 901.1 | **3973.600 ± 10832.000 (13060.000) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 7440-29-1 | |
| Thorium-234 | EPA 901.1 | **119.930 ± 619.240 (752.300) C:NA T:NA** | pCi/L | 06/28/17 11:24 | 15065-10-8 | |
| Radium-226 | EPA 903.1 | **2.85 ± 1.53 (0.552) C:NA T:70%** | pCi/L | 06/19/17 13:09 | 13982-63-3 | |
| Radium-228 | EPA 904.0 | **3.90 ± 1.30 (1.88) C:67% T:64%** | pCi/L | 06/23/17 15:47 | 15262-20-1 | |
| Total Uranium | ASTM D5174-97 | **2.51 ± 0.127 (0.385) C:NA T:NA** | ug/L | 06/28/17 17:11 | 7440-61-1 | |

**Sample: Cell 3 - 0617 Dissolved** **Lab ID: 30221031006** Collected: 06/06/17 11:15 Received: 06/08/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:

| Parameters | Method | Act ± Unc (MDC) Carr Trac | Units | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|
| Actinium-228 | EPA 901.1 | **0.000 ± 10.788 (18.930) C:NA T:NA** | pCi/L | 06/29/17 09:29 | 14331-83-0 | |
| Bismuth-212 | EPA 901.1 | **0.000 ± 31.352 (64.850) C:NA T:NA** | pCi/L | 06/29/17 09:29 | 14913-49-6 | |
| Bismuth-214 | EPA 901.1 | **64.221 ± 13.485 (10.560) C:NA T:NA** | pCi/L | 06/29/17 09:29 | 14733-03-0 | |
| Cesium-134 | EPA 901.1 | **2.105 ± 3.133 (4.385) C:NA T:NA** | pCi/L | 06/29/17 09:29 | 13967-70-9 | |
| Cesium-137 | EPA 901.1 | **-2.202 ± 4.723 (4.966) C:NA T:NA** | pCi/L | 06/29/17 09:29 | 10045-97-3 | |
| Lead-212 | EPA 901.1 | **4.075 ± 5.714 (7.888) C:NA T:NA** | pCi/L | 06/29/17 09:29 | 15092-94-1 | |
| Lead-214 | EPA 901.1 | **48.159 ± 13.024 (11.740) C:NA T:NA** | pCi/L | 06/29/17 09:29 | 15067-28-4 | |

## REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: R1705111
Pace Project No.: 30221031

**Sample: Cell 3 - 0617 Dissolved** **Lab ID: 30221031006** Collected: 06/06/17 11:15 Received: 06/08/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:

| Parameters | Method | Act ± Unc (MDC) Carr Trac | Units | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|
| Potassium-40 | EPA 901.1 | **163.990 ± 66.366 (54.830) C:NA T:NA** | pCi/L | 06/29/17 09:29 | 13966-00-2 | |
| Radium-226 | EPA 901.1 | **19.146 ± 84.796 (108.700) C:NA T:NA** | pCi/L | 06/29/17 09:29 | 13982-63-3 | |
| Radium-228 | EPA 901.1 | **0.000 ± 10.788 (18.930) C:NA T:NA** | pCi/L | 06/29/17 09:29 | 15262-20-1 | |
| Thallium-208 | EPA 901.1 | **2.794 ± 4.492 (4.558) C:NA T:NA** | pCi/L | 06/29/17 09:29 | 14913-50-9 | |
| Thorium-232 | EPA 901.1 | **3383.000 ± 7122.000 (8586.000) C:NA T:NA** | pCi/L | 06/29/17 09:29 | 7440-29-1 | |
| Thorium-234 | EPA 901.1 | **62.960 ± 78.827 (488.500) C:NA T:NA** | pCi/L | 06/29/17 09:29 | 15065-10-8 | |
| Radium-226, Dissolved | EPA 903.1 | **1.75 ± 1.10 (0.473) C:NA T:74%** | pCi/L | 06/21/17 13:36 | 13982-63-3 | |
| Radium-228, Dissolved | EPA 904.0 | **3.25 ± 0.960 (1.15) C:80% T:61%** | pCi/L | 06/21/17 11:25 | 15262-20-1 | |
| Total Uranium | ASTM D5174-97 | **3.59 ± 0.156 (0.385) C:NA T:NA** | ug/L | 06/28/17 17:18 | 7440-61-1 | |

**Sample: Cell 5 - 0617** **Lab ID: 30221031007** Collected: 06/06/17 11:55 Received: 06/08/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • Upon receipt at the laboratory, 12 mls of nitric acid were added to the sample to meet the sample preservation requirement of pH <2 for radiochemistry analysis.

| Parameters | Method | Act ± Unc (MDC) Carr Trac | Units | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|
| Actinium-228 | EPA 901.1 | **0.000 ± 7.662 (20.810) C:NA T:NA** | pCi/L | 06/28/17 12:31 | 14331-83-0 | |
| Bismuth-212 | EPA 901.1 | **0.000 ± 30.517 (67.340) C:NA T:NA** | pCi/L | 06/28/17 12:31 | 14913-49-6 | |
| Bismuth-214 | EPA 901.1 | **40.987 ± 11.091 (8.763) C:NA T:NA** | pCi/L | 06/28/17 12:31 | 14733-03-0 | |
| Cesium-134 | EPA 901.1 | **1.467 ± 3.817 (4.083) C:NA T:NA** | pCi/L | 06/28/17 12:31 | 13967-70-9 | |
| Cesium-137 | EPA 901.1 | **-0.102 ± 4.476 (4.993) C:NA T:NA** | pCi/L | 06/28/17 12:31 | 10045-97-3 | |
| Lead-212 | EPA 901.1 | **7.976 ± 14.760 (10.290) C:NA T:NA** | pCi/L | 06/28/17 12:31 | 15092-94-1 | |
| Lead-214 | EPA 901.1 | **31.945 ± 11.578 (10.130) C:NA T:NA** | pCi/L | 06/28/17 12:31 | 15067-28-4 | |
| Potassium-40 | EPA 901.1 | **132.780 ± 49.874 (46.860) C:NA T:NA** | pCi/L | 06/28/17 12:31 | 13966-00-2 | |
| Radium-226 | EPA 901.1 | **18.509 ± 98.768 (124.100) C:NA T:NA** | pCi/L | 06/28/17 12:31 | 13982-63-3 | |
| Radium-228 | EPA 901.1 | **0.000 ± 7.662 (20.810) C:NA T:NA** | pCi/L | 06/28/17 12:31 | 15262-20-1 | |
| Thallium-208 | EPA 901.1 | **0.000 ± 2.190 (6.381) C:NA T:NA** | pCi/L | 06/28/17 12:31 | 14913-50-9 | |
| Thorium-232 | EPA 901.1 | **-2397.000 ± 8099.700 (9950.000) C:NA T:NA** | pCi/L | 06/28/17 12:31 | 7440-29-1 | |
| Thorium-234 | EPA 901.1 | **0.000 ± 212.310 (505.700) C:NA T:NA** | pCi/L | 06/28/17 12:31 | 15065-10-8 | |

## REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: R1705111
Pace Project No.: 30221031

**Sample: Cell 5 - 0617** **Lab ID: 30221031007** Collected: 06/06/17 11:55 Received: 06/08/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • Upon receipt at the laboratory, 12 mls of nitric acid were added to the sample to meet the sample preservation requirement of pH <2 for radiochemistry analysis.

| Parameters | Method | Act ± Unc (MDC) Carr Trac | Units | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|
| Radium-226 | EPA 903.1 | **1.35 ± 1.30 (1.87) C:NA T:87%** | pCi/L | 06/19/17 13:09 | 13982-63-3 | |
| Radium-228 | EPA 904.0 | **1.32 ± 0.846 (1.64) C:62% T:85%** | pCi/L | 06/23/17 15:47 | 15262-20-1 | |
| Total Uranium | ASTM D5174-97 | **0.733 ± 0.034 (0.385) C:NA T:NA** | ug/L | 06/28/17 17:21 | 7440-61-1 | |

**Sample: Cell 5 - 0617 Dissolved** **Lab ID: 30221031008** Collected: 06/06/17 11:55 Received: 06/08/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:

| Parameters | Method | Act ± Unc (MDC) Carr Trac | Units | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|
| Actinium-228 | EPA 901.1 | **11.148 ± 16.458 (16.640) C:NA T:NA** | pCi/L | 06/28/17 16:11 | 14331-83-0 | |
| Bismuth-212 | EPA 901.1 | **23.217 ± 62.770 (60.750) C:NA T:NA** | pCi/L | 06/28/17 16:11 | 14913-49-6 | |
| Bismuth-214 | EPA 901.1 | **15.948 ± 9.449 (8.905) C:NA T:NA** | pCi/L | 06/28/17 16:11 | 14733-03-0 | |
| Cesium-134 | EPA 901.1 | **2.276 ± 4.549 (4.221) C:NA T:NA** | pCi/L | 06/28/17 16:11 | 13967-70-9 | |
| Cesium-137 | EPA 901.1 | **0.274 ± 4.280 (4.579) C:NA T:NA** | pCi/L | 06/28/17 16:11 | 10045-97-3 | |
| Lead-212 | EPA 901.1 | **1.188 ± 5.691 (8.065) C:NA T:NA** | pCi/L | 06/28/17 16:11 | 15092-94-1 | |
| Lead-214 | EPA 901.1 | **8.424 ± 8.783 (9.561) C:NA T:NA** | pCi/L | 06/28/17 16:11 | 15067-28-4 | |
| Potassium-40 | EPA 901.1 | **110.430 ± 53.662 (50.040) C:NA T:NA** | pCi/L | 06/28/17 16:11 | 13966-00-2 | |
| Radium-226 | EPA 901.1 | **12.579 ± 103.520 (119.400) C:NA T:NA** | pCi/L | 06/28/17 16:11 | 13982-63-3 | |
| Radium-228 | EPA 901.1 | **11.148 ± 16.458 (16.640) C:NA T:NA** | pCi/L | 06/28/17 16:11 | 15262-20-1 | |
| Thallium-208 | EPA 901.1 | **1.525 ± 4.526 (4.652) C:NA T:NA** | pCi/L | 06/28/17 16:11 | 14913-50-9 | |
| Thorium-232 | EPA 901.1 | **4675.100 ± 4366.500 (7076.000) C:NA T:NA** | pCi/L | 06/28/17 16:11 | 7440-29-1 | |
| Thorium-234 | EPA 901.1 | **96.497 ± 139.230 (414.400) C:NA T:NA** | pCi/L | 06/28/17 16:11 | 15065-10-8 | |
| Radium-226, Dissolved | EPA 903.1 | **0.898 ± 0.933 (1.39) C:NA T:95%** | pCi/L | 06/21/17 13:36 | 13982-63-3 | |
| Radium-228, Dissolved | EPA 904.0 | **2.42 ± 0.699 (0.785) C:80% T:83%** | pCi/L | 06/21/17 11:25 | 15262-20-1 | |
| Total Uranium | ASTM D5174-97 | **0.797 ± 0.036 (0.385) C:NA T:NA** | ug/L | 06/28/17 17:23 | 7440-61-1 | |

## REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: R1705111
Pace Project No.: 30221031

**Sample: Cell 6 - 0617** **Lab ID: 30221031009** Collected: 06/06/17 12:40 Received: 06/08/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • Upon receipt at the laboratory, 12 mls of nitric acid were added to the sample to meet the sample preservation requirement of pH <2 for radiochemistry analysis.

| Parameters | Method | Act ± Unc (MDC) Carr Trac | Units | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|
| Actinium-228 | EPA 901.1 | **3.444 ± 16.759 (18.840) C:NA T:NA** | pCi/L | 06/28/17 13:50 | 14331-83-0 | |
| Bismuth-212 | EPA 901.1 | **28.150 ± 56.478 (60.370) C:NA T:NA** | pCi/L | 06/28/17 13:50 | 14913-49-6 | |
| Bismuth-214 | EPA 901.1 | **8.261 ± 9.579 (12.720) C:NA T:NA** | pCi/L | 06/28/17 13:50 | 14733-03-0 | |
| Cesium-134 | EPA 901.1 | **0.000 ± 0.965 (5.210) C:NA T:NA** | pCi/L | 06/28/17 13:50 | 13967-70-9 | |
| Cesium-137 | EPA 901.1 | **1.041 ± 3.824 (4.245) C:NA T:NA** | pCi/L | 06/28/17 13:50 | 10045-97-3 | |
| Lead-212 | EPA 901.1 | **3.325 ± 7.019 (8.608) C:NA T:NA** | pCi/L | 06/28/17 13:50 | 15092-94-1 | |
| Lead-214 | EPA 901.1 | **1.957 ± 8.850 (10.700) C:NA T:NA** | pCi/L | 06/28/17 13:50 | 15067-28-4 | |
| Potassium-40 | EPA 901.1 | **216.580 ± 52.598 (40.140) C:NA T:NA** | pCi/L | 06/28/17 13:50 | 13966-00-2 | |
| Radium-226 | EPA 901.1 | **8.462 ± 102.230 (128.400) C:NA T:NA** | pCi/L | 06/28/17 13:50 | 13982-63-3 | |
| Radium-228 | EPA 901.1 | **3.444 ± 16.759 (18.840) C:NA T:NA** | pCi/L | 06/28/17 13:50 | 15262-20-1 | |
| Thallium-208 | EPA 901.1 | **0.412 ± 4.491 (5.228) C:NA T:NA** | pCi/L | 06/28/17 13:50 | 14913-50-9 | |
| Thorium-232 | EPA 901.1 | **3529.600 ± 6603.800 (8070.000) C:NA T:NA** | pCi/L | 06/28/17 13:50 | 7440-29-1 | |
| Thorium-234 | EPA 901.1 | **0.000 ± 238.760 (515.500) C:NA T:NA** | pCi/L | 06/28/17 13:50 | 15065-10-8 | |
| Radium-226 | EPA 903.1 | **2.75 ± 1.80 (1.84) C:NA T:59%** | pCi/L | 06/19/17 13:28 | 13982-63-3 | |
| Radium-228 | EPA 904.0 | **2.40 ± 1.04 (1.77) C:77% T:58%** | pCi/L | 06/23/17 15:47 | 15262-20-1 | |
| Total Uranium | ASTM D5174-97 | **1.12 ± 0.039 (0.385) C:NA T:NA** | ug/L | 06/28/17 17:25 | 7440-61-1 | |

**Sample: Cell 6 - 0617 Dissolved** **Lab ID: 30221031010** Collected: 06/06/17 12:40 Received: 06/08/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:

| Parameters | Method | Act ± Unc (MDC) Carr Trac | Units | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|
| Actinium-228 | EPA 901.1 | **0.000 ± 15.628 (36.200) C:NA T:NA** | pCi/L | 06/28/17 16:12 | 14331-83-0 | |
| Bismuth-212 | EPA 901.1 | **0.000 ± 39.340 (126.700) C:NA T:NA** | pCi/L | 06/28/17 16:12 | 14913-49-6 | |
| Bismuth-214 | EPA 901.1 | **411.440 ± 51.257 (18.350) C:NA T:NA** | pCi/L | 06/28/17 16:12 | 14733-03-0 | |
| Cesium-134 | EPA 901.1 | **0.000 ± 3.379 (9.980) C:NA T:NA** | pCi/L | 06/28/17 16:12 | 13967-70-9 | |
| Cesium-137 | EPA 901.1 | **0.000 ± 1.039 (10.470) C:NA T:NA** | pCi/L | 06/28/17 16:12 | 10045-97-3 | |
| Lead-212 | EPA 901.1 | **10.857 ± 9.656 (14.800) C:NA T:NA** | pCi/L | 06/28/17 16:12 | 15092-94-1 | |
| Lead-214 | EPA 901.1 | **442.990 ± 53.175 (19.810) C:NA T:NA** | pCi/L | 06/28/17 16:12 | 15067-28-4 | |

## REPORT OF LABORATORY ANALYSIS

**Pace Analytical Services, LLC**
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

## ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: R1705111
Pace Project No.: 30221031

**Sample: Cell 6 - 0617 Dissolved** **Lab ID: 30221031010** Collected: 06/06/17 12:40 Received: 06/08/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:

| Parameters | Method | Act ± Unc (MDC) Carr Trac | Units | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|
| Potassium-40 | EPA 901.1 | **266.490 ± 95.889 (93.960) C:NA T:NA** | pCi/L | 06/28/17 16:12 | 13966-00-2 | |
| Radium-226 | EPA 901.1 | **0.000 ± 110.140 (207.100) C:NA T:NA** | pCi/L | 06/28/17 16:12 | 13982-63-3 | |
| Radium-228 | EPA 901.1 | **0.000 ± 15.628 (36.200) C:NA T:NA** | pCi/L | 06/28/17 16:12 | 15262-20-1 | |
| Thallium-208 | EPA 901.1 | **0.000 ± 6.558 (11.150) C:NA T:NA** | pCi/L | 06/28/17 16:12 | 14913-50-9 | |
| Thorium-232 | EPA 901.1 | **2714.000 ± 4543.300 (5446.000) C:NA T:NA** | pCi/L | 06/28/17 16:12 | 7440-29-1 | |
| Thorium-234 | EPA 901.1 | **11.694 ± 258.590 (314.300) C:NA T:NA** | pCi/L | 06/28/17 16:12 | 15065-10-8 | |
| Radium-226, Dissolved | EPA 903.1 | **2.34 ± 1.21 (1.01) C:NA T:97%** | pCi/L | 06/21/17 13:40 | 13982-63-3 | |
| Radium-228, Dissolved | EPA 904.0 | **2.07 ± 0.649 (0.807) C:78% T:84%** | pCi/L | 06/21/17 11:25 | 15262-20-1 | |
| Total Uranium | ASTM D5174-97 | **1.05 ± 0.047 (0.385) C:NA T:NA** | ug/L | 06/28/17 17:28 | 7440-61-1 | |

## REPORT OF LABORATORY ANALYSIS

**Pace Analytical Services, LLC**
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

## QUALITY CONTROL - RADIOCHEMISTRY

Project: R1705111
Pace Project No.: 30221031

QC Batch: 262651 Analysis Method: EPA 901.1
QC Batch Method: EPA 901.1 Analysis Description: 901.1 Gamma Spec
Associated Lab Samples: 30221031001, 30221031002, 30221031003, 30221031004, 30221031005, 30221031006, 30221031007, 30221031008

METHOD BLANK: 1293446 Matrix: Water
Associated Lab Samples: 30221031001, 30221031002, 30221031003, 30221031004, 30221031005, 30221031006, 30221031007, 30221031008

| Parameter | Act ± Unc (MDC) Carr Trac | Units | Analyzed | Qualifiers |
|---|---|---|---|---|
| Actinium-228 | 0.000 ± 2.322 (19.660) C:NA T:NA | pCi/L | 06/23/17 10:57 | |
| Bismuth-212 | 0.000 ± 18.516 (66.610) C:NA T:NA | pCi/L | 06/23/17 10:57 | |
| Bismuth-214 | 7.060 ± 12.359 (10.250) C:NA T:NA | pCi/L | 06/23/17 10:57 | |
| Cesium-134 | 2.533 ± 4.199 (4.335) C:NA T:NA | pCi/L | 06/23/17 10:57 | |
| Cesium-137 | 0.380 ± 4.261 (4.752) C:NA T:NA | pCi/L | 06/23/17 10:57 | |
| Lead-212 | 14.235 ± 12.532 (7.797) C:NA T:NA | pCi/L | 06/23/17 10:57 | |
| Lead-214 | 9.976 ± 18.903 (9.549) C:NA T:NA | pCi/L | 06/23/17 10:57 | |
| Potassium-40 | 20.562 ± 42.770 (50.630) C:NA T:NA | pCi/L | 06/23/17 10:57 | |
| Radium-226 | 15.071 ± 101.970 (126.200) C:NA T:NA | pCi/L | 06/23/17 10:57 | |
| Radium-228 | 0.000 ± 2.322 (19.660) C:NA T:NA | pCi/L | 06/23/17 10:57 | |
| Thallium-208 | 0.000 ± 2.326 (5.204) C:NA T:NA | pCi/L | 06/23/17 10:57 | |
| Thorium-232 | 3453.000 ± 7376.200 (9053.000) C:NA T:NA | pCi/L | 06/23/17 10:57 | |
| Thorium-234 | 0.000 ± 273.690 (544.800) C:NA T:NA | pCi/L | 06/23/17 10:57 | |

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## REPORT OF LABORATORY ANALYSIS

**Pace Analytical Services, LLC**
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

## QUALITY CONTROL - RADIOCHEMISTRY

Project: R1705111
Pace Project No.: 30221031

QC Batch: 261653 Analysis Method: EPA 904.0
QC Batch Method: EPA 904.0 Analysis Description: 904.0 Radium 228, Dissolved
Associated Lab Samples: 30221031002, 30221031004, 30221031006, 30221031008, 30221031010

METHOD BLANK: 1288484 Matrix: Water
Associated Lab Samples: 30221031002, 30221031004, 30221031006, 30221031008, 30221031010

| Parameter | Act ± Unc (MDC) Carr Trac | Units | Analyzed | Qualifiers |
|---|---|---|---|---|
| Radium-228, Dissolved | 0.00309 ± 0.299 (0.695) C:79% T:89% | pCi/L | 06/21/17 11:23 | |

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## REPORT OF LABORATORY ANALYSIS

**Pace Analytical Services, LLC**
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

## QUALITY CONTROL - RADIOCHEMISTRY

Project: R1705111
Pace Project No.: 30221031

QC Batch: 263462 Analysis Method: EPA 901.1
QC Batch Method: EPA 901.1 Analysis Description: 901.1 Gamma Spec
Associated Lab Samples: 30221031009, 30221031010

METHOD BLANK: 1297752 Matrix: Water
Associated Lab Samples: 30221031009, 30221031010

| Parameter | Act ± Unc (MDC) Carr Trac | Units | Analyzed | Qualifiers |
|---|---|---|---|---|
| Actinium-228 | 0.000 ± 6.503 (37.220) C:NA T:NA | pCi/L | 06/28/17 12:48 | |
| Bismuth-212 | 24.332 ± 104.170 (122.300) C:NA T:NA | pCi/L | 06/28/17 12:48 | |
| Bismuth-214 | 0.000 ± 9.226 (28.060) C:NA T:NA | pCi/L | 06/28/17 12:48 | |
| Cesium-134 | 0.000 ± 0.942 (9.769) C:NA T:NA | pCi/L | 06/28/17 12:48 | |
| Cesium-137 | 0.000 ± 3.454 (7.980) C:NA T:NA | pCi/L | 06/28/17 12:48 | |
| Lead-212 | 0.000 ± 9.207 (17.220) C:NA T:NA | pCi/L | 06/28/17 12:48 | |
| Lead-214 | 0.000 ± 8.852 (17.860) C:NA T:NA | pCi/L | 06/28/17 12:48 | |
| Potassium-40 | 36.283 ± 92.405 (125.900) C:NA T:NA | pCi/L | 06/28/17 12:48 | |
| Radium-226 | 0.000 ± 102.870 (219.900) C:NA T:NA | pCi/L | 06/28/17 12:48 | |
| Radium-228 | 0.000 ± 6.503 (37.220) C:NA T:NA | pCi/L | 06/28/17 12:48 | |
| Thallium-208 | 2.674 ± 7.570 (9.549) C:NA T:NA | pCi/L | 06/28/17 12:48 | |
| Thorium-232 | 1654.300 ± 4237.100 (5211.000) C:NA T:NA | pCi/L | 06/28/17 12:48 | |
| Thorium-234 | 0.000 ± 153.600 (321.200) C:NA T:NA | pCi/L | 06/28/17 12:48 | |

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## REPORT OF LABORATORY ANALYSIS

**Pace Analytical Services, LLC**
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

## QUALITY CONTROL - RADIOCHEMISTRY

Project: R1705111
Pace Project No.: 30221031

QC Batch: 261517 Analysis Method: EPA 903.1
QC Batch Method: EPA 903.1 Analysis Description: 903.1 Radium-226
Associated Lab Samples: 30221031001, 30221031003, 30221031005, 30221031007, 30221031009

METHOD BLANK: 1287920 Matrix: Water
Associated Lab Samples: 30221031001, 30221031003, 30221031005, 30221031007, 30221031009

| Parameter | Act ± Unc (MDC) Carr Trac | Units | Analyzed | Qualifiers |
|---|---|---|---|---|
| Radium-226 | 0.127 ± 0.351 (0.681) C:NA T:89% | pCi/L | 06/19/17 12:14 | |

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## REPORT OF LABORATORY ANALYSIS

**Pace Analytical Services, LLC**
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

## QUALITY CONTROL - RADIOCHEMISTRY

Project: R1705111
Pace Project No.: 30221031

QC Batch: 262259 Analysis Method: ASTM D5174-97
QC Batch Method: ASTM D5174-97 Analysis Description: D5174.97 Total Uranium KPA
Associated Lab Samples: 30221031001, 30221031002, 30221031003, 30221031004, 30221031005, 30221031006, 30221031007, 30221031008, 30221031009, 30221031010

METHOD BLANK: 1291808 Matrix: Water
Associated Lab Samples: 30221031001, 30221031002, 30221031003, 30221031004, 30221031005, 30221031006, 30221031007, 30221031008, 30221031009, 30221031010

| Parameter | Act ± Unc (MDC) Carr Trac | Units | Analyzed | Qualifiers |
|---|---|---|---|---|
| Total Uranium | 0.087 ± 0.004 (0.193) C:NA T:NA | ug/L | 06/28/17 16:47 | |

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## REPORT OF LABORATORY ANALYSIS

**Pace Analytical Services, LLC**
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

## QUALITY CONTROL - RADIOCHEMISTRY

Project: R1705111
Pace Project No.: 30221031

QC Batch: 261651 Analysis Method: EPA 903.1
QC Batch Method: EPA 903.1 Analysis Description: 903.1 Radium-226, Dissolved
Associated Lab Samples: 30221031002, 30221031004, 30221031006, 30221031008, 30221031010

METHOD BLANK: 1288482 Matrix: Water
Associated Lab Samples: 30221031002, 30221031004, 30221031006, 30221031008, 30221031010

| Parameter | Act ± Unc (MDC) Carr Trac | Units | Analyzed | Qualifiers |
|---|---|---|---|---|
| Radium-226, Dissolved | 0.0531 ± 0.242 (0.144) C:NA T:97% | pCi/L | 06/21/17 13:22 | |

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## REPORT OF LABORATORY ANALYSIS

**Pace Analytical Services, LLC**
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

## QUALITY CONTROL - RADIOCHEMISTRY

Project: R1705111
Pace Project No.: 30221031

QC Batch: 261754 Analysis Method: EPA 904.0
QC Batch Method: EPA 904.0 Analysis Description: 904.0 Radium 228
Associated Lab Samples: 30221031001, 30221031003, 30221031005, 30221031007, 30221031009

METHOD BLANK: 1288829 Matrix: Water
Associated Lab Samples: 30221031001, 30221031003, 30221031005, 30221031007, 30221031009

| Parameter | Act ± Unc (MDC) Carr Trac | Units | Analyzed | Qualifiers |
|---|---|---|---|---|
| Radium-228 | 0.690 ± 0.358 (0.620) C:77% T:86% | pCi/L | 06/23/17 11:51 | |

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## REPORT OF LABORATORY ANALYSIS

**Pace Analytical Services, LLC**
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

## QUALIFIERS

Project: R1705111
Pace Project No.: 30221031

**DEFINITIONS**

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

ND - Not Detected at or above adjusted reporting limit.

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

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

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

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

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

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

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

Act - Activity

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

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

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

TNI - The NELAC Institute.

# ALS Environmental Chain of Custody

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

ALS Contact: Janice Jaeger

**Project Number:** R1705111
**Project Manager:** Janice Jaeger
**QAP:** LAB QAP

WO#: 30221031

30221031

| Lab Code | Sample ID | # of Cont. | Matrix | Date | Time | Lab ID | Gamma Spec 901.1 | Nat U 908.0 | Radium 226 903.1 | Radium 228 904.0 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| R1705111-001 | Cell 8B - 0617 | 5 | Water | 6/6/17 | 1000 | Pace PA | X | X | X | X | 001 |
| R1705111-002 | Cell 8B - 0617 Dissolved | 5 | Water | 6/6/17 | 1000 | Pace PA | X | X | X | X | 002 |
| R1705111-003 | Cell 4 - 0617 | 5 | Water | 6/6/17 | 1030 | Pace PA | X | X | X | X | 003 |
| R1705111-004 | Cell 4 - 0617 Dissolved | 5 | Water | 6/6/17 | 1030 | Pace PA | X | X | X | X | 004 |
| R1705111-005 | Cell 3 - 0617 | 5 | Water | 6/6/17 | 1115 | Pace PA | X | X | X | X | 005 |
| R1705111-006 | Cell 3 - 0617 Dissolved | 5 | Water | 6/6/17 | 1115 | Pace PA | X | X | X | X | 006 |
| R1705111-007 | Cell 5 - 0617 | 5 | Water | 6/6/17 | 1155 | Pace PA | X | X | X | X | 007 |
| R1705111-008 | Cell 5 - 0617 Dissolved | 5 | Water | 6/6/17 | 1155 | Pace PA | X | X | X | X | 008 |
| R1705111-009 | Cell 6 - 0617 | 5 | Water | 6/6/17 | 1240 | Pace PA | X | X | X | X | 009 |
| R1705111-010 | Cell 6 - 0617 Dissolved | 5 | Water | 6/6/17 | 1240 | Pace PA | X | X | X | X | 010 |

30221031

**Special Instructions/Comments**

NPDES

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

**Turnaround Requirements**

____ **RUSH** (Surcharges Apply)

**PLEASE CIRCLE WORK DAYS**

1 2 3 4 5

____ **STANDARD**

Requested FAX Date: _____

Requested Report Date: 06/16/17

**Report Requirements**

____ I. Results Only

____ II. Results + QC Summaries

____ III. Results + QC and Calibration Summaries

X IV. Data Validation Report with Raw Data

PQL/MDL/J N

EDD Y

**Invoice Information**

PO# 58R1705111

Bill to

Relinquished By: 6-7-17 13:05

Received By: Alyna R Muchmay Pace 6/8/17 1015

Airbill Number:

# ALS Environmental Chain of Custody

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

ALS Contact: Janice Jaeger

**Project Number:** R1705111
**Project Manager:** Janice Jaeger
**QAP:** LAB QAP

**Folder Comments:**
Gamma Isotope list Rad 226&228,Actinium 228,Bismuth 212&214,Cesium 134&137,Lead 212&214,Potssium 40,Thallium 208 & Thorium 232&234



30221031

| Special Instructions/Comments | Turnaround Requirements | Report Requirements | Invoice Information |
|---|---|---|---|
| NPDES<br><br>H - Test is On Hold P - Test is Authorized for Prep Only | ____RUSH (Surcharges Apply)<br>PLEASE CIRCLE WORK DAYS<br>1 2 3 4 5<br>____ STANDARD<br>Requested FAX Date: _____<br>Requested Report Date: 06/16/17 | ____ I. Results Only<br>____ II. Results + QC Summaries<br>____ III. Results + QC and Calibration Summaries<br>____ IV. Data Validation Report with Raw Data<br>PQL/MDL/J N<br>EDD Y | PO# 58R1705111<br>Bill to |

Relinquished By: 6-7-17 13:05 Received By: Airbill Number:

6/8/17 1005

# ALS Environmental Chain of Custody

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

ALS Contact: Janice Jaeger

**Project Number:** R1705111
**Project Manager:** Janice Jaeger
**QAP:** LAB QAP

**R1705111**

48 of 49

____ **Ship To: Pace PA**
Pace Analytical Services
1638 Roseytown Road
Suites 2,3, & 4
Greensburg, PA 15601

**Instructions:**

| | |
|---|---|
| Ice | X |
| Dry Ice | |
| No Ice | |

**Shipping:**

| | |
|---|---|
| Overnight | X |
| 2nd Day | |
| Ground | |

PC ____ Date ____
SMO JE Date 6-7-17

Bill to Client Account ____

30221031

Comments:



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

# Sample Condition Upon Receipt Pittsburgh

Pace Analytical

Client Name: MS Project # 30221031 -3

Courier: ☒ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace Other _____

Tracking #: 682680203222

Custody Seal on Cooler/Box Present: ☐ yes ☒ no Seals intact: ☐ yes ☐ no

Thermometer Used N/A Type of Ice: Wet Blue (None)

Cooler Temperature Observed Temp — °C Correction Factor: — °C Final Temp: — °C

Temp should be above freezing to 6°C

Date and initials of person examining contents: ARM 6/8/17

| Comments: | Yes | No | N/A | |
|---|---|---|---|---|
| Chain of Custody Present: | ✓ | | | 1. |
| Chain of Custody Filled Out: | ✓ | | | 2. |
| Chain of Custody Relinquished: | ✓ | | | 3. |
| Sampler Name & Signature on COC: | | ✓ | | 4. |
| Sample Labels match COC: -Includes date/time/ID Matrix: WT | ✓ | | | 5. |
| Samples Arrived within Hold Time: | ✓ | | | 6. |
| Short Hold Time Analysis (<72hr remaining): | | ✓ | | 7. |
| Rush Turn Around Time Requested: | | ✓ | | 8. |
| Sufficient Volume: | ✓ | | | 9. |
| Correct Containers Used: -Pace Containers Used: | ✓ | | | 10. |
| Containers Intact: | ✓ | | | 11. |
| Orthophosphate field filtered | | | | 12. |
| Organic Samples checked for dechlorination: | | | ✓ | 13. |
| Filtered volume received for Dissolved tests | | | ✓ | 14. Samples 002, 004, 006, 008, 010 need filtered before preservation |
| All containers have been checked for preservation. | ✓ | | | 15. Added 12mL HNO3 to samples 001, 003, 005, 007 and 009 bottles. pH<2 |
| All containers needing preservation are found to be in compliance with EPA recommendation. | | ✓ | | |
| exceptions: VOA, coliform, TOC, O&G, Phenolics | | | | Initial when completed: ARM Date/time of preservation: 6/8/17 1630 |
| | | | | Lot # of added preservative: DL17-0625 |
| Headspace in VOA Vials ( >6mm): | | | ✓ | 16. |
| Trip Blank Present: | | | ✓ | 17. |
| Trip Blank Custody Seals Present | | | ✓ | |
| Rad Aqueous Samples Screened > 0.5 mrem/hr | | ✓ | | Initial when completed: ARM Date: 6/8/17 |

**Client Notification/ Resolution:**

Person Contacted: _____ Date/Time: _____ Contacted By: _____

Comments/ Resolution: _____

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

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

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