ZION STATION RESTORATION PROJECT
FINAL STATUS SURVEY RELEASE RECORD

SE CORNER OF EXCLUSION AREA - LAKESHORE

SURVEY UNIT 10220H

REVISION 1

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LIST OF ACRONYMS AND ABBREVIATIONS

ALARA	As Low As Reasonably Achievable
AMCG	Average Member of the Critical Group
BcDCGL	Base Case DCGLs
BcSOF	Base Case Sum of Fractions
C/LT	Characterization/License Termination
cpm	Counts per minute
DQO	Data Quality Objective
DCGL	Derived Concentration Guideline Level
EMC	Elevated Measurement Comparison
FSS	Final Status Survey
GPS	Global Positioning System
HTD	Hard-to-Detect
HSA	Historical Site Assessment
IC	Insignificant Contributor
LBGR	Lower Bound of the Gray Region
LTP	License Termination Plan
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	Minimum Detectable Concentration
MDCR	Minimum Detectable Count Rate
NAD	North American Datum
NaI	Sodium Iodide
OpDCGL	Operational Derived Concentration Guideline Level
OpSOF	Operational Sum of Fractions
QC	Quality Control
RE	Radiological Engineer
ROC	Radionuclides of Concern
SOF	Sum of Fractions
TEDE	Total Effective Dose Equivalent

TSD	Technical Support Document
UBGR	Upper Bound of the Gray Region
VSP	Visual Sample Plan
ZNPS	Zion Nuclear Power Station
ZSRP	Zion Station Restoration Project

1. EXECUTIVE SUMMARY

This Final Status Survey (FSS) Release Record for Survey Unit 10220H, "SE Corner of Exclusion Area – Lakeshore," has been generated for the Zion Station Restoration Project (ZSRP) in accordance with Zion*Solutions* procedure ZS-LT-300-001-005, *"Final Status Survey Data Reporting"* (Reference 1) and satisfies the requirements of Section 5.11 of the *"Zion Station Restoration Project License Termination Plan"* (LTP) (Reference 2).

An FSS package (L1-10220H-F) was developed in accordance with Zion*Solutions* procedure ZS-LT-300-001-001, *"Final Status Survey Package Development"* (Reference 3), the ZSRP LTP, and guidance from NUREG-1575, "*Multi-Agency Radiation Survey and Site Investigation Manual"* (MARSSIM) (Reference 4).

This open land survey unit has a MARSSIM classification of one. A survey plan was designed based upon use of the Sign Test as the nonparametric statistical test for compliance. Both the Type I (α) and Type II (β) decision error rates were set at 0.05. Seventeen (17) systematic surface soil samples were acquired from the survey unit. In addition, surface scanning was performed on 100% of the total accessible surface area in the survey unit. No areas of elevated activity were detected during the scans. Judgmental samples taken in the wetland area, which were not accessible for scan surveys, showed low levels of Cs-137 activity. The highest activity was 0.948 pCi/g for Cs-137, with an Operational Sum of Fractions (OpSOF) of 0.372. The analytical results for all systematic and judgmental soil samples taken in survey unit 10220H indicated that the SOF for each sample, when compared to the Operational Derived Concentration Guideline Levels (OpDCGL), was less than 1.0. The maximum OpSOF for the systematic samples was 0.100. The mean OpSOF for the systematic samples was 0.048. The mean Base Case SOF (BcSOF) for the systematic samples, when the analytical results were compared to the Base Case DCGLs (BcDCGL), was 0.012, which results in a dose assigned to the survey unit of 0.307 mrem/year Total Effective Dose Equivalent (TEDE). Therefore, the null hypothesis is rejected and survey unit 10220H is acceptable for unrestricted release.

2. SURVEY UNIT DESCRIPTION

Survey unit 10220H, "SE Corner of Exclusion Area – Lakeshore," is a Class 1 open land survey unit and is 2,088 m^2 in size. It is bounded on the west by survey unit 10220A, the south by survey unit 10220C, the east by survey unit 10220I, and the north by survey units 10221B and 10221C.

The topography of the survey unit is mainly flat with some small dips and depressions. The soil is mostly loam. A wetland area runs along the southeast boundary of the survey unit.

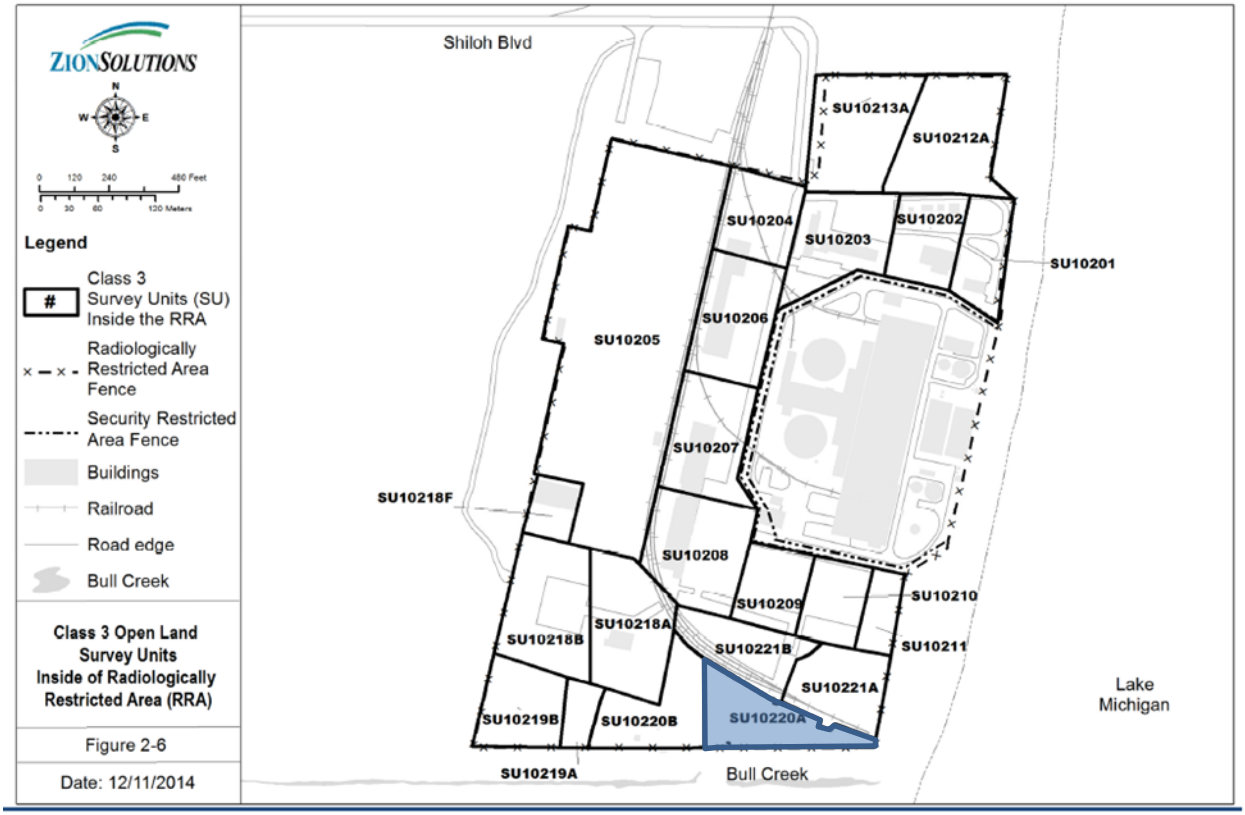
The boundary of the survey unit was defined using a Global Positioning System (GPS) based on the Illinois State Plane System North American Datum (NAD) 1983 East. The reference coordinates associated with the sample locations in this survey unit are presented in Table 8.

3. CLASSIFICATION BASIS

Survey unit 10220H was classified in accordance with Zion*Solutions* procedure ZS-LT-300-001-002, "*Survey Unit Classification*" (Reference 5).

The area encompassing this survey unit was formerly described as the "Southeast Corner of Exclusion Area" and is located within survey unit 10220 as identified in Figure 4 of the "*Zion Station Historical Site Assessment"* (HSA) (Reference 6). Subsequently, this area was described as the "SE Corner of Exclusion Area – Lakeshore" (survey unit 10220A) in Table 2-29 of the ZSRP LTP as represented in Figure 2-6 of the LTP, which is replicated below as Figure 1.

Figure 1 - Class 3 Open Land Survey Units from Figure 2-6 of the LTP



A characterization survey was performed in July 2012 for the Class 3 survey unit 10220A. The following data was obtained:

- Twenty two (22) systematic surface and sub-surface samples.
- Six (6) judgmental surface and sub-surface samples designated to be taken in the two Wetland areas.
- Sodium iodide (NaI) walkover scans of approximately 50% of the survey unit.

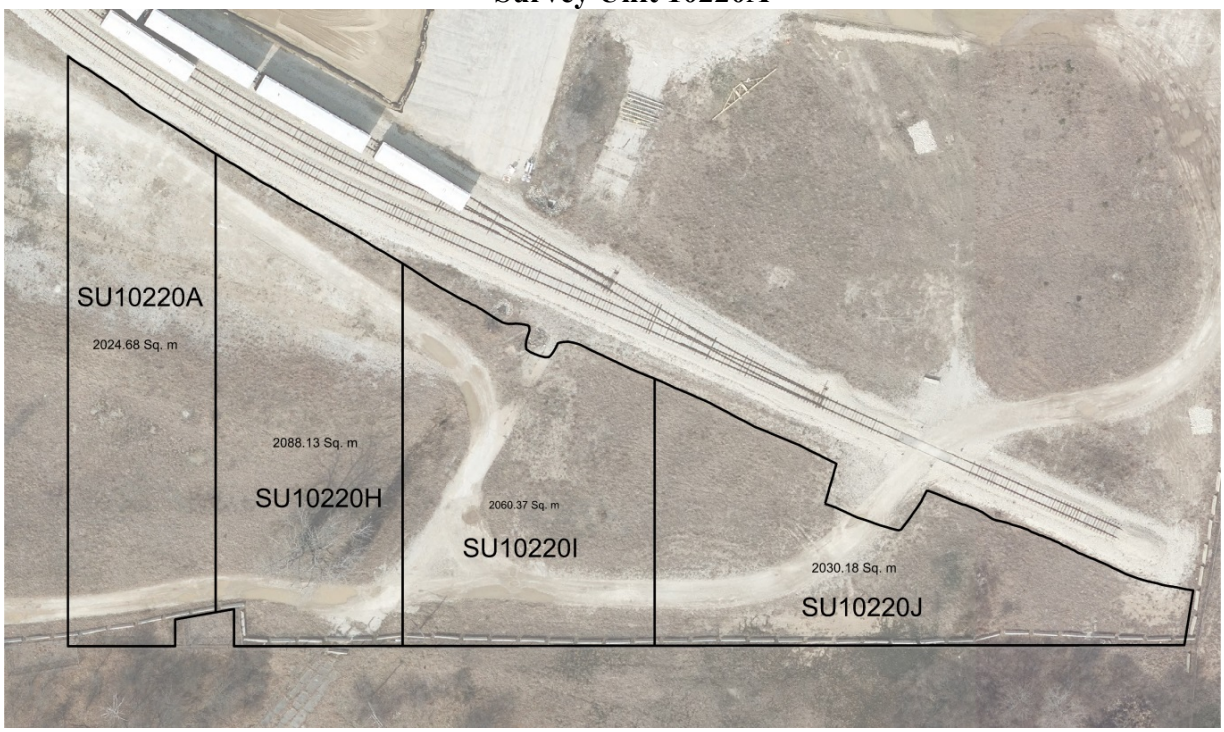
The results of the characterization survey were:

- Four (4) of the twenty-eight (28) surface samples had positive results for Cs-137. Two (2) of the four (4) samples were among the judgmental samples taken in the Wetland area on the east side of the survey unit with the highest activity at 0.243 pCi/g. This sample was also positive for Co-60 at 0.125 pCi/g. Two (2) systematic samples were also positive for Cs-137 at 0.06 and 0.09 pCi/g.
- One (1) of the sub-surface samples had positive results for Cs-137, at an activity at 0.11 pCi/g. This location was judgmental sample #5 from the Wetland area.

In June of 2017, the survey units adjacent and to the north of this survey unit were reclassified as Class 1. As a conservative measure, the classification of 10220A was increased to Class 2.

In May of 2019, during the performance of FSS of the Class 2 survey unit 10220A, a 90,000 cpm small radioactive particle was found in the area. Survey unit 10220A was reclassified as Class 1, and divided into 4 survey units: 10220A, 10220H, 10220I, and 10220J to comply with the survey unit size recommendations from MARSSIM Section 4.6. Figure 2 below shows the boundaries of the resulting Class 1 survey units. The change in classification was a conservative response which ensured that the survey unit was surveyed with the appropriate rigor.

Figure 2 - The Four Class 1 Open Land Survey Units Created from the Original Class 3 Survey Unit 10220A



A Radiological Engineer (RE) and a Characterization/License Termination (C/LT) Supervisor performed a visual inspection and walk-down of the survey unit on May 16, 2019, prior to

performing FSS. The purpose of the walk-down was to assess the physical condition of the survey unit, evaluate access points and travel paths and identify potentially hazardous conditions. A final classification assessment was performed in accordance with ZS-LT-300-001-002, as part of the survey design for FSS. The assessment confirmed that survey unit 10220H was correctly classified as Class 1.

4. DATA QUALITY OBJECTIVES

FSS planning and design hinges on coherence with the Data Quality Objective (DQO) process to ensure, through compliance with explicitly defined inputs and boundaries, that the primary objective of the survey is satisfied. The DQO process, utilized in accordance with MARSSIM, is described in the ZSRP LTP. The appropriate design for a given survey is developed using the DQO process as outlined in Appendix D of MARSSIM.

The DQO process incorporated hypothesis testing and probabilistic sampling distributions to control decision errors during data analysis. Hypothesis testing is a process based on the scientific method that compares a baseline condition to an alternate condition. The baseline condition is technically known as the null hypothesis. Hypothesis testing rests on the premise that the null hypothesis is true and that sufficient evidence must be provided for rejection. In designing the survey plan, the underlying assumption, or null hypothesis, was that residual activity in the survey unit exceeded the release criteria. Rejection of the null hypothesis would indicate that residual activity within the survey unit does not exceed the release criteria. Therefore, the survey unit would satisfy the primary objective of the FSS sample plan.

The primary objective of the FSS sample plan is to demonstrate that the level of residual radioactivity in survey unit 10220H does not exceed the release criteria specified in the LTP and that the potential dose from residual radioactivity is As Low As Reasonably Achievable (ALARA).

Zion*Solutions* Technical Support Document (TSD) 11-001, *"Technical Support Document for Potential Radionuclides of Concern During the Decommissioning of the Zion Station"* (Reference 7), established the basis for an initial suite of potential Radionuclides of Concern (ROC) for the decommissioning of the Zion Nuclear Power Station (ZNPS).

Zion*Solutions* TSD 14-019, *"Radionuclides of Concern for Soil and Basement Fill Model Source Terms"* (Reference 8), was written to refine the initial selection of ROC for decommissioning at the ZSRP. The list of ROC was evaluated using Containment Building(s) and Auxiliary Building concrete core analysis data to evaluate the dose significance of each radionuclide in the end state model. Section 4.4 of TSD 14-019 evaluated the results of the characterization data of surveys taken of soils. The following conclusion was reached: *"The results of surface and subsurface soil characterization in the impacted area surrounding Zion indicate that there is minimal residual radioactivity in soil. Essentially all of the soil results were reported as non-detectable. Other than Cs-137 at very low levels, and Co-60 at a concentration of 0.24 pCi/g in one sample,*

the results for all radionuclides were less than Minimum Detectable Concentration (MDC). Therefore, the direct determination of radionuclide mixture fractions for initial suite radionuclides in soil is not technically feasible due to the MDC biasing issues discussed above. Based on a generalized assumption that the contaminated water that caused concrete contamination would be similar to the source of soil contamination, the ROC and radionuclide mixture derived for the Auxiliary Building concrete was considered to be reasonably representative of soils for FSS planning and implementation."

The ROC for surface soils are listed in Table 1 below (from Table 5-2 of the LTP):

Table 1 - Dose Significant Radionuclides and Mixture

Radionuclide	**Auxiliary Building % of Total Activity (normalized)**(1)(2)
Co-60	0.92%
Ni-63	23.71%
Sr-90	0.05%
Cs-134	0.01%
Cs-137	75.32%

(1) Based on maximum percent of total activity from Table 20 of TSD 14-019, normalized to one for the dose significant radionuclides.
(2) Does not include dose significant radionuclides for activated concrete (H-3, Eu-152, Eu-154).

A fundamental precursor to survey design is to establish a relationship between the release criteria and some measurable quantity. This is done through the development of DCGLs. The DCGLs represent average levels of radioactivity above background levels and are presented in terms of surface or mass activity concentrations. Chapter 6 of the LTP describes in detail the modeling used to develop the DCGLs for soils.

Surface soil is defined as soil residing in the first 0.15 m (6 inches) layer of soil. A subsurface soil category, which is defined as a layer of soil beginning at the surface but extending to a depth of 1 m, is also assessed to allow for flexibility in compliance demonstration if contamination deeper than 0.15 m is encountered. Site-specific DCGLs for soil were calculated for both the 0.15 m and 1 m thicknesses. Based on characterization data and historical information, there are no expectations of encountering a source term geometry that is comprised of a clean surface layer of soil over a contaminated subsurface soil layer. Zion*Solutions* TSD 14-011, *"Soil Area Factors"* (Reference 9) and LTP, Section 6.8 provide the exposure scenarios and modeling parameters that were used to calculate the site-specific DCGLs for soils (referred to as BcDCGL in this Release Record).

At ZNPS, compliance is demonstrated through the summation of dose from four distinct source terms (basements, soils, buried pipe and groundwater) for the end-state. Basements are comprised of the summation of four structural source terms (surfaces, embedded pipe, penetrations and fill). When applied to soil, the DCGLs are expressed in units of activity per unit of mass (pCi/g). The "unity rule" is applied when there is more than one ROC. The measurement results for each singular ROC present in the mixture are compared against their respective DCGL to derive a dose fraction.

The surface and subsurface soil BcDCGLs for the unrestricted release of open land survey units are listed in Tables 5-5 and 5-6 of the LTP and are provided in Table 2 and Table 3, respectively. The Insignificant Contributor (IC) dose percentage of 10% was used to adjust the DCGLs in soils to account for the dose from the eliminated IC radionuclides.

Table 2 - Base Case DCGLs for Surface Soils ($BcDCGL_{SS}$)

Radionuclide	Surface Soil DCGL (pCi/g)
Co-60	4.26
Cs-134	6.77
Cs-137	14.18
Ni-63	3,572.10
Sr-90	12.09

Table 3 - Base Case DCGLs for Subsurface Soils ($BcDCGL_{SB}$)

Radionuclide	Subsurface Soil DCGL (pCi/g)
Co-60	3.44
Cs-134	4.44
Cs-137	7.75
Ni-63	763.02
Sr-90	1.66

Each radionuclide-specific BcDCGL is equivalent to the level of residual radioactivity (above background levels) that could, when considered independently, result in a TEDE of 25 mrem/year to an Average Member of the Critical Group (AMCG). To ensure that the summation of dose from each source term is 25 mrem/year or less after all FSS is completed, the BcDCGLs are reduced based on an expected, or *a priori*, fraction of the 25 mrem/year dose limit from each source term. The reduced DCGLs, or "Operational" DCGLs, can be related to the BcDCGLs as an expected fraction of dose based on an *a priori* assessment of what the expected

dose should be based on the results of site characterization, process knowledge and the extent of planned remediation. The OpDCGL is then used as the DCGL for the FSS design of the survey unit (calculation of surrogate DCGLs, investigations levels, etc.). Details of the OpDCGLs derived for each dose component and the basis for the applied *a priori* dose fractions are provided in Zion*Solutions* TSD 17-004, *"Operational Derived Concentration Guideline Levels for Final Status Survey"* (Reference 10).

The OpDCGLs for the FSS of surface and subsurface soils are listed in Tables 5-7 and 5-8 of the LTP and are presented in Table 4 and Table 5, respectively.

Table 4 - Operational DCGLs for Surface Soils (OpDCGL$_{SS}$)

Radionuclide	Surface Soil DCGL (pCi/g)
Co-60	1.091
Cs-134	1.733
Cs-137	3.630
Ni-63	914.458
Sr-90	3.095

Table 5 - Operational DCGLs for Subsurface Soils (OpDCGL$_{SB}$)

Radionuclide	Subsurface Soil DCGL (pCi/g)
Co-60	0.881
Cs-134	1.137
Cs-137	1.984
Ni-63	195.333
Sr-90	0.425

In accordance with NUREG-1757, Appendix G, if the HSA indicates that there is no likelihood of substantial subsurface residual radioactivity, subsurface surveys are not necessary. The HSA, as well as the results of the extensive characterization of subsurface soils in the impacted area surrounding the Zion facility have shown that there is minimal residual radioactivity in subsurface soil. Consequently, the ZSRP performed minimal subsurface sampling during FSS.

Instrument DQOs included a verification of the ability of the survey instrument to detect the radiation(s) of interest at the required scan MDC, which for Class 1 open land survey units, is the *a priori* DCGL Elevated Measurement Comparison (DCGL$_{EMC}$). Survey instrument response checks were required prior to issuance and after the instrument had been used. Control and

accountability of survey instruments was required to ensure the quality and prevent the loss of data.

As part of the DQOs applied to laboratory processes, analysis results were reported as actual calculated results. The actual recorded value was used as the recorded FSS result for measurement and/or sample values that are less than MDC. Negative values were recorded as "zero." For radionuclides less than MDC, the value representing the highest abundance was selected. Results were not reported as "less than MDC." Sample report summaries included unique sample identification, analytical method, radionuclide, result, uncertainty, laboratory data qualifiers, units and the observed MDC.

In accordance with the LTP, for laboratory analysis, MDCs less than 10% of the OpDCGL were preferable, while MDCs up to 50% of the OpDCGL were acceptable. The maximum acceptable MDC for measurements obtained using field instruments was the *a priori* $DCGL_{EMC}$, which was calculated using the methodology described in the LTP, Section 5.6.4.3.

5. SURVEY DESIGN

The level of effort associated with planning a survey is based on the complexity of the survey and nature of the hazards. Guidance for preparing FSS plans is provided in ZS-LT-300-001-001,*"Final Status Survey Package Development."*

The DQO process determined that Co-60, Ni-63, Sr-90, Cs-134 and Cs-137 would be the ROC in survey unit 10220H. During FSS, concentrations for Hard-to-Detect (HTD) ROC Ni-63 and Sr-90 are inferred using a surrogate approach. Cs-137 is the principle surrogate radionuclide for Sr-90, and Co-60 is the principle surrogate radionuclide for Ni-63. The mean, maximum and 95% Upper Confidence Level (UCL) of the surrogate ratios for concrete core samples taken in the Auxiliary Building basement were calculated in Zion*Solutions* TSD 14-019, *"Radionuclides of Concern for Soil and Basement Fill Model Source Terms,"* and are presented in Table 6. The maximum ratios will be used in the surrogate calculations during FSS unless area specific ratios are determined by continuing characterization.

Table 6 - Surrogate Ratios

Ratios	Auxiliary Building		
	Mean	Max	95%UCL
Ni-63/Co-60	44.143	180.450	154.632
Sr-90/Cs-137	0.001	0.002	0.002

For the FSS of survey unit 10220H, the surrogate OpDCGLs for Co-60 and Cs-137 were computed based on the maximum ratios from Table 6.

The equation for calculating a surrogate DCGL is as follows:

Equation 1

$$Surrogate_{DCGL} = \frac{1}{\left[\left(\frac{1}{DCGL_{Sur}}\right) + \left(\frac{R_2}{DCGL_2}\right) + \left(\frac{R_3}{DCGL_3}\right) + \cdots \left(\frac{R_n}{DCGL_n}\right)\right]}$$

Where: $DCGL_{Sur}$ = Surrogate radionuclide DCGL

$DCGL_{2,3\ldots n}$ = DCGL for radionuclides to be represented by the surrogate

R_n = Ratio of concentration (or nuclide mixture fraction) of radionuclide "n" to surrogate radionuclide

Using the OpDCGLs for surface soils presented in Table 4 and the maximum ratios from Table 6, the following surrogate calculations for surface soils were performed:

Equation 2

$$Surrogate_{OpDCGL\,(Cs-137)} = \frac{1}{\left[\left(\frac{1}{3.630_{(Cs-137)}}\right) + \left(\frac{0.002}{3.095_{(Sr-90)}}\right)\right]} = 3.622\ pCi/g$$

The surrogate OpDCGL for surface soils that was used for Cs-137 in this survey unit for direct comparison of surface soil sample results to demonstrate compliance is 3.622 pCi/g.

Equation 3

$$Surrogate_{OpDCGL\,(Co-60)} = \frac{1}{\left[\left(\frac{1}{1.091_{(Co-60)}}\right) + \left(\frac{180.45}{914.458_{(Ni-63)}}\right)\right]} = 0.898\ pCi/g$$

The surrogate OpDCGL for surface soils that was used for Co-60 in this survey unit for direct comparison of surface soil sample results to demonstrate compliance is 0.898 pCi/g.

Using the BcDCGLs presented in Table 2 and the maximum ratios from Table 6, the following surrogate calculations were performed:

Equation 4

$$Surrogate_{BcDCGL\,(Cs-137)} = \frac{1}{\left[\left(\frac{1}{14.18_{(Cs-137)}}\right) + \left(\frac{0.002}{12.09_{(Sr-90)}}\right)\right]} = 14.15\ pCi/g$$

The surrogate BcDCGL for surface soils that was used for Cs-137 in this survey unit for calculating the $DCGL_{EMC}$ is 14.15 pCi/g.

Equation 5

$$Surrogate_{BcDCGL\,(Co-60)} = \frac{1}{\left[\left(\frac{1}{4.26_{(Co-60)}}\right) + \left(\frac{180.45}{3572.10_{(Ni-63)}}\right)\right]} = 3.51\ pCi/g$$

The surrogate BcDCGL for surface soils that was used for Co-60 in this survey unit for calculating the $DCGL_{EMC}$ is 3.51 pCi/g.

For this Class 1 open land survey unit, the "Investigation Levels" for area scanning and soil sample measurement results are those levels specified in LTP, Table 5-25, and are reproduced below in Table 7.

Table 7 - Investigation Levels

Classification	Scan Investigation Levels	Direct Investigation Levels
Class 1	>Operational DCGL or >MDC_{scan} if MDC_{scan} is greater than Operational DCGL	> Operational DCGL

The MDC_{scan} for the 2350-1/44-10 was calculated using the methodology of Zion*Solutions* TSD-11-004, *"Ludlum Model 44-10 Detector Sensitivity"* (Reference 11) with the following parameters:

- background count rate of 5,000 counts per minute (cpm)
- scan speed of 0.5 m/sec
- distance from detector to surface of 2 inches
- isotopic mix of 95% Cs-137 and 5% Co-60

The calculated MDC_{scan} value was 3.75 pCi/g, which was greater than the calculated Surrogate DCGLs; therefore, the scan investigation level was set at the MDC_{scan} of the 2350-1/44-10. The collimator was used during the scan surveys to lower the background count rate.

The Sign Test was selected as the non-parametric statistical test. The use of the Sign Test did not require the selection or use of a background reference area, which simplified survey design and implementation. This approach was conservative since it included background Cs-137 as part of the sample set.

The number of soil samples for FSS was determined in accordance with ZS-LT-300-001-001. The relative shift (Δ/σ) for the survey unit data set is defined as shift (Δ), which is the Upper Bound of the Gray Region (UBGR), or the DCGL (SOF of 1), minus the Lower Bound of the Gray Region (LBGR) (SOF of 0.5), divided by sigma (σ), which is the standard deviation of the data set used for survey design. The optimal value for Δ/σ should range between one and three. The largest value the Δ/σ can have is three. If the Δ/σ exceeds three, then the value of three will be used for Δ/σ. For this survey design, a conservative estimate of the sample variability of 0.30 was used as the coefficient of variation to calculate Δ/σ.

The calculated relative shift was 1.67. Both the Type I error, or α value, and the Type II error, or β value, was set at 0.05. The sample size from Table 5.5 of MARSSIM that equates to the Type I and Type II error of 0.05 for use with the Sign Test is an N value of seventeen (17).

The computer program Visual Sample Plan (VSP) was used to generate the sample map, in accordance with ZS-LT-300-001-001. The map used was provided by the Survey Mapping/Computer Assisted Design Specialist, with coordinates based on the Illinois State Plane NAD 1983 standard topographical grid coordinate system. The number of samples generated by VSP for a systematic triangular grid was 17. The Prospective Power Curve generated by VSP showed adequate power for the survey design.

In accordance with Section 5.6.4.3 of the LTP, the *a priori* $DCGL_{EMC}$ values were calculated for the gamma emitting ROC to ensure that the MDC_{scan} of the selected instrument was sufficient to detect small areas of elevated activity in the survey unit. The calculations were:

- To calculate the area bounded by the systematic samples: $A = \frac{A_{SU}}{N} = \frac{2088}{17} = 122.8\ m^2$
- From the LTP, Table 5-16, the Area Factors for the next larger area (300 m^2) were used:
  - Cs-137 - 1.46
  - Cs-134 - 1.30
  - Co-60 - 1.16
- The $DCGL_{EMC}$ is the Surrogate Base Case DCGL times the Area Factor:
  - The $DCGL_{EMC}$ for Cs-137 = $1.46 * 14.15 = 20.66\ pCi/g$
  - The $DCGL_{EMC}$ for Cs-134 = $1.30 * 6.77 = 8.80\ pCi/g$
  - The $DCGL_{EMC}$ for Co-60 = $1.16 * 3.51 = 4.07\ pCi/g$

The calculated MDC_{scan}, 3.75 pCi/g, is less than the $DCGL_{EMC}$ values calculated above; therefore, the spacing of the statistical systematic sampling and measurement locations was adequate to detect small areas of elevated radioactivity. No adjustment to the sample number was required.

The implementation of quality control (QC) measures as referenced by LTP, Section 5.9 and Zion*Solutions* procedure ZS-LT-01, "*Quality Assurance Project Plan (for Characterization and FSS)*" (Reference 12) includes the collection of a soil sample for "split sample" analysis on 5% of the soil samples taken in a survey unit with the locations selected at random. One (1) surface soil sample (L1-10220H-FQGS-006-SS) was selected randomly for split sample analysis for the FSS of this survey unit.

In accordance with Section 5.7.1.6.2 of the LTP, a subsurface soil sample was taken at 10% of the systematic surface soil sample locations in the survey unit with the location(s) selected at random. Sample locations L1-10220H-FSGS-009-SB and L1-10220H-FSGS-015-SB were selected for this survey unit. Following selection, it was discovered that due to the presence of an active water supply line buried at location L1-10220H-FSGS-015-SB, acquisition of a subsurface soil sample at that location was not possible. Sample location L1-10220H-FSGS-017-SB was randomly selected as a replacement.

The locations of the seventeen (17) systematic samples are listed in Table 8. Also included are the locations of the two (2) subsurface samples. A map of the systematic sample locations

is included in Attachment 1.

Table 8 - Systematic Sample Measurement Locations

MEASUREMENT ID	NORTHING (meters)	EASTING (meters)
L1-10220H-FSGS-001-SS	641424.54	343545.59
L1-10220H-FSGS-002-SS	641424.54	343557.50
L1-10220H-FSGS-003-SS	641424.54	343569.41
L1-10220H-FSGS-004-SS	641434.85	343551.54
L1-10220H-FSGS-005-SS	641434.85	343563.45
L1-10220H-FSGS-006-SS	641445.16	343545.59
L1-10220H-FSGS-007-SS	641445.16	343557.50
L1-10220H-FSGS-008-SS	641445.16	343569.41
L1-10220H-FSGS-009-SS	641455.48	343551.54
L1-10220H-FSGS-010-SS	641455.48	343563.45
L1-10220H-FSGS-011-SS	641465.79	343545.59
L1-10220H-FSGS-012-SS	641465.79	343557.50
L1-10220H-FSGS-013-SS	641465.79	343569.41
L1-10220H-FSGS-014-SS	641476.10	343551.54
L1-10220H-FSGS-015-SS	641476.10	343563.45
L1-10220H-FSGS-016-SS	641486.42	343545.59
L1-10220H-FSGS-017-SS	641486.42	343557.50
L1-10220H-FSGS-009-SB	641455.48	343551.54
L1-10220H-FSGS-017-SB	641476.10	343563.45

ZSRP LTP, Section 5.1 states that soil samples will be collected during FSS to confirm the HTD to surrogate radionuclide ratios (provided in Table 6). Ten percent (10%) of the FSS samples collected from open land survey units will be analyzed for HTD ROC. Only HTD radionuclides included as ROC (Ni-63 and Sr-90 for soils) will be analyzed in the FSS confirmatory samples. For soil samples with positive results for both a HTD ROC and the corresponding surrogate radionuclide (Cs-137 or Co-60), the HTD surrogate ratio will be derived and compared against the maximum ratio. The maximum ratios will be used unless specific survey information supports the use of a surrogate ratio that is specific to the area. In these cases, the survey unit-specific radiological data and the derived surrogate ratios will be submitted to the NRC for approval. If approved, then the survey unit-specific ratios used and the survey data serving as the basis for the surrogate ratios will be documented in the release record for the survey unit.

In addition, LTP, Section 5.1 states that if levels of residual gamma radioactivity in an individual soil sample exceed an OpSOF of 0.1, then the sample(s) will be analyzed for HTD ROC. Two (2) of the four (4) judgmental samples taken in the wetland area, along with the QC split sample of the 4th judgmental sample, exceeded an OpSOF of 0.1 during the FSS of

survey unit 10220H. The sample numbers were: L1-10220H-FJGS-001-SS, L1-10220H-FJGS-004-SS, and L1-10220H-QJGS-004-SS.

These three (3) samples met the requirement that 10% of the samples collected for the FSS of survey unit 10220H be analyzed for HTD ROC. Each sample was sent off-site (Eberline Analytical) for analysis of the HTD ROC as specified in LTP, Section 5.1. Eberline analytical reports are provided in Attachment 8.

Table 9 provides a synopsis of the survey design for survey unit 10220H.

Table 9 - Synopsis of Survey Design

FEATURE	DESIGN CRITERIA	BASIS
Survey Unit Area	2,088 m^2	GPS measurements of area
Number of Surface Soil Samples	17 (Systematic)	• $\sigma = 0.30$ • UBGR = SOF of 1 • LBGR = SOF of 0.5 • Type I error = 0.05 • Type II error = 0.05 • $\Delta/\sigma = 1.67$ (MARSSIM Table 5.5)
Grid Spacing	11.9 m	(LTP, Section 5.6.4.5.2)
DCGLs	• Co-60 – 1.091 pCi/g • Cs-134 – 1.733 pCi/g • Cs-137 – 3.630 pCi/g • Ni-63 – 914.458 pCi/g • Sr-90 – 3.095 pCi/g	Operational DCGLs for Surface Soils, (LTP, Table 5-7)
HTD ROC Analysis	A minimum of two (2) soil samples selected for HTD ROC analysis	(LTP, Section 5.1)
Measurement Investigation Level	Operational DCGL	(LTP, Table 5-25)
Scan Survey Area Coverage	100%	(LTP, Table 5-24)
QC	One (1) surface soil sample selected randomly for split sample analysis	(LTP, Section 5.9)
Number of Subsurface Soil Samples	Two (2) systematic surface soil sample locations selected, at locations 9 and 17	(LTP, Section 5.7.1.6.2)

6. SURVEY IMPLEMENTATION

Survey instructions for this FSS were incorporated into and performed in accordance with FSS sample plan L1-10220H-F, which was developed in accordance with ZS-LT-300-001-001. The FSS unit was inspected and controlled in accordance with Zion*Solutions* procedure ZS-LT-300-001-003, "*Isolation and Control for Final Status Survey*" (Reference 13).

For survey unit 10220H, compliance with the unrestricted release criteria was demonstrated through a combination of surface scanning with a Ludlum Model 44-10 gamma detector and the sampling of surface soil for isotopic analysis. In accordance with the LTP Chapter 5, two (2) subsurface samples were obtained and analyzed. Four (4) judgmental surface soil samples were taken in the wetland area, which was inaccessible for gamma walkover scans. Also, if during the performance of FSS the analysis of a surface soil sample, or the results of a surface gamma scan, indicated the potential presence of residual radioactivity at a concentration of 75% of the subsurface OpDCGL, then a biased subsurface soil sample(s) would have been taken to the appropriate depth within the area of concern as part of the investigation. Although this threshold was not exceeded during the FSS of survey unit 10220H, a subsurface sample was taken at the location of the 4th judgmental sample taken in the wetland area (L1-10220H-FJGS-004-SB), which had activity at 68% of the subsurface OpDCGL.

FSS field activities were conducted under FSS sample plan L1-10220H-F. A "Field Log" (ZS-LT-300-001-001, Attachment 14) was used to document field activities and other information pertaining to the performance of the FSS.

FSS field activities were projected to take four (4) working days to complete. Daily briefings were conducted to discuss the expectations for job performance and to review safety aspects of the job. The survey required field activities were performed during normal working hours starting on May 22, 2019, and concluding on August 1, 2019.

The seventeen (17) systematic surface soil sample locations were marked with flags based on GPS coordinates provided by VSP.

Gamma scans were performed on 100% of the surface area of the survey unit using a Ludlum 2350-1 paired with a Model 44-10 (2" x 2") NaI detector operated in the rate-meter mode and using audio response. The probe was positioned within 2 inches to the ground and was moved at a scan speed of approximately 0.5 meters per second. No areas of elevated activity were detected on the scans. Daily, prior to and following use, each detector was subjected to an Operational Response Check in accordance with Zion*Solutions* procedure ZS-RP-108-004-011, *"Operation of the Ludlum Model 2350-1 Data Logger"* (Reference 14). The daily Operational Response Check compared the background response and the response to check sources ranges established for normal background and detector source response to ensure that the detector was working properly.

The instruments and detectors used for this survey are presented in Table 10. The instruments and detectors were verified to be properly calibrated prior to use.

Table 10 - Instruments and Detectors

Instrument/Detector Type	Serial #	Calibration Due Date
Ludlum 2350-1/Ludlum 44-10	304711/PR321902	1/18/2020
Ludlum 2350-1/Ludlum 44-10	216166/PR372106	11/29/2019
Ludlum 2350-1/Ludlum 44-10	266669/PR311756	12/12/2019
Ludlum 2350-1/Ludlum 44-10	304730/PR375273	1/16/2020
Ludlum 2350-1/Ludlum 44-10	266656/PR311750	1/8/2020
Ludlum 2350-1/Ludlum 44-10	304726/PR363452	9/6/2019
Ludlum 2350-1/Ludlum 44-10	304718/PR363311	12/13/2019
Ludlum 2350-1/Ludlum 44-10	266669/PR311756	12/12/2019

In accordance with the survey design, seventeen (17) surface soil samples were collected at the designated systematic sample points. In addition, two (2) subsurface samples were collected at the randomly selected sample locations. Four (4) surface judgmental samples, and one (1) subsurface judgmental sample were taken in the wetland area on the southeast boundary of the survey unit.

Three (3) samples (L1-10220H-FJGS-001-SS, L1-10220H-FJGS-004-SS and L1-10220H-QJGS-004-SS) were selected for HTD radionuclide analysis.

7. SURVEY RESULTS

One hundred percent (100%) of the surface of the survey unit was scanned for elevated radiation levels. Seventy-nine (79) 1-meter wide scan rows, as shown on the map in Attachment 1, were marked in the field and scanned with the 2350-1/44-10 using latching mode. Readings were recorded at approximately 10-meter intervals during the scans. No elevated measurement locations were identified by surface scans. Table 11 provides an overview of the scan results. Complete scan results are provided in Attachment 2.

Table 11 - Synopsis of Scan Results

Scan Area	Highest Logged Reading (cpm)	Action Level[(1)] (cpm)	# of Scan Alarms	Investigation Samples
Row 1	2226	2618	None	None
Row 2	2260	2618	None	None
Row 3	2321	2618	None	None
Row 4	2338	2618	None	None

Table 11 (continued) - Synopsis of Scan Results

Scan Area	Highest Logged Reading (cpm)	Action Level[1] (cpm)	# of Scan Alarms	Investigation Samples
Row 5	2229	2618	None	None
Row 6	2209	2618	None	None
Row 7	2327	2618	None	None
Row 8	2216	2618	None	None
Row 9	2407	2618	None	None
Row 10	2342	2618	None	None
Row 11	2152	2584	None	None
Row 12	2171	2584	None	None
Row 13	2380	2584	None	None
Row 14	2214	2584	None	None
Row 15	2306	2584	None	None
Row 16	2245	2584	None	None
Row 17	2291	2584	None	None
Row 18	2228	2584	None	None
Row 19	2392	2584	None	None
Row 20	2260	2584	None	None
Row 21	2385	2942	None	None
Row 22	2410	2942	None	None
Row 23	2479	2942	None	None
Row 24	2445	2942	None	None
Row 25	2558	2942	None	None
Row 26	2460	2818	None	None
Row 27	2528	2818	None	None
Row 28	2486	2818	None	None
Row 29	2453	2818	None	None
Row 30	2550	2818	None	None
Row 31	2879	3067	None	None
Row 32	2762	3067	None	None
Row 33	2705	3067	None	None
Row 34	2813	3067	None	None
Row 35	2809	3067	None	None
Row 36	2398	2429	None	None
Row 37	2425	2429	None	None
Row 38	2394	2429	None	None
Row 39	2309	2429	None	None
Row 40	2295	2429	None	None
Row 41	2194	2256	None	None
Row 42	2097	2256	None	None

Table 11 (continued) - Synopsis of Scan Results

Scan Area	Highest Logged Reading (cpm)	Action Level[1] (cpm)	# of Scan Alarms	Investigation Samples
Row 43	2162	2256	None	None
Row 44	2224	2256	None	None
Row 45	2167	2256	None	None
Row 46	2251	2547	None	None
Row 47	2099	2547	None	None
Row 48	2190	2547	None	None
Row 49	2187	2547	None	None
Row 50	2248	2547	None	None
Row 51	2529	2855	None	None
Row 52	2520	2855	None	None
Row 53	2645	2855	None	None
Row 54	2509	2855	None	None
Row 55	2648	2855	None	None
Row 56	2599	2855	None	None
Row 57	2598	2855	None	None
Row 58	2699	2855	None	None
Row 59	2689	2855	None	None
Row 60	2766	2855	None	None
Row 61	2660	2898	None	None
Row 62	2469	2898	None	None
Row 63	2474	2898	None	None
Row 64	2711	2898	None	None
Row 65	2694	2898	None	None
Row 66	2790	2881	None	None
Row 67	2595	2871	None	None
Row 68	2713	2871	None	None
Row 69	2689	2871	None	None
Row 70	2398	2871	None	None
Row 71	2603	2871	None	None
Row 72	2587	2871	None	None
Row 73	2561	2871	None	None
Row 74	2727	2871	None	None
Row 75	2742	2871	None	None
Row 76	2569	2871	None	None
Row 77	2679	2871	None	None
Row 78	2481	2871	None	None
Row 79	2400	2871	None	None

1) The action level is based on the measurement Minimum Detectable Count Rate (MDCR) plus background in accordance with the FSS plan.

The seventeen (17) soil samples taken for non-parametric statistical testing, the four (4) judgmental samples, and the three (3) subsurface soil samples (two selected at random and one judgmental sample), were analyzed using the on-site gamma spectroscopy system. Summaries of the sample analysis results are provided in Tables 12, 13 and 14 respectively. The basic statistics for the systematic sample population are summarized in Table 21. The gamma spectroscopy results revealed eight (8) samples with activity level above MDC for Cs-137, two (2) samples with activity level above MDC for Co-60, and no samples with activity levels above the MDC for Cs-134. The concentrations for Ni-63 and Sr-90 were inferred based on the maximum ratios as specified in Table 6. The mean of the gamma spectroscopic analysis results for the systematic sample population indicated that Cs-137 was present at levels lower than the concentrations of Cs-137 expected to be found in off-site soil in the vicinity of the ZNPS as presented in Zion*Solutions* TSD 13-004, "*Examination of Cs-137 Global Fallout In Soils At Zion Station*" (Reference 15). The complete gamma spectroscopy reports are presented in Attachment 7.

Table 12 - Summary of Gamma Spectroscopy Results for Surface Soil Samples Comprising the Statistical Sample Population

MEASUREMENT ID	Co-60[(1)] (pCi/g)	Cs-134[(1)] (pCi/g)	Cs-137[(1)] (pCi/g)	Ni-63[(2)] (pCi/g)	Sr-90[(2)] (pCi/g)
L1-10220H-FSGS-001SS	4.76E-02	3.15E-02	2.03E-02	8.59E+00	4.06E-05
L1-10220H-FSGS-002SS	2.66E-02	3.70E-02	1.72E-02	4.80E+00	3.44E-05
L1-10220H-FSGS-003SS	4.87E-02	1.18E-03	6.06E-02	8.79E+00	1.21E-04
L1-10220H-FSGS-004SS	2.05E-02	5.15E-03	4.11E-02	3.70E+00	8.22E-05
L1-10220H-FSGS-005SS	2.00E-02	6.43E-03	**1.22E-01**	3.61E+00	2.44E-04
L1-10220H-FSGS-006SS	0.00E+00	5.27E-03	3.86E-02	0.00E+00	7.72E-05
L1-10220H-FSGS-007SS	4.28E-02	5.08E-03	2.97E-02	7.72E+00	5.94E-05
L1-10220H-FSGS-008SS	8.39E-03	1.45E-02	5.56E-02	1.51E+00	1.11E-04
L1-10220H-FSGS-009SS	1.96E-02	3.68E-02	4.22E-02	3.54E+00	8.44E-05
L1-10220H-FSGS-010SS	4.57E-02	3.46E-02	**1.04E-01**	8.25E+00	2.08E-04
L1-10220H-FSGS-011SS	2.39E-02	0.00E+00	3.55E-02	4.31E+00	7.10E-05
L1-10220H-FSGS-012SS	4.45E-02	1.28E-02	**9.26E-02**	8.03E+00	1.85E-04
L1-10220H-FSGS-013SS	2.65E-02	1.93E-02	2.40E-03	4.78E+00	4.80E-06
L1-10220H-FSGS-014SS	0.00E+00	0.00E+00	4.45E-02	0.00E+00	8.90E-05
L1-10220H-FSGS-015SS	1.52E-02	0.00E+00	3.21E-02	2.74E+00	6.42E-05
L1-10220H-FSGS-016SS	0.00E+00	0.00E+00	3.63E-02	0.00E+00	7.26E-05
L1-10220H-FSGS-017SS	**2.96E-02**	1.37E-03	**4.56E-02**	5.34E+00	9.12E-05

Note: (1) Bold font indicates ROC positively detected at concentration greater than MDC.
(2) Ni-63 and Sr-90 are inferred concentrations using the maximum HTD ratio.

Table 13 - Summary of Gamma Spectroscopy Results for Judgmental Soil Samples

MEASUREMENT ID	Co-60[(1)] (pCi/g)	Cs-134[(1)] (pCi/g)	Cs-137[(1)] (pCi/g)	Ni-63[(2)] (pCi/g)	Sr-90[(2)] (pCi/g)
L1-10220H-FJGS-001-SS	8.97E-02	0.00E+00	**5.05E-01**	1.62E+01	1.01E-03
L1-10220H-FJGS-002-SS	2.18E-02	1.50E-02	**2.04E-01**	3.93E+00	4.08E-04
L1-10220H-FJGS-003-SS	1.82E-02	1.76E-02	**1.53E-01**	3.28E+00	3.06E-04
L1-10220H-FJGS-004-SS	**9.16E-02**	1.34E-02	**9.48E-01**	1.65E+01	1.90E-03

Note: (1) Bold font indicates ROC positively detected at concentration greater than MDC.
(2) Ni-63 and Sr-90 are inferred concentrations using the maximum HTD ratio.

Table 14 - Summary of Gamma Spectroscopy Results for Subsurface Soil Samples

MEASUREMENT ID	Co-60[(1)] (pCi/g)	Cs-134[(1)] (pCi/g)	Cs-137[(1)] (pCi/g)	Ni-63[(2)] (pCi/g)	Sr-90[(2)] (pCi/g)
L1-10220H-FSGS-009-SB	3.53E-02	0.00E+00	4.93E-02	6.37E+00	9.86E-05
L1-10220H-FSGS-017-SB	9.06E-03	1.99E-02	5.60E-03	1.63E+00	1.12E-05
L1-10220H-FJGS-004-SB	2.06E-02	1.89E-03	**9.93E-03**	3.72E+00	1.99E-05

Note: (1) Bold font indicates ROC positively detected at concentration greater than MDC.
(2) Ni-63 and Sr-90 are inferred concentrations using the maximum HTD ratio.

The off-site laboratory, Eberline Analytical, processed the three (3) samples selected for HTD ROC analysis. Samples L1-10220H-FJGS-001-SS-A, L1-10220H-FJGS-004-SS-A and L1-10220H-QJGS-004-SS-A were selected. Only HTD radionuclides included as ROC (Ni-63 and Sr-90 for soils) were included in the analysis. All analyses met the required MDC. Only Cs-137 and Co-60 was detected in the samples at a concentration greater than MDC. Consequently, comparison of existing ratios verses the maximum ratios from Table 6 was not required. The off-site analysis results are provided in Table 14.

Table 15 - Off-Site Analysis Results

Sample # L1-10220H-FJGS-001-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	2.03E-01	9.54E-02	2.09E-01	No
Cs-134	1.77E-02	4.73E-02	1.34E-01	No
Cs-137	1.00E+00	1.88E-01	1.71E-01	Yes
Ni-63	-2.69E-01	1.98E+00	3.43E+00	No
Sr-90	1.73E-01	2.97E-01	7.40E-01	No

Table 15 (continued) - Off-Site Analysis Results

Sample # L1-10220H-FSGS-004-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	1.72E-01	8.67E-02	1.69E-01	Yes
Cs-134	-1.14E-02	3.18E-02	1.25E-01	No
Cs-137	1.37E+00	1.88E-01	1.22E-01	Yes
Ni-63	-2.75E-01	2.03E+00	3.50E+00	No
Sr-90	1.14E-02	4.30E-01	1.10E+00	No

Sample # L1-10220H-QJGS-004-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	1.29E-01	4.51E-02	7.54E-02	Yes
Cs-134	2.28E-03	1.80E-02	5.68E-02	No
Cs-137	8.97E-01	1.35E-01	7.86E-02	Yes
Ni-63	-1.04E+00	1.98E+00	3.46E+00	No
Sr-90	1.97E-01	3.06E-01	8.22E-01	No

The implementation of survey specific QC measures included the collection of one (1) systematic sample (L1-10220H-FQGS-006-SS) and one (1) biased sample (L1-10220H-QJGS-004-SS) for "split sample" analysis. The on-site laboratory analyzed the designated QC samples using the on-site gamma spectroscopy system. Gamma spectroscopy results (summarized in Table 16) indicate that concentrations for Cs-137, Co-60 and Cs-134 were less than MDC in the sample. The concentrations for Ni-63 and Sr-90 were inferred based on the maximum ratios as specified in Table 6.

Table 16 - Summary of Gamma Spectroscopy Results for QC Surface Soil Samples

MEASUREMENT ID	Co-60(1) (pCi/g)	Cs-134(1) (pCi/g)	Cs-137(1) (pCi/g)	Ni-63(2) (pCi/g)	Sr-90(2) (pCi/g)
L1-10220H-FQGS-006-SS	3.61E-02	1.76E-03	**4.69E-02**	6.51E+00	9.38E-05
L1-10220H-QJGS-004-SS	**5.12E-02**	1.39E-02	**4.74E-01**	9.24E+00	9.48E-04

Note: (1) Bold font indicates ROC positively detected at concentration greater than MDC.
(2) Ni-63 and Sr-90 are inferred concentrations using the maximum HTD ratio.

The SOF or "unity rule" is the mathematical test used to evaluate compliance with radiological criteria for license termination when more than one radionuclide has been determined to be potentially present.

The equation for the unity rule is:

Equation 6

$$\frac{C_1}{DCGL_1}+\frac{C_2}{DCGL_2}+\ldots\ldots\frac{C_n}{DCGL_n}\le 1$$

Where: C_n = concentration of radionuclide *n*

$DCGL_n$ = DCGL of radionuclide *n*.

The results of the unity calculations for the systematic sample population when compared against the OpDCGLs for surface soils are presented in Table 17. The results of the unity rule calculation for the ROC for the biased samples are presented in Table 18, results for the subsurface samples are presented in Table 19 and the results for the QC samples are presented in Table 20.

Table 17 - Sum of Fractions for Individual Systematic Surface Soil Samples, when compared to the OpDCGLs

MEASUREMENT ID	Fraction of the OpDCGLs for Surface Soils					OpSOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L1-10220H-FSGS-001-SS	4.36E-02	1.82E-02	5.59E-03	9.39E-03	1.31E-05	0.0768
L1-10220H-FSGS-002-SS	2.44E-02	2.14E-02	4.74E-03	5.25E-03	1.11E-05	0.0557
L1-10220H-FSGS-003-SS	4.46E-02	6.81E-04	1.67E-02	9.61E-03	3.92E-05	0.0717
L1-10220H-FSGS-004-SS	1.88E-02	2.97E-03	1.13E-02	4.05E-03	2.66E-05	0.0372
L1-10220H-FSGS-005-SS	1.83E-02	3.71E-03	3.36E-02	3.95E-03	7.88E-05	0.0597
L1-10220H-FSGS-006-SS	0.00E+00	3.04E-03	1.06E-02	0.00E+00	2.49E-05	0.0137
L1-10220H-FSGS-007-SS	3.92E-02	2.93E-03	8.18E-03	8.45E-03	1.92E-05	0.0588
L1-10220H-FSGS-008-SS	7.69E-03	8.37E-03	1.53E-02	1.66E-03	3.59E-05	0.0331
L1-10220H-FSGS-009-SS	1.80E-02	2.12E-02	1.16E-02	3.87E-03	2.73E-05	0.0547
L1-10220H-FSGS-010-SS	4.19E-02	2.00E-02	2.87E-02	9.02E-03	6.72E-05	0.0996
L1-10220H-FSGS-011-SS	2.19E-02	0.00E+00	9.78E-03	4.72E-03	2.29E-05	0.0364
L1-10220H-FSGS-012-SS	4.08E-02	7.39E-03	2.55E-02	8.78E-03	5.98E-05	0.0825
L1-10220H-FSGS-013-SS	2.43E-02	1.11E-02	6.61E-04	5.23E-03	1.55E-06	0.0413
L1-10220H-FSGS-014-SS	0.00E+00	0.00E+00	1.23E-02	0.00E+00	2.88E-05	0.0123
L1-10220H-FSGS-015-SS	1.39E-02	0.00E+00	8.84E-03	3.00E-03	2.07E-05	0.0258
L1-10220H-FSGS-016-SS	0.00E+00	0.00E+00	1.00E-02	0.00E+00	2.35E-05	0.0100
L1-10220H-FSGS-017-SS	2.71E-02	7.91E-04	1.26E-02	5.84E-03	2.95E-05	0.0464

Systematic Measurements

Number of Systematic Measurements =	17
# of Systematic Measurements with OpSOF $\ge$ 1 =	0
# of Systematic Measurements with OpSOF > 0.1 (HTD Assessment) =	0
Max Individual Systematic Measurement OpSOF =	0.100
Mean Systematic Measurement OpSOF =	0.048

Table 18 - Sum of Fractions for Individual Biased Soil Samples, when compared to the OpDCGLs

MEASUREMENT ID	Fraction of the OpDCGLs for Surface Soils					OpSOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L1-10220H-FJGS-001-SS	8.22E-02	0.00E+00	1.39E-01	1.77E-02	3.26E-04	0.239
L1-10220H-FJGS-002-SS	2.00E-02	8.66E-03	5.62E-02	4.30E-03	1.32E-04	0.089
L1-10220H-FJGS-003-SS	1.67E-02	1.02E-02	4.21E-02	3.59E-03	9.89E-05	0.073
L1-10220H-FJGS-004-SS	8.40E-02	7.73E-03	2.61E-01	1.81E-02	6.13E-04	0.372

Table 19 - Sum of Fractions for Individual Subsurface Soil Samples, when compared to the OpDCGLs

MEASUREMENT ID	Fraction of the OpDCGLs for Subsurface Soils					OpSOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L1-10220H-FSGS-009-SB	4.01E-02	0.00E+00	2.48E-02	3.26E-02	2.32E-04	0.098
L1-10220H-FSGS-017-SB	1.03E-02	1.75E-02	2.82E-03	8.37E-03	2.64E-05	0.039
L1-10220H-FJGS-004-SB	2.34E-02	1.66E-03	5.01E-03	1.90E-02	4.67E-05	0.049

Table 20 - Sum of Fractions for Individual QC Soil Samples, when compared to the OpDCGLs

MEASUREMENT ID	Fraction of the OpDCGLs for Surface Soils					OpSOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L1-10220H-FQGS-006-SS	3.31E-02	1.02E-03	1.29E-02	7.12E-03	3.03E-05	0.054
L1-10220H-QJGS-004-SS	4.69E-02	8.02E-03	1.31E-01	1.01E-02	3.06E-04	0.196

Table 21 - Basic Statistical Properties of Systematic Sample Population

ROC	Mean (pCi/g)	Median (pCi/g)	Max (pCi/g)	Min (pCi/g)	Std. Dev. (pCi/g)	BcDCGL (pCi/g)	Avg. SOF per ROC	Avg. Dose Per ROC
Co-60	2.47E-02	2.39E-02	4.87E-02	0.00E+00	0.017	4.26	5.79E-03	1.45E-01
Cs-134	1.24E-02	5.27E-03	3.70E-02	0.00E+00	0.014	6.77	1.83E-03	4.58E-02
Cs-137	4.83E-02	4.11E-02	1.22E-01	2.40E-03	0.031	14.18	3.40E-03	8.51E-02
Ni-63	4.45E+00	4.31E+00	8.79E+00	0.00E+00	3.041	3572.1	1.25E-03	3.12E-02
Sr-90	9.65E-05	8.22E-05	2.44E-04	4.80E-06	0.000	12.09	7.98E-06	2.00E-04

The mean BcSOF for survey unit 10220H is 0.012, which equates to a dose of 0.307 mrem/year TEDE.

The mean of all identified isotopes is less than the Consultation Triggers for Residential and Commercial/Industrial Soil Contamination depicted in Table H.1 of NUREG 1757, Vol. 1, (MOU Table 1). The full table is included in Attachment 3 of this Release Record.

8. QUALITY CONTROL

The on-site laboratory processed one (1) split sample, L1-10220H-FQGS-006-SS, from the systematic population and one (1) split sample, L1-10220H-QJGS-004-SS from the biased sample population using gamma spectroscopy analysis. The data was evaluated using acceptance

criteria specified in ZS-LT-01. For both samples there was not acceptable agreement between field split results when using Cs-137 due to the fact that it is present in the samples at relatively low concentrations. However, when using K-40 (which is present in the samples at higher concentrations), there was acceptable agreement. Refer to Attachment 5 for data and QC analysis results.

9. INVESTIGATIONS AND RESULTS

An area of elevated activity above an OpSOF of 1.0 was found in survey unit 10221D. This activity was found at the discharge point of a drain-pipe that runs under the rail line. This water drains to the wetland area in survey units 10220I and 10220H. An additional area was found in the wetland in 10220I that was also above an OpSOF of 1.0. To determine if the activity had spread to the wetlands in 10220H, four (4) judgmental samples were taken in the wetland starting at the boundary with 10220I. Positive Cs-137 was identified in all of the samples, with Co-60 present above the MDC in one (1) of the samples. These samples were all below an OpSOF of 1.0, with the highest at 0.371. No further action was taken. The gamma spectroscopy results are summarized in Table 13, and the OpSOF is summarized in Table 18.

10. REMEDIATION AND RESULTS

No remediation was performed in this survey unit.

11. CHANGES FROM THE SURVEY PLAN

There were no addendums to the FSS plan.

12. DATA QUALITY ASSESSMENT

The DQO sample design and data were reviewed in accordance with Zion*Solutions* procedure ZS-LT-300-001-004, *"Final Status Survey Data Assessment"* (Reference 16) for completeness and consistency. Documentation was complete and legible. Surveys and sample collection were consistent with the DQOs. The sampling design had adequate power as indicated by the Retrospective Power Curve.

The analytical results of all samples were less than an OpSOF of one when compared to the OpDCGLs.

Although MARSSIM states that the Sign Test need not be performed in the instance that no measurements surpass the DCGL, the test was conducted to demonstrate coherence to the statistical principles of the DQO process. The Sign Test was performed on the data and compared to the original assumptions of the DQOs. The evaluation of the Sign Test results clearly demonstrates that the survey unit passes the unrestricted release criteria; thus, the null hypothesis is rejected. The Sign Test is included in Attachment 4.

The preliminary data review consisted of calculating basic statistical quantities (e.g., mean, median, standard deviation). All data was considered valid including negative values, zeros, values reported below the MDC and values with uncertainties greater than two standard deviations. The mean and median values for each ROC were well below the respective OpDCGLs. Also, the retrospective power curve shows that a sufficient number of samples were collected to achieve the desired power. Therefore, the survey unit meets the unrestricted release criteria with adequate power as required by the DQOs.

The data for Co-60 and Cs-137 is represented graphically through a frequency plot and a quantile plot. All graphical representations are provided in Attachment 6.

13. ANOMALIES

No anomalies were observed during the performance or analyses of the survey.

14. CONCLUSION

Survey unit 10220H has met the DQOs of the FSS plan. The ALARA criteria for soils as specified in Chapter 4 of the LTP were achieved. The EMC for soils was not needed for this survey unit.

All identified ROC were used for statistical testing to determine the adequacy of the survey unit for FSS. Evaluation of the data shows that none of the ROC concentration values exceed the OpDCGL or any investigational levels; therefore, in accordance with the LTP Section 5.10, the survey unit meets the release criterion.

The sample data passed the Sign Test. The null hypothesis was rejected. The Retrospective Power Curve showed that adequate power was achieved.

The mean BcSOF, when the analytical results were compared to the BcDCGLs, was 0.012, which results in a dose contribution from soil in survey unit 10220H of 0.307 mrem/yr, based on the average concentration of the ROC in samples used for non-parametric statistical sampling.

The conclusion of this Release Record is that survey unit 10220H is acceptable for unrestricted release.

15. REFERENCES

1. Zion*Solutions* procedure ZS-LT-300-001-005, “Final Status Survey Data Reporting”
2. Zion Station Restoration Project License Termination Plan
3. Zion*Solutions* procedure ZS-LT-300-001-001, “Final Status Survey Package Development”
4. NUREG-1575, “Multi-Agency Radiation Survey and Site Investigation Manual”
5. Zion*Solutions* procedure ZS-LT-300-001-002, “Survey Unit Classification”

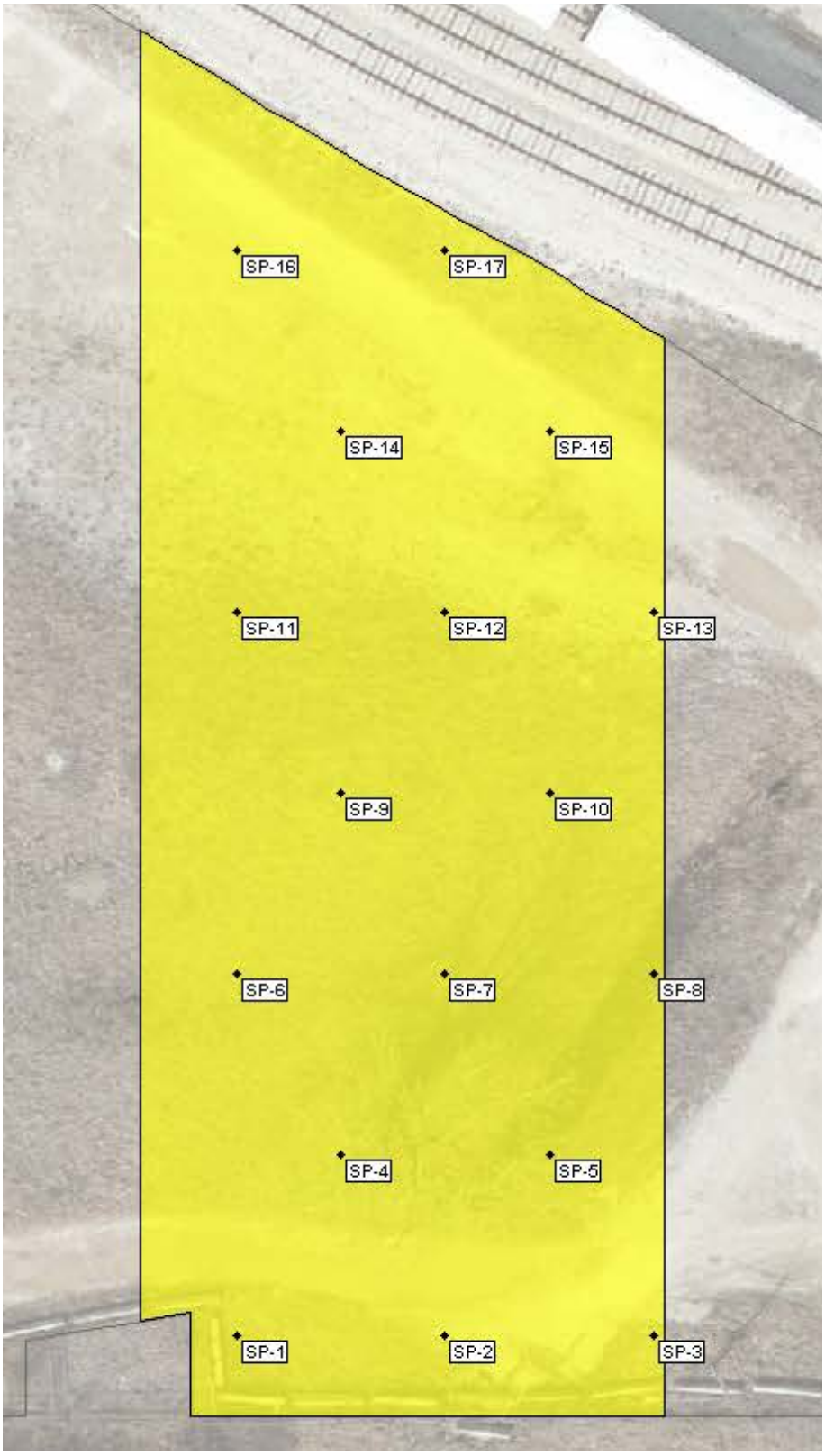
6. "Zion Station Historical Site Assessment"
7. Zion*Solutions* TSD 11-001, "Technical Support Document for Potential Radionuclides of Concern During the Decommissioning of the Zion Station"
8. Zion*Solutions* TSD 14-019, "Radionuclides of Concern for Soil and Basement Fill Model Source Terms"
9. Zion*Solutions* TSD 14-011, "Soil Area Factors"
10. Zion*Solutions* TSD 17-004, "Operational Derived Concentration Guideline Levels for Final Status Survey"
11. Zion*Solutions* TSD 11-004, "Ludlum Model 44-10 Detector Sensitivity"
12. Zion*Solutions* procedure ZS-LT-01, "Quality Assurance Project Plan (for Characterization and FSS)"
13. Zion*Solutions* procedure ZS-LT-300-001-003, "Isolation and Control for Final Status Survey"
14. Zion*Solutions* procedure ZS-RP-108-004-011, "Operation of the Ludlum Model 2350-1 Data Logger"
15. Zion*Solutions* TSD 13-004, "Examination of Cs-137 Global Fallout In Soils At Zion Station"
16. Zion*Solutions* procedure ZS-LT-300-001-004, "Final Status Survey Data Assessment"

16. ATTACHMENTS

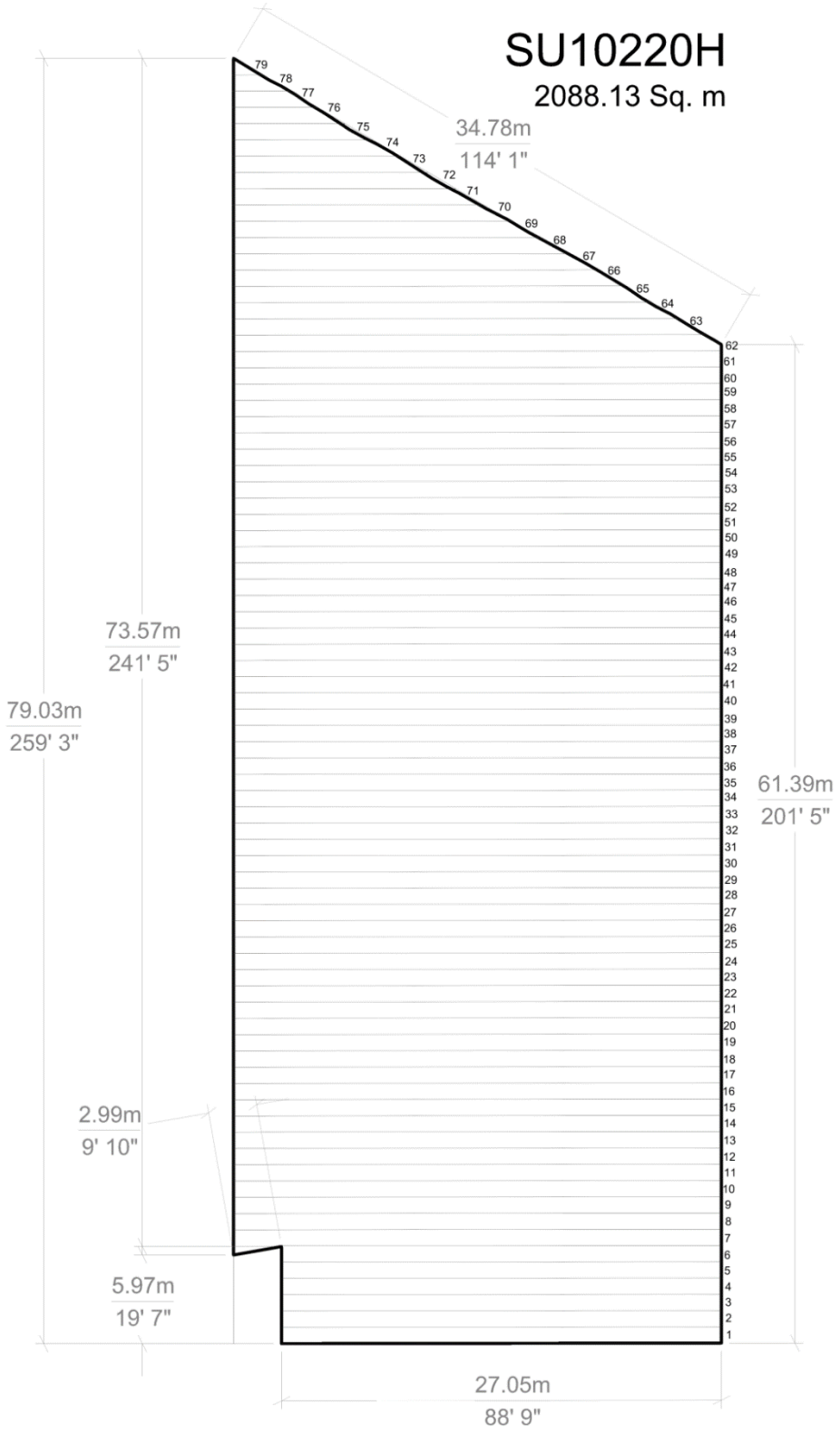
1. Attachment 1 - Figure and Map
2. Attachment 2 - Scan Data
3. Attachment 3 - Consultation Triggers for Residential and Commercial/Industrial Soil Contamination
4. Attachment 4 - Sign Test
5. Attachment 5 - QC Sample Assessment
6. Attachment 6 - Graphical Presentations
7. Attachment 7 - Sample Analytical Reports
8. Attachment 8 - Eberline Analytical Reports

ATTACHMENT 1
FIGURE AND MAP

Survey Unit 10220H Final Status Survey Boundaries and Systematic Sample Points



Survey Unit 10220H Final Status Survey Scan Rows



ATTACHMENT 2
SCAN DATA

Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	PR311756	266669	10220H	GS001	5/22/2019 13:20	2166	1950	2618	No
44-10	PR311756	266669	10220H	GS001	5/22/2019 13:23	2226	1950	2618	No
44-10	PR311756	266669	10220H	GS001	5/22/2019 13:25	2194	1950	2618	No
44-10	PR311756	266669	10220H	GS002	5/22/2019 13:29	2260	1950	2618	No
44-10	PR311756	266669	10220H	GS002	5/22/2019 13:33	2095	1950	2618	No
44-10	PR311756	266669	10220H	GS002	5/22/2019 13:36	2102	1950	2618	No
44-10	PR311756	266669	10220H	GS003	5/22/2019 13:39	2134	1950	2618	No
44-10	PR311756	266669	10220H	GS003	5/22/2019 13:42	2254	1950	2618	No
44-10	PR311756	266669	10220H	GS003	5/22/2019 13:45	2321	1950	2618	No
44-10	PR311756	266669	10220H	GS004	5/22/2019 13:48	2338	1950	2618	No
44-10	PR311756	266669	10220H	GS004	5/22/2019 13:51	2163	1950	2618	No
44-10	PR311756	266669	10220H	GS004	5/22/2019 13:55	2158	1950	2618	No
44-10	PR311756	266669	10220H	GS005	5/22/2019 13:58	2037	1950	2618	No
44-10	PR311756	266669	10220H	GS005	5/22/2019 14:02	2107	1950	2618	No
44-10	PR311756	266669	10220H	GS005	5/22/2019 14:04	2229	1950	2618	No
44-10	PR311756	266669	10220H	GS006	5/22/2019 14:06	2209	1950	2618	No
44-10	PR311756	266669	10220H	GS006	5/22/2019 14:10	2096	1950	2618	No
44-10	PR311756	266669	10220H	GS006	5/22/2019 14:14	2171	1950	2618	No
44-10	PR311756	266669	10220H	GS007	5/22/2019 14:17	2106	1950	2618	No
44-10	PR311756	266669	10220H	GS007	5/22/2019 14:20	2115	1950	2618	No
44-10	PR311756	266669	10220H	GS007	5/22/2019 14:23	2327	1950	2618	No
44-10	PR311756	266669	10220H	GS008	5/22/2019 14:27	2212	1950	2618	No
44-10	PR311756	266669	10220H	GS008	5/22/2019 14:30	2216	1950	2618	No
44-10	PR311756	266669	10220H	GS008	5/22/2019 14:33	2117	1950	2618	No
44-10	PR311756	266669	10220H	GS009	5/22/2019 14:36	2004	1950	2618	No
44-10	PR311756	266669	10220H	GS009	5/22/2019 14:39	2318	1950	2618	No
44-10	PR311756	266669	10220H	GS009	5/22/2019 14:41	2407	1950	2618	No
44-10	PR311756	266669	10220H	GS010	5/22/2019 14:44	2342	1950	2618	No
44-10	PR311756	266669	10220H	GS010	5/22/2019 14:46	2335	1950	2618	No
44-10	PR311756	266669	10220H	GS010	5/22/2019 14:51	1979	1950	2618	No
44-10	PR311750	266656	10220H	GS011	5/22/2019 13:29	2152	1921	2584	No
44-10	PR311750	266656	10220H	GS011	5/22/2019 13:31	2152	1921	2584	No
44-10	PR311750	266656	10220H	GS011	5/22/2019 13:34	1940	1921	2584	No
44-10	PR311750	266656	10220H	GS012	5/22/2019 13:37	2142	1921	2584	No
44-10	PR311750	266656	10220H	GS012	5/22/2019 13:40	2171	1921	2584	No
44-10	PR311756	266669	10220H	GS012	5/22/2019 13:42	2046	1921	2584	No

Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	PR311750	266656	10220H	GS013	5/22/2019 13:46	2380	1921	2584	No
44-10	PR311750	266656	10220H	GS013	5/22/2019 13:52	2089	1921	2584	No
44-10	PR311750	266656	10220H	GS013	5/22/2019 13:54	1946	1921	2584	No
44-10	PR311750	266656	10220H	GS014	5/22/2019 13:58	2214	1921	2584	No
44-10	PR311750	266656	10220H	GS014	5/22/2019 14:00	2022	1921	2584	No
44-10	PR311756	266669	10220H	GS014	5/22/2019 14:02	1959	1921	2584	No
44-10	PR311750	266656	10220H	GS015	5/22/2019 14:05	2306	1921	2584	No
44-10	PR311750	266656	10220H	GS015	5/22/2019 14:07	2155	1921	2584	No
44-10	PR311750	266656	10220H	GS015	5/22/2019 14:09	2060	1921	2584	No
44-10	PR311750	266656	10220H	GS016	5/22/2019 14:13	2245	1921	2584	No
44-10	PR311750	266656	10220H	GS016	5/22/2019 14:15	2169	1921	2584	No
44-10	PR311756	266669	10220H	GS016	5/22/2019 14:18	1968	1921	2584	No
44-10	PR311750	266656	10220H	GS017	5/22/2019 14:23	2291	1921	2584	No
44-10	PR311750	266656	10220H	GS017	5/22/2019 14:25	1971	1921	2584	No
44-10	PR311750	266656	10220H	GS017	5/22/2019 14:29	2089	1921	2584	No
44-10	PR311750	266656	10220H	GS018	5/22/2019 14:32	2228	1921	2584	No
44-10	PR311750	266656	10220H	GS018	5/22/2019 14:35	2205	1921	2584	No
44-10	PR311756	266669	10220H	GS018	5/22/2019 14:38	2075	1921	2584	No
44-10	PR311750	266656	10220H	GS019	5/22/2019 14:41	2392	1921	2584	No
44-10	PR311750	266656	10220H	GS019	5/22/2019 14:45	2066	1921	2584	No
44-10	PR311750	266656	10220H	GS019	5/22/2019 14:47	2051	1921	2584	No
44-10	PR311750	266656	10220H	GS020	5/22/2019 14:50	2260	1921	2584	No
44-10	PR311750	266656	10220H	GS020	5/22/2019 14:52	2222	1921	2584	No
44-10	PR311750	266656	10220H	GS020	5/22/2019 14:54	2021	1921	2584	No
44-10	PR372106	216166	10220H	GS051	5/22/2019 13:40	2529	2153	2855	No
44-10	PR372106	216166	10220H	GS051	5/22/2019 13:42	2422	2153	2855	No
44-10	PR372106	216166	10220H	GS051	5/22/2019 13:44	2512	2153	2855	No
44-10	PR372106	216166	10220H	GS052	5/22/2019 13:46	2520	2153	2855	No
44-10	PR372106	216166	10220H	GS052	5/22/2019 13:48	2340	2153	2855	No
44-10	PR372106	216166	10220H	GS052	5/22/2019 13:50	2412	2153	2855	No
44-10	PR372106	216166	10220H	GS053	5/22/2019 13:52	2433	2153	2855	No
44-10	PR372106	216166	10220H	GS053	5/22/2019 13:54	2408	2153	2855	No
44-10	PR372106	216166	10220H	GS053	5/22/2019 13:56	2645	2153	2855	No
44-10	PR372106	216166	10220H	GS054	5/22/2019 13:58	2491	2153	2855	No
44-10	PR372106	216166	10220H	GS054	5/22/2019 14:00	2509	2153	2855	No
44-10	PR372106	216166	10220H	GS054	5/22/2019 14:02	2325	2153	2855	No
44-10	PR372106	216166	10220H	GS055	5/22/2019 14:04	2480	2153	2855	No

Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	PR372106	216166	10220H	GS055	5/22/2019 14:06	2517	2153	2855	No
44-10	PR372106	216166	10220H	GS055	5/22/2019 14:08	2648	2153	2855	No
44-10	PR372106	216166	10220H	GS056	5/22/2019 14:10	2588	2153	2855	No
44-10	PR372106	216166	10220H	GS056	5/22/2019 14:12	2599	2153	2855	No
44-10	PR372106	216166	10220H	GS056	5/22/2019 14:14	2347	2153	2855	No
44-10	PR372106	216166	10220H	GS057	5/22/2019 14:16	2249	2153	2855	No
44-10	PR372106	216166	10220H	GS057	5/22/2019 14:18	2399	2153	2855	No
44-10	PR372106	216166	10220H	GS057	5/22/2019 14:20	2598	2153	2855	No
44-10	PR372106	216166	10220H	GS058	5/22/2019 14:22	2699	2153	2855	No
44-10	PR372106	216166	10220H	GS058	5/22/2019 14:24	2494	2153	2855	No
44-10	PR372106	216166	10220H	GS058	5/22/2019 14:26	2231	2153	2855	No
44-10	PR372106	216166	10220H	GS059	5/22/2019 14:28	2289	2153	2855	No
44-10	PR372106	216166	10220H	GS059	5/22/2019 14:30	2493	2153	2855	No
44-10	PR372106	216166	10220H	GS059	5/22/2019 14:32	2689	2153	2855	No
44-10	PR372106	216166	10220H	GS060	5/22/2019 14:34	2766	2153	2855	No
44-10	PR372106	216166	10220H	GS060	5/22/2019 14:36	2450	2153	2855	No
44-10	PR372106	216166	10220H	GS060	5/22/2019 14:38	2215	2153	2855	No
44-10	PR321902	304711	10220H	GS061	5/22/2019 13:41	2276	2190	2898	No
44-10	PR321902	304711	10220H	GS061	5/22/2019 13:43	2660	2190	2898	No
44-10	PR321902	304711	10220H	GS061	5/22/2019 13:46	2423	2190	2898	No
44-10	PR321902	304711	10220H	GS062	5/22/2019 13:48	2469	2190	2898	No
44-10	PR321902	304711	10220H	GS062	5/22/2019 13:50	2384	2190	2898	No
44-10	PR321902	304711	10220H	GS062	5/22/2019 13:53	2060	2190	2898	No
44-10	PR321902	304711	10220H	GS063	5/22/2019 13:56	2474	2190	2898	No
44-10	PR321902	304711	10220H	GS063	5/22/2019 13:58	2453	2190	2898	No
44-10	PR321902	304711	10220H	GS063	5/22/2019 14:00	2398	2190	2898	No
44-10	PR321902	304711	10220H	GS064	5/22/2019 14:03	2711	2190	2898	No
44-10	PR321902	304711	10220H	GS064	5/22/2019 14:05	2323	2190	2898	No
44-10	PR321902	304711	10220H	GS064	5/22/2019 14:07	2651	2190	2898	No
44-10	PR321902	304711	10220H	GS065	5/22/2019 14:10	2694	2190	2898	No
44-10	PR321902	304711	10220H	GS065	5/22/2019 14:12	2462	2190	2898	No
44-10	PR321902	304711	10220H	GS065	5/22/2019 14:14	2209	2190	2898	No
44-10	PR311750	266656	10220H	GS021	5/28/2019 8:05	2385	2228	2942	No
44-10	PR311750	266656	10220H	GS021	5/28/2019 8:08	2259	2228	2942	No
44-10	PR311750	266656	10220H	GS021	5/28/2019 8:11	2253	2228	2942	No
44-10	PR311750	266656	10220H	GS022	5/28/2019 8:15	2410	2228	2942	No
44-10	PR311750	266656	10220H	GS022	5/28/2019 8:18	2283	2228	2942	No

Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	PR311750	266656	10220H	GS022	5/28/2019 8:23	2210	2228	2942	No
44-10	PR311750	266656	10220H	GS023	5/28/2019 8:26	2479	2228	2942	No
44-10	PR311750	266656	10220H	GS023	5/28/2019 8:28	2308	2228	2942	No
44-10	PR311750	266656	10220H	GS023	5/28/2019 8:30	2349	2228	2942	No
44-10	PR311750	266656	10220H	GS024	5/28/2019 8:34	2445	2228	2942	No
44-10	PR311750	266656	10220H	GS024	5/28/2019 8:37	2410	2228	2942	No
44-10	PR311750	266656	10220H	GS024	5/28/2019 8:40	2377	2228	2942	No
44-10	PR311750	266656	10220H	GS025	5/28/2019 8:43	2558	2228	2942	No
44-10	PR311750	266656	10220H	GS025	5/28/2019 8:45	2426	2228	2942	No
44-10	PR311750	266656	10220H	GS025	5/28/2019 8:47	2309	2228	2942	No
44-10	PR311750	266656	10220H	GS046	5/28/2019 12:58	2251	1890	2547	No
44-10	PR311750	266656	10220H	GS046	5/28/2019 13:01	1969	1890	2547	No
44-10	PR311750	266656	10220H	GS046	5/28/2019 13:05	2004	1890	2547	No
44-10	PR311750	266656	10220H	GS047	5/28/2019 13:08	2099	1890	2547	No
44-10	PR311750	266656	10220H	GS047	5/28/2019 13:10	2082	1890	2547	No
44-10	PR311750	266656	10220H	GS047	5/28/2019 13:13	1853	1890	2547	No
44-10	PR311750	266656	10220H	GS048	5/28/2019 13:19	2190	1890	2547	No
44-10	PR311750	266656	10220H	GS048	5/28/2019 13:22	2070	1890	2547	No
44-10	PR311750	266656	10220H	GS048	5/28/2019 13:27	1970	1890	2547	No
44-10	PR311750	266656	10220H	GS049	5/28/2019 13:30	2187	1890	2547	No
44-10	PR311750	266656	10220H	GS049	5/28/2019 13:33	2106	1890	2547	No
44-10	PR311750	266656	10220H	GS049	5/28/2019 13:35	2049	1890	2547	No
44-10	PR311750	266656	10220H	GS050	5/28/2019 13:38	2248	1890	2547	No
44-10	PR311750	266656	10220H	GS050	5/28/2019 13:40	2030	1890	2547	No
44-10	PR311750	266656	10220H	GS050	5/28/2019 13:42	2181	1890	2547	No
44-10	PR311756	266669	10220H	GS026	5/28/2019 8:17	2443	2122	2818	No
44-10	PR311756	266669	10220H	GS026	5/28/2019 8:20	2386	2122	2818	No
44-10	PR311756	266669	10220H	GS026	5/28/2019 8:23	2460	2122	2818	No
44-10	PR311756	266669	10220H	GS027	5/28/2019 8:27	2343	2122	2818	No
44-10	PR311756	266669	10220H	GS027	5/28/2019 8:31	2411	2122	2818	No
44-10	PR311756	266669	10220H	GS027	5/28/2019 8:34	2528	2122	2818	No
44-10	PR311756	266669	10220H	GS028	5/28/2019 8:39	2486	2122	2818	No
44-10	PR311756	266669	10220H	GS028	5/28/2019 8:42	2382	2122	2818	No
44-10	PR311756	266669	10220H	GS028	5/28/2019 8:45	2308	2122	2818	No
44-10	PR311756	266669	10220H	GS029	5/28/2019 8:50	2333	2122	2818	No
44-10	PR311756	266669	10220H	GS029	5/28/2019 8:53	2410	2122	2818	No
44-10	PR311756	266669	10220H	GS029	5/28/2019 8:57	2453	2122	2818	No

Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	PR311756	266669	10220H	GS030	5/28/2019 9:00	2550	2122	2818	No
44-10	PR311756	266669	10220H	GS030	5/28/2019 9:04	2333	2122	2818	No
44-10	PR311756	266669	10220H	GS030	5/28/2019 9:08	2286	2122	2818	No
44-10	PR363452	304726	10220H	GS031	5/28/2019 8:36	2879	2336	3067	No
44-10	PR363452	304726	10220H	GS031	5/28/2019 8:39	2496	2336	3067	No
44-10	PR363452	304726	10220H	GS031	5/28/2019 8:41	2338	2336	3067	No
44-10	PR363452	304726	10220H	GS032	5/28/2019 8:44	2512	2336	3067	No
44-10	PR363452	304726	10220H	GS032	5/28/2019 8:47	2425	2336	3067	No
44-10	PR363452	304726	10220H	GS032	5/28/2019 8:49	2762	2336	3067	No
44-10	PR363452	304726	10220H	GS033	5/28/2019 8:52	2705	2336	3067	No
44-10	PR363452	304726	10220H	GS033	5/28/2019 8:55	2490	2336	3067	No
44-10	PR363452	304726	10220H	GS033	5/28/2019 8:57	2468	2336	3067	No
44-10	PR363452	304726	10220H	GS034	5/28/2019 9:00	2267	2336	3067	No
44-10	PR363452	304726	10220H	GS034	5/28/2019 9:03	2665	2336	3067	No
44-10	PR363452	304726	10220H	GS034	5/28/2019 9:06	2813	2336	3067	No
44-10	PR363452	304726	10220H	GS035	5/28/2019 9:09	2809	2336	3067	No
44-10	PR363452	304726	10220H	GS035	5/28/2019 9:12	2415	2336	3067	No
44-10	PR363452	304726	10220H	GS035	5/28/2019 9:14	2126	2336	3067	No
44-10	PR363311	304718	10220H	GS036	5/28/2019 8:02	2398	1789	2429	No
44-10	PR363311	304718	10220H	GS036	5/28/2019 8:04	2018	1789	2429	No
44-10	PR363311	304718	10220H	GS036	5/28/2019 8:06	1992	1789	2429	No
44-10	PR363311	304718	10220H	GS037	5/28/2019 8:08	2073	1789	2429	No
44-10	PR363311	304718	10220H	GS037	5/28/2019 8:10	1912	1789	2429	No
44-10	PR363311	304718	10220H	GS037	5/28/2019 8:12	2425	1789	2429	No
44-10	PR363311	304718	10220H	GS038	5/28/2019 8:14	2394	1789	2429	No
44-10	PR363311	304718	10220H	GS038	5/28/2019 8:16	1968	1789	2429	No
44-10	PR363311	304718	10220H	GS038	5/28/2019 8:18	1966	1789	2429	No
44-10	PR363311	304718	10220H	GS039	5/28/2019 8:20	2069	1789	2429	No
44-10	PR363311	304718	10220H	GS039	5/28/2019 8:22	2003	1789	2429	No
44-10	PR363311	304718	10220H	GS039	5/28/2019 8:24	2309	1789	2429	No
44-10	PR363311	304718	10220H	GS040	5/28/2019 8:26	2295	1789	2429	No
44-10	PR363311	304718	10220H	GS040	5/28/2019 8:28	2189	1789	2429	No
44-10	PR363311	304718	10220H	GS040	5/28/2019 8:30	2099	1789	2429	No
44-10	PR375273	304730	10220H	GS041	5/28/2019 7:43	2184	1643	2256	No
44-10	PR375273	304730	10220H	GS041	5/28/2019 7:45	2194	1643	2256	No
44-10	PR375273	304730	10220H	GS041	5/28/2019 7:47	1999	1643	2256	No
44-10	PR375273	304730	10220H	GS042	5/28/2019 7:51	1939	1643	2256	No

Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	PR375273	304730	10220H	GS042	5/28/2019 7:53	1943	1643	2256	No
44-10	PR375273	304730	10220H	GS042	5/28/2019 7:55	2097	1643	2256	No
44-10	PR375273	304730	10220H	GS043	5/28/2019 7:59	2093	1643	2256	No
44-10	PR375273	304730	10220H	GS043	5/28/2019 8:01	2162	1643	2256	No
44-10	PR375273	304730	10220H	GS043	5/28/2019 8:03	1919	1643	2256	No
44-10	PR375273	304730	10220H	GS044	5/28/2019 8:07	1981	1643	2256	No
44-10	PR375273	304730	10220H	GS044	5/28/2019 8:09	2164	1643	2256	No
44-10	PR375273	304730	10220H	GS044	5/28/2019 8:11	2224	1643	2256	No
44-10	PR375273	304730	10220H	GS045	5/28/2019 8:15	2046	1643	2256	No
44-10	PR375273	304730	10220H	GS045	5/28/2019 8:17	1873	1643	2256	No
44-10	PR375273	304730	10220H	GS045	5/28/2019 8:19	2167	1643	2256	No
44-10	PR321902	304711	10220H	GS067	5/28/2019 9:06	2595	2167	2871	No
44-10	PR321902	304711	10220H	GS067	5/28/2019 9:09	2429	2167	2871	No
44-10	PR321902	304711	10220H	GS067	5/28/2019 9:11	2423	2167	2871	No
44-10	PR321902	304711	10220H	GS068	5/28/2019 9:15	2713	2167	2871	No
44-10	PR321902	304711	10220H	GS068	5/28/2019 9:17	2390	2167	2871	No
44-10	PR321902	304711	10220H	GS068	5/28/2019 9:20	2104	2167	2871	No
44-10	PR321902	304711	10220H	GS069	5/28/2019 9:23	2689	2167	2871	No
44-10	PR321902	304711	10220H	GS069	5/28/2019 9:25	2532	2167	2871	No
44-10	PR321902	304711	10220H	GS070	5/28/2019 9:30	2398	2167	2871	No
44-10	PR321902	304711	10220H	GS070	5/28/2019 9:32	2365	2167	2871	No
44-10	PR321902	304711	10220H	GS071	5/28/2019 9:40	2603	2167	2871	No
44-10	PR321902	304711	10220H	GS071	5/28/2019 9:44	2554	2167	2871	No
44-10	PR321902	304711	10220H	GS072	5/28/2019 9:50	2587	2167	2871	No
44-10	PR321902	304711	10220H	GS072	5/28/2019 9:52	2497	2167	2871	No
44-10	PR321902	304711	10220H	GS073	5/28/2019 9:54	2544	2167	2871	No
44-10	PR321902	304711	10220H	GS073	5/28/2019 9:58	2540	2167	2871	No
44-10	PR321902	304711	10220H	GS074	5/28/2019 10:05	2561	2167	2871	No
44-10	PR321902	304711	10220H	GS074	5/28/2019 10:11	2727	2167	2871	No
44-10	PR321902	304711	10220H	GS075	5/28/2019 10:16	2742	2167	2871	No
44-10	PR321902	304711	10220H	GS076	5/28/2019 10:20	2569	2167	2871	No
44-10	PR321902	304711	10220H	GS077	5/28/2019 10:25	2679	2167	2871	No
44-10	PR321902	304711	10220H	GS078	5/28/2019 10:28	2481	2167	2871	No
44-10	PR321902	304711	10220H	GS079	5/28/2019 10:33	2400	2167	2871	No
44-10	PR321902	304711	10220H	GS066	6/4/2019 9:31	2790	2176	2881	No
44-10	PR321902	304711	10220H	GS066	6/4/2019 9:34	2402	2176	2881	No
44-10	PR321902	304711	10220H	GS066	6/4/2019 9:36	2352	2176	2881	No

ATTACHMENT 3

CONSULTATION TRIGGERS FOR RESIDENTIAL AND COMMERCIAL/INDUSTRIAL SOIL CONTAMINATION

Table H.1 Consultation Triggers for Residential and Commercial/Industrial Soil Contamination (MOU Table 1)

Except for radium-226, thorium-232, or total uranium, concentrations should be aggregated using a sum of the fraction approach to determine site-specific consultation trigger concentrations. This table is based on single contaminant concentrations for residential and commercial/industrial land use when using generally accepted exposure parameters. Table users should select the appropriate column based on the site's reasonably anticipated land use.

Radionuclide	Residential Soil Concentration	Industrial/Commercial Soil Concentration
H-3	228 pCi/g	423 pCi/g
C-14	46 pCi/g	123,000 pCi/g
Na-22	9 pCi/g	14 pCi/g
S-35	19,600 pCi/g	32,200,000 pCi/g
Cl-36	6 pCi/g	10,700 pCi/g
Ca-45	13,500 pCi/g	3,740,000 pCi/g
Sc-46	105 pCi/g	169 pCi/g
Mn-54	69 pCi/g	112 pCi/g
Fe-55	269,000 pCi/g	2,210,000 pCi/g
Co-57	873 pCi/g	1,420 pCi/g
Co-60	4 pCi/g	6 pCi/g
Ni-59	20,800 pCi/g	1,230,000 pCi/g
Ni-63	9,480 pCi/g	555,000 pCi/g
Sr-90+D	23 pCi/g	1,070 pCi/g
Nb-94	2 pCi/g	3 pCi/g
Tc-99	25 pCi/g	89,400 pCi/g
I-129	60 pCi/g	1,080 pCi/g
Cs-134	16 pCi/g	26 pCi/g
Cs-137+D	6 pCi/g	11 pCi/g
Eu-152	4 pCi/g	7 pCi/g
Eu-154	5 pCi/g	8 pCi/g
Ir-192	336 pCi/g	544 pCi/g
Pb-210+D	15 pCi/g	123 pCi/g
Ra-226	5 pCi/g	5 pCi/g
Ac-227+D	10 pCi/g	21 pCi/g
Th-228+D	15 pCi/g	25 pCi/g
Th-232	5 pCi/g	5 pCi/g
U-234	401 pCi/g	3,310 pCi/g
U-235+D	20 pCi/g	39 pCi/g
U-238+D	74 pCi/g	179 pCi/g
total uranium	47 mg/kg	1230 mg/kg
Pu-238	297 pCi/g	1,640 pCi/g
Pu-239	259 pCi/g	1,430 pCi/g
Pu-241	40,600 pCi/g	172,000 pCi/g
Am-241	187 pCi/g	568 pCi/g
Cm-242	32,200 pCi/g	344,000 pCi/g
Cm-243	35 pCi/g	67 pCi/g

ATTACHMENT 4
SIGN TEST

Attachment 12
Sign Statistical Test

ZS-LT-300-001-004
Revision 7
Information Use

Survey Area: No. 10200 **Description:** Radiological Restricted Area Grounds
Survey Unit: No. 10220H **Description:** SE Corner of Exclusion Area – Lakeshore
Classification: 1 **Type I (α) Error:** 0.05 **Number of Samples:** 17

#	Fraction of the Release Criterion						Weighted Sum (W_s)	1-W_s	Sign
	Radionuclides of Concern					Activity or SOF (as applicable)			
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90				
1	4.36E-02	1.82E-02	5.59E-03	9.39E-03	1.31E-05	SOF	0.077	0.923	+
2	2.44E-02	2.14E-02	4.74E-03	5.25E-03	1.11E-05	SOF	0.056	0.944	+
3	4.46E-02	6.81E-04	1.67E-02	9.61E-03	3.92E-05	SOF	0.072	0.928	+
4	1.88E-02	2.97E-03	1.13E-02	4.05E-03	2.66E-05	SOF	0.037	0.963	+
5	1.83E-02	3.71E-03	3.36E-02	3.95E-03	7.88E-05	SOF	0.060	0.940	+
6	0.00E+00	3.04E-03	1.06E-02	0.00E+00	2.49E-05	SOF	0.014	0.986	+
7	3.92E-02	2.93E-03	8.18E-03	8.45E-03	1.92E-05	SOF	0.059	0.941	+
8	7.69E-03	8.37E-03	1.53E-02	1.66E-03	3.59E-05	SOF	0.033	0.967	+
9	1.80E-02	2.12E-02	1.16E-02	3.87E-03	2.73E-05	SOF	0.055	0.945	+
10	4.19E-02	2.00E-02	2.87E-02	9.02E-03	6.72E-05	SOF	0.100	0.900	+
11	2.19E-02	0.00E+00	9.78E-03	4.72E-03	2.29E-05	SOF	0.036	0.964	+
12	4.08E-02	7.39E-03	2.55E-02	8.78E-03	5.98E-05	SOF	0.083	0.917	+
13	2.43E-02	1.11E-02	6.61E-04	5.23E-03	1.55E-06	SOF	0.041	0.959	+
14	0.00E+00	0.00E+00	1.23E-02	0.00E+00	2.88E-05	SOF	0.012	0.988	+
15	1.39E-02	0.00E+00	8.84E-03	3.00E-03	2.07E-05	SOF	0.026	0.974	+
16	0.00E+00	0.00E+00	1.00E-02	0.00E+00	2.35E-05	SOF	0.010	0.990	+
17	2.71E-02	7.91E-04	1.26E-02	5.84E-03	2.95E-05	SOF	0.046	0.954	+

Critical Value (Table I.3 of MARSSIM) = **12** Number of Positive Differences (S+) = **17**

The survey unit ☑ (meets) ☐(does not meet) the acceptance criteria.

Prepared By (RE): J Graham (Print Name) (Signature) 9/17/2019 (Date)

Peer Reviewed By (RE): R.J. Mandia (Print Name) (Signature) 9-17-19 (Date)

ATTACHMENT 5
QC SAMPLE ASSESSMENT

Duplicate Sample Assessment Form

Survey Area #: 10200	Survey Unit # 10220H	Survey Unit Name: SE Corner of Exclusion Area – Lakeshore
Sample Plan#: L1-10220H-F		

Sample Description: Comparison of split samples collected from systematic surface soil sample location #6 and judgmental surface soil sample #4 and analyzed using gamma spectroscopy by on-site HPGe system. The standard/comparison samples were L1-10220H-FSGS-006SS / L1-10220H-FQGS-006SS and L1-10220H-FJGS-004SS / L1-10220H-QJGS-004SS

	STANDARD				COMPARISON			
Radionuclide	Activity Value	Standard Error	Resolution	Agreement Range	Activity Value	Standard Error	Comparison Ratio	Acceptable (Y/N)
Systematic Sample #6								
K-40	4.89E+00	4.17E-01	11.70	0.6 - 1.66	5.26E+00	4.17E-01	0.93	Y
Judgmental Sample #4								
Cs-137	9.48E-01	6.36E-02	14.91	0.6 - 1.66	4.74E-01	3.52E-02	2.00	N
Co-60	9.16E-02	8.94E-03	10.25	0.6 - 1.66	5.12E-02	7.14E-03	1.79	N
K-40	6.49E+00	3.88E-01	16.73	0.75-1.33	6.17E+00	3.71E-01	1.05	Y

Comments/Corrective Actions:

For systematic sample #6, the standard sample and QC sample did not both have a positive result for a gamma emitting ROC, therefore K-40 was used in the QC comparison.There was acceptable agreement when using K-40. No further action is necessary.

For judgmental sample #4, there was not acceptable agreement between the standard sample and QC sample when using either Co-60 or Cs-137. This is due to the fact that Co-60 and Cs-137 are present at very low concentrations in both samples. However, when using K-40, which is present in the samples at a higher concentration, there was acceptable agreement. No further action is necessary

Table 4-1 from the QAPP is reproduced below to show acceptance criteria used to assess split samples.

Resolution	Acceptable Ratio
<4	0.4-2.5
4-7	0.5-2.0
8-15	0.6-1.66
16-50	0.75-1.33
51-200	0.80-1.25
>200	0.85-1.18

Performed by:	Date:	Reveiwed by:	Date:
T Graham	9/17/19	R.S. Mandia	9-17-19

ATTACHMENT 6
GRAPHICAL PRESENTATIONS

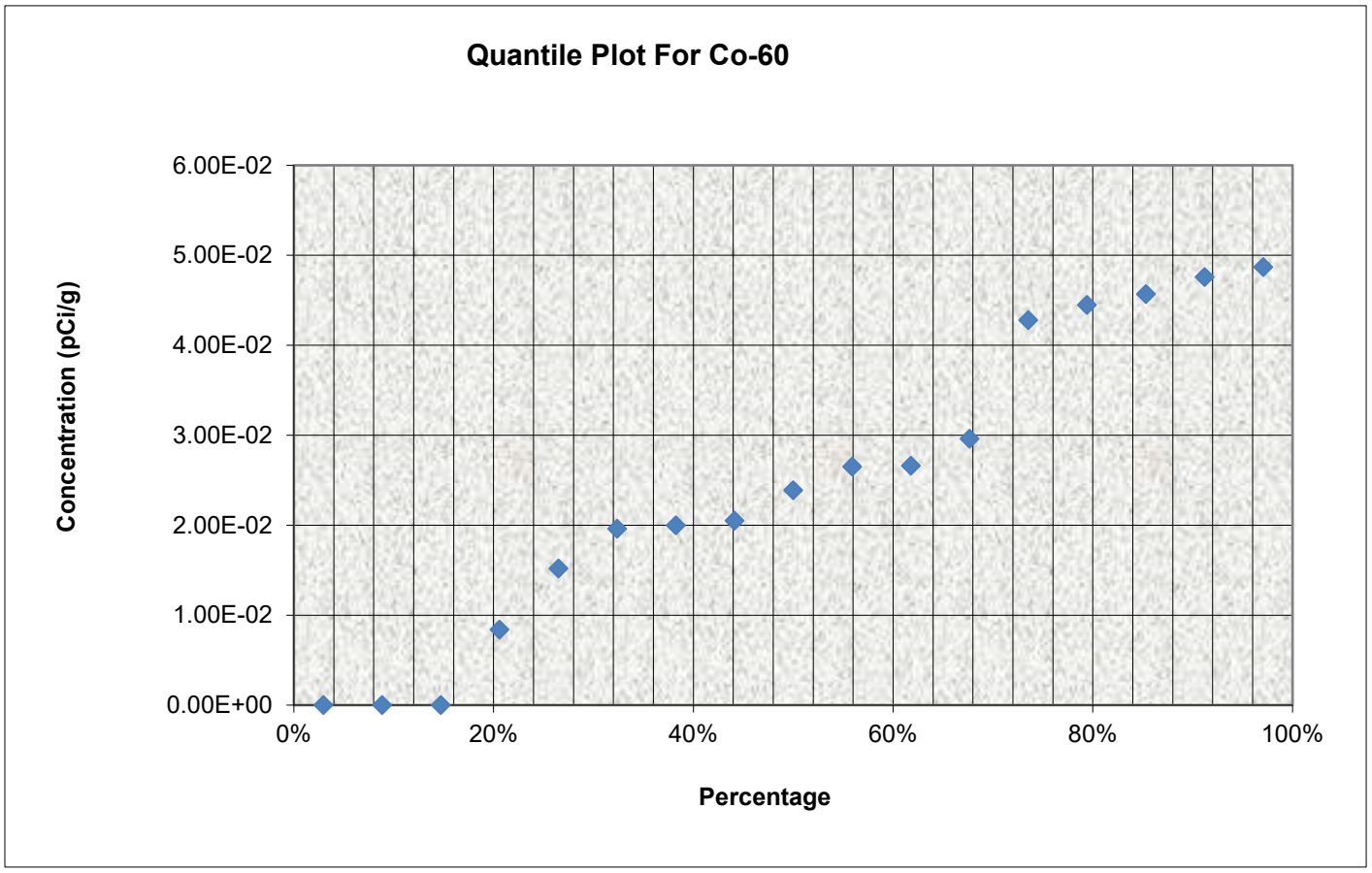
POSTING PLOT

QUANTILE PLOT FOR Co-60

Survey Unit: 10220H

Survey Unit Name: SE Corner of Exclusion Area – Lakeshore

Mean: 2.47E-02 pCi/g

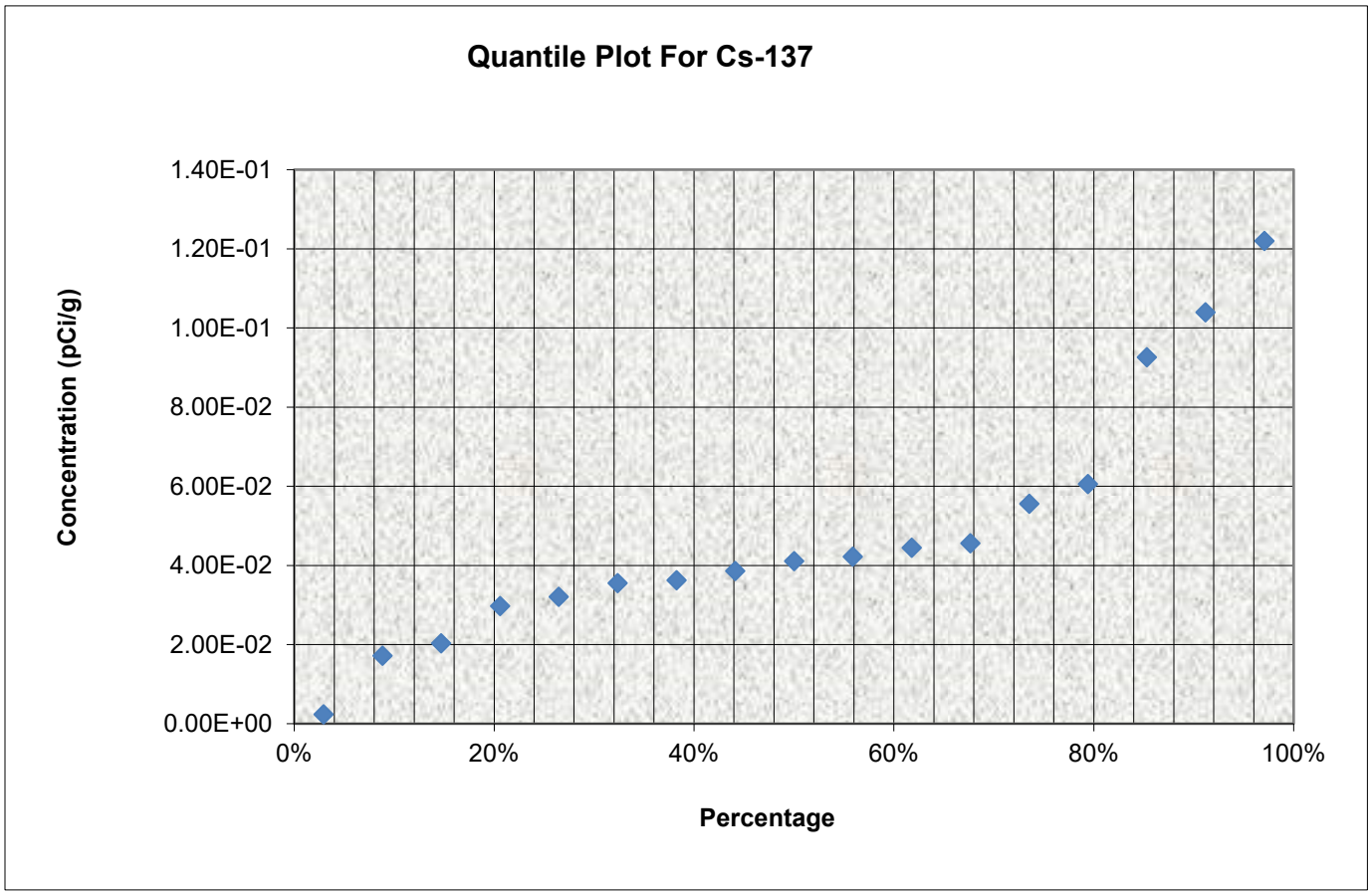


QUANTILE PLOT FOR Cs-137

Survey Unit: 10220H

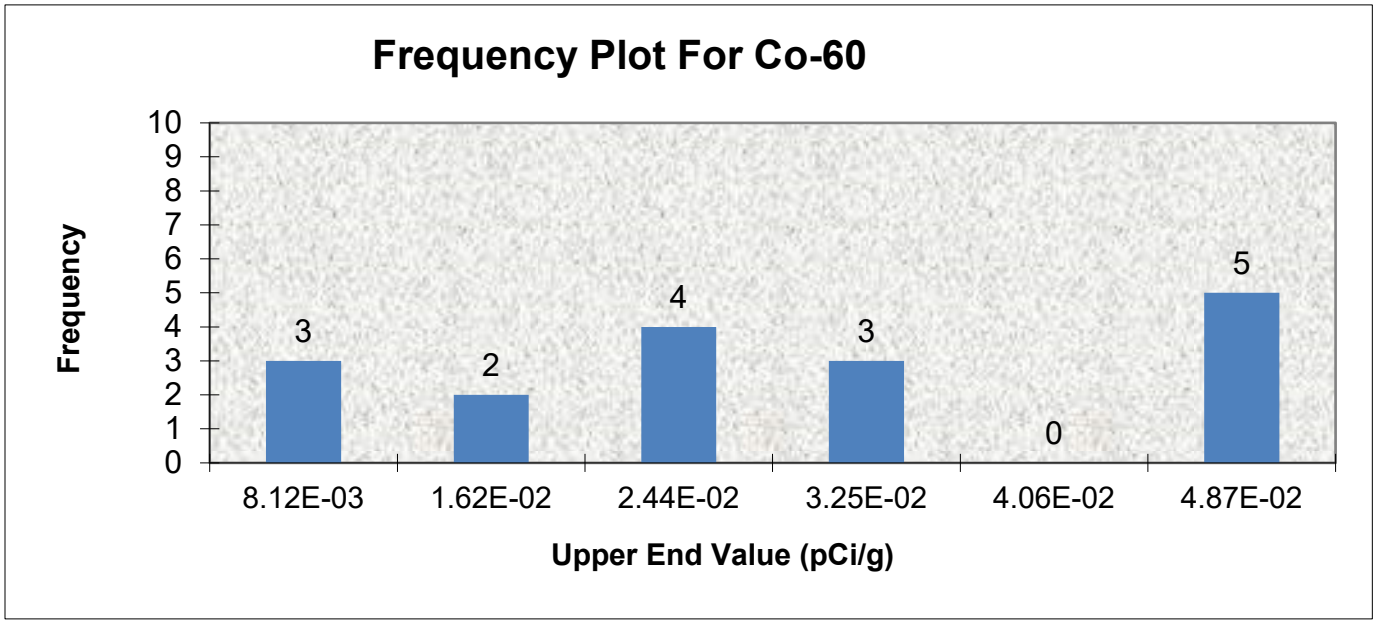
Survey Unit Name: SE Corner of Exclusion Area – Lakeshore

Mean: 4.83E-02 pCi/g



HISTOGRAM FOR Co-60

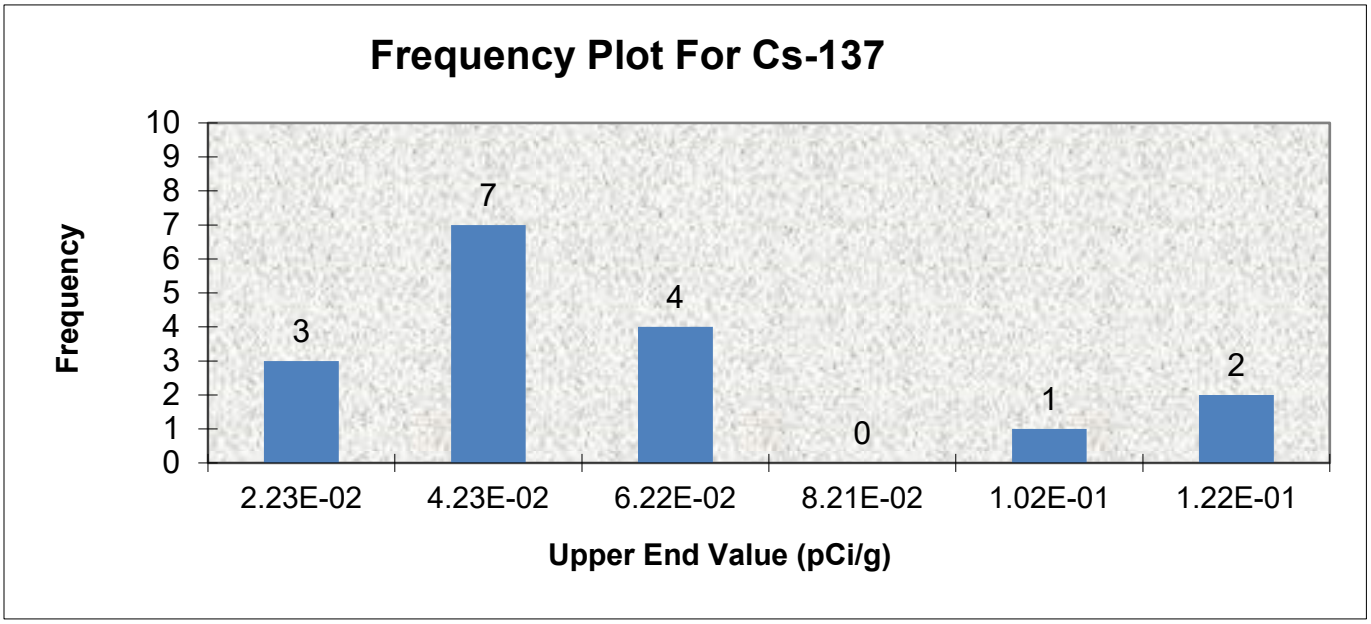
Survey Unit:	10220H	
Survey Unit Name:	SE Corner of Exclusion Area – Lakeshore	
Mean:	2.47E-02	pCi/g
Median:	2.39E-02	pCi/g
ST DEV:	0.017	
Skew:	-0.023	



Upper Value	Observation Frequency	Observation %
8.12E-03	3	18%
1.62E-02	2	12%
2.44E-02	4	24%
3.25E-02	3	18%
4.06E-02	0	0%
4.87E-02	5	29%
TOTAL	17	100%

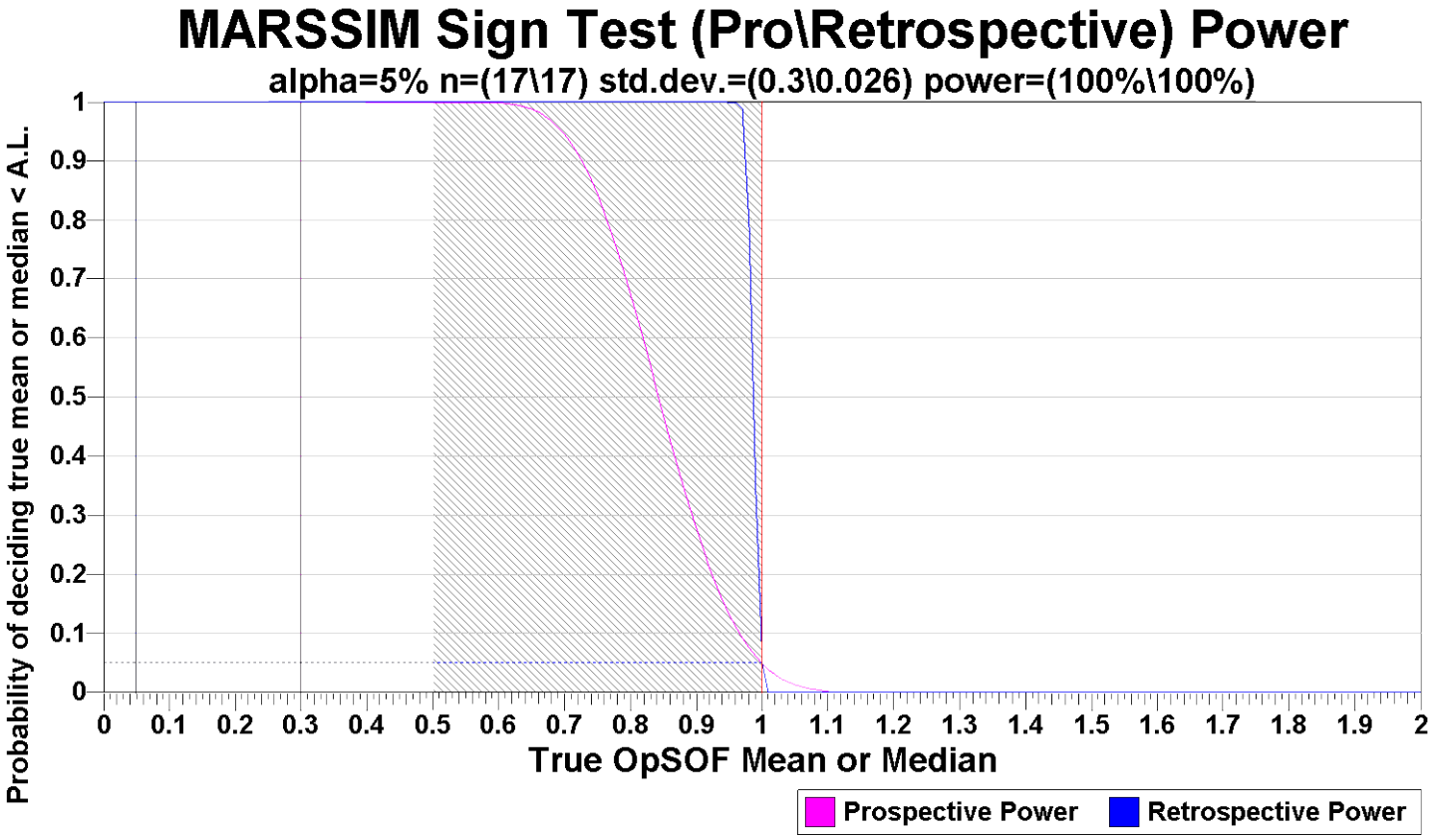
HISTOGRAM FOR Cs-137

Survey Unit:	10220H	
Survey Unit Name:	SE Corner of Exclusion Area – Lakeshore	
Mean:	4.83E-02	pCi/g
Median:	4.11E-02	pCi/g
ST DEV:	0.031	
Skew:	1.154	



Upper Value	Observation Frequency	Observation %
2.23E-02	3	18%
4.23E-02	7	41%
6.22E-02	4	24%
8.21E-02	0	0%
1.02E-01	1	6%
1.22E-01	2	12%
TOTAL	17	100%

Prospective and Retrospective Power Curves for Survey Unit 10220H



ATTACHMENT 7
SAMPLE ANALYTICAL REPORTS

Apex-Gamma

Analysis Report for 29-May-19-10014

L1-10220H-FSGS-001SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-May-19-10014
Sample Description	: L1-10220H-FSGS-001SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 9.660E+02 grams
Facility	: Default
Sample Taken On	: 5/23/2019 8:25:00AM
Acquisition Started	: 5/29/2019 8:31:55AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 5/29/2019
Efficiency Calibration Description	:
Sample Number	: 76853
Fill Height	: 966.05 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/29/2019 8:47:06AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

DATA VALIDATED 5/30/19 1000

J Graham/

Analysis Report for 29-May-19-10014

L1-10220H-FSGS-001SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	76.96	306 -	316	309.14	2.81E+01	13.28	5.69E+01	0.52
2	238.60	945 -	960	954.87	1.21E+02	16.95	5.56E+01	0.84
3	295.14	1175 -	1187	1180.76	4.02E+01	9.77	2.08E+01	0.70
4	351.86	1400 -	1414	1407.43	8.02E+01	13.10	3.18E+01	0.87
5	583.02	2326 -	2337	2331.38	3.80E+01	8.27	1.20E+01	0.74
6	609.17	2428 -	2444	2435.94	6.72E+01	10.19	1.18E+01	0.75
7	910.86	3637 -	3649	3642.47	2.79E+01	8.15	1.41E+01	1.34
8	1460.19	5831 -	5851	5841.12	2.19E+02	16.02	1.05E+01	2.10

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.93	1460.82	*	10.66	5.49E+00	4.68E-01
Tl-208	0.99	583.19	*	85.00	6.38E-02	1.44E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.18E-01	3.52E-02
		300.09		3.30		
Pb212-XR	0.99	74.82		10.28		
		77.11	*	17.10	2.94E-01	1.42E-01
		87.35		3.97		
		89.78		1.46		

Analysis Report for 29-May-19-10014

L1-10220H-FSGS-001SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	609.32	*	45.49	2.17E-01	3.54E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	1.93E-01	4.94E-02
		351.93	*	35.60	2.26E-01	4.12E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	5.19E-01	2.52E-01
		87.35		2.24		
		89.78		0.82		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.09E-01	6.18E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

Analysis Report for 29-May-19-10014

L1-10220H-FSGS-001SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.938	5.49E+00	4.68E-01	
	Tl-208	0.995	6.38E-02	1.44E-02	
X	Bi-211	0.905			
	Pb-212	1.000	2.18E-01	3.52E-02	
?	Pb212-XR	0.998	2.94E-01	1.42E-01	
	Bi-214	0.999	2.17E-01	3.54E-02	
	Pb-214	0.999	2.13E-01	3.16E-02	
?	Pb214-XR	0.998	5.19E-01	2.52E-01	
	Ac-228	0.994	2.09E-01	6.18E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-May-19-10014

L1-10220H-FSGS-001SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/29/2019 8:47:06AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	9.87E-02	6.68E-02	6.68E-02
	BE-7	477.60		10.44	-1.55E-01	4.23E-01	4.23E-01
+	K-40	1460.82	*	10.66	5.49E+00	5.99E-01	5.99E-01
	Mn-54	834.85		99.98	-3.92E-03	4.29E-02	4.29E-02
	Co-60	1173.23		99.85	-2.51E-02	5.47E-02	5.47E-02
		1332.49		99.98	4.76E-02		5.96E-02
	Nb-94	702.65		99.81	-1.33E-02	4.46E-02	4.80E-02
		871.09		99.89	-2.71E-02		4.46E-02
	Ag-108m	79.13		6.60	3.90E-01	3.81E-02	1.51E+00
		433.94		90.50	8.18E-03		3.81E-02
		614.28		89.80	-3.24E-03		7.67E-02
		722.94		90.80	2.17E-02		6.25E-02
	Sb-125	176.31		6.84	2.58E-01	1.27E-01	5.14E-01
		380.45		1.52	7.33E-01		2.64E+00
		427.87		29.60	-3.91E-03		1.27E-01
		463.36		10.49	2.85E-02		3.96E-01
		600.60		17.65	-7.89E-02		2.69E-01
		606.71		4.98	2.48E+00		1.49E+00
		635.95		11.22	2.35E-01		3.83E-01

Analysis Report for 29-May-19-10014

L1-10220H-FSGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.12E+00	1.27E-01	2.45E+00
Ba-133	79.61	2.65	-6.13E-01	8.51E-02	3.60E+00
	81.00	32.90	-6.75E-02		2.38E-01
	276.40	7.16	1.33E-01		5.19E-01
	302.85	18.34	-3.45E-03		2.00E-01
	356.01	62.05	-1.18E-02		8.51E-02
	383.85	8.94	1.72E-01		4.45E-01
Cs-134	475.36	1.48	7.81E-01	6.22E-02	2.84E+00
	563.25	8.34	9.34E-03		4.67E-01
	569.33	15.37	-4.59E-02		2.47E-01
	604.72	97.62	-3.08E-02		7.18E-02
	795.86	85.46	3.15E-02		6.22E-02
	801.95	8.69	-6.38E-01		5.20E-01
	1038.61	0.99	-9.66E-01		4.47E+00
	1167.97	1.79	-8.34E-01		3.19E+00
	1365.19	3.02	1.10E+00		1.71E+00
Cs-137	661.66	85.10	2.03E-02	7.97E-02	7.97E-02
Eu-152	121.78	28.67	-1.20E-01	1.19E-01	1.31E-01
	244.70	7.61	1.24E-01		5.44E-01
	295.94	0.45	8.81E+00		9.93E+00
	344.28	26.60	-1.54E-01		1.19E-01
	367.79	0.86	-3.13E+00		3.72E+00
	411.12	2.24	5.31E-01		1.59E+00
	443.96	2.83	-5.23E-02		1.18E+00
	488.68	0.42	-3.01E+00		8.91E+00
	563.99	0.49	1.85E+00		7.91E+00
	586.26	0.46	1.01E+01		1.38E+01
	678.62	0.47	1.05E+00		9.64E+00
	688.67	0.86	3.44E-02		4.82E+00
	719.35	0.28	-8.55E+00		1.64E+01
	778.90	12.96	-3.35E-02		3.33E-01
	810.45	0.32	2.57E+00		1.55E+01
	867.37	4.26	-2.04E-01		1.09E+00
	919.33	0.43	-2.21E+00		1.11E+01
	964.08	14.65	4.87E-01		4.72E-01
	1085.87	10.24	3.72E-01		5.61E-01
	1089.74	1.73	-3.21E-01		3.74E+00
	1112.07	13.69	-1.21E-01		3.85E-01
	1212.95	1.43	-2.32E+00		4.87E+00
	1249.94	0.19	6.83E+00		3.64E+01
	1299.14	1.63	8.70E-01		3.68E+00
	1408.01	21.07	1.98E-01		2.73E-01
	1457.64	0.50	1.21E+02		4.08E+01
	1528.10	0.28	1.53E+00		1.70E+01
Eu-154	123.07	40.40	-1.03E-02	9.35E-02	9.35E-02
	247.93	6.89	-1.20E-01		4.55E-01
	591.76	4.95	-3.80E-01		9.00E-01
	692.42	1.78	2.00E-01		2.43E+00
	723.30	20.06	9.45E-02		2.83E-01
	756.80	4.52	-6.26E-01		8.98E-01
	873.18	12.08	1.77E-02		3.78E-01

Analysis Report for 29-May-19-10014

L1-10220H-FSGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-2.61E-02	9.35E-02	5.28E-01
	1004.76	18.01	1.28E-01		2.73E-01
	1274.43	34.80	-1.25E-01		1.58E-01
	1596.48	1.80	1.12E+00		2.49E+00
Eu-155	45.30	1.31	-1.18E+00	2.16E-01	1.90E+01
	60.01	1.22	-7.70E+00		2.08E+01
	86.55	30.70	3.88E-02		2.29E-01
	105.31	21.10	9.21E-02		2.16E-01
Ra-226	186.21	3.64	7.00E-01	1.10E+00	1.10E+00
Pa-231	27.36	10.30	1.98E+00	1.50E+00	2.47E+00
	283.69	1.70	9.41E-01		2.17E+00
	300.07	2.47	-2.23E-02		1.50E+00
	302.65	2.20	9.57E-02		1.64E+00
	330.06	1.40	-7.96E-01		2.76E+00
U-235	143.76	10.96	-1.89E-01	7.09E-02	3.05E-01
	163.33	5.08	7.33E-01		7.68E-01
	185.71	57.20	4.42E-02		7.09E-02
	202.11	1.08	2.87E+00		3.57E+00
	205.31	5.01	-1.75E-01		7.49E-01
Am-241	59.54	35.90	-4.03E-01	7.34E-01	7.34E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-May-19-10015

L1-10220H-FSGS-002SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-May-19-10015
Sample Description	: L1-10220H-FSGS-002SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.384E+03 grams
Facility	: Default
Sample Taken On	: 5/23/2019 8:30:00AM
Acquisition Started	: 5/29/2019 9:19:26AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.2 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 5/29/2019
Efficiency Calibration Description	:
Sample Number	: 76858
Fill Height	: 1384.00 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/29/2019 9:34:33AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

DATA VALIDATED 5/30/19 1000

J Graham/

Analysis Report for 29-May-19-10015

L1-10220H-FSGS-002SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.66	949 -	960	955.09	7.38E+01	13.49	4.32E+01	0.74
2	295.10	1177 -	1188	1180.64	2.96E+01	8.74	1.84E+01	0.69
3	351.62	1402 -	1415	1406.48	6.52E+01	9.73	1.08E+01	0.81
4	1460.01	5830 -	5852	5840.42	1.90E+02	14.45	5.20E+00	1.68

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.90	1460.82	*	10.66	4.09E+00	3.59E-01
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.18E-01	2.35E-02
		300.09		3.30		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	1.26E-01	3.85E-02
		351.93	*	35.60	1.62E-01	2.74E-02
		785.96		1.06		

Analysis Report for 29-May-19-10015

L1-10220H-FSGS-002SS

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	***Nuclide Id Confidence***	***Wt mean Activity (pCi/grams)***	***Wt mean Activity Uncertainty***	***Comments***
	K-40	0.900	4.09E+00	3.59E-01	
X	Bi-211	0.953			
	Pb-212	1.000	1.18E-01	2.35E-02	
	Pb-214	0.991	1.50E-01	2.23E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-May-19-10015

L1-10220H-FSGS-002SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/29/2019 9:34:33AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	2.35E-02	4.74E-02	4.74E-02
	BE-7	477.60		10.44	3.35E-01	4.16E-01	4.16E-01
+	K-40	1460.82	*	10.66	4.09E+00	3.80E-01	3.80E-01
	Mn-54	834.85		99.98	1.85E-02	4.52E-02	4.52E-02
	Co-60	1173.23		99.85	7.50E-03	5.24E-02	5.78E-02
		1332.49		99.98	2.66E-02		5.24E-02
	Nb-94	702.65		99.81	-7.06E-04	3.58E-02	3.58E-02
		871.09		99.89	2.50E-03		3.86E-02
	Ag-108m	79.13		6.60	-7.75E-01	3.44E-02	1.20E+00
		433.94		90.50	9.53E-03		3.44E-02
		614.28		89.80	-1.29E-02		5.43E-02
		722.94		90.80	1.65E-03		4.81E-02
	Sb-125	176.31		6.84	1.49E-01	1.00E-01	4.36E-01
		380.45		1.52	-1.49E+00		1.83E+00
		427.87		29.60	-6.71E-02		1.00E-01
		463.36		10.49	1.73E-01		3.43E-01
		600.60		17.65	6.97E-02		1.94E-01
		606.71		4.98	8.05E-01		1.15E+00
		635.95		11.22	-1.80E-01		2.46E-01

Analysis Report for 29-May-19-10015

L1-10220H-FSGS-002SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.15E-01	1.00E-01	1.91E+00
Ba-133	79.61	2.65	2.15E-01	5.85E-02	2.96E+00
	81.00	32.90	-1.68E-01		2.12E-01
	276.40	7.16	1.52E-01		4.57E-01
	302.85	18.34	2.50E-02		1.67E-01
	356.01	62.05	8.89E-03		5.85E-02
	383.85	8.94	9.55E-02		3.21E-01
Cs-134	475.36	1.48	1.53E+00	4.47E-02	2.67E+00
	563.25	8.34	2.27E-01		4.34E-01
	569.33	15.37	8.96E-02		2.19E-01
	604.72	97.62	3.70E-02		5.46E-02
	795.86	85.46	-1.51E-02		4.47E-02
	801.95	8.69	2.71E-01		4.95E-01
	1038.61	0.99	2.10E+00		4.41E+00
	1167.97	1.79	1.04E-01		3.27E+00
	1365.19	3.02	2.41E-01		1.42E+00
Cs-137	661.66	85.10	1.72E-02	4.85E-02	4.85E-02
Eu-152	121.78	28.67	3.73E-02	1.08E-01	1.17E-01
	244.70	7.61	-2.44E-02		4.22E-01
	295.94	0.45	6.12E+00		8.16E+00
	344.28	26.60	-1.56E-02		1.08E-01
	367.79	0.86	1.27E+00		3.72E+00
	411.12	2.24	3.30E-01		1.58E+00
	443.96	2.83	1.76E-01		1.16E+00
	488.68	0.42	4.02E+00		8.14E+00
	563.99	0.49	-5.05E-01		7.13E+00
	586.26	0.46	1.51E+01		1.11E+01
	678.62	0.47	-2.47E+00		7.11E+00
	688.67	0.86	1.59E-02		4.58E+00
	719.35	0.28	-3.53E+00		1.28E+01
	778.90	12.96	-3.85E-02		2.77E-01
	810.45	0.32	5.85E+00		1.22E+01
	867.37	4.26	2.72E-01		1.02E+00
	919.33	0.43	-2.90E-01		9.16E+00
	964.08	14.65	3.52E-01		3.81E-01
	1085.87	10.24	-1.48E-01		4.37E-01
	1089.74	1.73	-9.95E-01		2.53E+00
	1112.07	13.69	-1.08E-01		3.32E-01
	1212.95	1.43	2.96E+00		4.25E+00
	1249.94	0.19	2.45E+00		2.40E+01
	1299.14	1.63	1.16E+00		2.87E+00
	1408.01	21.07	8.50E-02		1.75E-01
	1457.64	0.50	8.65E+01		3.22E+01
	1528.10	0.28	3.38E+00		1.05E+01
Eu-154	123.07	40.40	-4.04E-02	8.23E-02	8.23E-02
	247.93	6.89	-1.57E-01		3.97E-01
	591.76	4.95	5.19E-01		6.84E-01
	692.42	1.78	-1.02E+00		2.19E+00
	723.30	20.06	1.83E-02		2.18E-01
	756.80	4.52	4.68E-01		7.98E-01
	873.18	12.08	-1.01E-01		3.05E-01

Analysis Report for 29-May-19-10015

L1-10220H-FSGS-002SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.40E-01	8.23E-02	4.22E-01
	1004.76	18.01	-2.48E-02		2.57E-01
	1274.43	34.80	-5.07E-02		1.29E-01
	1596.48	1.80	-2.39E+00		2.67E+00
Eu-155	45.30	1.31	-1.10E+01	1.74E-01	1.42E+01
	60.01	1.22	-1.08E+01		1.59E+01
	86.55	30.70	1.20E-01		1.97E-01
	105.31	21.10	6.95E-02		1.74E-01
Ra-226	186.21	3.64	7.99E-01	8.73E-01	8.73E-01
Pa-231	27.36	10.30	1.05E+00	1.36E+00	1.82E+00
	283.69	1.70	-1.43E+00		1.77E+00
	300.07	2.47	4.49E-01		1.36E+00
	302.65	2.20	5.70E-01		1.38E+00
	330.06	1.40	6.31E-01		2.01E+00
U-235	143.76	10.96	-1.11E-01	5.53E-02	2.56E-01
	163.33	5.08	-5.83E-01		5.70E-01
	185.71	57.20	4.16E-02		5.53E-02
	202.11	1.08	-1.02E+00		2.83E+00
	205.31	5.01	-9.47E-02		6.01E-01
Am-241	59.54	35.90	-4.80E-01	5.36E-01	5.36E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-May-19-10016

L1-10220H-FSGS-003SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-May-19-10016
Sample Description	: L1-10220H-FSGS-003SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.419E+03 grams
Facility	: Default
Sample Taken On	: 5/23/2019 8:35:00AM
Acquisition Started	: 5/29/2019 11:39:57AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 324
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.5 seconds
Dead Time	: 0.05 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 4096
Peak Area Range (in channels)	: 120 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 5/29/2019
Efficiency Calibration Description	:
Sample Number	: 76872
Fill Height	: 1418.56 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/29/2019 11:55:00AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

DATA VALIDATED 5/30/19 1000

J Graham

Analysis Report for 29-May-19-10016

L1-10220H-FSGS-003SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.20	151 -	158	155.00	6.93E+01	16.41	9.77E+01	0.68
2	238.62	472 -	481	477.41	1.46E+02	19.56	1.03E+02	1.38
3	295.12	585 -	594	590.29	5.41E+01	14.09	6.39E+01	1.34
4	351.78	698 -	708	703.50	8.95E+01	14.15	4.65E+01	1.18
5	510.76	1015 -	1026	1021.21	5.70E+01	12.43	3.90E+01	1.41
6	583.05	1160 -	1171	1165.71	6.60E+01	10.55	1.80E+01	1.24
7	609.29	1212 -	1223	1218.15	6.71E+01	11.27	2.39E+01	1.06
8	1460.71	2915 -	2928	2921.48	2.37E+02	15.84	5.13E+00	2.29

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.99	511.00	*	100.00	6.32E-02	1.44E-02
K-40	0.99	1460.82	*	10.66	4.55E+00	3.63E-01
Tl-208	0.99	583.19	*	85.00	8.67E-02	1.48E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.08E-01	3.25E-02
		300.09		3.30		
Pb212-XR	0.99	74.82		10.28		
		77.11	*	17.10	4.56E-01	1.18E-01
		87.35		3.97		

Analysis Report for 29-May-19-10016

L1-10220H-FSGS-003SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb212-XR	0.99	89.78		1.46		
Bi-214	1.00	609.32	*	45.49	1.69E-01	3.02E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	2.06E-01	5.60E-02
		351.93	*	35.60	1.99E-01	3.53E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	8.04E-01	2.11E-01
		87.35		2.24		
		89.78		0.82		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments

Analysis Report for 29-May-19-10016

L1-10220H-FSGS-003SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.991	6.32E-02	1.44E-02	
	K-40	0.998	4.55E+00	3.63E-01	
	Tl-208	0.997	8.67E-02	1.48E-02	
X	Bi-211	0.924			
	Pb-212	1.000	2.08E-01	3.25E-02	
?	Pb212-XR	0.999	4.56E-01	1.18E-01	
	Bi-214	1.000	1.69E-01	3.02E-02	
	Pb-214	0.997	2.01E-01	2.99E-02	
?	Pb214-XR	0.999	8.04E-01	2.11E-01	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-May-19-10016

L1-10220H-FSGS-003SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/29/2019 11:55:00AM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	*	100.00	6.32E-02	4.03E-02	4.03E-02
	BE-7	477.60		10.44	1.17E-01	3.90E-01	3.90E-01
+	K-40	1460.82	*	10.66	4.55E+00	2.99E-01	2.99E-01
	Mn-54	834.85		99.98	-4.03E-03	3.71E-02	3.71E-02
	Co-60	1173.23		99.85	4.87E-02	4.87E-02	6.38E-02
		1332.49		99.98	2.21E-02		4.87E-02
	Nb-94	702.65		99.81	-8.08E-03	3.27E-02	3.27E-02
		871.09		99.89	2.68E-03		3.69E-02
	Ag-108m	79.13		6.60	-4.09E-01	3.48E-02	9.93E-01
		433.94		90.50	5.07E-03		3.48E-02
		614.28		89.80	-1.05E-02		5.07E-02
		722.94		90.80	-2.91E-02		4.13E-02
	Sb-125	176.31		6.84	6.07E-02	1.01E-01	4.82E-01
		380.45		1.52	-5.97E-01		2.11E+00
		427.87		29.60	-4.54E-02		1.01E-01
		463.36		10.49	-6.19E-02		2.55E-01
		600.60		17.65	5.67E-02		1.89E-01
		606.71		4.98	6.48E-02		1.19E+00
		635.95		11.22	2.18E-02		2.84E-01

Analysis Report for 29-May-19-10016

L1-10220H-FSGS-003SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	1.80E-01	1.01E-01	2.00E+00
Ba-133	79.61	2.65	-1.34E+00	6.46E-02	2.33E+00
	81.00	32.90	-1.85E-01		1.57E-01
	276.40	7.16	8.50E-02		4.47E-01
	302.85	18.34	7.19E-02		1.78E-01
	356.01	62.05	-2.40E-02		6.46E-02
	383.85	8.94	-6.60E-02		3.47E-01
Cs-134	475.36	1.48	1.33E+00	4.63E-02	2.51E+00
	563.25	8.34	-1.18E-01		3.84E-01
	569.33	15.37	2.00E-02		2.30E-01
	604.72	97.62	1.18E-03		5.26E-02
	795.86	85.46	-1.26E-02		4.63E-02
	801.95	8.69	-4.32E-02		4.28E-01
	1038.61	0.99	4.79E-01		4.29E+00
	1167.97	1.79	1.11E+00		3.20E+00
	1365.19	3.02	-5.81E-01		1.31E+00
Cs-137	661.66	85.10	6.06E-02	6.45E-02	6.45E-02
Eu-152	121.78	28.67	7.40E-03	1.12E-01	1.12E-01
	244.70	7.61	-2.93E-01		4.23E-01
	295.94	0.45	-1.66E+00		9.15E+00
	344.28	26.60	2.91E-02		1.27E-01
	367.79	0.86	3.32E-01		3.19E+00
	411.12	2.24	-5.09E-02		1.41E+00
	443.96	2.83	5.50E-01		1.21E+00
	488.68	0.42	2.88E+00		7.77E+00
	563.99	0.49	1.01E+00		6.87E+00
	586.26	0.46	-1.39E+00		1.17E+01
	678.62	0.47	-2.29E+00		6.77E+00
	688.67	0.86	9.05E-01		4.10E+00
	719.35	0.28	6.44E+00		1.40E+01
	778.90	12.96	-1.37E-02		2.54E-01
	810.45	0.32	2.69E+00		1.03E+01
	867.37	4.26	-3.29E-01		8.63E-01
	919.33	0.43	-1.11E+01		6.87E+00
	964.08	14.65	-1.17E-01		3.36E-01
	1085.87	10.24	-2.27E-02		4.16E-01
	1089.74	1.73	-1.12E+00		2.52E+00
	1112.07	13.69	-1.53E-01		2.96E-01
	1212.95	1.43	-2.18E+00		3.27E+00
	1249.94	0.19	-4.13E+00		2.70E+01
	1299.14	1.63	-1.50E+00		2.76E+00
	1408.01	21.07	-1.34E-01		1.97E-01
	1457.64	0.50	-2.60E+00		3.18E+01
	1528.10	0.28	-2.88E+00		8.42E+00
Eu-154	123.07	40.40	2.20E-02	7.82E-02	7.82E-02
	247.93	6.89	1.77E-02		4.17E-01
	591.76	4.95	-1.28E-01		6.34E-01
	692.42	1.78	-9.33E-01		1.71E+00
	723.30	20.06	-1.85E-02		2.03E-01
	756.80	4.52	5.51E-01		9.17E-01
	873.18	12.08	-2.61E-01		2.73E-01

Analysis Report for 29-May-19-10016

L1-10220H-FSGS-003SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.14E-01	7.82E-02	4.15E-01
	1004.76	18.01	6.10E-02		2.51E-01
	1274.43	34.80	-2.67E-02		1.30E-01
	1596.48	1.80	-1.76E+00		1.52E+00
Eu-155	45.30	1.31	9.47E-01	1.64E-01	1.04E+01
	60.01	1.22	-9.13E-01		1.20E+01
	86.55	30.70	6.31E-02		1.72E-01
	105.31	21.10	-1.40E-02		1.64E-01
Ra-226	186.21	3.64	1.92E-01	9.82E-01	9.82E-01
Pa-231	27.36	10.30	4.34E-01	1.06E+00	1.06E+00
	283.69	1.70	-4.47E-01		1.62E+00
	300.07	2.47	-1.37E+00		1.27E+00
	302.65	2.20	5.98E-01		1.48E+00
	330.06	1.40	8.90E-01		2.45E+00
U-235	143.76	10.96	-7.05E-02	6.23E-02	2.63E-01
	163.33	5.08	-9.04E-02		6.86E-01
	185.71	57.20	1.25E-02		6.23E-02
	202.11	1.08	-5.79E-03		2.92E+00
	205.31	5.01	-3.22E-01		6.01E-01
Am-241	59.54	35.90	-2.79E-02	4.14E-01	4.14E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-May-19-10017

L1-10220H-FSGS-004SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-May-19-10017
Sample Description	: L1-10220H-FSGS-004SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.056E+03 grams
Facility	: Default
Sample Taken On	: 5/23/2019 8:40:00AM
Acquisition Started	: 5/29/2019 9:47:35AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.1 seconds
Dead Time	: 0.13 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/29/2019
Efficiency Calibration Used Done On	: 5/29/2019
Efficiency Calibration Description	:
Sample Number	: 76860
Fill Height	: 1055.66 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/29/2019 10:02:39AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

DATA VALIDATED 5/30/19 1000

J Graham/

Analysis Report for 29-May-19-10017

L1-10220H-FSGS-004SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.78	950 -	961	955.20	1.04E+02	15.03	4.66E+01	0.95
2	295.15	1176 -	1189	1180.51	3.31E+01	10.27	2.59E+01	0.92
3	338.38	1350 -	1359	1353.29	2.94E+01	7.19	9.55E+00	0.33
4	351.84	1402 -	1413	1407.10	5.23E+01	10.20	2.07E+01	1.17
5	510.50	2037 -	2046	2041.34	1.91E+01	7.27	1.49E+01	0.53
6	583.44	2328 -	2337	2332.98	2.75E+01	7.47	1.25E+01	1.14
7	609.33	2431 -	2443	2436.48	5.40E+01	8.33	5.97E+00	1.41
8	911.06	3636 -	3648	3643.19	2.16E+01	7.03	1.04E+01	1.01
9	1460.75	5832 -	5854	5842.85	2.07E+02	15.15	5.75E+00	1.55

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.96	511.00	*	100.00	3.04E-02	1.18E-02
K-40	0.99	1460.82	*	10.66	6.00E+00	5.10E-01
Tl-208	0.99	583.19	*	85.00	5.23E-02	1.45E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	2.09E-01	3.44E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	1.98E-01	3.27E-02
		768.36		4.89		

Analysis Report for 29-May-19-10017

L1-10220H-FSGS-004SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	1.77E-01	5.67E-02
		351.93	*	35.60	1.65E-01	3.48E-02
		785.96		1.06		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	2.85E-01	7.34E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	1.85E-01	6.07E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 29-May-19-10017

L1-10220H-FSGS-004SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.961	3.04E-02	1.18E-02	
	K-40	0.999	6.00E+00	5.10E-01	
	Tl-208	0.990	5.23E-02	1.45E-02	
X	Bi-211	0.909			
	Pb-212	0.997	2.09E-01	3.44E-02	
	Bi-214	1.000	1.98E-01	3.27E-02	
	Pb-214	0.999	1.68E-01	2.97E-02	
	Ac-228	0.999	2.26E-01	4.68E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-May-19-10017

L1-10220H-FSGS-004SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/29/2019 10:02:39AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	*	100.00	3.04E-02	3.60E-02	3.60E-02
	BE-7	477.60		10.44	3.48E-01	4.66E-01	4.66E-01
+	K-40	1460.82	*	10.66	6.00E+00	5.47E-01	5.47E-01
	Mn-54	834.85		99.98	-4.61E-02	5.12E-02	5.12E-02
	Co-60	1173.23		99.85	2.05E-02	5.19E-02	6.42E-02
		1332.49		99.98	7.05E-03		5.19E-02
	Nb-94	702.65		99.81	-2.70E-02	4.28E-02	4.28E-02
		871.09		99.89	1.67E-02		4.97E-02
	Ag-108m	79.13		6.60	1.27E+00	4.28E-02	1.92E+00
		433.94		90.50	6.20E-03		4.28E-02
		614.28		89.80	1.22E-03		6.87E-02
		722.94		90.80	4.55E-02		5.84E-02
	Sb-125	176.31		6.84	-1.32E-01	1.48E-01	5.92E-01
		380.45		1.52	3.74E-01		2.79E+00
		427.87		29.60	2.64E-02		1.48E-01
		463.36		10.49	-3.04E-02		4.21E-01
		600.60		17.65	9.71E-02		2.28E-01
		606.71		4.98	1.63E+00		1.49E+00
		635.95		11.22	1.77E-01		4.20E-01

Analysis Report for 29-May-19-10017

L1-10220H-FSGS-004SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-8.39E-01	1.48E-01	2.54E+00
Ba-133	79.61	2.65	-6.29E-01	7.03E-02	4.45E+00
	81.00	32.90	-3.19E-02		3.05E-01
	276.40	7.16	5.30E-02		5.55E-01
	302.85	18.34	-4.04E-02		2.09E-01
	356.01	62.05	-3.64E-02		7.03E-02
	383.85	8.94	1.26E-01		4.70E-01
Cs-134	475.36	1.48	1.13E+00	5.99E-02	3.05E+00
	563.25	8.34	-9.10E-03		4.92E-01
	569.33	15.37	2.60E-01		2.79E-01
	604.72	97.62	-6.18E-02		6.73E-02
	795.86	85.46	5.15E-03		5.99E-02
	801.95	8.69	-1.74E-01		5.92E-01
	1038.61	0.99	2.88E+00		6.24E+00
	1167.97	1.79	-1.75E+00		3.42E+00
	1365.19	3.02	2.88E-01		1.76E+00
Cs-137	661.66	85.10	4.11E-02	6.40E-02	6.40E-02
Eu-152	121.78	28.67	8.66E-02	1.33E-01	1.65E-01
	244.70	7.61	6.79E-01		6.07E-01
	295.94	0.45	9.27E+00		1.08E+01
	344.28	26.60	5.51E-02		1.33E-01
	367.79	0.86	-2.10E+00		4.58E+00
	411.12	2.24	8.98E-01		1.96E+00
	443.96	2.83	1.31E+00		1.58E+00
	488.68	0.42	5.18E-01		1.02E+01
	563.99	0.49	6.34E+00		8.65E+00
	586.26	0.46	5.27E+00		1.41E+01
	678.62	0.47	7.23E-01		1.06E+01
	688.67	0.86	-6.34E+00		5.03E+00
	719.35	0.28	4.36E+00		1.70E+01
	778.90	12.96	6.87E-02		4.10E-01
	810.45	0.32	-4.88E+00		1.54E+01
	867.37	4.26	-5.82E-01		1.10E+00
	919.33	0.43	-9.53E-01		1.37E+01
	964.08	14.65	-9.41E-02		5.03E-01
	1085.87	10.24	4.63E-01		5.80E-01
	1089.74	1.73	-6.21E-01		2.82E+00
	1112.07	13.69	2.47E-01		4.41E-01
	1212.95	1.43	-2.70E+00		5.42E+00
	1249.94	0.19	3.32E+00		3.62E+01
	1299.14	1.63	3.47E-01		3.62E+00
	1408.01	21.07	1.05E-01		2.96E-01
	1457.64	0.50	1.30E+02		4.55E+01
	1528.10	0.28	-4.40E+00		1.41E+01
Eu-154	123.07	40.40	4.78E-02	1.14E-01	1.14E-01
	247.93	6.89	2.20E-01		5.75E-01
	591.76	4.95	2.83E-01		8.71E-01
	692.42	1.78	-1.19E+00		2.61E+00
	723.30	20.06	1.46E-01		2.61E-01
	756.80	4.52	1.07E-02		1.27E+00
	873.18	12.08	1.67E-01		4.31E-01

Analysis Report for 29-May-19-10017

L1-10220H-FSGS-004SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-1.30E-01	1.14E-01	4.96E-01
	1004.76	18.01	4.31E-02		2.90E-01
	1274.43	34.80	-1.43E-01		1.72E-01
	1596.48	1.80	-8.76E-01		3.18E+00
Eu-155	45.30	1.31	1.18E+01	2.52E-01	2.89E+01
	60.01	1.22	1.09E+01		3.02E+01
	86.55	30.70	1.04E-01		2.52E-01
	105.31	21.10	-1.79E-02		2.76E-01
Ra-226	186.21	3.64	5.12E-01	1.26E+00	1.26E+00
Pa-231	27.36	10.30	1.06E+00	1.50E+00	3.22E+00
	283.69	1.70	-1.00E+00		2.30E+00
	300.07	2.47	2.02E-02		1.50E+00
	302.65	2.20	8.61E-02		1.77E+00
	330.06	1.40	-1.26E+00		3.22E+00
U-235	143.76	10.96	1.06E-01	7.99E-02	4.03E-01
	163.33	5.08	9.43E-02		7.88E-01
	185.71	57.20	2.67E-02		7.99E-02
	202.11	1.08	9.13E-01		3.49E+00
	205.31	5.01	-3.92E-01		7.62E-01
Am-241	59.54	35.90	2.49E-02	1.04E+00	1.04E+00

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-May-19-10018

L1-10220H-FSGS-005SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-May-19-10018
Sample Description	: L1-10220H-FSGS-005SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.130E+03 grams
Facility	: Default
Sample Taken On	: 5/23/2019 8:45:00AM
Acquisition Started	: 5/29/2019 9:47:44AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P11314
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.2 seconds
Dead Time	: 0.02 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/24/2019
Efficiency Calibration Used Done On	: 5/29/2019
Efficiency Calibration Description	:
Sample Number	: 76861
Fill Height	: 1130.40 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/29/2019 10:02:54AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

DATA VALIDATED 5/30/19 1000

J Graham/

Analysis Report for 29-May-19-10018

L1-10220H-FSGS-005SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.35	306 -	314	309.93	4.25E+01	12.65	5.45E+01	0.61
2	186.02	738 -	749	743.95	5.21E+01	10.94	2.69E+01	0.95
3	238.74	949 -	961	954.54	9.01E+01	16.33	6.59E+01	0.61
4	351.87	1399 -	1413	1406.51	9.02E+01	11.77	1.68E+01	1.36
5	582.99	2324 -	2337	2330.08	4.03E+01	7.30	4.75E+00	0.62
6	609.15	2427 -	2442	2434.64	6.39E+01	9.07	6.05E+00	1.24
7	661.64	2638 -	2651	2644.46	6.75E+01	9.53	8.53E+00	1.14
8	911.07	3637 -	3648	3641.75	2.57E+01	7.37	1.13E+01	0.59
9	1459.98	5828 -	5848	5837.85	1.97E+02	14.38	2.57E+00	1.28

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.89	1460.82	*	10.66	4.96E+00	4.20E-01
Cs-137	1.00	661.66	*	85.10	1.22E-01	1.88E-02
Tl-208	0.99	583.19	*	85.00	6.68E-02	1.28E-02
Bi-211	0.90	351.07	*	13.02	6.79E-01	1.04E-01
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.55E-01	3.08E-02
		300.09		3.30		
Pb212-XR	0.99	74.82		10.28		

Analysis Report for 29-May-19-10018

L1-10220H-FSGS-005SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb212-XR	0.99	77.11	*	17.10	3.13E-01	9.85E-02
		87.35		3.97		
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	2.04E-01	3.15E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.51	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	2.48E-01	3.80E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	5.52E-01	1.75E-01
		87.35		2.24		
		89.78		0.82		
Ra-226	0.99	186.21	*	3.64	9.40E-01	2.11E-01
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	1.92E-01	5.56E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		
U-235	0.98	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	5.98E-02	1.35E-02
		202.11		1.08		
		205.31		5.01		

Analysis Report for 29-May-19-10018

L1-10220H-FSGS-005SS

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.893	4.96E+00	4.20E-01	
	Cs-137	1.000	1.22E-01	1.88E-02	
	Tl-208	0.994	6.68E-02	1.28E-02	
?	Bi-211	0.902	6.79E-01	1.04E-01	
	Pb-212	0.998	1.55E-01	3.08E-02	
?	Pb212-XR	0.995	3.13E-01	9.85E-02	
	Bi-214	0.998	2.04E-01	3.15E-02	
?	Pb-214	0.512	2.48E-01	3.80E-02	
?	Pb214-XR	0.995	5.52E-01	1.75E-01	
?	Ra-226	0.994	9.40E-01	2.11E-01	
	Ac-228	0.999	1.92E-01	5.56E-02	
?	U-235	0.989	5.98E-02	1.35E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-May-19-10018

L1-10220H-FSGS-005SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/29/2019 10:02:54AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	1.21E-02	5.60E-02	5.60E-02
	BE-7	477.60		10.44	-6.98E-02	3.91E-01	3.91E-01
+	K-40	1460.82	*	10.66	4.96E+00	3.31E-01	3.31E-01
	Mn-54	834.85		99.98	8.07E-03	4.46E-02	4.46E-02
	Co-60	1173.23		99.85	5.74E-05	5.36E-02	6.69E-02
		1332.49		99.98	2.00E-02		5.36E-02
	Nb-94	702.65		99.81	2.65E-02	3.64E-02	4.48E-02
		871.09		99.89	-6.14E-03		3.64E-02
	Ag-108m	79.13		6.60	-6.65E-01	4.10E-02	1.13E+00
		433.94		90.50	1.24E-02		4.10E-02
		614.28		89.80	-2.64E-02		6.26E-02
		722.94		90.80	6.83E-03		5.18E-02
	Sb-125	176.31		6.84	1.20E-01	1.41E-01	4.26E-01
		380.45		1.52	-2.91E-01		2.34E+00
		427.87		29.60	4.08E-02		1.41E-01
		463.36		10.49	2.30E-01		4.26E-01
		600.60		17.65	-1.59E-01		1.76E-01
		606.71		4.98	1.86E+00		1.33E+00
		635.95		11.22	3.35E-03		2.42E-01

Analysis Report for 29-May-19-10018

L1-10220H-FSGS-005SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	1.96E+00	1.41E-01	2.62E+00
	Ba-133	79.61		2.65	-1.09E+00	7.13E-02	2.81E+00
		81.00		32.90	-2.11E-01		1.75E-01
		276.40		7.16	4.09E-01		4.89E-01
		302.85		18.34	1.41E-01		1.84E-01
		356.01		62.05	-8.17E-03		7.13E-02
		383.85		8.94	-1.87E-01		3.89E-01
	Cs-134	475.36		1.48	1.00E+00	4.90E-02	2.69E+00
		563.25		8.34	-2.06E-01		5.51E-01
		569.33		15.37	1.77E-01		2.98E-01
		604.72		97.62	-1.21E-02		5.68E-02
		795.86		85.46	6.43E-03		4.90E-02
		801.95		8.69	1.99E-01		4.96E-01
		1038.61		0.99	3.21E-01		5.09E+00
		1167.97		1.79	-8.06E-01		3.38E+00
		1365.19		3.02	-1.33E+00		1.39E+00
+	Cs-137	661.66	*	85.10	1.22E-01	3.49E-02	3.49E-02
	Eu-152	121.78		28.67	-7.64E-02	1.12E-01	1.12E-01
		244.70		7.61	6.09E-02		4.66E-01
		295.94		0.45	7.33E+00		9.79E+00
		344.28		26.60	1.37E-02		1.26E-01
		367.79		0.86	1.81E+00		4.16E+00
		411.12		2.24	1.17E-01		1.69E+00
		443.96		2.83	9.86E-01		1.39E+00
		488.68		0.42	2.26E+00		9.38E+00
		563.99		0.49	-1.39E+01		8.43E+00
		586.26		0.46	7.32E-01		1.26E+01
		678.62		0.47	-1.24E+00		8.09E+00
		688.67		0.86	2.11E+00		4.59E+00
		719.35		0.28	8.06E-01		1.60E+01
		778.90		12.96	3.46E-02		3.45E-01
		810.45		0.32	2.37E+00		1.37E+01
		867.37		4.26	-8.17E-01		8.20E-01
		919.33		0.43	-4.25E+00		8.84E+00
		964.08		14.65	1.57E-01		4.22E-01
		1085.87		10.24	-2.18E-02		6.00E-01
		1089.74		1.73	-8.88E-01		3.67E+00
		1112.07		13.69	-1.46E-01		4.33E-01
		1212.95		1.43	-2.05E-01		4.25E+00
		1249.94		0.19	-1.64E+00		3.21E+01
		1299.14		1.63	1.84E+00		3.51E+00
		1408.01		21.07	4.14E-02		2.23E-01
		1457.64		0.50	1.06E+02		3.79E+01
		1528.10		0.28	2.09E+00		1.62E+01
	Eu-154	123.07		40.40	-3.46E-02	7.81E-02	7.81E-02
		247.93		6.89	-1.64E-01		4.38E-01
		591.76		4.95	4.38E-01		8.89E-01
		692.42		1.78	-2.26E+00		2.08E+00
		723.30		20.06	2.16E-01		2.42E-01
		756.80		4.52	-1.96E-01		9.31E-01
		873.18		12.08	-1.16E-01		3.32E-01

Analysis Report for 29-May-19-10018

L1-10220H-FSGS-005SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	-5.20E-01	7.81E-02	4.55E-01
		1004.76		18.01	2.38E-01		3.13E-01
		1274.43		34.80	1.08E-01		1.77E-01
		1596.48		1.80	1.60E-01		1.23E+00
	Eu-155	45.30		1.31	6.72E-01	1.71E-01	1.05E+01
		60.01		1.22	-8.14E+00		1.01E+01
		86.55		30.70	5.20E-02		1.71E-01
		105.31		21.10	7.60E-02		1.88E-01
+	Ra-226	186.21	*	3.64	9.40E-01	5.54E-01	5.54E-01
	Pa-231	27.36		10.30	5.39E-01	1.19E+00	1.19E+00
		283.69		1.70	1.56E+00		2.05E+00
		300.07		2.47	-2.36E+00		1.46E+00
		302.65		2.20	7.45E-01		1.53E+00
		330.06		1.40	1.15E+00		2.51E+00
+	U-235	143.76		10.96	8.80E-03	3.53E-02	2.82E-01
		163.33		5.08	-2.38E-01		5.72E-01
		185.71	*	57.20	5.98E-02		3.53E-02
		202.11		1.08	-9.71E-01		2.73E+00
		205.31		5.01	-1.65E-01		6.44E-01
	Am-241	59.54		35.90	-1.11E-01	3.65E-01	3.65E-01

+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-May-19-10019

L1-10220H-FSGS-006SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-May-19-10019
Sample Description	: L1-10220H-FSGS-006SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.463E+03 grams
Facility	: Default
Sample Taken On	: 5/23/2019 8:50:00AM
Acquisition Started	: 5/29/2019 9:47:52AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 5/29/2019
Efficiency Calibration Description	:
Sample Number	: 76862
Fill Height	: 1463.01 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/29/2019 10:02:58AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

DATA VALIDATED 5/30/19 1000

J Graham/

Analysis Report for 29-May-19-10019

L1-10220H-FSGS-006SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.01	307 -	316	309.35	3.79E+01	11.66	4.31E+01	0.86
2	238.64	947 -	961	955.02	1.09E+02	17.22	6.54E+01	1.28
3	295.10	1175 -	1188	1180.61	4.76E+01	11.47	3.04E+01	0.91
4	338.54	1350 -	1359	1354.22	2.19E+01	8.49	2.21E+01	0.30
5	351.82	1401 -	1413	1407.26	8.08E+01	12.57	2.93E+01	0.70
6	582.83	2324 -	2337	2330.63	5.77E+01	9.59	1.23E+01	1.32
7	609.13	2427 -	2443	2435.79	6.33E+01	10.16	1.27E+01	0.83
8	910.95	3635 -	3650	3642.83	4.39E+01	7.90	6.09E+00	1.24
9	969.12	3870 -	3881	3875.57	1.80E+01	5.05	3.00E+00	1.00
10	1460.22	5830 -	5852	5841.27	2.31E+02	16.91	1.43E+01	2.34

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.94	1460.82	*	10.66	4.89E+00	4.17E-01
Tl-208	0.98	583.19	*	85.00	8.34E-02	1.47E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.72E-01	3.05E-02
		300.09		3.30		
Pb212-XR	0.99	74.82		10.28		
		77.11	*	17.10	3.56E-01	1.16E-01

Analysis Report for 29-May-19-10019

L1-10220H-FSGS-006SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb212-XR	0.99	87.35		3.97		
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	1.76E-01	3.01E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	1.99E-01	5.07E-02
		351.93	*	35.60	1.98E-01	3.47E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	6.28E-01	2.06E-01
		87.35		2.24		
		89.78		0.82		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	1.66E-01	6.55E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.81E-01	5.20E-02
		964.77		4.99		
		968.97	*	15.80	1.96E-01	5.56E-02
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

Analysis Report for 29-May-19-10019

L1-10220H-FSGS-006SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.944	4.89E+00	4.17E-01	
	Tl-208	0.980	8.34E-02	1.47E-02	
X	Bi-211	0.915			
	Pb-212	1.000	1.72E-01	3.05E-02	
?	Pb212-XR	0.999	3.56E-01	1.16E-01	
	Bi-214	0.998	1.76E-01	3.01E-02	
	Pb-214	0.998	1.99E-01	2.86E-02	
?	Pb214-XR	0.999	6.28E-01	2.06E-01	
	Ac-228	0.995	2.22E-01	3.28E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-May-19-10019

L1-10220H-FSGS-006SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/29/2019 10:02:58AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	7.14E-02	5.70E-02	5.70E-02
	BE-7	477.60		10.44	2.63E-01	4.29E-01	4.29E-01
+	K-40	1460.82	*	10.66	4.89E+00	5.95E-01	5.95E-01
	Mn-54	834.85		99.98	-6.98E-03	4.16E-02	4.16E-02
	Co-60	1173.23		99.85	-4.48E-02	5.78E-02	6.40E-02
		1332.49		99.98	-1.10E-02		5.78E-02
	Nb-94	702.65		99.81	-2.50E-02	3.87E-02	3.87E-02
		871.09		99.89	-2.78E-02		4.59E-02
	Ag-108m	79.13		6.60	-3.92E-01	3.91E-02	1.40E+00
		433.94		90.50	2.03E-02		3.91E-02
		614.28		89.80	-1.96E-02		6.67E-02
		722.94		90.80	-4.00E-02		4.93E-02
	Sb-125	176.31		6.84	1.33E-01	1.36E-01	4.77E-01
		380.45		1.52	9.54E-01		2.37E+00
		427.87		29.60	1.05E-01		1.36E-01
		463.36		10.49	9.91E-02		3.31E-01
		600.60		17.65	9.55E-02		2.31E-01
		606.71		4.98	1.46E+00		1.26E+00
		635.95		11.22	-1.48E-01		3.24E-01

Analysis Report for 29-May-19-10019

L1-10220H-FSGS-006SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	2.24E-01	1.36E-01	2.20E+00
Ba-133	79.61	2.65	-9.89E-01	7.63E-02	3.50E+00
	81.00	32.90	-7.91E-02		2.54E-01
	276.40	7.16	-2.34E-01		4.86E-01
	302.85	18.34	1.90E-02		1.90E-01
	356.01	62.05	-3.41E-02		7.63E-02
	383.85	8.94	-1.47E-02		3.72E-01
Cs-134	475.36	1.48	2.97E-01	5.01E-02	2.76E+00
	563.25	8.34	-2.62E-01		4.53E-01
	569.33	15.37	-1.11E-01		2.20E-01
	604.72	97.62	5.27E-03		6.10E-02
	795.86	85.46	-1.44E-02		5.01E-02
	801.95	8.69	-5.81E-01		4.87E-01
	1038.61	0.99	-4.83E+00		4.24E+00
	1167.97	1.79	-3.20E-01		3.22E+00
	1365.19	3.02	-5.73E-01		1.49E+00
Cs-137	661.66	85.10	3.86E-02	6.48E-02	6.48E-02
Eu-152	121.78	28.67	-2.55E-02	1.29E-01	1.40E-01
	244.70	7.61	5.24E-01		5.34E-01
	295.94	0.45	1.55E+01		9.66E+00
	344.28	26.60	-1.21E-01		1.29E-01
	367.79	0.86	-1.81E+00		3.40E+00
	411.12	2.24	4.90E-01		1.74E+00
	443.96	2.83	2.19E-01		1.24E+00
	488.68	0.42	-3.93E+00		7.23E+00
	563.99	0.49	1.74E+00		7.85E+00
	586.26	0.46	-3.86E+00		1.30E+01
	678.62	0.47	-1.01E+00		7.73E+00
	688.67	0.86	8.24E-01		4.86E+00
	719.35	0.28	1.72E-01		1.66E+01
	778.90	12.96	5.39E-02		3.29E-01
	810.45	0.32	-1.33E+01		1.13E+01
	867.37	4.26	-5.68E-01		1.12E+00
	919.33	0.43	-6.23E+00		1.10E+01
	964.08	14.65	6.87E-02		4.02E-01
	1085.87	10.24	-1.45E-01		4.76E-01
	1089.74	1.73	2.42E-02		2.66E+00
	1112.07	13.69	-1.33E-01		4.40E-01
	1212.95	1.43	-1.31E+00		4.52E+00
	1249.94	0.19	6.97E+00		3.31E+01
	1299.14	1.63	-1.82E+00		3.11E+00
	1408.01	21.07	3.57E-02		1.80E-01
	1457.64	0.50	1.10E+02		3.57E+01
	1528.10	0.28	4.98E+00		1.21E+01
Eu-154	123.07	40.40	3.97E-02	1.00E-01	1.00E-01
	247.93	6.89	4.45E-01		5.12E-01
	591.76	4.95	-3.64E-02		7.42E-01
	692.42	1.78	4.62E-01		2.39E+00
	723.30	20.06	2.30E-02		2.27E-01
	756.80	4.52	6.74E-01		1.05E+00
	873.18	12.08	-2.52E-01		3.87E-01

Analysis Report for 29-May-19-10019

L1-10220H-FSGS-006SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-5.85E-02	1.00E-01	4.24E-01
	1004.76	18.01	9.19E-03		2.98E-01
	1274.43	34.80	-1.32E-02		1.75E-01
	1596.48	1.80	-2.02E+00		2.43E+00
Eu-155	45.30	1.31	1.30E-01	2.15E-01	1.93E+01
	60.01	1.22	-7.72E+00		2.12E+01
	86.55	30.70	-1.16E-01		2.16E-01
	105.31	21.10	-9.03E-02		2.15E-01
Ra-226	186.21	3.64	7.36E-01	1.07E+00	1.07E+00
Pa-231	27.36	10.30	2.76E+00	1.41E+00	2.39E+00
	283.69	1.70	-2.33E+00		1.96E+00
	300.07	2.47	-2.11E-01		1.41E+00
	302.65	2.20	6.42E-01		1.59E+00
	330.06	1.40	8.23E-01		2.57E+00
U-235	143.76	10.96	-1.24E-01	6.75E-02	3.19E-01
	163.33	5.08	-8.03E-02		6.49E-01
	185.71	57.20	3.03E-02		6.75E-02
	202.11	1.08	-9.33E-01		2.96E+00
	205.31	5.01	-7.10E-01		6.37E-01
Am-241	59.54	35.90	-6.03E-02	7.41E-01	7.41E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-May-19-10020

L1-10220H-FQGS-006SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-May-19-10020
Sample Description	: L1-10220H-FQGS-006SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.443E+03 grams
Facility	: Default
Sample Taken On	: 5/23/2019 8:50:00AM
Acquisition Started	: 5/29/2019 10:25:21AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 5/29/2019
Efficiency Calibration Description	:
Sample Number	: 76863
Fill Height	: 1442.87 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/29/2019 10:40:26AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

DATA VALIDATED 5/30/19 1000

J Graham/

Analysis Report for 29-May-19-10020

L1-10220H-FQGS-006SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.07	305 -	317	309.58	3.46E+01	14.95	6.64E+01	0.43
2	238.58	945 -	961	954.78	1.32E+02	18.84	7.15E+01	1.18
3	295.13	1176 -	1188	1180.73	5.08E+01	10.46	2.22E+01	0.88
4	351.83	1403 -	1412	1407.30	8.63E+01	11.43	1.97E+01	0.83
5	582.79	2326 -	2337	2330.49	4.84E+01	8.36	8.61E+00	1.20
6	661.51	2637 -	2652	2645.22	2.98E+01	9.61	2.02E+01	0.56
7	910.88	3635 -	3649	3642.55	5.20E+01	7.21	0.00E+00	0.50
8	1119.44	4472 -	4483	4477.04	1.49E+01	6.72	1.11E+01	0.51
9	1460.33	5830 -	5852	5841.67	2.47E+02	16.41	5.66E+00	1.27

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.96	1460.82	*	10.66	5.26E+00	4.17E-01
Cs-137	0.99	661.66	*	85.10	4.69E-02	1.54E-02
Tl-208	0.97	583.19	*	85.00	7.01E-02	1.28E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.08E-01	3.42E-02
		300.09		3.30		
Pb212-XR	1.00	74.82		10.28		
		77.11	*	17.10	3.25E-01	1.44E-01

Analysis Report for 29-May-19-10020

L1-10220H-FQGS-006SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb212-XR	1.00	87.35		3.97		
		89.78		1.46		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	2.14E-01	4.72E-02
		351.93	*	35.60	2.13E-01	3.29E-02
		785.96		1.06		
Pb214-XR	1.00	74.82		5.80		
		77.11	*	9.70	5.73E-01	2.56E-01
		87.35		2.24		
		89.78		0.82		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	3.34E-01	4.85E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.961	5.26E+00	4.17E-01	
	Cs-137	0.997	4.69E-02	1.54E-02	
	Tl-208	0.975	7.01E-02	1.28E-02	
X	Bi-211	0.913			
	Pb-212	1.000	2.08E-01	3.42E-02	

Analysis Report for 29-May-19-10020

L1-10220H-FQGS-006SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
?	Pb212-XR	1.000	3.25E-01	1.44E-01	
	Pb-214	0.999	2.13E-01	2.70E-02	
?	Pb214-XR	1.000	5.73E-01	2.56E-01	
	Ac-228	0.995	3.34E-01	4.85E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-May-19-10020

L1-10220H-FQGS-006SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/29/2019 10:40:26AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
8	1119.44	1.65171E-02	45.19	Tol.	Bi-214

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	7.48E-02	6.00E-02	6.00E-02
	BE-7	477.60		10.44	3.17E-01	4.61E-01	4.61E-01
+	K-40	1460.82	*	10.66	5.26E+00	3.99E-01	3.99E-01
	Mn-54	834.85		99.98	2.72E-02	5.07E-02	5.07E-02
	Co-60	1173.23		99.85	-2.20E-02	4.81E-02	5.70E-02
		1332.49		99.98	3.61E-02		4.81E-02
	Nb-94	702.65		99.81	2.30E-02	4.24E-02	4.58E-02
		871.09		99.89	-1.55E-02		4.24E-02
	Ag-108m	79.13		6.60	2.39E-01	3.96E-02	1.44E+00
		433.94		90.50	-2.20E-02		3.96E-02
		614.28		89.80	3.05E-02		6.62E-02
		722.94		90.80	3.23E-03		4.76E-02
	Sb-125	176.31		6.84	3.37E-01	1.30E-01	5.20E-01
		380.45		1.52	2.52E-01		2.28E+00
		427.87		29.60	4.95E-02		1.30E-01
		463.36		10.49	1.52E-01		3.86E-01
		600.60		17.65	-4.00E-02		2.53E-01
		606.71		4.98	1.86E+00		1.33E+00

Analysis Report for 29-May-19-10020

L1-10220H-FQGS-006SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	635.95		11.22	2.12E-01	1.30E-01	3.56E-01
		671.44		1.79	-1.99E+00		2.58E+00
	Ba-133	79.61		2.65	2.67E-01	8.00E-02	3.48E+00
		81.00		32.90	4.72E-02		2.36E-01
		276.40		7.16	1.18E-01		5.03E-01
		302.85		18.34	1.64E-01		1.94E-01
		356.01		62.05	-1.03E-01		8.00E-02
		383.85		8.94	-2.02E-01		3.84E-01
	Cs-134	475.36		1.48	-7.61E-01	4.78E-02	3.00E+00
		563.25		8.34	-4.18E-01		3.90E-01
		569.33		15.37	1.25E-01		2.17E-01
		604.72		97.62	-2.30E-03		6.23E-02
		795.86		85.46	1.76E-03		4.78E-02
		801.95		8.69	-4.16E-01		4.37E-01
		1038.61		0.99	-1.25E+01		4.55E+00
		1167.97		1.79	3.31E-01		3.04E+00
		1365.19		3.02	9.35E-01		1.45E+00
+	Cs-137	661.66	*	85.10	4.69E-02	4.68E-02	4.68E-02
	Eu-152	121.78		28.67	-9.02E-02	1.25E-01	1.32E-01
		244.70		7.61	2.29E-01		5.02E-01
		295.94		0.45	9.45E+00		9.95E+00
		344.28		26.60	-1.52E-01		1.25E-01
		367.79		0.86	1.05E+00		3.75E+00
		411.12		2.24	-3.65E-01		1.61E+00
		443.96		2.83	-5.84E-01		1.37E+00
		488.68		0.42	-4.23E+00		7.72E+00
		563.99		0.49	-6.45E+00		6.60E+00
		586.26		0.46	1.64E+01		1.23E+01
		678.62		0.47	-3.06E+00		8.42E+00
		688.67		0.86	4.69E-01		4.74E+00
		719.35		0.28	3.62E+00		1.34E+01
		778.90		12.96	-1.96E-01		2.54E-01
		810.45		0.32	3.41E+00		1.28E+01
		867.37		4.26	-4.24E-01		1.11E+00
		919.33		0.43	-6.70E+00		8.82E+00
		964.08		14.65	2.80E-01		4.66E-01
		1085.87		10.24	-2.77E-01		4.70E-01
		1089.74		1.73	2.60E+00		3.19E+00
		1112.07		13.69	-5.58E-01		3.83E-01
		1212.95		1.43	3.55E-01		4.54E+00
		1249.94		0.19	-5.38E-01		2.99E+01
		1299.14		1.63	1.45E+00		3.12E+00
		1408.01		21.07	1.78E-01		2.38E-01
		1457.64		0.50	1.15E+02		3.61E+01
		1528.10		0.28	4.17E+00		1.13E+01
	Eu-154	123.07		40.40	-1.72E-02	9.41E-02	9.41E-02
		247.93		6.89	-4.26E-01		4.63E-01
		591.76		4.95	-2.46E-01		7.56E-01
		692.42		1.78	-7.95E-01		2.30E+00
		723.30		20.06	6.74E-02		2.13E-01
		756.80		4.52	1.86E-01		7.71E-01

Analysis Report for 29-May-19-10020

L1-10220H-FQGS-006SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	873.18	12.08	1.66E-01	9.41E-02	3.51E-01
	996.29	10.48	-4.01E-01		3.99E-01
	1004.76	18.01	-8.76E-02		2.54E-01
	1274.43	34.80	1.03E-01		1.62E-01
	1596.48	1.80	-8.60E-02		2.54E+00
Eu-155	45.30	1.31	-8.25E-01	2.00E-01	1.90E+01
	60.01	1.22	-5.23E+00		2.21E+01
	86.55	30.70	1.10E-01		2.36E-01
	105.31	21.10	-7.86E-02		2.00E-01
Ra-226	186.21	3.64	6.62E-01	1.08E+00	1.08E+00
Pa-231	27.36	10.30	2.07E+00	1.48E+00	2.37E+00
	283.69	1.70	-7.67E-01		1.92E+00
	300.07	2.47	5.73E-01		1.48E+00
	302.65	2.20	4.46E-01		1.59E+00
	330.06	1.40	2.82E-01		2.34E+00
U-235	143.76	10.96	7.59E-02	6.91E-02	3.33E-01
	163.33	5.08	-9.66E-02		6.70E-01
	185.71	57.20	1.75E-02		6.91E-02
	202.11	1.08	-3.13E+00		3.00E+00
	205.31	5.01	-5.89E-01		6.67E-01
Am-241	59.54	35.90	1.91E-01	7.91E-01	7.91E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-May-19-10021

L1-10220H-FSGS-007SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-May-19-10021
Sample Description	: L1-10220H-FSGS-007SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.460E+03 grams
Facility	: Default
Sample Taken On	: 5/23/2019 8:55:00AM
Acquisition Started	: 5/29/2019 10:25:27AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.3 seconds
Dead Time	: 0.14 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/29/2019
Efficiency Calibration Used Done On	: 5/29/2019
Efficiency Calibration Description	:
Sample Number	: 76864
Fill Height	: 1459.72 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/29/2019 10:40:46AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

DATA VALIDATED 5/30/19 1000

J Graham/

Analysis Report for 29-May-19-10021

L1-10220H-FSGS-007SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.61	948 -	961	954.54	1.09E+02	16.75	6.16E+01	1.14
2	295.18	1174 -	1187	1180.63	5.64E+01	11.28	2.56E+01	0.97
3	338.27	1348 -	1357	1352.84	1.51E+01	8.59	2.59E+01	0.38
4	351.96	1402 -	1415	1407.57	7.92E+01	11.42	1.88E+01	0.85
5	583.32	2326 -	2339	2332.49	4.59E+01	8.25	8.10E+00	1.00
6	609.25	2432 -	2443	2436.18	5.05E+01	8.30	7.48E+00	1.34
7	661.56	2641 -	2650	2645.33	1.61E+01	6.03	8.86E+00	0.54
8	911.25	3638 -	3651	3643.97	3.10E+01	7.64	1.00E+01	0.42
9	968.80	3869 -	3880	3874.18	1.63E+01	6.62	1.07E+01	0.59
10	1460.74	5832 -	5853	5842.79	2.07E+02	15.41	8.23E+00	1.53

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82	*	10.66	5.23E+00	4.51E-01
Cs-137	0.99	661.66	*	85.10	2.97E-02	1.12E-02
Tl-208	0.99	583.19	*	85.00	7.75E-02	1.47E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.97E-01	3.42E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	1.64E-01	2.87E-02

Analysis Report for 29-May-19-10021

L1-10220H-FSGS-007SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	1.00	241.99		7.25		
		295.22	*	18.42	2.71E-01	5.85E-02
		351.93	*	35.60	2.24E-01	3.70E-02
		785.96		1.06		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	1.31E-01	7.53E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.34E-01	5.86E-02
		964.77		4.99		
		968.97	*	15.80	2.09E-01	8.56E-02
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 29-May-19-10021

L1-10220H-FSGS-007SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.999	5.23E+00	4.51E-01	
	Cs-137	0.998	2.97E-02	1.12E-02	
	Tl-208	0.997	7.75E-02	1.47E-02	
X	Bi-211	0.881			
	Pb-212	1.000	1.97E-01	3.42E-02	
	Bi-214	1.000	1.64E-01	2.87E-02	
	Pb-214	1.000	2.38E-01	3.12E-02	
	Ac-228	0.999	1.98E-01	4.07E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-May-19-10021

L1-10220H-FSGS-007SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/29/2019 10:40:46AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	5.12E-02	5.97E-02	5.97E-02
	BE-7	477.60		10.44	-1.32E-01	4.40E-01	4.40E-01
+	K-40	1460.82	*	10.66	5.23E+00	5.49E-01	5.49E-01
	Mn-54	834.85		99.98	-5.11E-04	4.52E-02	4.52E-02
	Co-60	1173.23		99.85	4.28E-02	5.85E-02	6.11E-02
		1332.49		99.98	-3.29E-02		5.85E-02
	Nb-94	702.65		99.81	-4.46E-03	4.05E-02	4.54E-02
		871.09		99.89	3.46E-03		4.05E-02
	Ag-108m	79.13		6.60	8.06E-01	4.19E-02	1.87E+00
		433.94		90.50	-2.47E-02		4.19E-02
		614.28		89.80	-2.35E-02		5.87E-02
		722.94		90.80	4.05E-03		5.87E-02
	Sb-125	176.31		6.84	6.91E-01	1.30E-01	6.39E-01
		380.45		1.52	1.41E+00		2.67E+00
		427.87		29.60	-1.47E-02		1.30E-01
		463.36		10.49	3.18E-02		3.66E-01
		600.60		17.65	2.99E-01		2.80E-01
		606.71		4.98	1.55E+00		1.39E+00
		635.95		11.22	1.55E-01		3.97E-01

Analysis Report for 29-May-19-10021

L1-10220H-FSGS-007SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-9.57E-01	1.30E-01	2.66E+00
	Ba-133	79.61		2.65	5.28E-01	7.68E-02	4.41E+00
		81.00		32.90	-4.48E-01		2.95E-01
		276.40		7.16	2.14E-01		5.93E-01
		302.85		18.34	-6.09E-03		2.32E-01
		356.01		62.05	1.47E-02		7.68E-02
		383.85		8.94	2.91E-01		4.66E-01
	Cs-134	475.36		1.48	5.30E-02	6.17E-02	2.94E+00
		563.25		8.34	-6.69E-02		4.46E-01
		569.33		15.37	-4.14E-02		2.61E-01
		604.72		97.62	-1.40E-01		6.52E-02
		795.86		85.46	5.08E-03		6.17E-02
		801.95		8.69	3.36E-01		5.74E-01
		1038.61		0.99	4.32E-01		5.26E+00
		1167.97		1.79	1.39E+00		3.71E+00
		1365.19		3.02	-1.54E+00		1.72E+00
+	Cs-137	661.66	*	85.10	2.97E-02	3.34E-02	3.34E-02
	Eu-152	121.78		28.67	6.07E-02	1.27E-01	1.61E-01
		244.70		7.61	6.56E-01		6.43E-01
		295.94		0.45	3.96E-01		1.08E+01
		344.28		26.60	-1.03E-01		1.27E-01
		367.79		0.86	-4.17E+00		4.06E+00
		411.12		2.24	6.93E-01		1.78E+00
		443.96		2.83	1.89E-02		1.31E+00
		488.68		0.42	2.60E+00		9.58E+00
		563.99		0.49	-2.04E+00		7.68E+00
		586.26		0.46	-2.19E+00		1.35E+01
		678.62		0.47	1.86E+00		9.07E+00
		688.67		0.86	4.66E+00		5.46E+00
		719.35		0.28	-4.55E+00		1.68E+01
		778.90		12.96	-1.82E-01		3.56E-01
		810.45		0.32	-5.62E+00		1.30E+01
		867.37		4.26	1.77E-02		9.47E-01
		919.33		0.43	8.33E+00		1.36E+01
		964.08		14.65	8.71E-02		5.09E-01
		1085.87		10.24	-2.53E-01		5.65E-01
		1089.74		1.73	6.94E-01		3.35E+00
		1112.07		13.69	-2.14E-02		3.49E-01
		1212.95		1.43	3.35E-01		4.12E+00
		1249.94		0.19	7.97E+00		3.03E+01
		1299.14		1.63	1.82E+00		3.45E+00
		1408.01		21.07	3.70E-02		2.75E-01
		1457.64		0.50	1.17E+02		3.99E+01
		1528.10		0.28	-1.46E+01		1.24E+01
	Eu-154	123.07		40.40	-2.81E-02	1.09E-01	1.09E-01
		247.93		6.89	2.26E-01		5.86E-01
		591.76		4.95	2.49E-01		8.29E-01
		692.42		1.78	-8.80E-01		2.65E+00
		723.30		20.06	2.21E-02		2.69E-01
		756.80		4.52	-8.62E-01		1.12E+00
		873.18		12.08	5.95E-02		3.36E-01

Analysis Report for 29-May-19-10021

L1-10220H-FSGS-007SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.81E-01	1.09E-01	5.41E-01
	1004.76	18.01	2.45E-02		3.42E-01
	1274.43	34.80	-3.70E-02		1.46E-01
	1596.48	1.80	-2.42E-01		2.91E+00
Eu-155	45.30	1.31	-2.10E+00	2.69E-01	3.06E+01
	60.01	1.22	3.42E+00		2.94E+01
	86.55	30.70	-1.67E-01		2.75E-01
	105.31	21.10	-1.05E-01		2.69E-01
Ra-226	186.21	3.64	2.39E-01	1.16E+00	1.16E+00
Pa-231	27.36	10.30	3.17E+00	1.64E+00	3.58E+00
	283.69	1.70	-4.85E-01		2.24E+00
	300.07	2.47	4.35E-01		1.64E+00
	302.65	2.20	3.87E-01		1.95E+00
	330.06	1.40	2.28E+00		3.09E+00
U-235	143.76	10.96	1.06E-01	7.48E-02	3.99E-01
	163.33	5.08	2.69E-01		8.46E-01
	185.71	57.20	5.35E-02		7.48E-02
	202.11	1.08	-3.77E-01		3.50E+00
	205.31	5.01	-1.09E-01		7.45E-01
Am-241	59.54	35.90	-4.14E-01	1.03E+00	1.03E+00

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-May-19-10022

L1-10220H-FSGS-008SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-May-19-10022
Sample Description	: L1-10220H-FSGS-008SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.432E+03 grams
Facility	: Default
Sample Taken On	: 5/23/2019 9:00:00AM
Acquisition Started	: 5/29/2019 10:25:33AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P11314
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.2 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/24/2019
Efficiency Calibration Used Done On	: 5/29/2019
Efficiency Calibration Description	:
Sample Number	: 76865
Fill Height	: 1431.57 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/29/2019 10:40:43AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

DATA VALIDATED 5/30/19 1000

J Graham/

Analysis Report for 29-May-19-10022

L1-10220H-FSGS-008SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.81	949 -	962	954.84	1.27E+02	17.65	6.38E+01	0.90
2	351.91	1400 -	1415	1406.65	8.41E+01	12.59	2.49E+01	0.80
3	582.85	2323 -	2336	2329.51	4.46E+01	8.56	1.04E+01	0.36
4	609.08	2428 -	2440	2434.36	5.69E+01	8.44	5.14E+00	0.42
5	726.79	2900 -	2909	2904.90	1.57E+01	4.34	1.31E+00	0.45
6	910.50	3634 -	3646	3639.44	2.69E+01	6.95	8.14E+00	1.10
7	968.92	3869 -	3878	3873.08	1.11E+01	5.49	7.89E+00	0.45
8	1460.27	5828 -	5851	5839.02	2.38E+02	16.74	1.10E+01	1.67

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.95	1460.82	*	10.66	5.45E+00	4.50E-01
Tl-208	0.98	583.19	*	85.00	6.83E-02	1.37E-02
Bi-211	0.89	351.07	*	13.02	5.88E-01	9.99E-02
Bi-212	0.97	39.86		1.06		
		727.33	*	6.67	3.56E-01	1.01E-01
		785.37		1.10		
		1620.50		1.47		
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	2.05E-01	3.29E-02

Analysis Report for 29-May-19-10022

L1-10220H-FSGS-008SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb-212	0.99	300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.68E-01	2.68E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	1.00	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	2.15E-01	3.65E-02
		785.96		1.06		
Ac-228	0.97	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	1.84E-01	4.83E-02
		964.77		4.99		
		968.97	*	15.80	1.29E-01	6.42E-02
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 29-May-19-10022

L1-10220H-FSGS-008SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.952	5.45E+00	4.50E-01	
	Tl-208	0.982	6.83E-02	1.37E-02	
?	Bi-211	0.893	5.88E-01	9.99E-02	
	Bi-212	0.970	3.56E-01	1.01E-01	
	Pb-212	0.995	2.05E-01	3.29E-02	
	Bi-214	0.996	1.68E-01	2.68E-02	
?	Pb-214	1.000	2.15E-01	3.65E-02	
	Ac-228	0.976	1.64E-01	3.86E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-May-19-10022

L1-10220H-FSGS-008SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/29/2019 10:40:43AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	8.70E-02	6.21E-02	6.21E-02
	BE-7	477.60		10.44	1.27E-01	4.15E-01	4.15E-01
+	K-40	1460.82	*	10.66	5.45E+00	5.70E-01	5.70E-01
	Mn-54	834.85		99.98	-1.07E-02	4.10E-02	4.10E-02
	Co-60	1173.23		99.85	-5.17E-02	5.32E-02	5.32E-02
		1332.49		99.98	8.39E-03		5.67E-02
	Nb-94	702.65		99.81	1.08E-02	4.07E-02	4.51E-02
		871.09		99.89	6.55E-03		4.07E-02
	Ag-108m	79.13		6.60	2.89E-01	3.61E-02	1.11E+00
		433.94		90.50	1.39E-02		3.61E-02
		614.28		89.80	-2.24E-02		4.44E-02
		722.94		90.80	4.83E-03		5.26E-02
	Sb-125	176.31		6.84	2.15E-01	1.14E-01	4.53E-01
		380.45		1.52	8.10E-01		2.49E+00
		427.87		29.60	-8.40E-03		1.14E-01
		463.36		10.49	3.53E-01		3.94E-01
		600.60		17.65	-3.78E-02		2.27E-01
		606.71		4.98	1.83E+00		1.24E+00
		635.95		11.22	7.51E-02		3.60E-01

Analysis Report for 29-May-19-10022

L1-10220H-FSGS-008SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-2.69E-01	1.14E-01	2.24E+00
Ba-133	79.61	2.65	2.96E-01	6.24E-02	2.67E+00
	81.00	32.90	-4.57E-01		1.71E-01
	276.40	7.16	-3.47E-02		4.16E-01
	302.85	18.34	4.33E-02		1.87E-01
	356.01	62.05	-2.41E-02		6.24E-02
	383.85	8.94	2.37E-02		3.73E-01
Cs-134	475.36	1.48	2.92E+00	4.80E-02	2.85E+00
	563.25	8.34	-8.54E-01		4.33E-01
	569.33	15.37	-3.29E-02		2.40E-01
	604.72	97.62	-2.12E-02		5.87E-02
	795.86	85.46	1.45E-02		4.80E-02
	801.95	8.69	2.39E-01		4.85E-01
	1038.61	0.99	2.93E+00		5.54E+00
	1167.97	1.79	1.24E-01		3.09E+00
	1365.19	3.02	-1.35E-01		1.45E+00
Cs-137	661.66	85.10	5.56E-02	6.78E-02	6.78E-02
Eu-152	121.78	28.67	1.88E-02	1.20E-01	1.20E-01
	244.70	7.61	2.73E-01		4.63E-01
	295.94	0.45	3.58E+00		9.25E+00
	344.28	26.60	-6.06E-02		1.26E-01
	367.79	0.86	2.13E+00		3.94E+00
	411.12	2.24	8.14E-02		1.53E+00
	443.96	2.83	1.30E-01		1.31E+00
	488.68	0.42	6.99E-02		9.89E+00
	563.99	0.49	-5.41E+00		7.32E+00
	586.26	0.46	-6.44E+00		1.22E+01
	678.62	0.47	6.49E+00		8.93E+00
	688.67	0.86	-6.89E-01		3.65E+00
	719.35	0.28	5.77E+00		1.40E+01
	778.90	12.96	-7.43E-02		2.98E-01
	810.45	0.32	-4.36E+00		1.12E+01
	867.37	4.26	-1.19E-01		1.02E+00
	919.33	0.43	-8.03E+00		1.03E+01
	964.08	14.65	-2.73E-01		3.92E-01
	1085.87	10.24	3.82E-01		5.12E-01
	1089.74	1.73	-2.22E+00		2.54E+00
	1112.07	13.69	-3.10E-01		4.03E-01
	1212.95	1.43	-1.54E+00		4.50E+00
	1249.94	0.19	1.73E+01		3.05E+01
	1299.14	1.63	-1.17E+00		3.57E+00
	1408.01	21.07	-4.79E-02		2.03E-01
	1457.64	0.50	1.18E+02		3.86E+01
	1528.10	0.28	4.49E+00		1.22E+01
Eu-154	123.07	40.40	5.44E-02	8.69E-02	8.69E-02
	247.93	6.89	-5.01E-01		3.99E-01
	591.76	4.95	4.91E-01		7.98E-01
	692.42	1.78	2.30E-01		1.92E+00
	723.30	20.06	1.55E-01		2.35E-01
	756.80	4.52	-3.36E-01		8.57E-01
	873.18	12.08	-1.35E-01		3.53E-01

Analysis Report for 29-May-19-10022

L1-10220H-FSGS-008SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	3.36E-01	8.69E-02	5.23E-01
	1004.76	18.01	1.82E-01		2.77E-01
	1274.43	34.80	4.10E-02		1.55E-01
	1596.48	1.80	1.46E-02		1.98E+00
Eu-155	45.30	1.31	-4.88E+00	1.75E-01	9.93E+00
	60.01	1.22	5.46E+00		1.20E+01
	86.55	30.70	6.87E-02		1.86E-01
	105.31	21.10	1.02E-01		1.75E-01
Ra-226	186.21	3.64	1.03E+00	9.94E-01	9.94E-01
Pa-231	27.36	10.30	4.67E-01	1.22E+00	1.22E+00
	283.69	1.70	5.10E-03		1.84E+00
	300.07	2.47	-1.50E+00		1.43E+00
	302.65	2.20	2.62E-01		1.55E+00
	330.06	1.40	9.65E-01		2.53E+00
U-235	143.76	10.96	-1.06E-01	6.21E-02	2.92E-01
	163.33	5.08	-6.85E-02		6.32E-01
	185.71	57.20	6.02E-02		6.21E-02
	202.11	1.08	-2.44E+00		2.77E+00
	205.31	5.01	5.95E-02		6.02E-01
Am-241	59.54	35.90	5.63E-03	4.08E-01	4.08E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-May-19-10023

L1-10220H-FSGS-009SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-May-19-10023
Sample Description	: L1-10220H-FSGS-009SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.110E+03 grams
Facility	: Default
Sample Taken On	: 5/23/2019 9:05:00AM
Acquisition Started	: 5/29/2019 10:48:34AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.8 seconds
Dead Time	: 0.09 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/29/2019
Efficiency Calibration Used Done On	: 5/29/2019
Efficiency Calibration Description	:
Sample Number	: 76866
Fill Height	: 1110.40 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/29/2019 11:03:40AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

DATA VALIDATED 5/30/19 1000

J Graham/

Analysis Report for 29-May-19-10023

L1-10220H-FSGS-009SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.53	946 -	958	954.19	3.90E+01	11.50	3.50E+01	0.88
2	352.02	1402 -	1411	1407.82	2.35E+01	7.19	1.25E+01	0.55
3	1460.71	5835 -	5851	5842.68	5.60E+01	7.48	0.00E+00	1.38

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82	*	10.66	1.58E+00	2.22E-01
Bi-211	0.86	351.07	*	13.02	1.98E-01	6.27E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	7.62E-02	2.33E-02
		300.09		3.30		
Pb-214	0.99	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	7.26E-02	2.29E-02
		785.96		1.06		

Analysis Report for 29-May-19-10023

L1-10220H-FSGS-009SS

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	***Nuclide Id Confidence***	***Wt mean Activity (pCi/grams)***	***Wt mean Activity Uncertainty***	***Comments***
	K-40	0.998	1.58E+00	2.22E-01	
?	Bi-211	0.865	1.98E-01	6.27E-02	
	Pb-212	0.998	7.62E-02	2.33E-02	
?	Pb-214	0.999	7.26E-02	2.29E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-May-19-10023

L1-10220H-FSGS-009SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/29/2019 11:03:40AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	6.25E-02	6.13E-02	6.13E-02
	BE-7	477.60		10.44	1.42E-01	3.75E-01	3.75E-01
+	K-40	1460.82	*	10.66	1.58E+00	8.11E-02	8.11E-02
	Mn-54	834.85		99.98	-7.98E-03	3.86E-02	3.86E-02
	Co-60	1173.23		99.85	-5.15E-02	4.37E-02	5.36E-02
		1332.49		99.98	1.96E-02		4.37E-02
	Nb-94	702.65		99.81	4.62E-03	2.84E-02	3.87E-02
		871.09		99.89	-7.16E-02		2.84E-02
	Ag-108m	79.13		6.60	6.94E-02	4.18E-02	1.44E+00
		433.94		90.50	5.68E-03		4.18E-02
		614.28		89.80	-5.55E-02		4.81E-02
		722.94		90.80	9.59E-03		4.33E-02
	Sb-125	176.31		6.84	-1.23E-01	1.13E-01	4.41E-01
		380.45		1.52	2.06E+00		2.41E+00
		427.87		29.60	-2.78E-02		1.13E-01
		463.36		10.49	-2.91E-02		3.45E-01
		600.60		17.65	-6.73E-02		2.28E-01
		606.71		4.98	1.28E-01		1.07E+00
		635.95		11.22	3.32E-02		2.93E-01

Analysis Report for 29-May-19-10023

L1-10220H-FSGS-009SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-4.34E-01	1.13E-01	1.69E+00
Ba-133	79.61	2.65	1.92E+00	6.07E-02	3.63E+00
	81.00	32.90	7.04E-02		2.53E-01
	276.40	7.16	2.18E-01		4.78E-01
	302.85	18.34	-1.89E-02		1.91E-01
	356.01	62.05	-6.37E-02		6.07E-02
	383.85	8.94	2.93E-02		3.71E-01
Cs-134	475.36	1.48	9.12E-01	4.65E-02	2.58E+00
	563.25	8.34	-4.65E-02		4.10E-01
	569.33	15.37	-3.66E-02		2.73E-01
	604.72	97.62	3.68E-02		5.48E-02
	795.86	85.46	6.34E-03		4.65E-02
	801.95	8.69	1.42E-01		4.28E-01
	1038.61	0.99	1.22E+00		4.67E+00
	1167.97	1.79	-2.11E-01		3.25E+00
	1365.19	3.02	-2.50E-01		1.19E+00
Cs-137	661.66	85.10	4.22E-02	5.54E-02	5.54E-02
Eu-152	121.78	28.67	5.09E-02	1.26E-01	1.26E-01
	244.70	7.61	-3.51E-01		4.35E-01
	295.94	0.45	3.17E+00		8.98E+00
	344.28	26.60	3.11E-02		1.38E-01
	367.79	0.86	3.08E-01		3.48E+00
	411.12	2.24	3.69E-01		1.53E+00
	443.96	2.83	-2.02E-01		1.24E+00
	488.68	0.42	-3.98E+00		8.59E+00
	563.99	0.49	9.53E-01		6.94E+00
	586.26	0.46	3.62E+00		9.90E+00
	678.62	0.47	4.91E+00		8.65E+00
	688.67	0.86	-1.81E+00		4.68E+00
	719.35	0.28	-4.22E+00		1.08E+01
	778.90	12.96	-5.59E-02		2.69E-01
	810.45	0.32	3.50E+00		1.16E+01
	867.37	4.26	-5.88E-01		6.64E-01
	919.33	0.43	-6.34E-01		9.15E+00
	964.08	14.65	1.86E-01		3.64E-01
	1085.87	10.24	-3.27E-01		3.23E-01
	1089.74	1.73	-7.76E-01		2.32E+00
	1112.07	13.69	2.45E-02		2.81E-01
	1212.95	1.43	2.58E+00		3.83E+00
	1249.94	0.19	1.42E+01		2.56E+01
	1299.14	1.63	-1.31E+00		2.30E+00
	1408.01	21.07	1.11E-01		2.28E-01
	1457.64	0.50	3.40E+01		2.33E+01
	1528.10	0.28	-9.26E+00		1.07E+01
Eu-154	123.07	40.40	-1.63E-02	8.45E-02	8.45E-02
	247.93	6.89	-9.35E-02		4.36E-01
	591.76	4.95	3.11E-01		7.50E-01
	692.42	1.78	-2.40E-01		2.33E+00
	723.30	20.06	1.20E-02		2.02E-01
	756.80	4.52	4.37E-01		9.00E-01
	873.18	12.08	1.56E-02		3.12E-01

Analysis Report for 29-May-19-10023

L1-10220H-FSGS-009SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	3.51E-01	8.45E-02	4.84E-01
	1004.76	18.01	-6.01E-02		2.50E-01
	1274.43	34.80	3.14E-02		1.58E-01
	1596.48	1.80	5.24E-02		2.63E+00
Eu-155	45.30	1.31	1.34E+01	2.13E-01	2.82E+01
	60.01	1.22	8.79E+00		2.43E+01
	86.55	30.70	5.39E-02		2.13E-01
	105.31	21.10	-5.89E-02		2.23E-01
Ra-226	186.21	3.64	4.70E-01	9.42E-01	9.42E-01
Pa-231	27.36	10.30	2.22E+00	1.38E+00	2.81E+00
	283.69	1.70	5.91E-01		2.01E+00
	300.07	2.47	-7.44E-01		1.38E+00
	302.65	2.20	-2.78E-01		1.59E+00
	330.06	1.40	-1.09E+00		2.47E+00
U-235	143.76	10.96	-7.18E-02	6.13E-02	3.27E-01
	163.33	5.08	-4.68E-01		6.06E-01
	185.71	57.20	3.14E-02		6.13E-02
	202.11	1.08	6.51E-01		3.36E+00
	205.31	5.01	-2.37E-01		6.72E-01
Am-241	59.54	35.90	-2.46E-01	8.03E-01	8.03E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-May-19-10024

L1-10220H-FSGS-010SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-May-19-10024
Sample Description	: L1-10220H-FSGS-010SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 9.801E+02 grams
Facility	: Default
Sample Taken On	: 5/23/2019 9:10:00AM
Acquisition Started	: 5/29/2019 10:48:41AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P11314
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.2 seconds
Dead Time	: 0.02 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/24/2019
Efficiency Calibration Used Done On	: 5/29/2019
Efficiency Calibration Description	:
Sample Number	: 76867
Fill Height	: 980.11 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/29/2019 11:03:57AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

DATA VALIDATED 5/30/19 1000

J Graham/

Analysis Report for 29-May-19-10024

L1-10220H-FSGS-010SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.67	946 -	961	954.26	8.01E+01	12.48	2.49E+01	0.93
2	352.05	1402 -	1413	1407.21	2.90E+01	7.70	1.20E+01	1.17
3	477.17	1903 -	1911	1907.18	1.54E+01	5.23	5.58E+00	0.46
4	582.99	2325 -	2335	2330.07	1.97E+01	5.59	4.34E+00	0.87
5	609.23	2430 -	2440	2434.95	2.95E+01	6.15	3.48E+00	0.88
6	661.62	2636 -	2651	2644.39	5.34E+01	8.74	7.56E+00	0.82
7	1460.46	5831 -	5849	5839.76	8.00E+01	10.60	1.00E+01	0.59

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
BE-7	0.97	477.60	*	10.44	2.09E-01	7.26E-02
K-40	0.97	1460.82	*	10.66	2.16E+00	3.02E-01
Cs-137	1.00	661.66	*	85.10	1.04E-01	1.81E-02
Tl-208	0.99	583.19	*	85.00	3.49E-02	1.01E-02
Bi-211	0.85	351.07	*	13.02	2.33E-01	6.45E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.47E-01	2.58E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.01E-01	2.19E-02
		768.36		4.89		

Analysis Report for 29-May-19-10024

L1-10220H-FSGS-010SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	8.51E-02	2.36E-02
		785.96		1.06		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	BE-7	0.971	2.09E-01	7.26E-02	
	K-40	0.979	2.16E+00	3.02E-01	
	Cs-137	1.000	1.04E-01	1.81E-02	
	Tl-208	0.994	3.49E-02	1.01E-02	
?	Bi-211	0.858	2.33E-01	6.45E-02	
	Pb-212	1.000	1.47E-01	2.58E-02	
	Bi-214	0.999	1.01E-01	2.19E-02	

Analysis Report for 29-May-19-10024

L1-10220H-FSGS-010SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
?	Pb-214	0.999	8.51E-02	2.36E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-May-19-10024

L1-10220H-FSGS-010SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/29/2019 11:03:57AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	5.17E-02	6.00E-02	6.00E-02
+	BE-7	477.60	*	10.44	2.09E-01	1.98E-01	1.98E-01
+	K-40	1460.82	*	10.66	2.16E+00	5.99E-01	5.99E-01
	Mn-54	834.85		99.98	5.41E-03	3.97E-02	3.97E-02
	Co-60	1173.23		99.85	3.27E-02	6.09E-02	6.63E-02
		1332.49		99.98	4.57E-02		6.09E-02
	Nb-94	702.65		99.81	-1.18E-02	3.59E-02	3.59E-02
		871.09		99.89	1.50E-03		3.76E-02
	Ag-108m	79.13		6.60	3.18E-02	4.05E-02	9.58E-01
		433.94		90.50	3.14E-02		4.05E-02
		614.28		89.80	-3.05E-02		4.33E-02
		722.94		90.80	-8.53E-03		5.00E-02
	Sb-125	176.31		6.84	1.72E-01	1.16E-01	4.14E-01
		380.45		1.52	-1.75E+00		1.74E+00
		427.87		29.60	-1.01E-01		1.16E-01
		463.36		10.49	1.67E-01		3.41E-01
		600.60		17.65	1.31E-02		2.13E-01
		606.71		4.98	1.22E+00		1.15E+00
		635.95		11.22	-3.73E-01		2.90E-01

Analysis Report for 29-May-19-10024

L1-10220H-FSGS-010SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-7.01E-02	1.16E-01	1.61E+00
	Ba-133	79.61		2.65	4.75E-01	5.71E-02	2.35E+00
		81.00		32.90	-1.21E-01		1.58E-01
		276.40		7.16	-1.55E-01		3.71E-01
		302.85		18.34	5.01E-02		1.71E-01
		356.01		62.05	7.32E-03		5.71E-02
		383.85		8.94	-2.35E-01		2.90E-01
	Cs-134	475.36		1.48	1.62E+00	5.17E-02	3.12E+00
		563.25		8.34	-3.92E-01		4.51E-01
		569.33		15.37	-5.58E-02		1.89E-01
		604.72		97.62	-6.10E-02		5.17E-02
		795.86		85.46	3.46E-02		5.49E-02
		801.95		8.69	-8.90E-02		4.95E-01
		1038.61		0.99	-2.69E+00		3.97E+00
		1167.97		1.79	-1.85E+00		3.70E+00
		1365.19		3.02	1.18E+00		1.84E+00
+	Cs-137	661.66	*	85.10	1.04E-01	3.71E-02	3.71E-02
	Eu-152	121.78		28.67	-1.65E-02	9.56E-02	9.56E-02
		244.70		7.61	4.74E-02		4.07E-01
		295.94		0.45	1.64E+00		8.48E+00
		344.28		26.60	4.18E-02		1.09E-01
		367.79		0.86	-9.26E-01		3.05E+00
		411.12		2.24	-5.96E-01		1.28E+00
		443.96		2.83	-4.83E-01		9.96E-01
		488.68		0.42	4.20E+00		7.90E+00
		563.99		0.49	-4.16E+00		7.15E+00
		586.26		0.46	-5.77E+00		1.08E+01
		678.62		0.47	2.14E+00		8.07E+00
		688.67		0.86	-2.53E+00		4.12E+00
		719.35		0.28	-5.57E+00		1.38E+01
		778.90		12.96	-1.47E-03		3.23E-01
		810.45		0.32	-1.48E-01		1.07E+01
		867.37		4.26	-2.84E-01		9.44E-01
		919.33		0.43	-2.96E+00		8.40E+00
		964.08		14.65	3.17E-02		3.65E-01
		1085.87		10.24	-2.32E-02		5.03E-01
		1089.74		1.73	-7.37E-01		3.14E+00
		1112.07		13.69	-7.63E-02		3.50E-01
		1212.95		1.43	3.09E-01		3.68E+00
		1249.94		0.19	-1.85E+01		2.35E+01
		1299.14		1.63	3.25E-01		2.80E+00
		1408.01		21.07	4.69E-02		2.40E-01
		1457.64		0.50	5.05E+01		2.87E+01
		1528.10		0.28	-4.42E+00		1.19E+01
	Eu-154	123.07		40.40	-1.80E-02	6.76E-02	6.76E-02
		247.93		6.89	-2.62E-02		3.82E-01
		591.76		4.95	2.19E-01		7.67E-01
		692.42		1.78	-1.47E+00		2.00E+00
		723.30		20.06	-3.18E-02		2.31E-01
		756.80		4.52	7.03E-02		8.36E-01
		873.18		12.08	-1.78E-01		3.12E-01

Analysis Report for 29-May-19-10024

L1-10220H-FSGS-010SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.21E-01	6.76E-02	4.76E-01
	1004.76	18.01	8.61E-02		2.72E-01
	1274.43	34.80	1.05E-01		1.56E-01
	1596.48	1.80	-6.89E-01		2.15E+00
Eu-155	45.30	1.31	7.48E+00	1.38E-01	9.61E+00
	60.01	1.22	4.66E-01		8.70E+00
	86.55	30.70	-1.22E-02		1.38E-01
	105.31	21.10	-2.00E-02		1.55E-01
Ra-226	186.21	3.64	4.93E-01	8.06E-01	8.06E-01
Pa-231	27.36	10.30	8.25E-01	1.07E+00	1.07E+00
	283.69	1.70	6.21E-01		1.78E+00
	300.07	2.47	-1.01E+00		1.34E+00
	302.65	2.20	4.62E-01		1.44E+00
	330.06	1.40	9.81E-01		2.29E+00
U-235	143.76	10.96	1.15E-01	5.16E-02	2.54E-01
	163.33	5.08	-1.87E-01		5.07E-01
	185.71	57.20	2.95E-02		5.16E-02
	202.11	1.08	-1.26E-01		2.57E+00
	205.31	5.01	-3.15E-01		4.93E-01
Am-241	59.54	35.90	-7.49E-02	3.02E-01	3.02E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-May-19-10025

L1-10220H-FSGS-011SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-May-19-10025
Sample Description	: L1-10220H-FSGS-011SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.116E+03 grams
Facility	: Default
Sample Taken On	: 5/23/2019 9:15:00AM
Acquisition Started	: 5/29/2019 11:18:36AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.0 seconds
Dead Time	: 0.11 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/29/2019
Efficiency Calibration Used Done On	: 5/29/2019
Efficiency Calibration Description	:
Sample Number	: 76869
Fill Height	: 1116.46 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/29/2019 11:33:40AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

DATA VALIDATED 5/30/19 1000

J Graham/

Analysis Report for 29-May-19-10025

L1-10220H-FSGS-011SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.80	949 -	960	955.28	5.41E+01	11.69	3.29E+01	1.22
2	351.98	1402 -	1412	1407.64	3.75E+01	8.28	1.25E+01	0.88
3	583.16	2326 -	2337	2331.87	2.93E+01	6.60	5.70E+00	0.90
4	1460.84	5833 -	5852	5843.20	9.76E+01	10.29	2.42E+00	1.65

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.82	*	10.66	2.75E+00	3.13E-01
Tl-208	1.00	583.19	*	85.00	5.43E-02	1.27E-02
Bi-211	0.87	351.07	*	13.02	3.16E-01	7.42E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.06E-01	2.44E-02
		300.09		3.30		
Pb-214	1.00	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	1.16E-01	2.71E-02
		785.96		1.06		

Analysis Report for 29-May-19-10025

L1-10220H-FSGS-011SS

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	***Nuclide Id Confidence***	***Wt mean Activity (pCi/grams)***	***Wt mean Activity Uncertainty***	***Comments***
	K-40	1.000	2.75E+00	3.13E-01	
	Tl-208	1.000	5.43E-02	1.27E-02	
?	Bi-211	0.877	3.16E-01	7.42E-02	
	Pb-212	0.996	1.06E-01	2.44E-02	
?	Pb-214	1.000	1.16E-01	2.71E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-May-19-10025

L1-10220H-FSGS-011SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/29/2019 11:33:40AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	7.48E-02	6.26E-02	6.26E-02
	BE-7	477.60		10.44	-6.35E-02	3.67E-01	3.67E-01
+	K-40	1460.82	*	10.66	2.75E+00	3.57E-01	3.57E-01
	Mn-54	834.85		99.98	-2.30E-03	4.26E-02	4.26E-02
	Co-60	1173.23		99.85	2.39E-02	4.83E-02	5.66E-02
		1332.49		99.98	-2.82E-02		4.83E-02
	Nb-94	702.65		99.81	3.10E-02	4.56E-02	4.56E-02
		871.09		99.89	1.36E-02		5.39E-02
	Ag-108m	79.13		6.60	8.14E-01	4.18E-02	1.73E+00
		433.94		90.50	-1.13E-02		4.18E-02
		614.28		89.80	-9.98E-03		5.38E-02
		722.94		90.80	2.52E-03		6.05E-02
	Sb-125	176.31		6.84	-2.82E-01	1.39E-01	4.98E-01
		380.45		1.52	-7.47E-01		2.44E+00
		427.87		29.60	6.21E-02		1.39E-01
		463.36		10.49	1.72E-01		3.84E-01
		600.60		17.65	4.82E-03		2.18E-01
		606.71		4.98	1.31E+00		1.20E+00
		635.95		11.22	-1.66E-01		3.56E-01

Analysis Report for 29-May-19-10025

L1-10220H-FSGS-011SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.85E+00	1.39E-01	2.37E+00
Ba-133	79.61	2.65	1.45E+00	7.15E-02	4.20E+00
	81.00	32.90	-1.99E-01		2.90E-01
	276.40	7.16	1.46E-01		5.04E-01
	302.85	18.34	9.03E-02		1.98E-01
	356.01	62.05	-5.39E-02		7.15E-02
	383.85	8.94	-1.40E-01		4.15E-01
Cs-134	475.36	1.48	3.63E-01	5.21E-02	2.35E+00
	563.25	8.34	-2.42E-01		4.41E-01
	569.33	15.37	6.31E-02		2.52E-01
	604.72	97.62	-2.71E-02		5.34E-02
	795.86	85.46	-6.26E-03		5.21E-02
	801.95	8.69	1.08E-01		4.88E-01
	1038.61	0.99	1.18E+00		4.49E+00
	1167.97	1.79	9.42E-03		3.41E+00
	1365.19	3.02	-2.12E+00		1.39E+00
Cs-137	661.66	85.10	3.55E-02	5.72E-02	5.72E-02
Eu-152	121.78	28.67	-2.79E-02	1.35E-01	1.40E-01
	244.70	7.61	-9.48E-02		4.69E-01
	295.94	0.45	1.90E+00		9.35E+00
	344.28	26.60	7.15E-02		1.35E-01
	367.79	0.86	-4.51E-02		4.11E+00
	411.12	2.24	-6.74E-01		1.58E+00
	443.96	2.83	-3.67E-01		1.28E+00
	488.68	0.42	5.34E+00		9.65E+00
	563.99	0.49	-7.21E+00		7.46E+00
	586.26	0.46	-3.14E+00		1.19E+01
	678.62	0.47	4.16E-01		9.98E+00
	688.67	0.86	-1.70E+00		4.55E+00
	719.35	0.28	-6.33E+00		1.66E+01
	778.90	12.96	-1.12E-01		3.00E-01
	810.45	0.32	-3.39E+00		1.32E+01
	867.37	4.26	-2.61E-01		1.16E+00
	919.33	0.43	2.78E+00		1.05E+01
	964.08	14.65	1.49E-01		3.80E-01
	1085.87	10.24	-9.12E-02		4.78E-01
	1089.74	1.73	1.38E+00		3.11E+00
	1112.07	13.69	1.13E-01		3.52E-01
	1212.95	1.43	2.83E+00		4.66E+00
	1249.94	0.19	6.87E+00		2.76E+01
	1299.14	1.63	-1.34E+00		3.05E+00
	1408.01	21.07	-7.96E-02		2.15E-01
	1457.64	0.50	5.50E+01		3.06E+01
	1528.10	0.28	5.51E+00		1.50E+01
Eu-154	123.07	40.40	8.67E-02	9.71E-02	1.06E-01
	247.93	6.89	-3.47E-01		4.26E-01
	591.76	4.95	2.01E-01		7.11E-01
	692.42	1.78	6.92E-01		2.43E+00
	723.30	20.06	-5.30E-02		2.70E-01
	756.80	4.52	-3.20E-01		8.97E-01
	873.18	12.08	2.59E-02		4.55E-01

Analysis Report for 29-May-19-10025

L1-10220H-FSGS-011SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.31E-01	9.71E-02	3.95E-01
	1004.76	18.01	3.92E-02		2.10E-01
	1274.43	34.80	-8.37E-02		9.71E-02
	1596.48	1.80	1.43E+00		2.95E+00
Eu-155	45.30	1.31	2.72E+00	2.09E-01	2.90E+01
	60.01	1.22	1.48E+01		2.80E+01
	86.55	30.70	-1.46E-01		2.09E-01
	105.31	21.10	-2.69E-02		2.34E-01
Ra-226	186.21	3.64	7.43E-01	1.03E+00	1.03E+00
Pa-231	27.36	10.30	1.41E+00	1.42E+00	2.81E+00
	283.69	1.70	-4.48E-01		2.06E+00
	300.07	2.47	-1.46E+00		1.42E+00
	302.65	2.20	1.09E+00		1.65E+00
	330.06	1.40	-2.49E+00		2.32E+00
U-235	143.76	10.96	1.72E-01	6.52E-02	3.36E-01
	163.33	5.08	4.02E-01		7.64E-01
	185.71	57.20	4.16E-02		6.52E-02
	202.11	1.08	7.45E-01		3.41E+00
	205.31	5.01	-3.07E-01		7.07E-01
Am-241	59.54	35.90	-2.35E-01	9.67E-01	9.67E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-May-19-10026

L1-10220H-FSGS-012SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-May-19-10026
Sample Description	: L1-10220H-FSGS-012SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.275E+03 grams
Facility	: Default
Sample Taken On	: 5/23/2019 9:20:00AM
Acquisition Started	: 5/29/2019 11:18:43AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P11314
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/24/2019
Efficiency Calibration Used Done On	: 5/29/2019
Efficiency Calibration Description	:
Sample Number	: 76870
Fill Height	: 1274.63 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/29/2019 11:33:45AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

DATA VALIDATED 5/30/19 1000

J Graham

Analysis Report for 29-May-19-10026

L1-10220H-FSGS-012SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.25	304 -	314	309.52	2.94E+01	13.70	6.26E+01	0.66
2	238.71	947 -	960	954.43	1.07E+02	15.70	5.06E+01	0.65
3	295.28	1174 -	1188	1180.40	6.30E+01	11.45	2.30E+01	0.67
4	352.00	1401 -	1414	1407.00	7.10E+01	10.20	1.20E+01	1.08
5	477.55	1904 -	1914	1908.68	2.64E+01	8.00	1.56E+01	0.76
6	609.27	2430 -	2442	2435.12	4.87E+01	8.23	7.35E+00	0.98
7	661.61	2636 -	2650	2644.32	5.35E+01	8.66	7.50E+00	0.74
8	1460.16	5829 -	5850	5838.56	2.07E+02	15.76	1.10E+01	1.41

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
BE-7	0.99	477.60	*	10.44	3.21E-01	1.00E-01
K-40	0.93	1460.82	*	10.66	4.94E+00	4.33E-01
Cs-137	1.00	661.66	*	85.10	9.26E-02	1.60E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.78E-01	2.97E-02
		300.09		3.30		
Pb212-XR	0.99	74.82		10.28		
		77.11	*	17.10	2.12E-01	1.01E-01
		87.35		3.97		

Analysis Report for 29-May-19-10026

L1-10220H-FSGS-012SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb212-XR	0.99	89.78		1.46		
Bi-214	1.00	609.32	*	45.49	1.49E-01	2.67E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	2.82E-01	5.59E-02
		351.93	*	35.60	1.87E-01	3.08E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	3.74E-01	1.79E-01
		87.35		2.24		
		89.78		0.82		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments

Analysis Report for 29-May-19-10026

L1-10220H-FSGS-012SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	BE-7	0.999	3.21E-01	1.00E-01	
	K-40	0.931	4.94E+00	4.33E-01	
	Cs-137	1.000	9.26E-02	1.60E-02	
X	Bi-211	0.872			
	Pb-212	0.999	1.78E-01	2.97E-02	
?	Pb212-XR	0.998	2.12E-01	1.01E-01	
	Bi-214	1.000	1.49E-01	2.67E-02	
	Pb-214	0.999	2.09E-01	2.70E-02	
?	Pb214-XR	0.998	3.74E-01	1.79E-01	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-May-19-10026

L1-10220H-FSGS-012SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/29/2019 11:33:45AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	6.49E-02	5.95E-02	5.95E-02
+	BE-7	477.60	*	10.44	3.21E-01	2.88E-01	2.88E-01
+	K-40	1460.82	*	10.66	4.94E+00	5.90E-01	5.90E-01
	Mn-54	834.85		99.98	1.66E-02	4.70E-02	4.70E-02
	Co-60	1173.23		99.85	4.45E-02	5.52E-02	5.97E-02
		1332.49		99.98	2.93E-02		5.52E-02
	Nb-94	702.65		99.81	-5.69E-03	3.70E-02	3.90E-02
		871.09		99.89	1.44E-02		3.70E-02
	Ag-108m	79.13		6.60	-5.12E-01	3.78E-02	1.00E+00
		433.94		90.50	-1.17E-02		3.78E-02
		614.28		89.80	-3.04E-02		5.23E-02
		722.94		90.80	2.46E-03		4.94E-02
	Sb-125	176.31		6.84	-6.25E-02	1.13E-01	4.30E-01
		380.45		1.52	6.47E-01		2.11E+00
		427.87		29.60	-8.17E-02		1.13E-01
		463.36		10.49	6.76E-02		3.25E-01
		600.60		17.65	-2.45E-02		1.95E-01
		606.71		4.98	1.16E+00		1.20E+00
		635.95		11.22	1.56E-01		3.56E-01

Analysis Report for 29-May-19-10026

L1-10220H-FSGS-012SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	8.96E-01	1.13E-01	2.28E+00
	Ba-133	79.61		2.65	-1.48E+00	6.12E-02	2.40E+00
		81.00		32.90	-9.06E-02		1.57E-01
		276.40		7.16	-1.29E-02		4.14E-01
		302.85		18.34	-8.65E-02		1.72E-01
		356.01		62.05	1.13E-04		6.12E-02
		383.85		8.94	6.24E-03		4.09E-01
	Cs-134	475.36		1.48	2.63E+00	4.56E-02	3.33E+00
		563.25		8.34	-3.31E-01		4.76E-01
		569.33		15.37	-8.67E-02		2.41E-01
		604.72		97.62	-4.80E-02		5.09E-02
		795.86		85.46	1.28E-02		4.56E-02
		801.95		8.69	1.11E-01		4.62E-01
		1038.61		0.99	2.93E+00		4.96E+00
		1167.97		1.79	-6.53E-01		2.96E+00
		1365.19		3.02	2.41E-01		9.00E-01
+	Cs-137	661.66	*	85.10	9.26E-02	3.22E-02	3.22E-02
	Eu-152	121.78		28.67	-1.46E-02	1.08E-01	1.08E-01
		244.70		7.61	8.52E-02		4.52E-01
		295.94		0.45	3.82E+00		1.00E+01
		344.28		26.60	2.61E-03		1.14E-01
		367.79		0.86	-1.96E+00		3.74E+00
		411.12		2.24	-8.96E-01		1.69E+00
		443.96		2.83	-4.26E-01		1.26E+00
		488.68		0.42	-7.81E+00		8.03E+00
		563.99		0.49	-1.48E+01		7.08E+00
		586.26		0.46	1.28E+01		1.26E+01
		678.62		0.47	1.13E+00		8.83E+00
		688.67		0.86	-6.02E-01		4.38E+00
		719.35		0.28	-1.40E+00		1.30E+01
		778.90		12.96	1.06E-02		3.47E-01
		810.45		0.32	2.64E-01		1.31E+01
		867.37		4.26	1.56E-01		8.66E-01
		919.33		0.43	-7.16E+00		1.00E+01
		964.08		14.65	-9.44E-02		3.86E-01
		1085.87		10.24	1.66E-01		4.80E-01
		1089.74		1.73	1.47E+00		2.78E+00
		1112.07		13.69	5.54E-02		3.82E-01
		1212.95		1.43	4.47E+00		4.82E+00
		1249.94		0.19	7.43E+00		3.05E+01
		1299.14		1.63	2.33E+00		3.64E+00
		1408.01		21.07	5.78E-02		2.29E-01
		1457.64		0.50	1.11E+02		3.77E+01
		1528.10		0.28	-2.34E+00		1.17E+01
	Eu-154	123.07		40.40	-1.30E-02	7.55E-02	7.55E-02
		247.93		6.89	4.72E-02		4.40E-01
		591.76		4.95	2.04E-01		7.66E-01
		692.42		1.78	-8.19E-01		2.34E+00
		723.30		20.06	1.69E-02		2.28E-01
		756.80		4.52	3.49E-01		8.70E-01
		873.18		12.08	1.81E-01		3.43E-01

Analysis Report for 29-May-19-10026

L1-10220H-FSGS-012SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	6.28E-02	7.55E-02	4.64E-01
	1004.76	18.01	6.87E-02		2.88E-01
	1274.43	34.80	-5.86E-02		1.19E-01
	1596.48	1.80	-8.87E-01		1.70E+00
Eu-155	45.30	1.31	-1.34E+00	1.66E-01	1.03E+01
	60.01	1.22	-3.49E-01		1.11E+01
	86.55	30.70	4.48E-02		1.66E-01
	105.31	21.10	-7.40E-02		1.70E-01
Ra-226	186.21	3.64	5.07E-01	9.00E-01	9.00E-01
Pa-231	27.36	10.30	1.25E+00	1.30E+00	1.30E+00
	283.69	1.70	6.40E-01		1.74E+00
	300.07	2.47	6.14E-01		1.37E+00
	302.65	2.20	1.70E-02		1.47E+00
	330.06	1.40	-7.64E-01		2.22E+00
U-235	143.76	10.96	-3.09E-02	5.80E-02	2.84E-01
	163.33	5.08	7.24E-02		5.71E-01
	185.71	57.20	3.20E-02		5.80E-02
	202.11	1.08	-1.18E+00		2.82E+00
	205.31	5.01	2.17E-01		6.37E-01
Am-241	59.54	35.90	6.19E-02	3.97E-01	3.97E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-May-19-10027

L1-10220H-FSGS-013SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-May-19-10027
Sample Description	: L1-10220H-FSGS-013SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.279E+03 grams
Facility	: Default
Sample Taken On	: 5/23/2019 9:25:00AM
Acquisition Started	: 5/29/2019 11:18:51AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.2 seconds
Dead Time	: 0.02 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 5/29/2019
Efficiency Calibration Description	:
Sample Number	: 76871
Fill Height	: 1278.88 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/29/2019 11:34:10AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

DATA VALIDATED 5/30/19 1000

J Graham

Analysis Report for 29-May-19-10027

L1-10220H-FSGS-013SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.50	948 -	959	954.46	4.36E+01	9.98	2.24E+01	0.88
2	351.77	1401 -	1413	1407.09	3.60E+01	8.38	1.30E+01	0.80
3	609.19	2430 -	2444	2436.01	3.62E+01	7.45	6.80E+00	0.63
4	1460.24	5831 -	5850	5841.33	1.01E+02	11.49	9.15E+00	1.39

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.94	1460.82	*	10.66	2.24E+00	2.73E-01
Bi-211	0.92	351.07	*	13.02	2.50E-01	6.16E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	7.09E-02	1.72E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.04E-01	2.24E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		

Analysis Report for 29-May-19-10027

L1-10220H-FSGS-013SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	9.14E-02	2.25E-02
		785.96		1.06		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.948	2.24E+00	2.73E-01	
?	Bi-211	0.924	2.50E-01	6.16E-02	
	Pb-212	0.997	7.09E-02	1.72E-02	
	Bi-214	0.999	1.04E-01	2.24E-02	
?	Pb-214	0.998	9.14E-02	2.25E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-May-19-10027

L1-10220H-FSGS-013SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/29/2019 11:34:10AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	7.22E-02	5.13E-02	5.13E-02
	BE-7	477.60		10.44	3.44E-01	4.05E-01	4.05E-01
+	K-40	1460.82	*	10.66	2.24E+00	4.84E-01	4.84E-01
	Mn-54	834.85		99.98	8.00E-03	2.96E-02	2.96E-02
	Co-60	1173.23		99.85	-3.91E-03	4.10E-02	4.10E-02
		1332.49		99.98	2.65E-02		4.31E-02
	Nb-94	702.65		99.81	1.71E-03	3.25E-02	3.89E-02
		871.09		99.89	1.03E-02		3.25E-02
	Ag-108m	79.13		6.60	-2.88E-01	2.99E-02	1.06E+00
		433.94		90.50	-4.82E-03		2.99E-02
		614.28		89.80	-1.02E-02		5.56E-02
		722.94		90.80	-1.40E-02		4.03E-02
	Sb-125	176.31		6.84	-5.64E-02	9.76E-02	3.74E-01
		380.45		1.52	6.10E-02		1.82E+00
		427.87		29.60	-4.42E-02		9.76E-02
		463.36		10.49	1.48E-02		3.09E-01
		600.60		17.65	-1.59E-01		2.02E-01
		606.71		4.98	1.22E+00		1.07E+00
		635.95		11.22	1.35E-01		2.67E-01

Analysis Report for 29-May-19-10027

L1-10220H-FSGS-013SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	1.18E-01	9.76E-02	2.07E+00
Ba-133	79.61	2.65	1.22E+00	5.89E-02	2.59E+00
	81.00	32.90	-3.63E-01		1.71E-01
	276.40	7.16	2.72E-03		3.77E-01
	302.85	18.34	-4.24E-02		1.37E-01
	356.01	62.05	-1.07E-02		5.89E-02
	383.85	8.94	1.34E-01		2.99E-01
Cs-134	475.36	1.48	2.67E+00	4.07E-02	2.60E+00
	563.25	8.34	9.28E-02		3.40E-01
	569.33	15.37	-3.84E-02		1.76E-01
	604.72	97.62	-2.88E-03		5.26E-02
	795.86	85.46	1.93E-02		4.07E-02
	801.95	8.69	-1.11E-01		4.81E-01
	1038.61	0.99	2.17E+00		4.20E+00
	1167.97	1.79	2.04E+00		2.64E+00
	1365.19	3.02	2.25E-01		8.37E-01
Cs-137	661.66	85.10	2.40E-03	3.79E-02	3.79E-02
Eu-152	121.78	28.67	-2.85E-02	8.85E-02	9.25E-02
	244.70	7.61	2.24E-01		3.97E-01
	295.94	0.45	2.45E+00		6.29E+00
	344.28	26.60	-1.13E-02		8.85E-02
	367.79	0.86	8.12E-01		2.96E+00
	411.12	2.24	-1.37E+00		1.17E+00
	443.96	2.83	-5.57E-01		9.71E-01
	488.68	0.42	1.00E+00		7.86E+00
	563.99	0.49	-8.53E-01		5.29E+00
	586.26	0.46	5.42E+00		9.66E+00
	678.62	0.47	5.22E+00		7.89E+00
	688.67	0.86	1.62E+00		3.66E+00
	719.35	0.28	2.50E+00		1.16E+01
	778.90	12.96	5.11E-02		2.77E-01
	810.45	0.32	-1.44E+00		1.09E+01
	867.37	4.26	3.00E-01		7.60E-01
	919.33	0.43	-8.41E+00		7.59E+00
	964.08	14.65	2.92E-01		3.21E-01
	1085.87	10.24	2.36E-02		3.92E-01
	1089.74	1.73	1.34E+00		2.66E+00
	1112.07	13.69	-1.93E-01		2.23E-01
	1212.95	1.43	-2.48E+00		2.26E+00
	1249.94	0.19	-1.58E+01		2.02E+01
	1299.14	1.63	1.60E+00		2.60E+00
	1408.01	21.07	-1.50E-01		1.49E-01
	1457.64	0.50	5.40E+01		2.60E+01
	1528.10	0.28	-6.29E+00		1.43E+01
Eu-154	123.07	40.40	-1.15E-02	6.85E-02	6.85E-02
	247.93	6.89	2.58E-01		3.99E-01
	591.76	4.95	-3.21E-01		7.00E-01
	692.42	1.78	-1.10E+00		1.63E+00
	723.30	20.06	1.89E-02		1.83E-01
	756.80	4.52	1.38E-02		7.61E-01
	873.18	12.08	-2.78E-01		2.49E-01

Analysis Report for 29-May-19-10027

L1-10220H-FSGS-013SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.28E-01	6.85E-02	3.84E-01
	1004.76	18.01	1.54E-01		2.48E-01
	1274.43	34.80	3.44E-02		1.24E-01
	1596.48	1.80	-7.04E-02		2.43E+00
Eu-155	45.30	1.31	6.86E+00	1.54E-01	1.53E+01
	60.01	1.22	-4.08E+00		1.50E+01
	86.55	30.70	1.28E-01		1.74E-01
	105.31	21.10	-7.60E-02		1.54E-01
Ra-226	186.21	3.64	4.50E-01	7.88E-01	7.88E-01
Pa-231	27.36	10.30	1.09E+00	1.02E+00	1.71E+00
	283.69	1.70	4.85E-01		1.63E+00
	300.07	2.47	-1.30E+00		1.02E+00
	302.65	2.20	-1.45E-01		1.15E+00
	330.06	1.40	1.59E-01		1.94E+00
U-235	143.76	10.96	-8.45E-03	5.04E-02	2.38E-01
	163.33	5.08	1.15E-01		5.10E-01
	185.71	57.20	2.85E-02		5.04E-02
	202.11	1.08	-5.26E-01		2.67E+00
	205.31	5.01	-8.48E-02		5.65E-01
Am-241	59.54	35.90	-1.65E-01	5.31E-01	5.31E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-May-19-10028

L1-10220H-FSGS-014SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-May-19-10028
Sample Description	: L1-10220H-FSGS-014SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.510E+03 grams
Facility	: Default
Sample Taken On	: 5/23/2019 9:30:00AM
Acquisition Started	: 5/29/2019 11:40:03AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.3 seconds
Dead Time	: 0.14 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/29/2019
Efficiency Calibration Used Done On	: 5/29/2019
Efficiency Calibration Description	:
Sample Number	: 76873
Fill Height	: 1510.20 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/29/2019 11:55:07AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

DATA VALIDATED 5/30/19 1000

J Graham

Analysis Report for 29-May-19-10028

L1-10220H-FSGS-014SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.70	949 -	960	954.91	1.08E+02	16.06	5.99E+01	0.49
2	352.06	1400 -	1415	1407.98	7.18E+01	12.05	2.42E+01	1.14
3	583.11	2325 -	2339	2331.65	4.54E+01	8.59	9.60E+00	0.51
4	609.28	2429 -	2442	2436.29	5.31E+01	9.30	1.19E+01	0.98
5	911.13	3636 -	3649	3643.50	4.04E+01	7.12	3.57E+00	0.40
6	1460.69	5831 -	5852	5842.60	2.15E+02	15.33	5.50E+00	1.66

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82	*	10.66	5.37E+00	4.49E-01
Tl-208	0.99	583.19	*	85.00	7.60E-02	1.51E-02
Bi-211	0.85	351.07	*	13.02	5.51E-01	1.03E-01
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.94E-01	3.28E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	1.71E-01	3.17E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		

Analysis Report for 29-May-19-10028

L1-10220H-FSGS-014SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	2.02E-01	3.75E-02
		785.96		1.06		
Ac-228	1.00	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	3.02E-01	5.48E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 29-May-19-10028

L1-10220H-FSGS-014SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.997	5.37E+00	4.49E-01	
	Tl-208	0.999	7.60E-02	1.51E-02	
?	Bi-211	0.854	5.51E-01	1.03E-01	
	Pb-212	0.999	1.94E-01	3.28E-02	
	Bi-214	1.000	1.71E-01	3.17E-02	
?	Pb-214	0.998	2.02E-01	3.75E-02	
	Ac-228	1.000	3.02E-01	5.48E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-May-19-10028

L1-10220H-FSGS-014SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/29/2019 11:55:07AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	5.44E-02	6.16E-02	6.16E-02
	BE-7	477.60		10.44	3.85E-01	5.34E-01	5.34E-01
+	K-40	1460.82	*	10.66	5.37E+00	4.58E-01	4.58E-01
	Mn-54	834.85		99.98	-3.14E-02	4.27E-02	4.27E-02
	Co-60	1173.23		99.85	-2.04E-02	5.35E-02	7.16E-02
		1332.49		99.98	-4.72E-02		5.35E-02
	Nb-94	702.65		99.81	-3.28E-02	4.03E-02	4.03E-02
		871.09		99.89	-7.62E-02		5.11E-02
	Ag-108m	79.13		6.60	1.15E+00	3.85E-02	2.07E+00
		433.94		90.50	-5.52E-03		3.85E-02
		614.28		89.80	-4.97E-02		6.47E-02
		722.94		90.80	4.94E-03		4.87E-02
	Sb-125	176.31		6.84	1.56E-01	1.26E-01	5.85E-01
		380.45		1.52	-1.74E+00		2.24E+00
		427.87		29.60	-5.29E-02		1.26E-01
		463.36		10.49	3.26E-01		4.11E-01
		600.60		17.65	1.32E-01		2.37E-01
		606.71		4.98	1.95E+00		1.33E+00
		635.95		11.22	-1.67E-02		4.06E-01

Analysis Report for 29-May-19-10028

L1-10220H-FSGS-014SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.02E+00	1.26E-01	2.14E+00
Ba-133	79.61	2.65	-9.24E-01	7.83E-02	4.75E+00
	81.00	32.90	-1.73E-01		3.28E-01
	276.40	7.16	-2.22E-01		4.98E-01
	302.85	18.34	7.20E-02		2.35E-01
	356.01	62.05	-1.91E-03		7.83E-02
	383.85	8.94	1.67E-02		4.38E-01
Cs-134	475.36	1.48	2.84E+00	6.06E-02	3.44E+00
	563.25	8.34	-1.02E-01		4.58E-01
	569.33	15.37	-1.83E-02		2.86E-01
	604.72	97.62	-2.96E-02		6.06E-02
	795.86	85.46	-5.06E-02		6.12E-02
	801.95	8.69	-3.09E-01		5.87E-01
	1038.61	0.99	9.84E-01		5.54E+00
	1167.97	1.79	2.98E+00		3.67E+00
	1365.19	3.02	2.98E-01		1.52E+00
Cs-137	661.66	85.10	4.45E-02	5.99E-02	5.99E-02
Eu-152	121.78	28.67	-7.75E-03	1.56E-01	1.63E-01
	244.70	7.61	3.51E-01		5.65E-01
	295.94	0.45	5.15E-01		1.08E+01
	344.28	26.60	-2.10E-02		1.56E-01
	367.79	0.86	-3.41E-02		4.41E+00
	411.12	2.24	6.03E-01		1.97E+00
	443.96	2.83	-2.57E-01		1.27E+00
	488.68	0.42	1.16E+00		9.25E+00
	563.99	0.49	7.09E-02		8.01E+00
	586.26	0.46	1.83E+00		1.41E+01
	678.62	0.47	3.22E+00		8.99E+00
	688.67	0.86	-2.09E+00		4.32E+00
	719.35	0.28	8.26E+00		1.40E+01
	778.90	12.96	-5.99E-02		3.33E-01
	810.45	0.32	-8.32E-01		1.32E+01
	867.37	4.26	4.26E-01		1.33E+00
	919.33	0.43	-1.59E+00		1.08E+01
	964.08	14.65	1.76E-01		4.75E-01
	1085.87	10.24	1.96E-01		5.27E-01
	1089.74	1.73	-2.17E+00		2.92E+00
	1112.07	13.69	2.22E-01		4.84E-01
	1212.95	1.43	-3.82E-01		5.12E+00
	1249.94	0.19	6.62E+00		2.93E+01
	1299.14	1.63	1.45E+00		3.32E+00
	1408.01	21.07	7.70E-02		2.93E-01
	1457.64	0.50	1.19E+02		3.97E+01
	1528.10	0.28	-1.41E+01		1.33E+01
Eu-154	123.07	40.40	7.56E-02	1.18E-01	1.18E-01
	247.93	6.89	-2.40E-01		5.00E-01
	591.76	4.95	-2.21E-01		8.35E-01
	692.42	1.78	5.98E-01		2.29E+00
	723.30	20.06	4.53E-02		2.32E-01
	756.80	4.52	2.18E-01		1.11E+00
	873.18	12.08	3.74E-03		4.45E-01

Analysis Report for 29-May-19-10028

L1-10220H-FSGS-014SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	7.77E-02	1.18E-01	4.87E-01
	1004.76	18.01	7.38E-02		2.97E-01
	1274.43	34.80	-2.27E-01		1.25E-01
	1596.48	1.80	1.27E+00		2.62E+00
Eu-155	45.30	1.31	-1.08E+01	2.76E-01	3.06E+01
	60.01	1.22	-3.06E+00		2.90E+01
	86.55	30.70	1.29E-01		2.76E-01
	105.31	21.10	6.01E-02		2.82E-01
Ra-226	186.21	3.64	8.63E-01	1.22E+00	1.22E+00
Pa-231	27.36	10.30	3.32E+00	1.74E+00	3.53E+00
	283.69	1.70	1.83E-01		2.29E+00
	300.07	2.47	-1.37E+00		1.74E+00
	302.65	2.20	2.09E+00		2.01E+00
	330.06	1.40	-9.79E-01		2.97E+00
U-235	143.76	10.96	2.81E-03	7.63E-02	4.11E-01
	163.33	5.08	1.25E-01		8.04E-01
	185.71	57.20	2.04E-02		7.63E-02
	202.11	1.08	1.38E+00		3.57E+00
	205.31	5.01	-2.67E-01		7.54E-01
Am-241	59.54	35.90	1.69E-01	1.05E+00	1.05E+00

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-May-19-10029

L1-10220H-FSGS-015SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-May-19-10029
Sample Description	: L1-10220H-FSGS-015SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.387E+03 grams
Facility	: Default
Sample Taken On	: 5/23/2019 9:35:00AM
Acquisition Started	: 5/29/2019 11:40:10AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P11314
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/24/2019
Efficiency Calibration Used Done On	: 5/29/2019
Efficiency Calibration Description	:
Sample Number	: 76874
Fill Height	: 1386.60 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/29/2019 11:55:22AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

DATA VALIDATED 5/30/19 1000

J Graham

Analysis Report for 29-May-19-10029

L1-10220H-FSGS-015SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	186.22	741 -	749	744.74	2.15E+01	8.93	2.65E+01	0.63
2	238.85	947 -	962	954.97	1.13E+02	14.77	3.44E+01	1.27
3	351.99	1402 -	1414	1406.99	7.82E+01	9.94	7.79E+00	1.07
4	477.62	1905 -	1913	1908.96	1.84E+01	6.79	1.26E+01	0.55
5	583.09	2324 -	2337	2330.50	2.90E+01	8.62	1.60E+01	0.63
6	609.22	2427 -	2442	2434.94	4.20E+01	9.18	1.40E+01	0.63
7	1460.34	5828 -	5849	5839.29	2.18E+02	14.76	0.00E+00	1.43

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
BE-7	1.00	477.60	*	10.44	2.18E-01	8.21E-02
K-40	0.96	1460.82	*	10.66	5.05E+00	4.06E-01
Tl-208	0.99	583.19	*	85.00	4.48E-02	1.36E-02
Bi-211	0.87	351.07	*	13.02	5.51E-01	8.29E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.83E-01	2.81E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.25E-01	2.83E-02
		768.36		4.89		
		806.18		1.26		

Analysis Report for 29-May-19-10029

L1-10220H-FSGS-015SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	1.00	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	2.02E-01	3.03E-02
		785.96		1.06		
Ra-226	1.00	186.21	*	3.64	3.66E-01	1.55E-01
U-235	0.97	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	2.33E-02	9.85E-03
		202.11		1.08		
		205.31		5.01		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
BE-7	1.000	2.18E-01	8.21E-02	
K-40	0.963	5.05E+00	4.06E-01	

Analysis Report for 29-May-19-10029

L1-10220H-FSGS-015SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	Tl-208	0.999	4.48E-02	1.36E-02	
?	Bi-211	0.872	5.51E-01	8.29E-02	
	Pb-212	0.993	1.83E-01	2.81E-02	
	Bi-214	0.999	1.25E-01	2.83E-02	
?	Pb-214	1.000	2.02E-01	3.03E-02	
?	Ra-226	1.000	3.66E-01	1.55E-01	
?	U-235	0.971	2.33E-02	9.85E-03	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-May-19-10029

L1-10220H-FSGS-015SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/29/2019 11:55:22AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	3.71E-02	5.51E-02	5.51E-02
+	BE-7	477.60	*	10.44	2.18E-01	2.46E-01	2.46E-01
+	K-40	1460.82	*	10.66	5.05E+00	6.66E-02	6.66E-02
	Mn-54	834.85		99.98	4.56E-03	4.32E-02	4.32E-02
	Co-60	1173.23		99.85	1.52E-02	5.22E-02	6.27E-02
		1332.49		99.98	9.79E-03		5.22E-02
	Nb-94	702.65		99.81	1.45E-02	3.81E-02	3.94E-02
		871.09		99.89	-1.85E-02		3.81E-02
	Ag-108m	79.13		6.60	3.64E-01	3.97E-02	1.15E+00
		433.94		90.50	2.34E-02		3.97E-02
		614.28		89.80	-7.29E-03		5.58E-02
		722.94		90.80	9.08E-04		5.31E-02
	Sb-125	176.31		6.84	-4.00E-02	1.15E-01	4.15E-01
		380.45		1.52	-1.03E+00		2.25E+00
		427.87		29.60	-2.35E-02		1.15E-01
		463.36		10.49	2.45E-02		3.80E-01
		600.60		17.65	2.48E-02		2.26E-01
		606.71		4.98	1.23E+00		1.19E+00
		635.95		11.22	3.29E-01		3.69E-01

Analysis Report for 29-May-19-10029

L1-10220H-FSGS-015SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-6.96E-02	1.15E-01	1.69E+00
Ba-133	79.61	2.65	3.87E-01	6.07E-02	2.76E+00
	81.00	32.90	-2.63E-02		1.92E-01
	276.40	7.16	1.14E-01		4.23E-01
	302.85	18.34	-3.39E-02		1.83E-01
	356.01	62.05	-1.61E-02		6.07E-02
	383.85	8.94	1.05E-01		4.03E-01
Cs-134	475.36	1.48	1.50E+00	3.98E-02	2.99E+00
	563.25	8.34	-5.38E-01		4.00E-01
	569.33	15.37	1.79E-01		2.31E-01
	604.72	97.62	-1.43E-02		5.38E-02
	795.86	85.46	-1.81E-03		3.98E-02
	801.95	8.69	-2.68E-01		4.05E-01
	1038.61	0.99	-2.97E-01		4.92E+00
	1167.97	1.79	5.32E-01		3.34E+00
	1365.19	3.02	3.45E-01		1.35E+00
Cs-137	661.66	85.10	3.21E-02	5.59E-02	5.59E-02
Eu-152	121.78	28.67	-4.68E-02	1.07E-01	1.07E-01
	244.70	7.61	-1.00E-01		4.50E-01
	295.94	0.45	6.02E+00		8.73E+00
	344.28	26.60	3.64E-02		1.13E-01
	367.79	0.86	5.97E-01		3.35E+00
	411.12	2.24	-3.87E-01		1.47E+00
	443.96	2.83	4.50E-01		1.12E+00
	488.68	0.42	2.08E-01		7.70E+00
	563.99	0.49	-1.46E+00		6.77E+00
	586.26	0.46	-2.49E+00		1.10E+01
	678.62	0.47	4.10E+00		7.35E+00
	688.67	0.86	2.55E+00		4.17E+00
	719.35	0.28	3.54E+00		1.51E+01
	778.90	12.96	-6.36E-03		2.80E-01
	810.45	0.32	3.97E+00		1.19E+01
	867.37	4.26	-2.02E-02		9.84E-01
	919.33	0.43	-1.91E+00		9.98E+00
	964.08	14.65	4.23E-01		4.11E-01
	1085.87	10.24	-1.64E-01		3.68E-01
	1089.74	1.73	-2.13E+00		2.10E+00
	1112.07	13.69	7.82E-02		3.38E-01
	1212.95	1.43	-1.08E+00		4.07E+00
	1249.94	0.19	7.38E+00		3.02E+01
	1299.14	1.63	-1.68E+00		3.31E+00
	1408.01	21.07	-3.78E-02		2.14E-01
	1457.64	0.50	1.09E+02		3.64E+01
	1528.10	0.28	9.98E+00		1.70E+01
Eu-154	123.07	40.40	-2.98E-02	7.42E-02	7.42E-02
	247.93	6.89	9.14E-02		4.85E-01
	591.76	4.95	-4.56E-01		5.76E-01
	692.42	1.78	5.20E-01		1.84E+00
	723.30	20.06	-3.80E-02		2.41E-01
	756.80	4.52	-9.39E-01		7.24E-01
	873.18	12.08	9.44E-02		3.25E-01

Analysis Report for 29-May-19-10029

L1-10220H-FSGS-015SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	-5.89E-02	7.42E-02	2.98E-01
		1004.76		18.01	2.05E-01		2.85E-01
		1274.43		34.80	-3.55E-02		1.60E-01
		1596.48		1.80	-1.11E-01		2.16E+00
	Eu-155	45.30		1.31	-6.36E-01	1.62E-01	1.01E+01
		60.01		1.22	-6.58E+00		1.09E+01
		86.55		30.70	4.20E-02		1.62E-01
		105.31		21.10	-2.01E-02		1.68E-01
+	Ra-226	186.21	*	3.64	3.66E-01	4.89E-01	4.89E-01
	Pa-231	27.36		10.30	8.30E-01	1.22E+00	1.22E+00
		283.69		1.70	1.26E-02		1.75E+00
		300.07		2.47	-1.28E+00		1.43E+00
		302.65		2.20	-8.68E-01		1.51E+00
		330.06		1.40	1.40E+00		2.49E+00
+	U-235	143.76		10.96	9.94E-02	3.11E-02	2.71E-01
		163.33		5.08	2.12E-01		5.91E-01
		185.71	*	57.20	2.33E-02		3.11E-02
		202.11		1.08	-1.31E+00		2.66E+00
		205.31		5.01	2.57E-03		5.82E-01
	Am-241	59.54		35.90	8.42E-02	3.94E-01	3.94E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-May-19-10030

L1-10220H-FSGS-016SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-May-19-10030
Sample Description	: L1-10220H-FSGS-016SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.277E+03 grams
Facility	: Default
Sample Taken On	: 5/23/2019 9:40:00AM
Acquisition Started	: 5/29/2019 11:40:16AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 5/29/2019
Efficiency Calibration Description	:
Sample Number	: 76875
Fill Height	: 1277.26 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/29/2019 11:55:20AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

DATA VALIDATED 5/30/19 1000

J Graham/

Analysis Report for 29-May-19-10030

L1-10220H-FSGS-016SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	209.24	834 -	841	837.57	1.38E+01	7.27	1.92E+01	0.51
2	238.61	947 -	960	954.91	1.17E+02	14.78	3.72E+01	0.98
3	295.01	1174 -	1186	1180.27	2.94E+01	9.85	2.56E+01	0.68
4	338.20	1348 -	1358	1352.83	1.78E+01	7.23	1.42E+01	0.99
5	351.84	1400 -	1415	1407.37	9.28E+01	12.17	1.82E+01	1.08
6	582.92	2325 -	2337	2330.99	3.50E+01	7.89	1.00E+01	0.71
7	608.71	2427 -	2443	2434.12	4.95E+01	9.23	1.15E+01	0.92
8	910.77	3637 -	3649	3642.12	2.96E+01	8.14	1.34E+01	0.70
9	1460.30	5832 -	5853	5841.57	2.20E+02	16.24	1.24E+01	1.84

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.95	1460.82	*	10.66	4.87E+00	4.18E-01
Tl-208	0.98	583.19	*	85.00	5.25E-02	1.22E-02
Bi-211	0.90	351.07	*	13.02	6.45E-01	9.92E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.90E-01	2.86E-02
		300.09		3.30		
Bi-214	0.97	609.32	*	45.49	1.43E-01	2.80E-02
		768.36		4.89		

Analysis Report for 29-May-19-10030

L1-10220H-FSGS-016SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.97	806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	1.27E-01	4.39E-02
		351.93	*	35.60	2.36E-01	3.62E-02
		785.96		1.06		
Ac-228	0.99	129.07		2.42		
		209.25	*	3.89	2.37E-01	1.26E-01
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	1.39E-01	5.75E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	1.97E-01	5.49E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 29-May-19-10030

L1-10220H-FSGS-016SS

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.957	4.87E+00	4.18E-01	
Tl-208	0.989	5.25E-02	1.22E-02	
Bi-211	0.909	2.96E-01	1.56E-01	
Pb-212	1.000	1.90E-01	2.86E-02	
Bi-214	0.976	1.43E-01	2.80E-02	
Pb-214	0.997	1.27E-01	4.39E-02	
Ac-228	0.990	1.75E-01	3.79E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-May-19-10030

L1-10220H-FSGS-016SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/29/2019 11:55:20AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	4.84E-02	5.92E-02	5.92E-02
	BE-7	477.60		10.44	2.79E-01	4.22E-01	4.22E-01
+	K-40	1460.82	*	10.66	4.87E+00	5.64E-01	5.64E-01
	Mn-54	834.85		99.98	2.50E-02	4.56E-02	4.56E-02
	Co-60	1173.23		99.85	-2.77E-02	4.95E-02	4.95E-02
		1332.49		99.98	-2.71E-02		5.14E-02
	Nb-94	702.65		99.81	3.40E-02	3.68E-02	4.81E-02
		871.09		99.89	-6.76E-02		3.68E-02
	Ag-108m	79.13		6.60	5.12E-01	3.66E-02	1.46E+00
		433.94		90.50	-1.52E-02		3.66E-02
		614.28		89.80	-9.93E-03		5.70E-02
		722.94		90.80	3.78E-02		5.32E-02
	Sb-125	176.31		6.84	1.74E-01	1.21E-01	4.70E-01
		380.45		1.52	7.91E-02		2.08E+00
		427.87		29.60	1.40E-02		1.21E-01
		463.36		10.49	-9.97E-02		3.59E-01
		600.60		17.65	-2.62E-01		2.16E-01
		606.71		4.98	1.19E+00		1.20E+00
		635.95		11.22	-1.13E-01		3.58E-01

Analysis Report for 29-May-19-10030

L1-10220H-FSGS-016SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.25E+00	1.21E-01	2.22E+00
Ba-133	79.61	2.65	9.36E-01	7.37E-02	3.48E+00
	81.00	32.90	-3.01E-01		2.27E-01
	276.40	7.16	1.59E-01		4.54E-01
	302.85	18.34	2.77E-02		1.98E-01
	356.01	62.05	9.11E-03		7.37E-02
	383.85	8.94	-2.50E-01		3.70E-01
Cs-134	475.36	1.48	6.41E-02	4.87E-02	2.54E+00
	563.25	8.34	2.66E-02		4.88E-01
	569.33	15.37	-6.12E-02		2.17E-01
	604.72	97.62	-1.66E-02		6.09E-02
	795.86	85.46	-3.32E-02		4.87E-02
	801.95	8.69	-9.40E-02		4.44E-01
	1038.61	0.99	-3.73E+00		4.31E+00
	1167.97	1.79	1.89E+00		3.21E+00
	1365.19	3.02	1.12E+00		1.61E+00
Cs-137	661.66	85.10	3.63E-02	6.33E-02	6.33E-02
Eu-152	121.78	28.67	-8.63E-02	1.20E-01	1.20E-01
	244.70	7.61	-3.10E-01		4.60E-01
	295.94	0.45	4.67E+00		8.91E+00
	344.28	26.60	1.66E-02		1.30E-01
	367.79	0.86	-2.88E-01		3.76E+00
	411.12	2.24	6.25E-01		1.78E+00
	443.96	2.83	-1.13E-01		1.19E+00
	488.68	0.42	7.24E-01		6.85E+00
	563.99	0.49	2.86E+00		8.15E+00
	586.26	0.46	1.21E+01		1.15E+01
	678.62	0.47	-1.42E+00		8.59E+00
	688.67	0.86	-4.14E+00		4.46E+00
	719.35	0.28	-1.01E-02		1.44E+01
	778.90	12.96	1.43E-01		3.73E-01
	810.45	0.32	5.09E-02		1.12E+01
	867.37	4.26	-9.75E-02		9.90E-01
	919.33	0.43	-1.77E+00		1.12E+01
	964.08	14.65	4.42E-01		4.44E-01
	1085.87	10.24	3.68E-01		5.15E-01
	1089.74	1.73	5.64E-01		3.00E+00
	1112.07	13.69	-1.61E-01		3.63E-01
	1212.95	1.43	-3.54E+00		3.91E+00
	1249.94	0.19	-2.80E+00		3.01E+01
	1299.14	1.63	-5.38E+00		2.70E+00
	1408.01	21.07	-5.79E-02		1.97E-01
	1457.64	0.50	1.03E+02		3.65E+01
	1528.10	0.28	8.68E+00		1.57E+01
Eu-154	123.07	40.40	-2.31E-03	8.82E-02	8.82E-02
	247.93	6.89	1.96E-01		4.96E-01
	591.76	4.95	1.58E-01		7.71E-01
	692.42	1.78	1.65E+00		2.45E+00
	723.30	20.06	1.70E-01		2.41E-01
	756.80	4.52	2.89E-01		1.09E+00
	873.18	12.08	9.78E-02		3.78E-01

Analysis Report for 29-May-19-10030

L1-10220H-FSGS-016SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	2.50E-01	8.82E-02	4.24E-01
	1004.76	18.01	2.60E-02		2.53E-01
	1274.43	34.80	6.32E-02		1.63E-01
	1596.48	1.80	1.27E+00		2.43E+00
Eu-155	45.30	1.31	1.33E+01	1.96E-01	1.97E+01
	60.01	1.22	1.61E+01		2.14E+01
	86.55	30.70	-1.64E-02		2.04E-01
	105.31	21.10	1.04E-01		1.96E-01
Ra-226	186.21	3.64	-6.72E-01	9.02E-01	9.02E-01
Pa-231	27.36	10.30	1.94E+00	1.43E+00	2.29E+00
	283.69	1.70	1.87E-02		1.98E+00
	300.07	2.47	-2.96E-02		1.43E+00
	302.65	2.20	7.10E-01		1.65E+00
	330.06	1.40	-8.08E-01		2.33E+00
U-235	143.76	10.96	1.83E-01	5.91E-02	3.51E-01
	163.33	5.08	4.71E-01		6.39E-01
	185.71	57.20	4.09E-03		5.91E-02
	202.11	1.08	-1.97E+00		2.99E+00
	205.31	5.01	-1.69E-01		6.14E-01
Am-241	59.54	35.90	2.75E-01	7.32E-01	7.32E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-May-19-10031

L1-10220H-FSGS-017SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-May-19-10031
Sample Description	: L1-10220H-FSGS-017SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.316E+03 grams
Facility	: Default
Sample Taken On	: 5/23/2019 9:45:00AM
Acquisition Started	: 5/29/2019 1:01:20PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 324
Geometry	: 130G_SOIL_1
Live Time	: 1800.0 seconds
Real Time	: 1800.9 seconds
Dead Time	: 0.05 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 4096
Peak Area Range (in channels)	: 120 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 5/29/2019
Efficiency Calibration Description	:
Sample Number	: 76883
Fill Height	: 1315.62 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/29/2019 1:40:43PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

DATA VALIDATED 5/30/19 1000

J Graham/

Analysis Report for 29-May-19-10031

L1-10220H-FSGS-017SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.20	151 -	158	155.00	7.55E+01	21.19	1.84E+02	0.67
2	238.67	473 -	481	477.51	1.56E+02	24.06	1.91E+02	1.11
3	295.13	585 -	595	590.31	9.79E+01	17.98	9.41E+01	1.30
4	351.97	698 -	708	703.89	1.40E+02	18.10	7.75E+01	1.26
5	477.39	949 -	959	954.51	4.45E+01	13.72	6.05E+01	0.84
6	510.83	1015 -	1026	1021.35	1.10E+02	15.67	5.40E+01	1.67
7	583.29	1160 -	1171	1166.18	6.90E+01	12.91	3.90E+01	1.31
8	609.36	1212 -	1224	1218.29	1.14E+02	13.34	2.45E+01	1.81
9	661.73	1318 -	1328	1323.00	6.26E+01	12.57	3.84E+01	0.88
10	911.32	1817 -	1826	1822.08	5.60E+01	10.53	2.40E+01	1.59
11	969.25	1934 -	1941	1937.97	1.89E+01	7.86	2.11E+01	0.62
12	1173.25	2341 -	2353	2346.11	3.13E+01	12.10	4.37E+01	0.81
13	1332.76	2660 -	2669	2665.34	3.08E+01	7.56	1.13E+01	1.31
14	1460.80	2915 -	2929	2921.66	5.18E+02	23.32	9.16E+00	2.10

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.99	511.00	*	100.00	6.23E-02	9.83E-03
BE-7	0.99	477.60	*	10.44	2.31E-01	7.30E-02
K-40	1.00	1460.82	*	10.66	5.10E+00	3.19E-01

Analysis Report for 29-May-19-10031

L1-10220H-FSGS-017SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Co-60	0.99	1173.23	*	99.85	2.83E-02	1.10E-02
		1332.49	*	99.98	3.03E-02	7.54E-03
Cs-137	0.99	661.66	*	85.10	4.56E-02	9.56E-03
Tl-208	0.99	583.19	*	85.00	4.63E-02	9.09E-03
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.13E-01	1.97E-02
		300.09		3.30		
Pb212-XR	0.99	74.82		10.28		
		77.11	*	17.10	2.50E-01	7.49E-02
		87.35		3.97		
		89.78		1.46		
Bi-214	1.00	609.32	*	45.49	1.46E-01	1.93E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	1.89E-01	3.80E-02
		351.93	*	35.60	1.59E-01	2.42E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	4.41E-01	1.34E-01
		87.35		2.24		
		89.78		0.82		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	1.67E-01	3.21E-02
		964.77		4.99		
		968.97	*	15.80	9.53E-02	3.99E-02
		1588.20		3.22		

Analysis Report for 29-May-19-10031

L1-10220H-FSGS-017SS

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.995	6.23E-02	9.83E-03	
	BE-7	0.992	2.31E-01	7.30E-02	
	K-40	1.000	5.10E+00	3.19E-01	
	Co-60	0.994	2.96E-02	6.22E-03	
	Cs-137	0.999	4.56E-02	9.56E-03	
	Tl-208	0.998	4.63E-02	9.09E-03	
X	Bi-211	0.877			
	Pb-212	1.000	1.13E-01	1.97E-02	
?	Pb212-XR	0.999	2.50E-01	7.49E-02	
	Bi-214	1.000	1.46E-01	1.93E-02	
	Pb-214	0.999	1.68E-01	2.04E-02	
?	Pb214-XR	0.999	4.41E-01	1.34E-01	
	Ac-228	0.997	1.39E-01	2.50E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-May-19-10031

L1-10220H-FSGS-017SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/29/2019 1:40:43PM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	*	100.00	6.23E-02	2.40E-02	2.40E-02
+	BE-7	477.60	*	10.44	2.31E-01	2.26E-01	2.26E-01
+	K-40	1460.82	*	10.66	5.10E+00	1.99E-01	1.99E-01
	Mn-54	834.85		99.98	-8.02E-03	2.35E-02	2.35E-02
+	Co-60	1173.23	*	99.85	2.83E-02	2.00E-02	3.56E-02
		1332.49	*	99.98	3.03E-02		2.00E-02
	Nb-94	702.65		99.81	6.50E-03	2.41E-02	2.63E-02
		871.09		99.89	0.00E+00		2.41E-02
	Ag-108m	79.13		6.60	1.48E-02	2.49E-02	6.46E-01
		433.94		90.50	4.42E-03		2.49E-02
		614.28		89.80	-5.32E-03		3.18E-02
		722.94		90.80	-1.94E-02		2.87E-02
	Sb-125	176.31		6.84	-1.50E-01	7.48E-02	3.06E-01
		380.45		1.52	-1.13E-01		1.34E+00
		427.87		29.60	-2.26E-02		7.48E-02
		463.36		10.49	6.90E-02		2.12E-01
		600.60		17.65	-7.36E-02		1.22E-01
		606.71		4.98	-1.26E-01		7.29E-01
		635.95		11.22	-1.72E-02		2.16E-01

Analysis Report for 29-May-19-10031

L1-10220H-FSGS-017SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-5.03E-01	7.48E-02	1.37E+00
	Ba-133	79.61		2.65	-2.17E-01	4.55E-02	1.51E+00
		81.00		32.90	-9.22E-02		9.84E-02
		276.40		7.16	2.37E-02		3.08E-01
		302.85		18.34	-1.21E-02		1.07E-01
		356.01		62.05	-1.62E-02		4.55E-02
		383.85		8.94	8.30E-02		2.40E-01
	Cs-134	475.36		1.48	2.54E-01	3.14E-02	1.93E+00
		563.25		8.34	-2.01E-02		2.73E-01
		569.33		15.37	2.57E-02		1.39E-01
		604.72		97.62	-5.53E-03		3.20E-02
		795.86		85.46	1.37E-03		3.14E-02
		801.95		8.69	1.88E-03		3.05E-01
		1038.61		0.99	-2.63E+00		2.75E+00
		1167.97		1.79	-1.41E-01		2.31E+00
		1365.19		3.02	-6.27E-02		7.55E-01
+	Cs-137	661.66	*	85.10	4.56E-02	2.62E-02	2.62E-02
	Eu-152	121.78		28.67	4.30E-03	7.30E-02	7.30E-02
		244.70		7.61	-1.47E-01		2.95E-01
		295.94		0.45	-2.36E-01		5.78E+00
		344.28		26.60	-6.86E-02		7.86E-02
		367.79		0.86	1.48E+00		2.64E+00
		411.12		2.24	-3.32E-01		9.90E-01
		443.96		2.83	3.46E-01		7.87E-01
		488.68		0.42	-2.86E-01		5.16E+00
		563.99		0.49	-9.99E-01		4.62E+00
		586.26		0.46	-4.34E-01		7.19E+00
		678.62		0.47	2.72E+00		4.78E+00
		688.67		0.86	-1.03E+00		2.55E+00
		719.35		0.28	3.93E+00		9.33E+00
		778.90		12.96	-1.24E-01		1.98E-01
		810.45		0.32	-3.74E+00		7.33E+00
		867.37		4.26	2.29E-02		5.65E-01
		919.33		0.43	-1.49E+00		5.92E+00
		964.08		14.65	3.38E-02		2.32E-01
		1085.87		10.24	1.54E-01		3.03E-01
		1089.74		1.73	-1.00E+00		1.58E+00
		1112.07		13.69	-8.78E-02		2.30E-01
		1212.95		1.43	4.48E-01		2.59E+00
		1249.94		0.19	3.38E+00		1.65E+01
		1299.14		1.63	-2.46E-01		1.93E+00
		1408.01		21.07	1.04E-01		1.37E-01
		1457.64		0.50	-7.53E+00		2.37E+01
		1528.10		0.28	4.82E-02		6.96E+00
	Eu-154	123.07		40.40	1.72E-02	5.26E-02	5.26E-02
		247.93		6.89	-4.64E-02		2.89E-01
		591.76		4.95	1.81E-01		5.07E-01
		692.42		1.78	-2.33E-01		1.38E+00
		723.30		20.06	4.64E-02		1.36E-01
		756.80		4.52	1.51E-01		5.36E-01
		873.18		12.08	-1.64E-01		1.82E-01

Analysis Report for 29-May-19-10031

L1-10220H-FSGS-017SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	3.73E-02	5.26E-02	2.64E-01
	1004.76	18.01	1.15E-02		1.56E-01
	1274.43	34.80	4.76E-03		9.21E-02
	1596.48	1.80	-5.56E-01		1.18E+00
Eu-155	45.30	1.31	-2.33E+00	1.05E-01	7.07E+00
	60.01	1.22	-1.92E+00		7.68E+00
	86.55	30.70	1.81E-02		1.05E-01
	105.31	21.10	-1.26E-03		1.14E-01
Ra-226	186.21	3.64	8.66E-01	6.90E-01	6.90E-01
Pa-231	27.36	10.30	7.02E-01	7.44E-01	7.44E-01
	283.69	1.70	-4.92E-03		1.17E+00
	300.07	2.47	-1.78E-01		8.19E-01
	302.65	2.20	-1.00E-01		8.89E-01
	330.06	1.40	-1.79E-01		1.57E+00
U-235	143.76	10.96	6.85E-03	4.42E-02	1.74E-01
	163.33	5.08	4.06E-02		4.48E-01
	185.71	57.20	6.31E-02		4.42E-02
	202.11	1.08	-9.15E-01		1.96E+00
	205.31	5.01	-1.64E-01		4.20E-01
Am-241	59.54	35.90	-3.38E-05	2.75E-01	2.75E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 31-May-19-10014

L1-10220H-FSGS-017SB

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 31-May-19-10014
Sample Description	: L1-10220H-FSGS-017SB
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.414E+03 grams
Facility	: Default
Sample Taken On	: 5/29/2019 9:25:00AM
Acquisition Started	: 5/31/2019 7:31:41AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 5/31/2019
Efficiency Calibration Description	:
Sample Number	: 76967
Fill Height	: 1414.10 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/31/2019 7:46:49AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
0930 5-31-19

Analysis Report for 31-May-19-10014

L1-10220H-FSGS-017SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.56	947 -	962	954.69	8.37E+01	19.34	9.63E+01	0.91
2	295.14	1175 -	1186	1180.80	5.25E+01	10.68	2.45E+01	1.40
3	351.77	1401 -	1416	1407.09	7.86E+01	10.60	1.14E+01	0.74
4	582.85	2323 -	2338	2330.70	3.55E+01	9.98	2.05E+01	0.40
5	609.00	2429 -	2443	2435.28	6.80E+01	9.36	6.98E+00	1.62
6	911.10	3638 -	3650	3643.42	2.90E+01	7.98	1.30E+01	0.52
7	1460.25	5829 -	5852	5841.38	3.25E+02	19.00	8.97E+00	1.41

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.94	1460.82	*	10.66	6.96E+00	5.07E-01
Tl-208	0.98	583.19	*	85.00	5.17E-02	1.49E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.33E-01	3.26E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.91E-01	2.86E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		

Analysis Report for 31-May-19-10014

L1-10220H-FSGS-017SB

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	2.22E-01	4.85E-02
		351.93	*	35.60	1.94E-01	3.05E-02
		785.96		1.06		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	1.87E-01	5.21E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 31-May-19-10014

L1-10220H-FSGS-017SB

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.949	6.96E+00	5.07E-01	
	Tl-208	0.981	5.17E-02	1.49E-02	
X	Bi-211	0.924			
	Pb-212	0.999	1.33E-01	3.26E-02	
	Bi-214	0.993	1.91E-01	2.86E-02	
	Pb-214	0.997	2.02E-01	2.58E-02	
	Ac-228	0.999	1.87E-01	5.21E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 31-May-19-10014

L1-10220H-FSGS-017SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/31/2019 7:46:49AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	5.19E-02	5.36E-02	5.36E-02
	BE-7	477.60		10.44	5.58E-02	3.58E-01	3.58E-01
+	K-40	1460.82	*	10.66	6.96E+00	4.98E-01	4.98E-01
	Mn-54	834.85		99.98	-2.67E-02	4.38E-02	4.38E-02
	Co-60	1173.23		99.85	2.70E-02	5.73E-02	6.14E-02
		1332.49		99.98	5.34E-02		5.73E-02
	Nb-94	702.65		99.81	9.81E-03	4.18E-02	4.66E-02
		871.09		99.89	-2.42E-03		4.18E-02
	Ag-108m	79.13		6.60	1.19E+00	4.28E-02	1.62E+00
		433.94		90.50	4.35E-03		4.28E-02
		614.28		89.80	-8.68E-03		6.58E-02
		722.94		90.80	1.81E-02		4.85E-02
	Sb-125	176.31		6.84	-3.00E-01	1.23E-01	4.85E-01
		380.45		1.52	4.53E-01		2.24E+00
		427.87		29.60	-4.85E-02		1.23E-01
		463.36		10.49	2.89E-01		3.66E-01
		600.60		17.65	-5.35E-02		2.46E-01
		606.71		4.98	1.41E+00		1.31E+00
		635.95		11.22	5.14E-02		3.56E-01

Analysis Report for 31-May-19-10014

L1-10220H-FSGS-017SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.59E+00	1.23E-01	2.01E+00
Ba-133	79.61	2.65	2.38E+00	7.14E-02	3.85E+00
	81.00	32.90	-3.77E-01		2.57E-01
	276.40	7.16	-2.48E-02		4.83E-01
	302.85	18.34	4.24E-02		2.01E-01
	356.01	62.05	-1.34E-02		7.14E-02
	383.85	8.94	-8.32E-02		3.92E-01
Cs-134	475.36	1.48	-1.72E+00	5.20E-02	2.29E+00
	563.25	8.34	-8.95E-02		4.94E-01
	569.33	15.37	-7.03E-02		2.55E-01
	604.72	97.62	-1.04E-02		6.59E-02
	795.86	85.46	-1.73E-02		5.20E-02
	801.95	8.69	-5.51E-01		4.38E-01
	1038.61	0.99	1.01E+00		5.43E+00
	1167.97	1.79	-1.86E-01		3.38E+00
	1365.19	3.02	3.41E-01		1.35E+00
Cs-137	661.66	85.10	3.04E-02	5.14E-02	5.14E-02
Eu-152	121.78	28.67	-6.01E-02	1.21E-01	1.33E-01
	244.70	7.61	2.43E-01		5.12E-01
	295.94	0.45	1.45E+01		1.02E+01
	344.28	26.60	-1.10E-01		1.21E-01
	367.79	0.86	-2.07E+00		3.91E+00
	411.12	2.24	-1.36E-01		1.76E+00
	443.96	2.83	-3.21E-01		1.31E+00
	488.68	0.42	-3.38E+00		7.98E+00
	563.99	0.49	4.94E-01		8.48E+00
	586.26	0.46	2.34E+00		1.25E+01
	678.62	0.47	5.03E+00		9.07E+00
	688.67	0.86	-1.11E+00		5.35E+00
	719.35	0.28	4.51E+00		1.51E+01
	778.90	12.96	5.83E-02		4.10E-01
	810.45	0.32	-4.97E+00		1.26E+01
	867.37	4.26	-2.31E-01		9.19E-01
	919.33	0.43	-4.80E+00		1.19E+01
	964.08	14.65	3.92E-01		4.18E-01
	1085.87	10.24	1.80E-01		5.23E-01
	1089.74	1.73	-1.04E+00		2.80E+00
	1112.07	13.69	-1.66E-01		3.72E-01
	1212.95	1.43	2.88E+00		5.08E+00
	1249.94	0.19	2.71E+00		3.15E+01
	1299.14	1.63	-2.51E+00		3.21E+00
	1408.01	21.07	-1.61E-01		1.64E-01
	1457.64	0.50	1.49E+02		4.16E+01
	1528.10	0.28	7.54E+00		1.45E+01
Eu-154	123.07	40.40	-3.71E-02	9.25E-02	9.25E-02
	247.93	6.89	-7.71E-02		4.56E-01
	591.76	4.95	-8.36E-01		8.01E-01
	692.42	1.78	6.78E-01		2.54E+00
	723.30	20.06	1.09E-01		2.17E-01
	756.80	4.52	4.04E-01		1.04E+00
	873.18	12.08	-3.53E-01		3.40E-01

Analysis Report for 31-May-19-10014

L1-10220H-FSGS-017SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	2.31E-01	9.25E-02	5.34E-01
	1004.76	18.01	-5.21E-03		3.08E-01
	1274.43	34.80	-8.15E-02		1.66E-01
	1596.48	1.80	1.50E+00		2.55E+00
Eu-155	45.30	1.31	-3.64E+00	2.15E-01	1.91E+01
	60.01	1.22	3.33E+00		2.32E+01
	86.55	30.70	2.44E-01		2.39E-01
	105.31	21.10	-1.71E-02		2.15E-01
Ra-226	186.21	3.64	2.74E-01	1.02E+00	1.02E+00
Pa-231	27.36	10.30	1.45E+00	1.54E+00	2.26E+00
	283.69	1.70	-1.46E+00		1.95E+00
	300.07	2.47	-8.58E-01		1.54E+00
	302.65	2.20	6.18E-01		1.71E+00
	330.06	1.40	-2.98E-01		2.55E+00
U-235	143.76	10.96	1.23E-01	6.58E-02	3.27E-01
	163.33	5.08	2.91E-01		6.56E-01
	185.71	57.20	4.17E-02		6.58E-02
	202.11	1.08	2.17E+00		3.43E+00
	205.31	5.01	-7.09E-02		7.36E-01
Am-241	59.54	35.90	-6.70E-02	7.99E-01	7.99E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 31-May-19-10013

L1-10220H-FSGS-009SB

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 31-May-19-10013
Sample Description	: L1-10220H-FSGS-009SB
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.535E+03 grams
Facility	: Default
Sample Taken On	: 5/29/2019 8:55:00AM
Acquisition Started	: 5/31/2019 7:07:42AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 5/31/2019
Efficiency Calibration Description	:
Sample Number	: 76965
Fill Height	: 1535.26 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/31/2019 7:22:45AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
0930 5-31-19

Analysis Report for 31-May-19-10013

L1-10220H-FSGS-009SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.55	946 -	961	954.69	9.72E+01	16.87	6.18E+01	0.72
2	295.25	1172 -	1188	1181.22	7.85E+01	12.35	2.35E+01	0.79
3	351.82	1400 -	1416	1407.27	1.01E+02	14.28	3.31E+01	1.34
4	609.03	2429 -	2441	2435.39	6.50E+01	9.97	1.30E+01	0.94
5	1460.24	5828 -	5852	5841.34	3.45E+02	19.60	9.48E+00	2.12

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.94	1460.82	*	10.66	7.20E+00	5.15E-01
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.52E-01	2.91E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.79E-01	2.94E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		

Analysis Report for 31-May-19-10013

L1-10220H-FSGS-009SB

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	3.27E-01	5.76E-02
		351.93	*	35.60	2.45E-01	3.99E-02
		785.96		1.06		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.948	7.20E+00	5.15E-01	
X	Bi-211	0.914			
	Pb-212	0.999	1.52E-01	2.91E-02	
	Bi-214	0.995	1.79E-01	2.94E-02	
	Pb-214	0.999	2.72E-01	3.28E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 31-May-19-10013

L1-10220H-FSGS-009SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/31/2019 7:22:45AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	4.86E-02	5.49E-02	5.49E-02
	BE-7	477.60		10.44	3.69E-03	3.70E-01	3.70E-01
+	K-40	1460.82	*	10.66	7.20E+00	5.06E-01	5.06E-01
	Mn-54	834.85		99.98	3.73E-02	5.24E-02	5.24E-02
	Co-60	1173.23		99.85	2.61E-02	5.50E-02	5.93E-02
		1332.49		99.98	3.53E-02		5.50E-02
	Nb-94	702.65		99.81	-1.57E-02	4.35E-02	4.35E-02
		871.09		99.89	-4.49E-02		4.94E-02
	Ag-108m	79.13		6.60	8.46E-01	3.71E-02	1.57E+00
		433.94		90.50	-1.66E-02		3.71E-02
		614.28		89.80	-3.81E-02		7.15E-02
		722.94		90.80	-5.68E-04		5.00E-02
	Sb-125	176.31		6.84	2.23E-01	1.20E-01	4.92E-01
		380.45		1.52	9.48E-01		2.34E+00
		427.87		29.60	-3.99E-03		1.20E-01
		463.36		10.49	1.33E-01		3.56E-01
		600.60		17.65	1.00E-01		2.46E-01
		606.71		4.98	2.29E+00		1.34E+00
		635.95		11.22	-3.98E-02		3.86E-01

Analysis Report for 31-May-19-10013

L1-10220H-FSGS-009SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-3.74E-01	1.20E-01	2.11E+00
Ba-133	79.61	2.65	-2.85E-03	7.42E-02	3.72E+00
	81.00	32.90	-2.15E-01		2.65E-01
	276.40	7.16	2.45E-01		4.86E-01
	302.85	18.34	5.28E-02		1.82E-01
	356.01	62.05	-3.91E-02		7.42E-02
	383.85	8.94	-4.26E-01		3.64E-01
Cs-134	475.36	1.48	2.84E-01	5.31E-02	2.52E+00
	563.25	8.34	8.50E-02		4.79E-01
	569.33	15.37	-3.12E-02		2.50E-01
	604.72	97.62	-4.72E-02		6.40E-02
	795.86	85.46	-2.23E-02		5.31E-02
	801.95	8.69	-5.03E-01		4.72E-01
	1038.61	0.99	-5.59E-01		4.55E+00
	1167.97	1.79	-1.87E+00		3.12E+00
	1365.19	3.02	-2.11E+00		1.10E+00
Cs-137	661.66	85.10	4.93E-02	5.33E-02	5.33E-02
Eu-152	121.78	28.67	4.72E-02	1.28E-01	1.42E-01
	244.70	7.61	3.46E-01		4.98E-01
	295.94	0.45	1.42E+01		1.02E+01
	344.28	26.60	-9.87E-02		1.28E-01
	367.79	0.86	-4.58E-01		3.67E+00
	411.12	2.24	-2.98E-01		1.45E+00
	443.96	2.83	1.43E+00		1.49E+00
	488.68	0.42	-3.16E+00		7.94E+00
	563.99	0.49	2.27E-01		7.76E+00
	586.26	0.46	2.89E+00		1.13E+01
	678.62	0.47	-3.24E+00		9.34E+00
	688.67	0.86	4.54E+00		5.70E+00
	719.35	0.28	-1.05E+01		1.46E+01
	778.90	12.96	-1.55E-01		3.40E-01
	810.45	0.32	-5.11E+00		1.37E+01
	867.37	4.26	-3.35E-01		1.14E+00
	919.33	0.43	-5.28E+00		1.01E+01
	964.08	14.65	2.79E-01		4.01E-01
	1085.87	10.24	-2.63E-01		5.57E-01
	1089.74	1.73	-5.26E+00		3.47E+00
	1112.07	13.69	-4.19E-01		4.34E-01
	1212.95	1.43	2.95E+00		4.67E+00
	1249.94	0.19	-4.08E+00		3.47E+01
	1299.14	1.63	-8.20E-01		3.20E+00
	1408.01	21.07	-5.41E-02		1.78E-01
	1457.64	0.50	1.54E+02		4.17E+01
	1528.10	0.28	-5.11E+00		1.41E+01
Eu-154	123.07	40.40	9.11E-02	1.03E-01	1.03E-01
	247.93	6.89	1.41E-01		4.76E-01
	591.76	4.95	1.73E-01		8.60E-01
	692.42	1.78	-1.85E+00		2.51E+00
	723.30	20.06	1.52E-01		2.32E-01
	756.80	4.52	1.27E-02		9.84E-01
	873.18	12.08	5.00E-02		4.04E-01

Analysis Report for 31-May-19-10013

L1-10220H-FSGS-009SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	2.05E-01	1.03E-01	4.81E-01
	1004.76	18.01	-2.57E-02		2.50E-01
	1274.43	34.80	-1.19E-02		1.56E-01
	1596.48	1.80	-1.85E+00		2.29E+00
Eu-155	45.30	1.31	-3.16E+00	2.21E-01	1.89E+01
	60.01	1.22	-7.32E+00		1.89E+01
	86.55	30.70	2.69E-02		2.23E-01
	105.31	21.10	4.72E-02		2.21E-01
Ra-226	186.21	3.64	3.81E-01	1.11E+00	1.11E+00
Pa-231	27.36	10.30	8.89E-01	1.42E+00	2.26E+00
	283.69	1.70	1.67E+00		2.04E+00
	300.07	2.47	9.34E-02		1.42E+00
	302.65	2.20	4.73E-01		1.52E+00
	330.06	1.40	2.75E+00		2.99E+00
U-235	143.76	10.96	-4.67E-02	7.23E-02	3.46E-01
	163.33	5.08	1.69E-01		6.76E-01
	185.71	57.20	7.27E-02		7.23E-02
	202.11	1.08	1.77E+00		3.49E+00
	205.31	5.01	1.47E-01		7.14E-01
Am-241	59.54	35.90	-7.51E-01	6.24E-01	6.24E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 03-Jun-19-10001

L1-10220H-FSGS-017SB

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 03-Jun-19-10001
Sample Description	: L1-10220H-FSGS-017SB
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.414E+03 grams
Facility	: Default
Sample Taken On	: 5/29/2019 9:25:00AM
Acquisition Started	: 6/3/2019 6:03:17AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 324
Geometry	: 130G_SOIL_1
Live Time	: 1800.0 seconds
Real Time	: 1800.8 seconds
Dead Time	: 0.04 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 4096
Peak Area Range (in channels)	: 120 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 6/3/2019
Efficiency Calibration Description	:
Sample Number	: 76983
Fill Height	: 1414.10 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/3/2019 6:41:02AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated
0930 5-31-19

Analysis Report for 03-Jun-19-10001

L1-10220H-FSGS-017SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.67	473 -	481	477.51	2.77E+02	27.33	2.13E+02	1.17
2	295.28	586 -	593	590.61	1.08E+02	17.03	9.08E+01	0.93
3	338.27	672 -	681	676.51	5.82E+01	17.25	1.05E+02	1.34
4	351.97	698 -	708	703.88	1.99E+02	20.20	8.80E+01	1.48
5	510.78	1015 -	1026	1021.25	8.45E+01	15.45	6.15E+01	1.03
6	583.18	1160 -	1171	1165.96	1.16E+02	14.71	4.02E+01	1.46
7	609.27	1212 -	1223	1218.12	1.54E+02	16.55	4.80E+01	1.18
8	911.22	1817 -	1827	1821.88	4.73E+01	11.75	3.67E+01	1.63
9	969.05	1933 -	1942	1937.55	4.00E+01	10.83	3.40E+01	1.26
10	1460.73	2914 -	2929	2921.52	7.92E+02	28.82	1.34E+01	1.98
11	1764.10	3523 -	3536	3529.05	4.11E+01	6.84	1.93E+00	2.00

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.99	511.00	*	100.00	4.61E-02	9.00E-03
K-40	0.99	1460.82	*	10.66	7.62E+00	4.32E-01
Tl-208	1.00	583.19	*	85.00	7.61E-02	1.07E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.97E-01	2.52E-02
		300.09		3.30		

Analysis Report for 03-Jun-19-10001

L1-10220H-FSGS-017SB

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	609.32	*	45.49	1.95E-01	2.40E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49	*	15.30	3.17E-01	5.44E-02
		1847.43		2.03		
		2118.51		1.16		
Pb-214	1.00	241.99		7.25		
		295.22	*	18.42	2.06E-01	3.63E-02
		351.93	*	35.60	2.22E-01	2.87E-02
		785.96		1.06		
Ac-228	1.00	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	1.99E-01	6.13E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	1.38E-01	3.47E-02
		964.77		4.99		
		968.97	*	15.80	1.97E-01	5.42E-02
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 03-Jun-19-10001

L1-10220H-FSGS-017SB

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.992	4.61E-02	9.00E-03	
	K-40	0.999	7.62E+00	4.32E-01	
	Tl-208	1.000	7.61E-02	1.07E-02	
X	Bi-211	0.879			
	Pb-212	1.000	1.97E-01	2.52E-02	
	Bi-214	0.996	2.15E-01	2.19E-02	
	Pb-214	1.000	2.16E-01	2.25E-02	
	Ac-228	1.000	1.63E-01	2.64E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 03-Jun-19-10001

L1-10220H-FSGS-017SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/3/2019 6:41:02AM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	*	100.00	4.61E-02	2.45E-02	2.45E-02
	BE-7	477.60		10.44	8.73E-02	2.38E-01	2.38E-01
+	K-40	1460.82	*	10.66	7.62E+00	2.32E-01	2.32E-01
	Mn-54	834.85		99.98	-6.15E-03	2.86E-02	2.86E-02
	Co-60	1173.23		99.85	-3.13E-03	3.33E-02	3.83E-02
		1332.49		99.98	9.06E-03		3.33E-02
	Nb-94	702.65		99.81	-1.12E-03	2.57E-02	2.57E-02
		871.09		99.89	-2.35E-02		2.60E-02
	Ag-108m	79.13		6.60	6.96E-01	2.59E-02	8.34E-01
		433.94		90.50	5.65E-03		2.59E-02
		614.28		89.80	-1.62E-02		3.71E-02
		722.94		90.80	-2.46E-04		3.05E-02
	Sb-125	176.31		6.84	3.36E-01	7.75E-02	3.57E-01
		380.45		1.52	-3.41E-02		1.39E+00
		427.87		29.60	3.27E-02		7.75E-02
		463.36		10.49	2.20E-01		2.36E-01
		600.60		17.65	2.04E-02		1.44E-01
		606.71		4.98	7.59E-02		8.75E-01
		635.95		11.22	7.49E-02		2.26E-01

Analysis Report for 03-Jun-19-10001

L1-10220H-FSGS-017SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-2.23E-02	7.75E-02	1.42E+00
Ba-133	79.61	2.65	4.89E-01	4.94E-02	1.94E+00
	81.00	32.90	-2.40E-01		1.26E-01
	276.40	7.16	1.32E-02		3.09E-01
	302.85	18.34	7.54E-02		1.26E-01
	356.01	62.05	-3.50E-02		4.94E-02
	383.85	8.94	4.92E-02		2.47E-01
Cs-134	475.36	1.48	1.66E-02	3.58E-02	1.55E+00
	563.25	8.34	1.16E-01		2.99E-01
	569.33	15.37	4.17E-02		1.62E-01
	604.72	97.62	5.51E-03		3.90E-02
	795.86	85.46	1.99E-02		3.58E-02
	801.95	8.69	-7.41E-02		3.28E-01
	1038.61	0.99	-1.57E+00		3.10E+00
	1167.97	1.79	-1.08E-01		2.03E+00
	1365.19	3.02	-1.47E-01		8.07E-01
Cs-137	661.66	85.10	5.60E-03	3.34E-02	3.34E-02
Eu-152	121.78	28.67	-3.70E-02	7.58E-02	7.58E-02
	244.70	7.61	-7.05E-02		3.26E-01
	295.94	0.45	7.05E+00		6.27E+00
	344.28	26.60	-5.25E-02		8.30E-02
	367.79	0.86	-5.01E-02		2.47E+00
	411.12	2.24	6.76E-04		9.81E-01
	443.96	2.83	-3.62E-02		7.22E-01
	488.68	0.42	-1.36E+00		4.92E+00
	563.99	0.49	3.27E+00		5.13E+00
	586.26	0.46	-1.72E+00		7.93E+00
	678.62	0.47	-2.52E+00		4.90E+00
	688.67	0.86	-1.03E+00		2.82E+00
	719.35	0.28	-3.11E+00		8.70E+00
	778.90	12.96	-2.94E-02		1.99E-01
	810.45	0.32	-4.76E+00		7.88E+00
	867.37	4.26	-2.16E-01		6.55E-01
	919.33	0.43	-2.42E-01		6.67E+00
	964.08	14.65	-4.36E-02		2.48E-01
	1085.87	10.24	1.11E-02		3.10E-01
	1089.74	1.73	1.43E+00		2.02E+00
	1112.07	13.69	-1.44E-01		2.35E-01
	1212.95	1.43	2.88E-01		2.70E+00
	1249.94	0.19	4.03E+00		1.98E+01
	1299.14	1.63	-7.04E-01		2.07E+00
	1408.01	21.07	9.35E-02		1.46E-01
	1457.64	0.50	-2.89E-01		2.85E+01
	1528.10	0.28	1.57E+00		7.84E+00
Eu-154	123.07	40.40	-1.20E-02	5.43E-02	5.43E-02
	247.93	6.89	-2.68E-02		3.14E-01
	591.76	4.95	-1.70E-02		4.81E-01
	692.42	1.78	1.96E-01		1.43E+00
	723.30	20.06	2.58E-02		1.44E-01
	756.80	4.52	-2.05E-03		5.83E-01
	873.18	12.08	1.48E-01		2.34E-01

Analysis Report for 03-Jun-19-10001

L1-10220H-FSGS-017SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-3.23E-02	5.43E-02	2.82E-01
	1004.76	18.01	-4.03E-02		1.68E-01
	1274.43	34.80	-8.03E-03		1.02E-01
	1596.48	1.80	-2.51E-01		1.15E+00
Eu-155	45.30	1.31	-9.21E-01	1.22E-01	7.67E+00
	60.01	1.22	-8.47E-01		8.67E+00
	86.55	30.70	3.44E-02		1.22E-01
	105.31	21.10	8.39E-03		1.25E-01
Ra-226	186.21	3.64	7.63E-01	7.24E-01	7.24E-01
Pa-231	27.36	10.30	6.43E-01	7.58E-01	7.58E-01
	283.69	1.70	-2.47E-02		1.28E+00
	300.07	2.47	-1.97E+00		9.31E-01
	302.65	2.20	6.28E-01		1.05E+00
	330.06	1.40	7.83E-01		1.73E+00
U-235	143.76	10.96	9.88E-02	4.60E-02	2.00E-01
	163.33	5.08	-5.35E-01		4.66E-01
	185.71	57.20	5.08E-02		4.60E-02
	202.11	1.08	1.24E-01		2.21E+00
	205.31	5.01	-2.31E-01		4.69E-01
Am-241	59.54	35.90	-8.54E-02	2.98E-01	2.98E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 01-Jul-19-10012

L1-10220H-FJGS-001SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 01-Jul-19-10012
Sample Description	: L1-10220H-FJGS-001SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.241E+03 grams
Facility	: Default
Sample Taken On	: 6/27/2019 9:48:00AM
Acquisition Started	: 7/1/2019 9:47:13AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P11314
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.04 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/24/2019
Efficiency Calibration Used Done On	: 7/1/2019
Efficiency Calibration Description	:
Sample Number	: 77684
Fill Height	: 1241.27 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/1/2019 10:02:16AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

DATA VALIDATED 7/1/19 - 1600

J Graham

Analysis Report for 01-Jul-19-10012

L1-10220H-FJGS-001SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	209.31	833 -	841	836.99	1.46E+01	8.92	3.04E+01	0.72
2	238.78	946 -	962	954.70	1.05E+02	19.68	8.84E+01	0.87
3	351.97	1400 -	1414	1406.91	9.09E+01	14.46	4.11E+01	1.15
4	583.02	2325 -	2337	2330.20	3.74E+01	8.08	1.06E+01	1.08
5	609.38	2427 -	2442	2435.55	7.13E+01	10.60	1.37E+01	1.15
6	661.70	2636 -	2654	2644.69	2.89E+02	19.82	3.07E+01	1.11
7	1460.40	5826 -	5851	5839.53	2.21E+02	15.31	3.21E+00	1.88

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.97	1460.82	*	10.66	5.33E+00	4.36E-01
Cs-137	1.00	661.66	*	85.10	5.05E-01	4.60E-02
Tl-208	0.99	583.19	*	85.00	5.98E-02	1.34E-02
Bi-211	0.87	351.07	*	13.02	6.62E-01	1.18E-01
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.75E-01	3.58E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	2.20E-01	3.52E-02
		768.36		4.89		
		806.18		1.26		

Analysis Report for 01-Jul-19-10012

L1-10220H-FJGS-001SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	1.00	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	2.42E-01	4.31E-02
		785.96		1.06		
Ac-228	1.00	129.07		2.42		
		209.25	*	3.89	2.53E-01	1.57E-01
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20		25.80		
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 01-Jul-19-10012

L1-10220H-FJGS-001SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.971	5.33E+00	4.36E-01	
	Cs-137	1.000	5.05E-01	4.60E-02	
	Tl-208	0.996	5.98E-02	1.34E-02	
?	Bi-211	0.877	6.62E-01	1.18E-01	
	Pb-212	0.997	1.75E-01	3.58E-02	
	Bi-214	1.000	2.20E-01	3.52E-02	
?	Pb-214	1.000	2.42E-01	4.31E-02	
	Ac-228	1.000	2.53E-01	1.57E-01	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 01-Jul-19-10012

L1-10220H-FJGS-001SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/1/2019 10:02:16AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	6.51E-02	6.45E-02	6.45E-02
	BE-7	477.60		10.44	1.84E-01	5.06E-01	5.06E-01
+	K-40	1460.82	*	10.66	5.33E+00	3.71E-01	3.71E-01
	Mn-54	834.85		99.98	3.44E-03	5.71E-02	5.71E-02
	Co-60	1173.23		99.85	8.97E-02	7.40E-02	8.26E-02
		1332.49		99.98	-7.65E-03		7.40E-02
	Nb-94	702.65		99.81	-2.51E-02	4.24E-02	4.24E-02
		871.09		99.89	2.60E-03		4.65E-02
	Ag-108m	79.13		6.60	5.61E-01	4.77E-02	1.20E+00
		433.94		90.50	1.00E-02		4.77E-02
		614.28		89.80	-6.77E-02		6.80E-02
		722.94		90.80	2.08E-02		5.91E-02
	Sb-125	176.31		6.84	1.16E-01	1.67E-01	4.92E-01
		380.45		1.52	4.61E-01		2.76E+00
		427.87		29.60	1.27E-01		1.67E-01
		463.36		10.49	-1.11E-02		4.72E-01
		600.60		17.65	-7.94E-02		2.08E-01
		606.71		4.98	2.19E+00		1.45E+00
		635.95		11.22	3.25E-02		3.82E-01

Analysis Report for 01-Jul-19-10012

L1-10220H-FJGS-001SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-2.89E+00	1.67E-01	2.04E+00
	Ba-133	79.61		2.65	2.34E+00	8.23E-02	2.95E+00
		81.00		32.90	-2.58E-01		1.92E-01
		276.40		7.16	-3.64E-01		5.15E-01
		302.85		18.34	1.32E-01		2.05E-01
		356.01		62.05	-8.11E-03		8.23E-02
		383.85		8.94	-7.14E-02		4.60E-01
	Cs-134	475.36		1.48	1.52E+00	5.03E-02	3.35E+00
		563.25		8.34	-3.60E-01		5.43E-01
		569.33		15.37	1.59E-01		2.93E-01
		604.72		97.62	-8.04E-03		5.92E-02
		795.86		85.46	-3.33E-02		5.03E-02
		801.95		8.69	-1.11E-01		4.97E-01
		1038.61		0.99	2.45E+00		5.32E+00
		1167.97		1.79	-5.38E-01		4.17E+00
		1365.19		3.02	2.64E-01		1.40E+00
+	Cs-137	661.66	*	85.10	5.05E-01	6.53E-02	6.53E-02
	Eu-152	121.78		28.67	4.48E-02	1.23E-01	1.28E-01
		244.70		7.61	1.61E-01		5.35E-01
		295.94		0.45	2.90E+00		1.03E+01
		344.28		26.60	-6.56E-02		1.23E-01
		367.79		0.86	2.92E+00		4.48E+00
		411.12		2.24	1.55E+00		1.90E+00
		443.96		2.83	-1.87E-01		1.43E+00
		488.68		0.42	-7.00E+00		1.00E+01
		563.99		0.49	-7.20E+00		8.68E+00
		586.26		0.46	-3.20E+00		1.21E+01
		678.62		0.47	-6.73E-02		8.61E+00
		688.67		0.86	2.39E+00		5.03E+00
		719.35		0.28	-1.59E+00		1.64E+01
		778.90		12.96	-8.55E-03		3.38E-01
		810.45		0.32	-1.01E+00		1.29E+01
		867.37		4.26	-1.86E-02		1.15E+00
		919.33		0.43	-7.22E-01		1.08E+01
		964.08		14.65	2.12E-01		4.80E-01
		1085.87		10.24	-1.14E-01		5.48E-01
		1089.74		1.73	1.82E-01		3.25E+00
		1112.07		13.69	1.66E-02		3.23E-01
		1212.95		1.43	2.72E+00		4.93E+00
		1249.94		0.19	-1.67E+01		3.14E+01
		1299.14		1.63	3.33E+00		3.75E+00
		1408.01		21.07	1.90E-01		2.62E-01
		1457.64		0.50	1.09E+02		3.84E+01
		1528.10		0.28	-1.87E+01		9.13E+00
	Eu-154	123.07		40.40	-5.36E-02	8.82E-02	8.82E-02
		247.93		6.89	4.58E-01		5.54E-01
		591.76		4.95	1.81E-01		7.47E-01
		692.42		1.78	-1.39E+00		2.44E+00
		723.30		20.06	6.94E-02		2.68E-01
		756.80		4.52	5.65E-01		1.07E+00
		873.18		12.08	-1.52E-02		4.21E-01

Analysis Report for 01-Jul-19-10012

L1-10220H-FJGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-6.30E-02	8.82E-02	4.97E-01
	1004.76	18.01	-1.89E-01		2.80E-01
	1274.43	34.80	-2.06E-02		1.47E-01
	1596.48	1.80	5.06E-01		2.88E+00
Eu-155	45.30	1.31	-5.71E-02	1.86E-01	1.16E+01
	60.01	1.22	-5.11E+00		1.16E+01
	86.55	30.70	6.57E-02		1.97E-01
	105.31	21.10	-6.80E-02		1.86E-01
Ra-226	186.21	3.64	7.95E-01	1.11E+00	1.11E+00
Pa-231	27.36	10.30	9.59E-01	1.34E+00	1.34E+00
	283.69	1.70	7.90E-01		2.22E+00
	300.07	2.47	-2.68E+00		1.59E+00
	302.65	2.20	8.71E-01		1.69E+00
	330.06	1.40	-2.52E+00		2.77E+00
U-235	143.76	10.96	-8.69E-02	7.13E-02	3.11E-01
	163.33	5.08	6.89E-01		7.18E-01
	185.71	57.20	8.37E-02		7.13E-02
	202.11	1.08	-7.69E-02		3.20E+00
	205.31	5.01	-2.63E-01		6.23E-01
Am-241	59.54	35.90	-2.75E-01	4.09E-01	4.09E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 01-Jul-19-10013

L1-10220H-FJGS-002SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 01-Jul-19-10013
Sample Description	: L1-10220H-FJGS-002SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.559E+03 grams
Facility	: Default
Sample Taken On	: 6/27/2019 9:50:00AM
Acquisition Started	: 7/1/2019 9:47:22AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 1800.0 seconds
Real Time	: 1800.6 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 7/1/2019
Efficiency Calibration Description	:
Sample Number	: 77685
Fill Height	: 1558.81 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/1/2019 10:19:57AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

DATA VALIDATED 7/1/19 - 1600

J Graham

Analysis Report for 01-Jul-19-10013

L1-10220H-FJGS-002SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	77.04	305 -	315	309.49	3.93E+01	19.84	1.49E+02	0.47
	2	186.10	739 -	752	745.10	4.28E+01	20.70	1.39E+02	0.32
	3	209.41	832 -	842	838.25	3.26E+01	15.35	8.44E+01	1.12
M	4	238.67	945 -	971	955.15	2.72E+02	18.02	1.13E+02	1.01
m	5	241.76	945 -	971	967.50	6.07E+01	10.62	8.70E+01	1.01
	6	295.01	1171 -	1187	1180.27	9.96E+01	19.27	8.64E+01	1.16
	7	338.31	1347 -	1360	1353.29	5.09E+01	15.20	6.51E+01	0.53
	8	351.85	1400 -	1415	1407.40	1.63E+02	19.07	6.70E+01	1.18
	9	510.59	2035 -	2053	2041.86	9.86E+01	14.51	3.34E+01	1.46
	10	583.08	2323 -	2340	2331.64	1.13E+02	14.09	2.63E+01	1.03
	11	609.20	2427 -	2446	2436.05	1.60E+02	16.34	3.09E+01	1.37
	12	661.52	2636 -	2656	2645.24	2.64E+02	20.35	4.03E+01	1.53
	13	911.01	3633 -	3652	3643.06	8.55E+01	9.70	2.45E+00	0.67
	14	968.77	3866 -	3881	3874.17	4.60E+01	9.39	1.40E+01	1.26
	15	1460.51	5829 -	5856	5842.39	5.26E+02	23.23	3.28E+00	2.00
	16	1763.61	7050 -	7063	7056.51	2.20E+01	6.56	6.97E+00	0.37

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.97	511.00	*	100.00	5.77E-02	9.35E-03

Analysis Report for 01-Jul-19-10013

L1-10220H-FJGS-002SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.82	*	10.66	5.47E+00	3.39E-01
Cs-137	0.99	661.66	*	85.10	2.04E-01	1.99E-02
Tl-208	0.99	583.19	*	85.00	8.02E-02	1.11E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.12E-01	2.22E-02
		300.09		3.30		
Pb212-XR	1.00	74.82		10.28		
		77.11	*	17.10	1.83E-01	9.45E-02
		87.35		3.97		
		89.78		1.46		
Bi-214	0.98	609.32	*	45.49	2.19E-01	2.60E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49	*	15.30	1.84E-01	5.53E-02
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	2.86E-01	5.51E-02
		295.22	*	18.42	2.06E-01	4.32E-02
		351.93	*	35.60	1.98E-01	2.80E-02
		785.96		1.06		
Pb214-XR	1.00	74.82		5.80		
		77.11	*	9.70	3.23E-01	1.67E-01
		87.35		2.24		
		89.78		0.82		
Ra-226	0.99	186.21	*	3.64	3.58E-01	1.75E-01
Ac-228	0.99	129.07		2.42		
		209.25	*	3.89	2.68E-01	1.28E-01
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	1.90E-01	5.87E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.69E-01	3.26E-02
		964.77		4.99		
		968.97	*	15.80	2.46E-01	5.14E-02
		1588.20		3.22		
U-235	0.98	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	2.28E-02	1.12E-02
		202.11		1.08		

Analysis Report for 01-Jul-19-10013

L1-10220H-FJGS-002SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
U-235	0.98	205.31	5.01		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.974	5.77E-02	9.35E-03	
	K-40	0.984	5.47E+00	3.39E-01	
	Cs-137	0.997	2.04E-01	1.99E-02	
	Tl-208	0.998	8.02E-02	1.11E-02	
X	Bi-211	0.907			
	Pb-212	1.000	2.12E-01	2.22E-02	
?	Pb212-XR	1.000	1.83E-01	9.45E-02	
	Bi-214	0.982	2.13E-01	2.35E-02	
	Pb-214	0.996	2.13E-01	2.16E-02	
?	Pb214-XR	1.000	3.23E-01	1.67E-01	
?	Ra-226	0.998	3.58E-01	1.75E-01	
	Ac-228	0.997	2.50E-01	2.45E-02	
?	U-235	0.983	2.28E-02	1.12E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 01-Jul-19-10013

L1-10220H-FJGS-002SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/1/2019 10:19:57AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	*	100.00	5.77E-02	2.27E-02	2.27E-02
	BE-7	477.60		10.44	1.86E-01	2.86E-01	2.86E-01
+	K-40	1460.82	*	10.66	5.47E+00	1.62E-01	1.62E-01
	Mn-54	834.85		99.98	1.64E-02	3.14E-02	3.14E-02
	Co-60	1173.23		99.85	1.99E-03	4.06E-02	4.98E-02
		1332.49		99.98	2.18E-02		4.06E-02
	Nb-94	702.65		99.81	-6.51E-03	2.70E-02	2.70E-02
		871.09		99.89	-1.07E-02		2.87E-02
	Ag-108m	79.13		6.60	8.16E-02	3.04E-02	1.00E+00
		433.94		90.50	1.17E-02		3.04E-02
		614.28		89.80	-6.22E-03		4.99E-02
		722.94		90.80	1.42E-02		3.71E-02
	Sb-125	176.31		6.84	2.04E-02	8.89E-02	3.47E-01
		380.45		1.52	7.60E-01		1.71E+00
		427.87		29.60	-2.83E-02		8.89E-02
		463.36		10.49	6.12E-02		2.76E-01
		600.60		17.65	1.98E-02		1.54E-01
		606.71		4.98	1.98E+00		9.46E-01
		635.95		11.22	9.93E-02		2.20E-01

Analysis Report for 01-Jul-19-10013

L1-10220H-FJGS-002SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-1.49E+00	8.89E-02	1.57E+00
	Ba-133	79.61		2.65	-1.57E-01	5.42E-02	2.43E+00
		81.00		32.90	-1.32E-01		1.61E-01
		276.40		7.16	-2.51E-01		3.44E-01
		302.85		18.34	2.78E-02		1.41E-01
		356.01		62.05	6.44E-03		5.42E-02
		383.85		8.94	-3.70E-02		2.82E-01
	Cs-134	475.36		1.48	5.69E-01	3.89E-02	2.01E+00
		563.25		8.34	1.42E-01		3.18E-01
		569.33		15.37	7.77E-02		1.74E-01
		604.72		97.62	-7.94E-03		4.53E-02
		795.86		85.46	1.50E-02		3.89E-02
		801.95		8.69	-2.02E-01		3.47E-01
		1038.61		0.99	-1.14E+00		3.33E+00
		1167.97		1.79	1.77E+00		2.74E+00
		1365.19		3.02	7.14E-02		1.02E+00
+	Cs-137	661.66	*	85.10	2.04E-01	3.44E-02	3.44E-02
	Eu-152	121.78		28.67	2.32E-02	9.82E-02	9.99E-02
		244.70		7.61	-5.11E-01		3.75E-01
		295.94		0.45	1.01E+01		7.13E+00
		344.28		26.60	-4.91E-02		9.82E-02
		367.79		0.86	-7.30E-01		2.96E+00
		411.12		2.24	2.92E-01		1.23E+00
		443.96		2.83	-3.42E-01		9.35E-01
		488.68		0.42	3.86E-01		6.32E+00
		563.99		0.49	2.62E+00		5.43E+00
		586.26		0.46	9.78E-02		9.14E+00
		678.62		0.47	-2.94E-01		5.72E+00
		688.67		0.86	1.89E+00		3.36E+00
		719.35		0.28	-9.79E+00		9.25E+00
		778.90		12.96	-1.79E-01		2.19E-01
		810.45		0.32	-2.89E+00		8.76E+00
		867.37		4.26	-1.42E+00		7.32E-01
		919.33		0.43	5.71E+00		7.87E+00
		964.08		14.65	5.67E-02		3.10E-01
		1085.87		10.24	-1.64E-01		3.33E-01
		1089.74		1.73	-8.36E-01		2.06E+00
		1112.07		13.69	-3.54E-01		2.90E-01
		1212.95		1.43	-7.96E-01		2.96E+00
		1249.94		0.19	-8.82E-01		2.11E+01
		1299.14		1.63	5.73E-01		2.20E+00
		1408.01		21.07	3.21E-02		1.45E-01
		1457.64		0.50	1.17E+02		2.52E+01
		1528.10		0.28	6.92E+00		9.23E+00
	Eu-154	123.07		40.40	4.05E-02	7.13E-02	7.13E-02
		247.93		6.89	2.23E-03		3.69E-01
		591.76		4.95	5.74E-01		5.92E-01
		692.42		1.78	-4.32E-01		1.61E+00
		723.30		20.06	1.18E-01		1.71E-01
		756.80		4.52	4.29E-02		6.51E-01
		873.18		12.08	-7.18E-02		2.40E-01

Analysis Report for 01-Jul-19-10013

L1-10220H-FJGS-002SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	4.93E-02	7.13E-02	3.21E-01
		1004.76		18.01	5.44E-02		1.86E-01
		1274.43		34.80	1.05E-03		1.09E-01
		1596.48		1.80	5.32E-02		1.84E+00
	Eu-155	45.30		1.31	5.52E+00	1.55E-01	1.46E+01
		60.01		1.22	3.74E+00		1.55E+01
		86.55		30.70	1.27E-01		1.61E-01
		105.31		21.10	-2.57E-02		1.55E-01
+	Ra-226	186.21	*	3.64	3.58E-01	5.81E-01	5.81E-01
	Pa-231	27.36		10.30	1.97E+00	1.09E+00	1.66E+00
		283.69		1.70	-3.32E-01		1.45E+00
		300.07		2.47	-4.17E-01		1.09E+00
		302.65		2.20	-9.41E-01		1.15E+00
		330.06		1.40	3.25E-01		1.89E+00
+	U-235	143.76		10.96	-5.86E-02	3.70E-02	2.44E-01
		163.33		5.08	1.40E-01		4.94E-01
		185.71	*	57.20	2.28E-02		3.70E-02
		202.11		1.08	1.83E-01		2.44E+00
		205.31		5.01	1.47E-01		5.14E-01
	Am-241	59.54		35.90	7.06E-02	5.43E-01	5.43E-01

+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 01-Jul-19-10014

L1-10220H-FJGS-003SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 01-Jul-19-10014
Sample Description	: L1-10220H-FJGS-003SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.371E+03 grams
Facility	: Default
Sample Taken On	: 6/27/2019 9:52:00AM
Acquisition Started	: 7/1/2019 10:06:13AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.3 seconds
Dead Time	: 0.15 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/29/2019
Efficiency Calibration Used Done On	: 7/1/2019
Efficiency Calibration Description	:
Sample Number	: 77686
Fill Height	: 1370.85 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/1/2019 10:21:17AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

DATA VALIDATED 7/1/19 - 1600

J Graham

Analysis Report for 01-Jul-19-10014

L1-10220H-FJGS-003SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	185.88	740 -	747	743.82	1.66E+01	10.06	4.04E+01	0.48
2	238.61	946 -	960	954.55	1.19E+02	19.48	9.05E+01	1.10
3	294.99	1175 -	1187	1179.87	6.65E+01	12.37	3.25E+01	0.90
4	351.79	1400 -	1415	1406.88	1.03E+02	12.77	2.04E+01	0.78
5	582.95	2326 -	2336	2331.02	5.74E+01	9.36	1.26E+01	0.74
6	608.99	2427 -	2442	2435.14	6.81E+01	11.56	2.19E+01	0.84
7	661.36	2638 -	2651	2644.56	8.16E+01	10.78	1.24E+01	0.96
8	910.44	3635 -	3648	3640.74	2.35E+01	8.49	1.75E+01	1.36
9	1459.78	5829 -	5851	5838.93	2.31E+02	15.80	5.17E+00	1.13

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Cs-137	0.98	661.66	*	85.10	1.53E-01	2.22E-02
Tl-208	0.99	583.19	*	85.00	9.87E-02	1.71E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.17E-01	3.97E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	2.25E-01	4.06E-02
		768.36		4.89		
		806.18		1.26		

Analysis Report for 01-Jul-19-10014

L1-10220H-FJGS-003SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	3.25E-01	6.58E-02
		351.93	*	35.60	2.95E-01	4.36E-02
		785.96		1.06		
Ra-226	0.98	186.21	*	3.64	3.25E-01	1.98E-01
Ac-228	0.97	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	1.81E-01	6.58E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		
U-235	0.99	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	2.07E-02	1.26E-02
		202.11		1.08		
		205.31		5.01		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

Analysis Report for 01-Jul-19-10014

L1-10220H-FJGS-003SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	Cs-137	0.986	1.53E-01	2.22E-02	
	Tl-208	0.991	9.87E-02	1.71E-02	
X	Bi-211	0.921			
	Pb-212	1.000	2.17E-01	3.97E-02	
	Bi-214	0.993	2.25E-01	4.06E-02	
	Pb-214	0.996	3.04E-01	3.64E-02	
?	Ra-226	0.983	3.25E-01	1.98E-01	
	Ac-228	0.972	1.81E-01	6.58E-02	
?	U-235	0.997	2.07E-02	1.26E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 01-Jul-19-10014

L1-10220H-FJGS-003SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/1/2019 10:21:17AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
9	1459.78	2.56474E-01	6.84		

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
An Pk	511.00	100.00	1.09E-01	7.00E-02	7.00E-02
BE-7	477.60	10.44	1.06E-01	4.72E-01	4.72E-01
K-40	1460.82	10.66	5.98E+00	1.99E+00	1.99E+00
Mn-54	834.85	99.98	-8.07E-03	4.78E-02	4.78E-02
Co-60	1173.23	99.85	-2.02E-02	5.51E-02	8.28E-02
	1332.49	99.98	1.82E-02		5.51E-02
Nb-94	702.65	99.81	3.10E-03	4.98E-02	5.00E-02
	871.09	99.89	-1.77E-02		4.98E-02
Ag-108m	79.13	6.60	1.02E-01	4.56E-02	1.90E+00
	433.94	90.50	9.82E-03		4.56E-02
	614.28	89.80	5.41E-03		6.70E-02
	722.94	90.80	4.27E-02		6.80E-02
Sb-125	176.31	6.84	1.12E-01	1.49E-01	5.78E-01
	380.45	1.52	-4.92E-01		2.73E+00
	427.87	29.60	-8.02E-02		1.49E-01
	463.36	10.49	2.50E-01		4.65E-01
	600.60	17.65	-7.15E-02		2.32E-01
	606.71	4.98	2.35E+00		1.64E+00

Analysis Report for 01-Jul-19-10014

L1-10220H-FJGS-003SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	635.95		11.22	-1.52E-01	1.49E-01	3.45E-01
		671.44		1.79	9.42E-01		2.42E+00
	Ba-133	79.61		2.65	-1.72E+00	7.76E-02	4.53E+00
		81.00		32.90	-1.58E-01		3.19E-01
		276.40		7.16	-1.61E-01		5.71E-01
		302.85		18.34	1.71E-01		2.43E-01
		356.01		62.05	8.09E-03		7.76E-02
		383.85		8.94	-3.10E-01		4.61E-01
	Cs-134	475.36		1.48	1.23E+00	5.05E-02	3.37E+00
		563.25		8.34	-4.84E-01		5.51E-01
		569.33		15.37	-2.38E-01		3.26E-01
		604.72		97.62	-2.87E-02		7.98E-02
		795.86		85.46	1.76E-02		5.05E-02
		801.95		8.69	-3.15E-02		4.99E-01
		1038.61		0.99	-9.17E-01		5.11E+00
		1167.97		1.79	4.87E+00		4.71E+00
		1365.19		3.02	2.37E-01		1.50E+00
+	Cs-137	661.66	*	85.10	1.53E-01	4.28E-02	4.28E-02
	Eu-152	121.78		28.67	-3.72E-02	1.57E-01	1.61E-01
		244.70		7.61	-6.98E-02		5.74E-01
		295.94		0.45	1.17E+01		1.21E+01
		344.28		26.60	-2.79E-02		1.57E-01
		367.79		0.86	1.61E+00		4.87E+00
		411.12		2.24	9.22E-01		1.90E+00
		443.96		2.83	3.41E-01		1.60E+00
		488.68		0.42	-3.50E+00		9.87E+00
		563.99		0.49	1.46E+00		9.88E+00
		586.26		0.46	-1.64E+01		1.51E+01
		678.62		0.47	-1.49E+00		8.73E+00
		688.67		0.86	-1.45E+00		5.04E+00
		719.35		0.28	9.45E+00		1.89E+01
		778.90		12.96	4.81E-02		3.63E-01
		810.45		0.32	-1.33E+01		1.48E+01
		867.37		4.26	-1.58E+00		9.66E-01
		919.33		0.43	1.84E+00		1.06E+01
		964.08		14.65	3.47E-01		5.33E-01
		1085.87		10.24	2.15E-01		5.55E-01
		1089.74		1.73	-1.98E+00		3.29E+00
		1112.07		13.69	1.70E-01		5.19E-01
		1212.95		1.43	-6.60E-01		5.07E+00
		1249.94		0.19	8.18E-01		3.96E+01
		1299.14		1.63	1.06E+00		3.69E+00
		1408.01		21.07	8.56E-02		2.65E-01
		1457.64		0.50	1.22E+02		4.23E+01
		1528.10		0.28	6.07E+00		1.48E+01
	Eu-154	123.07		40.40	-5.42E-02	1.13E-01	1.13E-01
		247.93		6.89	-7.38E-02		5.46E-01
		591.76		4.95	5.52E-01		9.09E-01
		692.42		1.78	-2.37E-01		2.40E+00
		723.30		20.06	1.34E-01		3.02E-01
		756.80		4.52	5.38E-01		1.13E+00

Analysis Report for 01-Jul-19-10014

L1-10220H-FJGS-003SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	873.18		12.08	3.66E-01	1.13E-01	4.51E-01
		996.29		10.48	-2.63E-01		4.45E-01
		1004.76		18.01	-3.44E-02		2.93E-01
		1274.43		34.80	2.37E-02		1.74E-01
		1596.48		1.80	6.58E-01		2.05E+00
	Eu-155	45.30		1.31	1.69E+01	2.64E-01	3.19E+01
		60.01		1.22	2.03E+01		3.50E+01
		86.55		30.70	-2.63E-02		2.64E-01
		105.31		21.10	1.09E-01		2.88E-01
+	Ra-226	186.21	*	3.64	3.25E-01	6.66E-01	6.66E-01
	Pa-231	27.36		10.30	3.24E+00	1.72E+00	3.65E+00
		283.69		1.70	5.14E-01		2.38E+00
		300.07		2.47	-6.60E-01		1.72E+00
		302.65		2.20	1.09E+00		2.03E+00
		330.06		1.40	1.75E+00		2.92E+00
+	U-235	143.76		10.96	-1.29E-01	4.24E-02	4.06E-01
		163.33		5.08	1.95E-01		8.68E-01
		185.71	*	57.20	2.07E-02		4.24E-02
		202.11		1.08	-5.22E-01		3.70E+00
		205.31		5.01	-5.33E-01		7.87E-01
	Am-241	59.54		35.90	7.11E-03	1.22E+00	1.22E+00

+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 10-Jul-19-10008

L1-10220H-FJGS-004SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 10-Jul-19-10008
Sample Description	: L1-10220H-FJGS-004SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.058E+03 grams
Facility	: Default
Sample Taken On	: 7/9/2019 8:20:00AM
Acquisition Started	: 7/10/2019 1:27:34PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 324
Geometry	: 130G_SOIL_1
Live Time	: 1800.0 seconds
Real Time	: 1800.7 seconds
Dead Time	: 0.04 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 4096
Peak Area Range (in channels)	: 120 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 7/10/2019
Efficiency Calibration Description	:
Sample Number	: 77862
Fill Height	: 1058.47 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/10/2019 2:05:37PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

DATA VALIDATED 7/10/19 1530

TGrolon

Analysis Report for 10-Jul-19-10008

L1-10220H-FJGS-004SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	185.85	367 -	376	372.01	8.71E+01	26.06	2.62E+02	1.17
2	238.68	473 -	482	477.55	2.75E+02	29.19	2.53E+02	1.24
3	295.32	586 -	595	590.70	1.15E+02	20.48	1.35E+02	1.24
4	352.05	699 -	708	704.05	2.02E+02	21.18	1.08E+02	1.57
5	510.63	1017 -	1026	1020.95	8.70E+01	16.90	8.80E+01	1.70
6	583.20	1160 -	1171	1166.00	1.24E+02	15.72	4.94E+01	1.43
7	609.43	1213 -	1222	1218.44	1.27E+02	15.69	5.26E+01	1.68
8	661.74	1317 -	1328	1323.02	1.20E+03	36.02	3.90E+01	1.50
9	911.46	1817 -	1828	1822.37	1.01E+02	13.17	2.86E+01	1.70
10	969.17	1932 -	1942	1937.80	3.38E+01	11.71	4.32E+01	1.48
11	1173.49	2340 -	2352	2346.58	8.38E+01	13.69	3.92E+01	1.76
12	1332.76	2659 -	2672	2665.34	9.09E+01	10.23	5.06E+00	1.82
13	1460.84	2914 -	2929	2921.74	6.01E+02	24.76	4.00E+00	1.96
14	1764.84	3525 -	3534	3530.53	1.95E+01	6.05	7.50E+00	0.86

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.97	511.00	*	100.00	4.99E-02	1.03E-02
K-40	1.00	1460.82	*	10.66	6.49E+00	3.88E-01
Co-60	0.98	1173.23	*	99.85	8.29E-02	1.39E-02

Analysis Report for 10-Jul-19-10008

L1-10220H-FJGS-004SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Co-60	0.98	1332.49	*	99.98	9.77E-02	1.17E-02
Cs-137	0.99	661.66	*	85.10	9.48E-01	6.36E-02
Tl-208	1.00	583.19	*	85.00	8.98E-02	1.26E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.14E-01	2.85E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.78E-01	2.44E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49	*	15.30	1.69E-01	5.31E-02
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	2.39E-01	4.67E-02
		351.93	*	35.60	2.48E-01	3.26E-02
		785.96		1.06		
Ra-226	0.98	186.21	*	3.64	7.14E-01	2.21E-01
Ac-228	0.73	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	3.28E-01	4.49E-02
		964.77		4.99		
		968.97	*	15.80	1.86E-01	6.50E-02
		1588.20		3.22		
U-235	0.99	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	4.54E-02	1.41E-02
		202.11		1.08		
		205.31		5.01		

Analysis Report for 10-Jul-19-10008

L1-10220H-FJGS-004SS

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.978	4.99E-02	1.03E-02	
	K-40	1.000	6.49E+00	3.88E-01	
	Co-60	0.989	9.16E-02	8.94E-03	
	Cs-137	0.999	9.48E-01	6.36E-02	
	Tl-208	1.000	8.98E-02	1.26E-02	
X	Bi-211	0.857			
	Pb-212	1.000	2.14E-01	2.85E-02	
	Bi-214	0.997	1.77E-01	2.22E-02	
	Pb-214	0.998	2.45E-01	2.67E-02	
?	Ra-226	0.980	7.14E-01	2.21E-01	
	Ac-228	0.734	2.82E-01	3.69E-02	
?	U-235	0.998	4.54E-02	1.41E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 10-Jul-19-10008

L1-10220H-FJGS-004SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/10/2019 2:05:37PM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	*	100.00	4.99E-02	2.91E-02	2.91E-02
	BE-7	477.60		10.44	1.70E-01	3.52E-01	3.52E-01
+	K-40	1460.82	*	10.66	6.49E+00	1.58E-01	1.58E-01
	Mn-54	834.85		99.98	2.25E-03	3.10E-02	3.10E-02
+	Co-60	1173.23	*	99.85	8.29E-02	1.66E-02	3.70E-02
		1332.49	*	99.98	9.77E-02		1.66E-02
	Nb-94	702.65		99.81	2.17E-03	2.62E-02	2.99E-02
		871.09		99.89	-1.11E-02		2.62E-02
	Ag-108m	79.13		6.60	7.17E-01	3.08E-02	8.97E-01
		433.94		90.50	-1.90E-02		3.08E-02
		614.28		89.80	-8.13E-02		4.22E-02
		722.94		90.80	-3.36E-03		3.55E-02
	Sb-125	176.31		6.84	7.21E-02	1.03E-01	4.09E-01
		380.45		1.52	-1.17E+00		1.80E+00
		427.87		29.60	8.77E-02		1.03E-01
		463.36		10.49	1.23E-01		3.11E-01
		600.60		17.65	-4.84E-02		1.63E-01
		606.71		4.98	-1.30E-02		9.45E-01
		635.95		11.22	2.77E-02		2.70E-01

Analysis Report for 10-Jul-19-10008

L1-10220H-FJGS-004SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	5.74E-01	1.03E-01	1.62E+00
	Ba-133	79.61		2.65	6.03E-01	5.96E-02	2.08E+00
		81.00		32.90	-2.98E-01		1.38E-01
		276.40		7.16	7.89E-02		3.79E-01
		302.85		18.34	-1.58E-02		1.40E-01
		356.01		62.05	-5.08E-02		5.96E-02
		383.85		8.94	7.16E-02		3.31E-01
	Cs-134	475.36		1.48	1.21E+00	3.62E-02	2.48E+00
		563.25		8.34	-2.26E-01		3.30E-01
		569.33		15.37	6.89E-02		1.97E-01
		604.72		97.62	-1.52E-02		4.02E-02
		795.86		85.46	1.34E-02		3.62E-02
		801.95		8.69	-1.32E-01		3.44E-01
		1038.61		0.99	1.37E+00		3.98E+00
		1167.97		1.79	4.78E-02		2.91E+00
		1365.19		3.02	2.72E-01		8.83E-01
+	Cs-137	661.66	*	85.10	9.48E-01	2.87E-02	2.87E-02
	Eu-152	121.78		28.67	2.35E-02	8.86E-02	8.86E-02
		244.70		7.61	-4.51E-01		3.63E-01
		295.94		0.45	7.76E+00		7.22E+00
		344.28		26.60	-1.33E-02		1.12E-01
		367.79		0.86	-2.20E+00		3.08E+00
		411.12		2.24	-1.07E-01		1.30E+00
		443.96		2.83	-8.90E-01		1.06E+00
		488.68		0.42	-1.89E+00		7.70E+00
		563.99		0.49	-3.36E+00		5.60E+00
		586.26		0.46	-3.11E+00		9.36E+00
		678.62		0.47	1.79E+00		6.10E+00
		688.67		0.86	-1.85E+00		3.04E+00
		719.35		0.28	-1.32E-01		1.03E+01
		778.90		12.96	-3.22E-01		2.01E-01
		810.45		0.32	1.19E+00		9.75E+00
		867.37		4.26	-3.62E-01		6.35E-01
		919.33		0.43	-2.21E+00		8.15E+00
		964.08		14.65	-4.39E-02		2.91E-01
		1085.87		10.24	6.09E-02		3.77E-01
		1089.74		1.73	-1.05E-01		2.37E+00
		1112.07		13.69	-1.55E-01		2.80E-01
		1212.95		1.43	-3.55E-01		2.98E+00
		1249.94		0.19	-1.11E+01		1.85E+01
		1299.14		1.63	-1.95E-01		2.32E+00
		1408.01		21.07	3.13E-02		1.43E-01
		1457.64		0.50	-7.01E-01		2.77E+01
		1528.10		0.28	-8.60E-01		8.79E+00
	Eu-154	123.07		40.40	6.12E-02	6.46E-02	6.46E-02
		247.93		6.89	-6.14E-02		3.72E-01
		591.76		4.95	-2.81E-03		5.87E-01
		692.42		1.78	-2.87E-01		1.54E+00
		723.30		20.06	6.70E-02		1.63E-01
		756.80		4.52	1.22E-02		6.15E-01
		873.18		12.08	-1.28E-01		2.17E-01

Analysis Report for 10-Jul-19-10008

L1-10220H-FJGS-004SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	-3.80E-02	6.46E-02	3.05E-01
		1004.76		18.01	3.39E-02		1.77E-01
		1274.43		34.80	-5.84E-02		1.03E-01
		1596.48		1.80	4.46E-01		1.63E+00
	Eu-155	45.30		1.31	3.80E-02	1.34E-01	8.13E+00
		60.01		1.22	-3.68E+00		8.91E+00
		86.55		30.70	-7.01E-03		1.34E-01
		105.31		21.10	-1.01E-02		1.36E-01
+	Ra-226	186.21	*	3.64	7.14E-01	7.00E-01	7.00E-01
	Pa-231	27.36		10.30	7.38E-01	8.62E-01	8.62E-01
		283.69		1.70	2.31E-01		1.52E+00
		300.07		2.47	-6.35E-01		1.04E+00
		302.65		2.20	-1.32E-01		1.17E+00
		330.06		1.40	1.28E+00		2.12E+00
+	U-235	143.76		10.96	-6.15E-02	4.46E-02	2.15E-01
		163.33		5.08	-5.97E-02		5.40E-01
		185.71	*	57.20	4.54E-02		4.46E-02
		202.11		1.08	4.15E-01		2.62E+00
		205.31		5.01	-2.79E-01		5.61E-01
	Am-241	59.54		35.90	-2.15E-01	3.02E-01	3.02E-01

+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 10-Jul-19-10009

L1-10220H-QJGS-004SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 10-Jul-19-10009
Sample Description	: L1-10220H-QJGS-004SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.193E+03 grams
Facility	: Default
Sample Taken On	: 7/9/2019 8:20:00AM
Acquisition Started	: 7/10/2019 2:08:41PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 324
Geometry	: 130G_SOIL_1
Live Time	: 1800.0 seconds
Real Time	: 1800.6 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 4096
Peak Area Range (in channels)	: 120 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 7/10/2019
Efficiency Calibration Description	:
Sample Number	: 77869
Fill Height	: 1192.93 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/10/2019 2:41:46PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

DATA VALIDATED 7/10/19 1530

JGrolon

Analysis Report for 10-Jul-19-10009

L1-10220H-QJGS-004SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	186.05	368 -	376	372.41	7.91E+01	23.13	2.13E+02	1.07
2	238.64	473 -	481	477.46	2.49E+02	27.29	2.26E+02	1.16
3	295.08	585 -	594	590.22	9.32E+01	18.45	1.10E+02	0.93
4	338.38	671 -	681	676.73	3.98E+01	19.31	1.40E+02	1.28
5	351.95	698 -	708	703.85	1.93E+02	21.97	1.22E+02	1.07
6	477.52	952 -	960	954.78	3.99E+01	12.98	5.61E+01	0.89
7	583.38	1162 -	1170	1166.37	8.96E+01	13.81	4.74E+01	1.82
8	609.36	1212 -	1223	1218.30	1.59E+02	16.02	3.90E+01	1.64
9	661.72	1317 -	1328	1322.97	6.30E+02	27.39	4.80E+01	1.53
10	911.37	1817 -	1827	1822.19	8.39E+01	12.08	2.61E+01	1.79
11	969.27	1935 -	1942	1938.01	2.85E+01	8.99	2.55E+01	1.44
12	1173.32	2343 -	2353	2346.24	7.00E+01	11.17	2.20E+01	1.57
13	1332.36	2659 -	2671	2664.53	3.92E+01	9.22	1.68E+01	2.14
14	1460.95	2914 -	2928	2921.95	6.03E+02	25.07	9.13E+00	1.88
15	1764.04	3525 -	3532	3528.92	1.90E+01	5.39	5.00E+00	1.45

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
BE-7	0.99	477.60	*	10.44	2.00E-01	6.67E-02
K-40	0.99	1460.82	*	10.66	6.17E+00	3.71E-01

Analysis Report for 10-Jul-19-10009

L1-10220H-QJGS-004SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Co-60	0.99	1173.23	*	99.85	6.56E-02	1.08E-02
		1332.49	*	99.98	3.99E-02	9.52E-03
Cs-137	0.99	661.66	*	85.10	4.74E-01	3.52E-02
Tl-208	0.99	583.19	*	85.00	6.21E-02	1.03E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.85E-01	2.52E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	2.12E-01	2.49E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49	*	15.30	1.56E-01	4.48E-02
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	1.85E-01	3.96E-02
		351.93	*	35.60	2.26E-01	3.14E-02
		785.96		1.06		
Ra-226	0.99	186.21	*	3.64	6.22E-01	1.89E-01
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	1.43E-01	7.03E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.58E-01	3.88E-02
		964.77		4.99		
		968.97	*	15.80	1.49E-01	4.75E-02
		1588.20		3.22		
U-235	0.98	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	3.96E-02	1.20E-02
		202.11		1.08		
		205.31		5.01		

Analysis Report for 10-Jul-19-10009

L1-10220H-QJGS-004SS

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	BE-7	0.999	2.00E-01	6.67E-02	
	K-40	0.998	6.17E+00	3.71E-01	
	Co-60	0.998	5.12E-02	7.14E-03	
	Cs-137	0.999	4.74E-01	3.52E-02	
	Tl-208	0.994	6.21E-02	1.03E-02	
X	Bi-211	0.883			
	Pb-212	1.000	1.85E-01	2.52E-02	
	Bi-214	0.995	1.99E-01	2.17E-02	
	Pb-214	0.999	2.10E-01	2.46E-02	
?	Ra-226	0.996	6.22E-01	1.89E-01	
	Ac-228	0.996	2.04E-01	2.76E-02	
?	U-235	0.987	3.96E-02	1.20E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 10-Jul-19-10009

L1-10220H-QJGS-004SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/10/2019 2:41:46PM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	5.44E-02	3.85E-02	3.85E-02
+	BE-7	477.60	*	10.44	2.00E-01	2.07E-01	2.07E-01
+	K-40	1460.82	*	10.66	6.17E+00	2.06E-01	2.06E-01
	Mn-54	834.85		99.98	1.31E-03	2.88E-02	2.88E-02
+	Co-60	1173.23	*	99.85	6.56E-02	2.62E-02	2.62E-02
		1332.49	*	99.98	3.99E-02		2.63E-02
	Nb-94	702.65		99.81	-7.23E-04	2.70E-02	2.79E-02
		871.09		99.89	-5.58E-03		2.70E-02
	Ag-108m	79.13		6.60	4.99E-01	2.80E-02	8.18E-01
		433.94		90.50	-1.03E-02		2.80E-02
		614.28		89.80	-2.63E-02		3.98E-02
		722.94		90.80	-8.79E-05		3.48E-02
	Sb-125	176.31		6.84	2.79E-02	9.30E-02	3.75E-01
		380.45		1.52	-7.26E-01		1.64E+00
		427.87		29.60	6.71E-02		9.30E-02
		463.36		10.49	9.76E-02		2.80E-01
		600.60		17.65	-9.16E-02		1.45E-01
		606.71		4.98	-1.48E-02		9.22E-01
		635.95		11.22	9.63E-02		2.52E-01

Analysis Report for 10-Jul-19-10009

L1-10220H-QJGS-004SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-8.12E-02	9.30E-02	1.38E+00
	Ba-133	79.61		2.65	9.25E-02	5.73E-02	1.88E+00
		81.00		32.90	-2.27E-01		1.26E-01
		276.40		7.16	-9.99E-02		3.30E-01
		302.85		18.34	4.09E-02		1.34E-01
		356.01		62.05	-2.71E-02		5.73E-02
		383.85		8.94	1.06E-02		2.89E-01
	Cs-134	475.36		1.48	-6.23E-01	3.55E-02	2.13E+00
		563.25		8.34	-6.99E-02		2.77E-01
		569.33		15.37	-5.66E-03		1.79E-01
		604.72		97.62	-2.47E-03		3.99E-02
		795.86		85.46	1.39E-02		3.55E-02
		801.95		8.69	-2.81E-01		3.06E-01
		1038.61		0.99	2.77E+00		3.53E+00
		1167.97		1.79	-3.83E+00		2.59E+00
		1365.19		3.02	-1.50E-01		8.73E-01
+	Cs-137	661.66	*	85.10	4.74E-01	3.01E-02	3.01E-02
	Eu-152	121.78		28.67	2.60E-03	8.41E-02	8.41E-02
		244.70		7.61	-4.81E-02		3.61E-01
		295.94		0.45	-1.82E+00		6.26E+00
		344.28		26.60	-6.28E-03		1.01E-01
		367.79		0.86	-4.99E-01		2.85E+00
		411.12		2.24	-2.34E-01		1.15E+00
		443.96		2.83	2.03E-01		9.82E-01
		488.68		0.42	1.22E+00		6.37E+00
		563.99		0.49	-9.43E-01		4.77E+00
		586.26		0.46	-4.89E+00		8.91E+00
		678.62		0.47	2.10E+00		5.61E+00
		688.67		0.86	1.00E+00		3.14E+00
		719.35		0.28	-9.31E-01		1.04E+01
		778.90		12.96	-5.19E-02		1.93E-01
		810.45		0.32	-2.86E+00		7.75E+00
		867.37		4.26	7.32E-02		6.80E-01
		919.33		0.43	-8.20E+00		6.34E+00
		964.08		14.65	-1.80E-01		2.59E-01
		1085.87		10.24	-1.45E-01		3.20E-01
		1089.74		1.73	2.89E-02		1.95E+00
		1112.07		13.69	-7.12E-02		2.31E-01
		1212.95		1.43	-8.79E-01		2.64E+00
		1249.94		0.19	-1.17E+00		1.83E+01
		1299.14		1.63	-1.01E+00		1.74E+00
		1408.01		21.07	6.65E-02		1.28E-01
		1457.64		0.50	-2.31E+00		2.64E+01
		1528.10		0.28	-1.61E+00		7.52E+00
	Eu-154	123.07		40.40	-1.15E-02	5.88E-02	5.88E-02
		247.93		6.89	-1.07E-01		3.42E-01
		591.76		4.95	2.89E-01		5.78E-01
		692.42		1.78	1.49E-01		1.50E+00
		723.30		20.06	6.01E-02		1.63E-01
		756.80		4.52	2.11E-01		6.57E-01
		873.18		12.08	7.90E-03		2.26E-01

Analysis Report for 10-Jul-19-10009

L1-10220H-QJGS-004SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	2.27E-01	5.88E-02	3.09E-01
		1004.76		18.01	5.50E-02		1.88E-01
		1274.43		34.80	-4.61E-02		9.22E-02
		1596.48		1.80	-4.20E-01		1.43E+00
	Eu-155	45.30		1.31	4.25E+00	1.22E-01	8.26E+00
		60.01		1.22	-1.76E+00		8.65E+00
		86.55		30.70	1.66E-02		1.22E-01
		105.31		21.10	-3.79E-02		1.26E-01
+	Ra-226	186.21	*	3.64	6.22E-01	5.92E-01	5.92E-01
	Pa-231	27.36		10.30	6.15E-01	7.94E-01	7.94E-01
		283.69		1.70	-9.80E-02		1.44E+00
		300.07		2.47	-4.20E-01		9.61E-01
		302.65		2.20	3.40E-01		1.12E+00
		330.06		1.40	1.54E-01		1.99E+00
+	U-235	143.76		10.96	7.42E-02	3.77E-02	2.21E-01
		163.33		5.08	3.54E-02		5.07E-01
		185.71	*	57.20	3.96E-02		3.77E-02
		202.11		1.08	-1.05E+00		2.32E+00
		205.31		5.01	-5.71E-01		4.84E-01
	Am-241	59.54		35.90	-6.50E-02	3.04E-01	3.04E-01

+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 05-Aug-19-10029

L1-10220H-FJGS-004SB

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 05-Aug-19-10029
Sample Description	: L1-10220H-FJGS-004SB
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.689E+03 grams
Facility	: Default
Sample Taken On	: 8/1/2019 8:35:00AM
Acquisition Started	: 8/5/2019 2:16:40PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 8/5/2019
Efficiency Calibration Description	:
Sample Number	: 78496
Fill Height	: 1689.42 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/5/2019 2:32:00PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Analysis Report for 05-Aug-19-10029

L1-10220H-FJGS-004SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.68	946 -	960	955.20	1.17E+02	16.81	5.80E+01	1.02
2	338.32	1348 -	1359	1353.33	3.23E+01	9.78	2.47E+01	0.80
3	351.97	1400 -	1415	1407.88	6.35E+01	12.11	2.65E+01	1.17
4	583.10	2327 -	2339	2331.73	4.34E+01	8.90	1.36E+01	0.36
5	609.29	2427 -	2443	2436.42	5.61E+01	8.98	7.89E+00	1.32
6	1460.60	5831 -	5855	5842.75	3.01E+02	18.01	5.90E+00	1.90

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82	*	10.66	6.14E+00	4.54E-01
Tl-208	0.99	583.19	*	85.00	6.09E-02	1.30E-02
Bi-211	0.87	351.07	*	13.02	4.16E-01	8.59E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.81E-01	2.97E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	1.51E-01	2.59E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		

Analysis Report for 05-Aug-19-10029

L1-10220H-FJGS-004SB

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	1.00	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	1.52E-01	3.14E-02
		785.96		1.06		
Ac-228	0.57	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	2.37E-01	7.45E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20		25.80		
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 05-Aug-19-10029

L1-10220H-FJGS-004SB

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.992	6.14E+00	4.54E-01	
	Tl-208	0.999	6.09E-02	1.30E-02	
?	Bi-211	0.878	4.16E-01	8.59E-02	
	Pb-212	1.000	1.81E-01	2.97E-02	
	Bi-214	1.000	1.51E-01	2.59E-02	
?	Pb-214	1.000	1.52E-01	3.14E-02	
	Ac-228	0.571	2.37E-01	7.45E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 05-Aug-19-10029

L1-10220H-FJGS-004SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/5/2019 2:32:00PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	6.07E-02	5.41E-02	5.41E-02
	BE-7	477.60		10.44	-1.03E-01	3.43E-01	3.43E-01
+	K-40	1460.82	*	10.66	6.14E+00	3.94E-01	3.94E-01
	Mn-54	834.85		99.98	1.77E-02	4.68E-02	4.68E-02
	Co-60	1173.23		99.85	3.64E-03	4.61E-02	5.64E-02
		1332.49		99.98	2.06E-02		4.61E-02
	Nb-94	702.65		99.81	-1.75E-02	3.68E-02	4.04E-02
		871.09		99.89	1.04E-02		3.68E-02
	Ag-108m	79.13		6.60	-3.08E-01	4.10E-02	1.37E+00
		433.94		90.50	7.09E-03		4.10E-02
		614.28		89.80	-5.07E-02		6.28E-02
		722.94		90.80	-3.02E-03		5.18E-02
	Sb-125	176.31		6.84	-2.30E-01	1.24E-01	4.65E-01
		380.45		1.52	-1.11E+00		2.00E+00
		427.87		29.60	5.15E-02		1.24E-01
		463.36		10.49	3.65E-01		3.50E-01
		600.60		17.65	6.85E-02		2.44E-01
		606.71		4.98	1.08E+00		1.17E+00
		635.95		11.22	3.38E-01		3.29E-01

Analysis Report for 05-Aug-19-10029

L1-10220H-FJGS-004SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	4.05E-01	1.24E-01	2.56E+00
Ba-133	79.61	2.65	-7.88E-01	7.04E-02	3.29E+00
	81.00	32.90	-4.77E-01		2.15E-01
	276.40	7.16	-2.01E-01		4.61E-01
	302.85	18.34	8.49E-02		1.72E-01
	356.01	62.05	2.82E-03		7.04E-02
	383.85	8.94	1.85E-01		3.58E-01
Cs-134	475.36	1.48	1.25E-01	4.76E-02	2.24E+00
	563.25	8.34	2.15E-01		4.97E-01
	569.33	15.37	-1.35E-01		2.54E-01
	604.72	97.62	-9.07E-03		5.47E-02
	795.86	85.46	1.89E-03		4.76E-02
	801.95	8.69	3.80E-02		5.22E-01
	1038.61	0.99	-1.94E+00		5.13E+00
	1167.97	1.79	1.22E+00		3.14E+00
	1365.19	3.02	-2.20E+00		1.24E+00
Cs-137	661.66	85.10	9.93E-03	5.11E-02	5.11E-02
Eu-152	121.78	28.67	-7.62E-02	1.14E-01	1.25E-01
	244.70	7.61	1.72E-01		4.99E-01
	295.94	0.45	3.66E+00		9.58E+00
	344.28	26.60	-2.35E-02		1.14E-01
	367.79	0.86	2.79E+00		3.78E+00
	411.12	2.24	7.23E-01		1.77E+00
	443.96	2.83	-8.88E-01		1.14E+00
	488.68	0.42	3.89E+00		8.77E+00
	563.99	0.49	-4.28E-01		8.24E+00
	586.26	0.46	1.30E+01		1.22E+01
	678.62	0.47	-1.29E+00		9.16E+00
	688.67	0.86	1.96E-01		4.44E+00
	719.35	0.28	8.70E+00		1.51E+01
	778.90	12.96	-8.13E-02		3.14E-01
	810.45	0.32	3.96E+00		1.14E+01
	867.37	4.26	-1.66E+00		8.20E-01
	919.33	0.43	-1.20E+01		1.04E+01
	964.08	14.65	6.20E-02		4.23E-01
	1085.87	10.24	-7.58E-02		4.24E-01
	1089.74	1.73	7.82E-01		2.68E+00
	1112.07	13.69	-2.82E-01		3.97E-01
	1212.95	1.43	-2.01E+00		4.09E+00
	1249.94	0.19	1.10E+01		3.10E+01
	1299.14	1.63	-1.72E+00		3.13E+00
	1408.01	21.07	-8.03E-02		2.16E-01
	1457.64	0.50	1.37E+02		3.81E+01
	1528.10	0.28	-5.44E+00		9.95E+00
Eu-154	123.07	40.40	5.62E-02	9.25E-02	9.25E-02
	247.93	6.89	-9.66E-02		4.76E-01
	591.76	4.95	4.72E-02		8.26E-01
	692.42	1.78	1.02E+00		2.38E+00
	723.30	20.06	-1.24E-02		2.35E-01
	756.80	4.52	1.60E-01		8.97E-01
	873.18	12.08	6.41E-02		3.05E-01

Analysis Report for 05-Aug-19-10029

L1-10220H-FJGS-004SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.19E-01	9.25E-02	5.17E-01
	1004.76	18.01	2.23E-02		2.19E-01
	1274.43	34.80	-2.68E-02		1.66E-01
	1596.48	1.80	-1.53E+00		2.34E+00
Eu-155	45.30	1.31	7.71E+00	2.01E-01	2.19E+01
	60.01	1.22	-5.57E+00		2.17E+01
	86.55	30.70	-1.95E-01		2.01E-01
	105.31	21.10	-9.82E-02		2.02E-01
Ra-226	186.21	3.64	7.36E-01	1.00E+00	1.00E+00
Pa-231	27.36	10.30	1.88E+00	1.40E+00	2.25E+00
	283.69	1.70	-9.30E-01		1.90E+00
	300.07	2.47	-2.68E+00		1.40E+00
	302.65	2.20	6.50E-01		1.44E+00
	330.06	1.40	1.07E+00		2.37E+00
U-235	143.76	10.96	4.56E-02	6.34E-02	3.24E-01
	163.33	5.08	-3.86E-01		6.57E-01
	185.71	57.20	3.88E-03		6.34E-02
	202.11	1.08	3.01E+00		3.34E+00
	205.31	5.01	-6.39E-01		6.68E-01
Am-241	59.54	35.90	-2.78E-01	7.51E-01	7.51E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

ATTACHMENT 8
EBERLINE ANALYTICAL REPORTS

EBERLINE ANALYTICAL

EBERLINE ANALYTICAL CORPORATION
601 SCARBORO ROAD
OAK RIDGE, TENNESSEE 37830
PHONE (865) 481-0683
FAX (865) 483-4621

EBS-OR-46288

November 6, 2019

Patricia Giza
Zion Solutions, LLC
2701 Deborah Avenue
Zion, IL 60099

CASE NARRATIVE
Work Order # 19-09014-OR

SAMPLE RECEIPT

This work order contains sixteen soil samples received 09/03/2019. Samples were analyzed for Total Strontium, Tritium, Nickel-63 and by Gamma Spectroscopy.

CLIENT ID	LAB ID	CLIENT ID	LAB ID
L1-10220A-FSGS-006-SS-A	19-09014-04	L1-10220H-FJGS-001-SS-A	19-09014-12
L1-10220A-FSGS-016-SS-A	19-09014-05	L1-10221D-FIGS-004-SS-A	19-09014-13
L1-10221B-FSGS-006-SS-A	19-09014-06	L1-10220H-FJGS-004-SS-A	19-09014-14
L1-10221D-FJGS-007-SS-A	19-09014-07	L1-10221D-FIGS-010-SS-A	19-09014-15
L1-10221C-FIGS-101-SS-A	19-09014-08	L1-10221D-FIGS-014-SS-A	19-09014-16
L1-10220I-FJGS-001-SS-A	19-09014-09	L1-10221D-QIGS-013-SS-A	19-09014-17
L1-10220I-FJGS-002-SS-A	19-09014-10	L1-10221D-FIGS-013-SS-A	19-09014-18
L1-10220I-FJGS-004-SS-A	19-09014-11	L1-10221D-FIGS-018-SS-A	19-09014-19

ANALYTICAL METHODS

Total Strontium was analyzed using EIChroM Method SRW01 Modified. Tritium was performed using Method LANL ER-210 Modified. Nickel-63 was performed using Method ASTM 3500-Ni Modified. Gamma Spectroscopy was performed using EPA Method 901.1 Modified.

Laboratory qualifiers are as follows:

U - Result is less than the MDA.

ANALYTICAL RESULTS

Combined Standard Uncertainty is reported at 1-sigma value.

Minimum Detectable Activity (MDA) values for data represented in this report are sample-specific. MDA measurements are determined based on factors and conditions including instrument settings, aliquot size and matrix type.

ANALYTICAL RESULTS CONTINUED

TOTAL STRONTIUM

Samples were prepared by acid digestion as appropriate for the matrix. Digested samples were acidified and selectively extracted and precipitated. Precipitates were mounted on 47mm filters. Filters were reweighed to determine aliquot size. Sample activities were determined by gas flow proportional counting.

Samples demonstrated acceptable results for all Total Strontium analyses. Strontium-90 results are reported from Total Strontium assuming secular equilibrium. Chemical recovery was acceptable for all samples. The Total Strontium method blank demonstrated an acceptable result. Results for the Total Strontium duplicate demonstrated an acceptable relative percent difference and normalized difference. Results for the Total Strontium laboratory control sample demonstrated an acceptable percent recovery.

TRITIUM

A representative aliquot of each sample was equilibrated with Tritium free water. Equilibrates were transferred into round-bottomed distillation flasks and attached to single stage stills. A portion of each middle distillation fraction was transferred to a liquid scintillation vial and cocktail was added. Samples were counted by beta liquid scintillation.

Samples demonstrated acceptable results for all Tritium analyses. The Tritium method blank demonstrated an acceptable result. Results for the Tritium duplicate demonstrated an acceptable relative percent difference and normalized difference. Results for the Tritium laboratory control sample demonstrated an acceptable percent recovery.

NICKEL-63

A representative aliquot of each sample was prepared by leaching in acids. Aliquots were placed into appropriately sized beakers. Stable elemental Nickel carrier was added to each sample prior to digestion. Samples were digested in concentrated Nitric acid. After digestion, sample pH was adjusted and Nickel-63 was precipitated selectively with Dimethylglyoxime. Precipitates were selectively separated, redissolved, and residual acid was effectively neutralized. Sample residuals were placed into scintillation vials, scintillation cocktail was added and Nickel-63 activity was determined by beta liquid scintillation.

Samples demonstrated acceptable results for all Nickel-63 analyses. The Nickel-63 method blank demonstrated an acceptable result. Results for the Nickel-63 duplicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Nickel-63 laboratory control sample demonstrated an acceptable percent recovery.

GAMMA SPECTROSCOPY

Samples for Gamma Spectroscopy analysis were prepared by transferring a known mass of each homogenized sample to a standard geometry container. Samples were counted on High Purity Germanium (HPGe) gamma ray detectors.

ANALYTICAL RESULTS CONTINUED

GAMMA SPECTROSCOPY CONTINUED

Samples demonstrated acceptable results for all gamma-emitting radionuclides as reported. The method blank demonstrated acceptable results for all radionuclides as reported. Results for the Actinium-228 and Bismuth-214 replicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Potassium-40 replicate demonstrated an acceptable relative percent difference and normalized difference. Results for the Cobalt-60 and Cesium-137 laboratory control sample demonstrated an acceptable percent recovery.

CERTIFICATION OF ACCURACY

I certify that this data report is in compliance with the terms and conditions of the Purchase Order, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the cognizant project manager or his/her designee to be accurate as verified by the following signature.

M.R. McDougall
Laboratory Manager

Date: 11/6/2019

Eberline Analytical wants and encourages your feedback regarding our performance providing radioanalytical services. Please visit http://eberlineanalytical.com/ to provide us with feedback on our services.

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09014
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	2.10E+02	7.56E+00				pCi/g
19-09014-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	2.22E+02	7.99E+00	1.48E+01	5.58E+00		pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	2.64E+00	3.31E+00	3.32E+00	5.58E+00	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	2.54E+00	3.19E+00	3.19E+00	5.38E+00	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	2.17E+00	3.17E+00	3.18E+00	5.37E+00	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	0.00E+00	3.29E+00	3.29E+00	5.71E+00	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	3.39E+00	3.34E+00	3.35E+00	5.59E+00	U	pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	-7.53E-01	3.19E+00	3.19E+00	5.58E+00	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	1.29E+00	3.21E+00	3.21E+00	5.48E+00	U	pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	-1.86E-01	3.18E+00	3.18E+00	5.53E+00	U	pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	9.21E-01	3.18E+00	3.18E+00	5.47E+00	U	pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	1.47E+00	3.19E+00	3.19E+00	5.45E+00	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	3.65E-01	3.13E+00	3.13E+00	5.41E+00	U	pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	-3.77E-01	3.20E+00	3.20E+00	5.59E+00	U	pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	5.36E-01	3.07E+00	3.07E+00	5.30E+00	U	pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	5.64E-01	3.23E+00	3.23E+00	5.58E+00	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	3.72E-01	3.19E+00	3.19E+00	5.52E+00	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	9.03E-01	3.12E+00	3.12E+00	5.36E+00	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	10/8/2019	19-09014	Tritium	LANL ER-210 Modified	1.64E+00	3.17E+00	3.17E+00	5.39E+00	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	10/8/2019	19-09014	Tritium	LANL ER-210 Modified	0.00E+00	3.16E+00	3.16E+00	5.49E+00	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09014
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	10/23/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	1.48E+03	4.44E+01				pCi/g
19-09014-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	10/23/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	1.47E+03	1.28E+01	8.75E+01	3.23E+00		pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	10/23/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-2.24E+00	1.85E+00	1.85E+00	3.29E+00	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-1.49E+00	1.90E+00	1.91E+00	3.36E+00	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-3.48E-01	1.92E+00	1.92E+00	3.33E+00	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-6.21E-01	1.95E+00	1.95E+00	3.40E+00	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-1.50E+00	1.92E+00	1.92E+00	3.38E+00	U	pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	3.04E+00	2.13E+00	2.14E+00	3.52E+00	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	6.32E-01	2.03E+00	2.03E+00	3.46E+00	U	pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	9.16E-01	2.06E+00	2.06E+00	3.51E+00	U	pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-1.46E+00	1.87E+00	1.87E+00	3.30E+00	U	pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-3.55E-01	1.96E+00	1.96E+00	3.40E+00	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-2.69E-01	1.98E+00	1.98E+00	3.43E+00	U	pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	7.63E-01	2.14E+00	2.14E+00	3.65E+00	U	pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-2.75E-01	2.03E+00	2.03E+00	3.50E+00	U	pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	2.67E+00	2.12E+00	2.13E+00	3.53E+00	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-1.05E+00	1.92E+00	1.92E+00	3.37E+00	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-1.24E+00	1.93E+00	1.94E+00	3.39E+00	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-1.13E+00	2.07E+00	2.07E+00	3.61E+00	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-2.87E-01	2.12E+00	2.12E+00	3.66E+00	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09014
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	10/11/2019	19-09014	Strontium-90	EIChroM SRW01 Modified	5.02E+01	2.81E-01				pCi/g
19-09014-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	10/11/2019	19-09014	Strontium-90	EIChroM SRW01 Modified	4.89E+01	2.65E+00	1.72E+01	1.14E+00		pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	10/11/2019	19-09014	Strontium-90	EIChroM SRW01 Modified	5.74E-02	3.43E-01	3.44E-01	8.73E-01	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	10/11/2019	19-09014	Strontium-90	EIChroM SRW01 Modified	3.09E-01	3.75E-01	3.90E-01	9.22E-01	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	10/11/2019	19-09014	Strontium-90	EIChroM SRW01 Modified	2.51E-01	3.65E-01	3.76E-01	9.04E-01	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	10/11/2019	19-09014	Strontium-90	EIChroM SRW01 Modified	5.41E-02	3.51E-01	3.51E-01	8.91E-01	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	10/11/2019	19-09014	Strontium-90	EIChroM SRW01 Modified	5.69E-02	3.44E-01	3.44E-01	8.75E-01	U	pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	10/11/2019	19-09014	Strontium-90	EIChroM SRW01 Modified	7.41E-01	3.63E-01	4.45E-01	8.34E-01	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	10/11/2019	19-09014	Strontium-90	EIChroM SRW01 Modified	3.55E-01	3.07E-01	3.31E-01	7.39E-01	U	pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	10/11/2019	19-09014	Strontium-90	EIChroM SRW01 Modified	1.50E-01	3.24E-01	3.28E-01	8.12E-01	U	pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	10/11/2019	19-09014	Strontium-90	EIChroM SRW01 Modified	6.18E-01	3.44E-01	4.06E-01	8.02E-01	U	pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	10/11/2019	19-09014	Strontium-90	EIChroM SRW01 Modified	-2.22E-01	3.35E-01	3.43E-01	8.90E-01	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	10/11/2019	19-09014	Strontium-90	EIChroM SRW01 Modified	1.73E-01	2.97E-01	3.03E-01	7.40E-01	U	pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	10/11/2019	19-09014	Strontium-90	EIChroM SRW01 Modified	1.98E-01	3.63E-01	3.69E-01	9.06E-01	U	pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	10/11/2019	19-09014	Strontium-90	EIChroM SRW01 Modified	1.14E-02	4.30E-01	4.30E-01	1.10E+00	U	pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	10/11/2019	19-09014	Strontium-90	EIChroM SRW01 Modified	4.57E-01	4.70E-01	4.96E-01	1.14E+00	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	10/11/2019	19-09014	Strontium-90	EIChroM SRW01 Modified	3.49E-01	3.29E-01	3.50E-01	7.96E-01	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	10/11/2019	19-09014	Strontium-90	EIChroM SRW01 Modified	-2.54E-01	4.10E-01	4.19E-01	1.08E+00	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	10/11/2019	19-09014	Strontium-90	EIChroM SRW01 Modified	-2.51E-01	3.85E-01	3.95E-01	1.02E+00	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	10/11/2019	19-09014	Strontium-90	EIChroM SRW01 Modified	2.38E-01	3.78E-01	3.87E-01	9.38E-01	U	pCi/g
19-09014-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Cobalt-60	EPA 901.1 Modified	1.31E+02	5.10E+00				pCi/g
19-09014-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Cesium-137	EPA 901.1 Modified	8.26E+01	3.39E+00				pCi/g
19-09014-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Cobalt-60	EPA 901.1 Modified	1.42E+02	1.03E+01	1.26E+01	8.42E-01		pCi/g
19-09014-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Cesium-137	EPA 901.1 Modified	8.52E+01	9.33E+00	1.03E+01	1.06E+00		pCi/g

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Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09014
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Actinium-228	EPA 901.1 Modified	0.00E+00	2.37E-02	2.37E-02	1.44E-01	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Silver-108m	EPA 901.1 Modified	-1.14E-02	2.38E-02	2.38E-02	3.47E-02	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Americium-241	EPA 901.1 Modified	-3.44E-02	3.62E-02	3.62E-02	4.79E-02	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Barium-133	EPA 901.1 Modified	3.91E-03	1.33E-02	1.33E-02	3.53E-02	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Bismuth-214	EPA 901.1 Modified	9.17E-03	5.74E-02	5.74E-02	8.51E-02	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Cobalt-60	EPA 901.1 Modified	2.28E-02	2.23E-02	2.23E-02	4.21E-02	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Cesium-134	EPA 901.1 Modified	-2.55E-04	3.00E-02	3.00E-02	4.13E-02	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Cesium-137	EPA 901.1 Modified	3.29E-02	2.18E-02	2.19E-02	4.69E-02	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Europium-152	EPA 901.1 Modified	-1.96E-02	6.80E-02	6.80E-02	6.10E-02	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Europium-154	EPA 901.1 Modified	-3.63E-02	1.07E-01	1.07E-01	3.11E-02	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Europium-155	EPA 901.1 Modified	2.98E-03	2.92E-02	2.92E-02	4.33E-02	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Holmium-166m	EPA 901.1 Modified	8.86E-03	4.01E-02	4.01E-02	3.07E-02	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Iodine-129	EPA 901.1 Modified	-4.39E-02	1.11E-01	1.11E-01	1.58E-01	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Potassium-40	EPA 901.1 Modified	-7.77E-02	3.50E-01	3.50E-01	4.67E-01	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Manganese-54	EPA 901.1 Modified	1.54E-02	1.33E-02	1.33E-02	1.85E-02	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	-5.12E-04	1.89E-02	1.89E-02	3.19E-02	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Niobium-94	EPA 901.1 Modified	1.95E-03	1.86E-02	1.86E-02	3.40E-02	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Lead-210	EPA 901.1 Modified	2.80E-01	4.00E-01	4.00E-01	6.21E-01	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Lead-212	EPA 901.1 Modified	3.43E-02	3.83E-02	3.84E-02	6.37E-02	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Lead-214	EPA 901.1 Modified	1.83E-02	3.66E-02	3.66E-02	6.35E-02	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Promethium-145	EPA 901.1 Modified	-1.35E-02	7.26E-02	7.26E-02	1.06E-01	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Radium-226	EPA 901.1 Modified	9.17E-03	5.74E-02	5.74E-02	8.51E-02	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Antimony-125	EPA 901.1 Modified	0.00E+00	7.32E-02	7.32E-02	1.06E-01	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Thorium-234	EPA 901.1 Modified	2.20E-01	2.84E-01	2.84E-01	4.46E-01	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Thallium-208	EPA 901.1 Modified	1.93E-02	6.39E-02	6.39E-02	1.03E-01	U	pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Uranium-235	EPA 901.1 Modified	1.11E-02	9.55E-02	9.55E-02	1.47E-01	U	pCi/g

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Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09014
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Actinium-228	EPA 901.1 Modified	2.63E-01	1.89E-01	1.90E-01	3.60E-01	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Silver-108m	EPA 901.1 Modified	1.36E-02	5.48E-02	5.48E-02	5.68E-02	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Americium-241	EPA 901.1 Modified	-7.23E-02	8.08E-02	8.09E-02	1.11E-01	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Barium-133	EPA 901.1 Modified	-1.00E-02	1.58E-02	1.58E-02	1.18E-01	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Bismuth-214	EPA 901.1 Modified	3.07E-01	1.38E-01	1.39E-01	2.55E-01		pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Cobalt-60	EPA 901.1 Modified	5.68E-02	6.05E-02	6.05E-02	6.81E-02	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Cesium-134	EPA 901.1 Modified	4.14E-03	2.18E-02	2.18E-02	8.21E-02	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Cesium-137	EPA 901.1 Modified	5.03E-02	6.22E-02	6.22E-02	9.83E-02	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Europium-152	EPA 901.1 Modified	8.87E-03	9.18E-02	9.18E-02	1.71E-01	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Europium-154	EPA 901.1 Modified	3.58E-02	1.57E-01	1.57E-01	8.78E-02	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Europium-155	EPA 901.1 Modified	6.44E-02	9.02E-02	9.03E-02	1.36E-01	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Holmium-166m	EPA 901.1 Modified	1.41E-02	9.84E-02	9.84E-02	6.12E-02	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Iodine-129	EPA 901.1 Modified	-5.87E-02	5.95E-02	5.95E-02	8.19E-02	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Potassium-40	EPA 901.1 Modified	7.14E+00	1.23E+00	1.28E+00	2.83E-01		pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Manganese-54	EPA 901.1 Modified	-2.38E-02	7.39E-02	7.40E-02	1.14E-01	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	2.52E-02	4.51E-02	4.52E-02	6.20E-02	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Niobium-94	EPA 901.1 Modified	1.75E-02	3.89E-02	3.89E-02	6.96E-02	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Lead-210	EPA 901.1 Modified	8.69E-01	6.32E-01	6.33E-01	9.95E-01	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Lead-212	EPA 901.1 Modified	4.05E-01	1.16E-01	1.18E-01	1.45E-01		pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Lead-214	EPA 901.1 Modified	3.31E-01	1.27E-01	1.28E-01	2.43E-01		pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Promethium-145	EPA 901.1 Modified	1.48E-02	7.13E-02	7.13E-02	1.06E-01	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Radium-226	EPA 901.1 Modified	3.07E-01	1.38E-01	1.39E-01	2.55E-01		pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Antimony-125	EPA 901.1 Modified	3.34E-02	1.29E-01	1.29E-01	1.88E-01	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Thorium-234	EPA 901.1 Modified	1.04E+00	7.09E-01	7.11E-01	1.11E+00	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Thallium-208	EPA 901.1 Modified	3.39E-01	1.41E-01	1.42E-01	1.11E-01		pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Uranium-235	EPA 901.1 Modified	1.94E-02	2.18E-01	2.18E-01	3.25E-01	U	pCi/g

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Final Report of Analysis

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Work Order Details:
SDG: 19-09014
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Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Actinium-228	EPA 901.1 Modified	4.09E-01	2.16E-01	2.17E-01	4.37E-01	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Silver-108m	EPA 901.1 Modified	3.50E-03	5.33E-02	5.33E-02	6.64E-02	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Americium-241	EPA 901.1 Modified	-5.86E-02	8.20E-02	8.20E-02	1.11E-01	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Barium-133	EPA 901.1 Modified	-3.15E-03	2.97E-02	2.97E-02	1.31E-01	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Bismuth-214	EPA 901.1 Modified	4.84E-01	1.37E-01	1.39E-01	2.04E-01		pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Cobalt-60	EPA 901.1 Modified	3.65E-02	5.87E-02	5.87E-02	9.00E-02	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Cesium-134	EPA 901.1 Modified	1.14E-03	2.70E-02	2.70E-02	1.04E-01	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Cesium-137	EPA 901.1 Modified	5.87E-02	6.90E-02	6.91E-02	1.09E-01	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Europium-152	EPA 901.1 Modified	0.00E+00	6.59E-02	6.59E-02	1.78E-01	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Europium-154	EPA 901.1 Modified	-6.96E-03	1.00E-01	1.00E-01	9.05E-02	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Europium-155	EPA 901.1 Modified	1.15E-01	1.21E-01	1.21E-01	1.84E-01	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Holmium-166m	EPA 901.1 Modified	-3.66E-02	1.15E-01	1.15E-01	6.79E-02	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Iodine-129	EPA 901.1 Modified	-3.28E-02	5.93E-02	5.93E-02	8.41E-02	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Potassium-40	EPA 901.1 Modified	8.14E+00	1.46E+00	1.52E+00	9.75E-01		pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Manganese-54	EPA 901.1 Modified	4.05E-02	5.30E-02	5.30E-02	9.93E-02	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	-5.41E-02	6.35E-02	6.35E-02	6.87E-02	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Niobium-94	EPA 901.1 Modified	8.64E-03	5.32E-02	5.32E-02	8.66E-02	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Lead-210	EPA 901.1 Modified	8.04E-01	7.38E-01	7.39E-01	1.22E+00	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Lead-212	EPA 901.1 Modified	4.68E-01	1.24E-01	1.26E-01	1.80E-01		pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Lead-214	EPA 901.1 Modified	3.56E-01	1.04E-01	1.05E-01	1.95E-01		pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Promethium-145	EPA 901.1 Modified	-7.31E-03	7.14E-02	7.14E-02	1.04E-01	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Radium-226	EPA 901.1 Modified	4.84E-01	1.37E-01	1.39E-01	2.04E-01		pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Antimony-125	EPA 901.1 Modified	1.80E-01	1.47E-01	1.48E-01	2.38E-01	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Thorium-234	EPA 901.1 Modified	4.15E-01	7.44E-01	7.44E-01	1.11E+00	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Thallium-208	EPA 901.1 Modified	2.79E-01	1.45E-01	1.46E-01	2.56E-01		pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Uranium-235	EPA 901.1 Modified	-7.62E-02	2.51E-01	2.51E-01	3.64E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09014
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Actinium-228	EPA 901.1 Modified	-6.64E-02	3.42E-01	3.42E-01	5.00E-01	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Silver-108m	EPA 901.1 Modified	6.57E-03	7.15E-02	7.15E-02	6.71E-02	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Americium-241	EPA 901.1 Modified	4.38E-02	9.86E-02	9.87E-02	1.32E-01	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Barium-133	EPA 901.1 Modified	-1.21E-01	9.02E-02	9.04E-02	9.82E-02	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Bismuth-214	EPA 901.1 Modified	2.17E-01	1.13E-01	1.14E-01	2.07E-01		pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Cobalt-60	EPA 901.1 Modified	5.75E+00	4.53E-01	5.41E-01	1.52E-01		pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Cesium-134	EPA 901.1 Modified	9.15E-03	3.89E-02	3.90E-02	7.68E-02	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Cesium-137	EPA 901.1 Modified	4.39E-02	7.07E-02	7.07E-02	1.10E-01	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Europium-152	EPA 901.1 Modified	3.99E-02	1.90E-01	1.90E-01	1.89E-01	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Europium-154	EPA 901.1 Modified	-8.82E-03	1.33E-01	1.33E-01	9.91E-02	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Europium-155	EPA 901.1 Modified	1.34E-01	1.01E-01	1.02E-01	1.35E-01	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Holmium-166m	EPA 901.1 Modified	6.93E-02	1.17E-01	1.17E-01	6.81E-02	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Iodine-129	EPA 901.1 Modified	2.68E+00	1.14E+01	1.14E+01	3.11E+00	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Potassium-40	EPA 901.1 Modified	8.61E+00	1.42E+00	1.48E+00	1.15E+00		pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Manganese-54	EPA 901.1 Modified	-5.09E-02	9.84E-02	9.84E-02	1.39E-01	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	3.59E-02	5.77E-02	5.78E-02	6.00E-02	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Niobium-94	EPA 901.1 Modified	-2.34E-02	8.34E-02	8.34E-02	9.32E-02	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Lead-210	EPA 901.1 Modified	3.24E-01	1.31E+00	1.31E+00	2.03E+00	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Lead-212	EPA 901.1 Modified	2.80E-01	8.48E-02	8.60E-02	2.33E-01		pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Lead-214	EPA 901.1 Modified	3.58E-01	1.49E-01	1.50E-01	3.02E-01		pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Promethium-145	EPA 901.1 Modified	-1.24E-02	5.96E-01	5.96E-01	8.82E-01	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Radium-226	EPA 901.1 Modified	2.17E-01	1.13E-01	1.14E-01	2.07E-01		pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Antimony-125	EPA 901.1 Modified	-5.77E-03	1.30E-01	1.30E-01	2.15E-01	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Thorium-234	EPA 901.1 Modified	3.44E-01	9.50E-01	9.50E-01	1.26E+00	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Thallium-208	EPA 901.1 Modified	1.68E-01	8.34E-02	8.39E-02	1.21E-01		pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Uranium-235	EPA 901.1 Modified	9.70E-02	3.21E-01	3.21E-01	4.22E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09014
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Actinium-228	EPA 901.1 Modified	5.11E-01	1.87E-01	1.89E-01	3.85E-01		pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Silver-108m	EPA 901.1 Modified	1.76E-02	2.91E-02	2.92E-02	5.69E-02	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Americium-241	EPA 901.1 Modified	-8.90E-02	6.88E-02	6.89E-02	9.10E-02	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Barium-133	EPA 901.1 Modified	5.52E-02	6.72E-02	6.72E-02	9.41E-02	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Bismuth-214	EPA 901.1 Modified	3.08E-01	1.31E-01	1.32E-01	2.18E-01		pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Cobalt-60	EPA 901.1 Modified	2.72E-02	7.05E-02	7.05E-02	1.18E-01	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Cesium-134	EPA 901.1 Modified	-1.37E-01	7.81E-02	7.84E-02	7.73E-02	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Cesium-137	EPA 901.1 Modified	2.83E-01	8.00E-02	8.13E-02	1.05E-01		pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Europium-152	EPA 901.1 Modified	7.03E-03	1.35E-01	1.35E-01	1.45E-01	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Europium-154	EPA 901.1 Modified	-7.31E-02	2.04E-01	2.04E-01	7.30E-02	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Europium-155	EPA 901.1 Modified	1.15E-01	6.86E-02	6.88E-02	1.30E-01	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Holmium-166m	EPA 901.1 Modified	6.99E-03	7.81E-02	7.81E-02	5.61E-02	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Iodine-129	EPA 901.1 Modified	1.89E-01	1.76E-01	1.77E-01	2.55E-01	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Potassium-40	EPA 901.1 Modified	1.15E+01	2.44E+00	2.52E+00	1.54E+00		pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Manganese-54	EPA 901.1 Modified	1.63E-02	4.87E-02	4.87E-02	8.39E-02	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	-1.84E-02	4.08E-02	4.08E-02	6.24E-02	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Niobium-94	EPA 901.1 Modified	8.98E-03	4.19E-02	4.19E-02	6.52E-02	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Lead-210	EPA 901.1 Modified	1.02E+00	8.62E-01	8.63E-01	1.42E+00	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Lead-212	EPA 901.1 Modified	3.75E-01	7.82E-02	8.06E-02	1.43E-01		pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Lead-214	EPA 901.1 Modified	2.43E-01	9.97E-02	1.00E-01	1.77E-01		pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Promethium-145	EPA 901.1 Modified	1.55E-01	1.09E-01	1.09E-01	1.68E-01	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Radium-226	EPA 901.1 Modified	3.08E-01	1.31E-01	1.32E-01	2.18E-01		pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Antimony-125	EPA 901.1 Modified	6.40E-02	1.34E-01	1.34E-01	1.99E-01	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Thorium-234	EPA 901.1 Modified	6.57E-01	5.63E-01	5.64E-01	8.70E-01	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Thallium-208	EPA 901.1 Modified	3.32E-01	1.65E-01	1.66E-01	2.56E-01		pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Uranium-235	EPA 901.1 Modified	1.02E-01	1.91E-01	1.91E-01	2.94E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:	Work Order Details:	
Patricia Giza	SDG:	19-09014
Zion Solutions	Purchase Order:	677118
2701 Deborah Ave	Analysis Category:	ENVIRONMENTAL
Zion, IL 60099	Sample Matrix:	SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Actinium-228	EPA 901.1 Modified	1.13E+00	5.38E-01	5.41E-01	1.00E+00		pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Silver-108m	EPA 901.1 Modified	1.01E-01	1.31E-01	1.31E-01	2.22E-01	U	pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Americium-241	EPA 901.1 Modified	-2.62E-01	2.00E-01	2.00E-01	2.68E-01	U	pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Barium-133	EPA 901.1 Modified	3.76E-03	9.79E-02	9.79E-02	3.25E-01	U	pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Bismuth-214	EPA 901.1 Modified	1.33E+00	3.56E-01	3.63E-01	5.62E-01		pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Cobalt-60	EPA 901.1 Modified	2.16E+00	2.38E-01	2.63E-01	2.65E-01		pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Cesium-134	EPA 901.1 Modified	3.45E-02	9.81E-02	9.81E-02	2.43E-01	U	pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Cesium-137	EPA 901.1 Modified	1.06E+01	1.22E+00	1.34E+00	4.28E-01		pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Europium-152	EPA 901.1 Modified	9.64E-02	4.29E-01	4.29E-01	4.73E-01	U	pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Europium-154	EPA 901.1 Modified	-5.54E-03	3.40E-01	3.40E-01	2.46E-01	U	pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Europium-155	EPA 901.1 Modified	1.18E-01	2.38E-01	2.38E-01	3.47E-01	U	pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Holmium-166m	EPA 901.1 Modified	-4.99E-02	2.50E-01	2.50E-01	1.76E-01	U	pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Iodine-129	EPA 901.1 Modified	2.72E-01	1.70E-01	1.70E-01	2.58E-01	U	pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Potassium-40	EPA 901.1 Modified	2.04E+01	3.08E+00	3.26E+00	1.58E+00		pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Manganese-54	EPA 901.1 Modified	2.28E-01	2.00E-01	2.00E-01	3.28E-01	U	pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	5.87E-02	1.33E-01	1.33E-01	1.44E-01	U	pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Niobium-94	EPA 901.1 Modified	-6.49E-02	1.38E-01	1.38E-01	1.89E-01	U	pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Lead-210	EPA 901.1 Modified	1.73E+00	1.61E+00	1.61E+00	2.68E+00	U	pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Lead-212	EPA 901.1 Modified	1.66E+00	4.04E-01	4.13E-01	6.09E-01		pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Lead-214	EPA 901.1 Modified	1.27E+00	3.53E-01	3.59E-01	6.33E-01		pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Promethium-145	EPA 901.1 Modified	-9.67E-03	1.29E-01	1.29E-01	2.92E-01	U	pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Radium-226	EPA 901.1 Modified	1.33E+00	3.56E-01	3.63E-01	5.62E-01		pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Antimony-125	EPA 901.1 Modified	1.38E-02	5.91E-01	5.91E-01	7.98E-01	U	pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Thorium-234	EPA 901.1 Modified	1.85E+00	1.78E+00	1.78E+00	2.67E+00	U	pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Thallium-208	EPA 901.1 Modified	6.93E-01	3.05E-01	3.07E-01	4.94E-01		pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Uranium-235	EPA 901.1 Modified	-9.70E-02	5.90E-01	5.90E-01	9.50E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:	Work Order Details:	
Patricia Giza	SDG:	19-09014
Zion Solutions	Purchase Order:	677118
2701 Deborah Ave	Analysis Category:	ENVIRONMENTAL
Zion, IL 60099	Sample Matrix:	SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Actinium-228	EPA 901.1 Modified	2.38E-01	1.61E-01	1.61E-01	3.01E-01	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Silver-108m	EPA 901.1 Modified	-3.49E-02	4.12E-02	4.13E-02	5.38E-02	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Americium-241	EPA 901.1 Modified	-1.85E-02	9.80E-02	9.80E-02	1.25E-01	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Barium-133	EPA 901.1 Modified	-6.08E-03	3.10E-02	3.10E-02	7.91E-02	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Bismuth-214	EPA 901.1 Modified	3.04E-01	1.08E-01	1.09E-01	1.84E-01		pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Cobalt-60	EPA 901.1 Modified	2.45E-01	5.59E-02	5.73E-02	6.76E-02		pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Cesium-134	EPA 901.1 Modified	1.30E-02	2.24E-02	2.24E-02	5.57E-02	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Cesium-137	EPA 901.1 Modified	1.06E+00	1.48E-01	1.58E-01	1.07E-01		pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Europium-152	EPA 901.1 Modified	1.06E-01	1.78E-01	1.78E-01	1.67E-01	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Europium-154	EPA 901.1 Modified	-4.58E-02	1.26E-01	1.26E-01	8.65E-02	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Europium-155	EPA 901.1 Modified	1.10E-01	9.50E-02	9.52E-02	1.30E-01	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Holmium-166m	EPA 901.1 Modified	-7.37E-03	7.15E-02	7.15E-02	6.64E-02	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Iodine-129	EPA 901.1 Modified	1.28E-01	3.64E+00	3.64E+00	3.38E+00	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Potassium-40	EPA 901.1 Modified	7.85E+00	1.46E+00	1.51E+00	1.35E+00		pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Manganese-54	EPA 901.1 Modified	6.31E-04	4.73E-02	4.73E-02	7.42E-02	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	-3.75E-03	3.59E-02	3.59E-02	5.52E-02	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Niobium-94	EPA 901.1 Modified	2.44E-02	3.43E-02	3.43E-02	5.41E-02	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Lead-210	EPA 901.1 Modified	5.86E-01	1.43E+00	1.43E+00	2.27E+00	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Lead-212	EPA 901.1 Modified	4.83E-01	1.18E-01	1.21E-01	1.53E-01		pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Lead-214	EPA 901.1 Modified	2.92E-01	1.38E-01	1.39E-01	2.14E-01		pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Promethium-145	EPA 901.1 Modified	9.00E-02	6.58E-01	6.58E-01	9.89E-01	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Radium-226	EPA 901.1 Modified	3.04E-01	1.08E-01	1.09E-01	1.84E-01		pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Antimony-125	EPA 901.1 Modified	5.47E-02	1.02E-01	1.02E-01	1.80E-01	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Thorium-234	EPA 901.1 Modified	3.83E-01	8.84E-01	8.84E-01	1.20E+00	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Thallium-208	EPA 901.1 Modified	1.58E-01	7.33E-02	7.37E-02	9.59E-02		pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Uranium-235	EPA 901.1 Modified	-2.78E-02	2.90E-01	2.90E-01	3.74E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09014
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Actinium-228	EPA 901.1 Modified	8.08E-01	2.63E-01	2.67E-01	7.55E-01		pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Silver-108m	EPA 901.1 Modified	-2.41E-02	8.09E-02	8.09E-02	1.25E-01	U	pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Americium-241	EPA 901.1 Modified	-1.13E-01	1.15E-01	1.15E-01	1.59E-01	U	pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Barium-133	EPA 901.1 Modified	1.39E-02	4.28E-02	4.28E-02	1.81E-01	U	pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Bismuth-214	EPA 901.1 Modified	6.70E-01	2.35E-01	2.37E-01	3.66E-01		pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Cobalt-60	EPA 901.1 Modified	5.89E-01	1.31E-01	1.34E-01	2.22E-01		pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Cesium-134	EPA 901.1 Modified	1.89E-04	3.91E-02	3.91E-02	1.51E-01	U	pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Cesium-137	EPA 901.1 Modified	2.78E+00	3.29E-01	3.58E-01	1.91E-01		pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Europium-152	EPA 901.1 Modified	-8.45E-02	3.32E-01	3.32E-01	2.43E-01	U	pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Europium-154	EPA 901.1 Modified	-3.13E-02	2.81E-01	2.81E-01	1.24E-01	U	pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Europium-155	EPA 901.1 Modified	2.36E-01	1.39E-01	1.40E-01	2.31E-01		pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Holmium-166m	EPA 901.1 Modified	1.95E-02	1.21E-01	1.21E-01	1.06E-01	U	pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Iodine-129	EPA 901.1 Modified	-5.39E-02	1.52E-01	1.52E-01	4.43E-01	U	pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Potassium-40	EPA 901.1 Modified	2.07E+01	4.08E+00	4.22E+00	1.45E+00		pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Manganese-54	EPA 901.1 Modified	2.05E-03	8.87E-02	8.87E-02	1.38E-01	U	pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	1.90E-02	6.31E-02	6.31E-02	1.05E-01	U	pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Niobium-94	EPA 901.1 Modified	-2.10E-02	7.41E-02	7.41E-02	1.07E-01	U	pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Lead-210	EPA 901.1 Modified	4.14E+00	1.63E+00	1.64E+00	2.56E+00		pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Lead-212	EPA 901.1 Modified	6.82E-01	1.54E-01	1.58E-01	2.90E-01		pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Lead-214	EPA 901.1 Modified	6.78E-01	1.92E-01	1.95E-01	3.48E-01		pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Promethium-145	EPA 901.1 Modified	-3.26E-02	1.30E-01	1.30E-01	2.84E-01	U	pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Radium-226	EPA 901.1 Modified	6.70E-01	2.35E-01	2.37E-01	3.66E-01		pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Antimony-125	EPA 901.1 Modified	6.42E-02	2.86E-01	2.86E-01	3.97E-01	U	pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Thorium-234	EPA 901.1 Modified	5.68E-01	9.88E-01	9.88E-01	1.48E+00	U	pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Thallium-208	EPA 901.1 Modified	5.08E-01	2.29E-01	2.30E-01	5.08E-01	U	pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Uranium-235	EPA 901.1 Modified	2.19E-01	3.57E-01	3.57E-01	5.44E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:

Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:

SDG: 19-09014
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Actinium-228	EPA 901.1 Modified	3.87E-01	1.39E-01	1.41E-01	2.55E-01		pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Silver-108m	EPA 901.1 Modified	-3.57E-02	4.51E-02	4.51E-02	4.05E-02	U	pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Americium-241	EPA 901.1 Modified	6.09E-02	8.95E-02	8.96E-02	1.22E-01	U	pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Barium-133	EPA 901.1 Modified	-9.67E-02	6.87E-02	6.89E-02	6.41E-02	U	pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Bismuth-214	EPA 901.1 Modified	3.79E-01	1.06E-01	1.08E-01	1.50E-01		pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Cobalt-60	EPA 901.1 Modified	1.04E-01	3.38E-02	3.42E-02	5.08E-02		pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Cesium-134	EPA 901.1 Modified	-6.60E-03	1.92E-02	1.92E-02	4.42E-02	U	pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Cesium-137	EPA 901.1 Modified	3.70E-01	8.50E-02	8.70E-02	9.95E-02		pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Europium-152	EPA 901.1 Modified	1.11E-01	1.14E-01	1.14E-01	1.50E-01	U	pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Europium-154	EPA 901.1 Modified	-2.09E-02	6.50E-02	6.50E-02	7.64E-02	U	pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Europium-155	EPA 901.1 Modified	1.02E-01	8.47E-02	8.48E-02	1.15E-01	U	pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Holmium-166m	EPA 901.1 Modified	-1.41E-03	5.68E-02	5.68E-02	5.78E-02	U	pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Iodine-129	EPA 901.1 Modified	6.91E-01	4.19E+00	4.19E+00	2.73E+00	U	pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Potassium-40	EPA 901.1 Modified	1.04E+01	1.48E+00	1.57E+00	5.00E-01		pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Manganese-54	EPA 901.1 Modified	2.21E-02	3.64E-02	3.64E-02	6.34E-02	U	pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	-9.35E-03	3.39E-02	3.39E-02	5.00E-02	U	pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Niobium-94	EPA 901.1 Modified	4.72E-03	3.54E-02	3.54E-02	4.80E-02	U	pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Lead-210	EPA 901.1 Modified	2.32E+00	1.68E+00	1.68E+00	2.69E+00	U	pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Lead-212	EPA 901.1 Modified	3.85E-01	8.99E-02	9.20E-02	1.87E-01		pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Lead-214	EPA 901.1 Modified	4.61E-01	1.11E-01	1.14E-01	1.67E-01		pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Promethium-145	EPA 901.1 Modified	5.14E-01	6.15E-01	6.16E-01	7.71E-01	U	pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Radium-226	EPA 901.1 Modified	3.79E-01	1.06E-01	1.08E-01	1.50E-01		pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Antimony-125	EPA 901.1 Modified	7.84E-02	8.25E-02	8.26E-02	1.53E-01	U	pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Thorium-234	EPA 901.1 Modified	1.07E-01	8.71E-01	8.71E-01	1.14E+00	U	pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Thallium-208	EPA 901.1 Modified	2.57E-01	7.41E-02	7.52E-02	8.21E-02		pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Uranium-235	EPA 901.1 Modified	4.63E-02	2.54E-01	2.54E-01	3.37E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:	Work Order Details:	
Patricia Giza	SDG:	19-09014
Zion Solutions	Purchase Order:	677118
2701 Deborah Ave	Analysis Category:	ENVIRONMENTAL
Zion, IL 60099	Sample Matrix:	SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Actinium-228	EPA 901.1 Modified	5.86E-01	1.87E-01	1.89E-01	3.28E-01		pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Silver-108m	EPA 901.1 Modified	1.90E-02	4.81E-02	4.81E-02	7.75E-02	U	pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Americium-241	EPA 901.1 Modified	-1.72E-02	7.08E-02	7.08E-02	1.00E-01	U	pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Barium-133	EPA 901.1 Modified	2.12E-03	2.98E-02	2.98E-02	1.04E-01	U	pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Bismuth-214	EPA 901.1 Modified	5.65E-01	1.26E-01	1.30E-01	1.63E-01		pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Cobalt-60	EPA 901.1 Modified	1.04E-01	7.27E-02	7.29E-02	1.36E-01	U	pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Cesium-134	EPA 901.1 Modified	2.22E-03	3.15E-02	3.15E-02	8.46E-02	U	pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Cesium-137	EPA 901.1 Modified	5.35E-01	9.81E-02	1.02E-01	9.68E-02		pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Europium-152	EPA 901.1 Modified	-5.58E-02	1.86E-01	1.86E-01	1.56E-01	U	pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Europium-154	EPA 901.1 Modified	3.40E-02	1.65E-01	1.65E-01	7.95E-02	U	pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Europium-155	EPA 901.1 Modified	1.60E-01	9.57E-02	9.60E-02	1.47E-01		pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Holmium-166m	EPA 901.1 Modified	4.06E-02	4.08E-02	4.09E-02	6.87E-02	U	pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Iodine-129	EPA 901.1 Modified	-7.51E-02	1.89E-01	1.89E-01	2.69E-01	U	pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Potassium-40	EPA 901.1 Modified	1.35E+01	2.70E+00	2.79E+00	1.22E+00		pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Manganese-54	EPA 901.1 Modified	1.54E-02	5.48E-02	5.48E-02	9.22E-02	U	pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	5.50E-03	2.50E-02	2.50E-02	6.35E-02	U	pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Niobium-94	EPA 901.1 Modified	1.67E-02	4.24E-02	4.24E-02	6.62E-02	U	pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Lead-210	EPA 901.1 Modified	9.63E-01	8.22E-01	8.24E-01	1.36E+00	U	pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Lead-212	EPA 901.1 Modified	4.52E-01	9.76E-02	1.00E-01	1.79E-01		pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Lead-214	EPA 901.1 Modified	4.05E-01	1.06E-01	1.08E-01	1.80E-01		pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Promethium-145	EPA 901.1 Modified	3.58E-02	1.22E-01	1.22E-01	1.81E-01	U	pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Radium-226	EPA 901.1 Modified	5.65E-01	1.26E-01	1.30E-01	1.63E-01		pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Antimony-125	EPA 901.1 Modified	-2.81E-02	1.64E-01	1.64E-01	2.23E-01	U	pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Thorium-234	EPA 901.1 Modified	5.31E-01	6.38E-01	6.39E-01	9.63E-01	U	pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Thallium-208	EPA 901.1 Modified	3.76E-01	1.73E-01	1.74E-01	2.63E-01		pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Uranium-235	EPA 901.1 Modified	1.12E-01	2.36E-01	2.36E-01	3.54E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:

Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:

SDG: **19-09014**
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Actinium-228	EPA 901.1 Modified	4.45E-01	2.69E-01	2.70E-01	4.80E-01	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Silver-108m	EPA 901.1 Modified	-4.42E-02	6.63E-02	6.63E-02	1.11E-01	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Americium-241	EPA 901.1 Modified	-8.38E-02	1.17E-01	1.17E-01	1.63E-01	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Barium-133	EPA 901.1 Modified	1.08E-02	4.26E-02	4.26E-02	1.90E-01	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Bismuth-214	EPA 901.1 Modified	3.89E-01	2.18E-01	2.19E-01	3.38E-01		pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Cobalt-60	EPA 901.1 Modified	2.03E-01	9.54E-02	9.60E-02	2.09E-01	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Cesium-134	EPA 901.1 Modified	1.77E-02	4.73E-02	4.73E-02	1.34E-01	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Cesium-137	EPA 901.1 Modified	1.00E+00	1.88E-01	1.95E-01	1.71E-01		pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Europium-152	EPA 901.1 Modified	7.19E-02	2.42E-01	2.42E-01	2.54E-01	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Europium-154	EPA 901.1 Modified	-4.35E-02	2.40E-01	2.40E-01	1.33E-01	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Europium-155	EPA 901.1 Modified	1.05E-01	1.38E-01	1.38E-01	2.06E-01	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Holmium-166m	EPA 901.1 Modified	6.91E-03	1.22E-01	1.22E-01	9.65E-02	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Iodine-129	EPA 901.1 Modified	2.90E-02	9.04E-02	9.04E-02	1.36E-01	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Potassium-40	EPA 901.1 Modified	1.05E+01	1.99E+00	2.06E+00	1.49E+00		pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Manganese-54	EPA 901.1 Modified	5.01E-04	9.53E-02	9.53E-02	1.50E-01	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	9.30E-03	5.48E-02	5.48E-02	9.86E-02	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Niobium-94	EPA 901.1 Modified	-1.66E-02	7.06E-02	7.06E-02	1.10E-01	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Lead-210	EPA 901.1 Modified	2.49E+00	1.34E+00	1.34E+00	2.16E+00	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Lead-212	EPA 901.1 Modified	6.94E-01	1.95E-01	1.99E-01	2.90E-01		pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Lead-214	EPA 901.1 Modified	4.05E-01	1.61E-01	1.63E-01	3.06E-01		pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Promethium-145	EPA 901.1 Modified	-1.18E-01	1.13E-01	1.14E-01	1.56E-01	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Radium-226	EPA 901.1 Modified	3.89E-01	2.18E-01	2.19E-01	3.38E-01		pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Antimony-125	EPA 901.1 Modified	-1.84E-02	2.65E-01	2.65E-01	3.64E-01	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Thorium-234	EPA 901.1 Modified	1.58E+00	1.89E+00	1.89E+00	3.16E+00	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Thallium-208	EPA 901.1 Modified	1.97E-01	1.59E-01	1.60E-01	3.40E-01	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Uranium-235	EPA 901.1 Modified	8.79E-02	3.62E-01	3.62E-01	5.46E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09014
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Actinium-228	EPA 901.1 Modified	9.53E-01	4.20E-01	4.23E-01	1.08E+00	U	pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Silver-108m	EPA 901.1 Modified	1.47E-02	6.28E-02	6.28E-02	1.42E-01	U	pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Americium-241	EPA 901.1 Modified	-2.23E-01	2.47E-01	2.47E-01	2.97E-01	U	pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Barium-133	EPA 901.1 Modified	1.86E-02	1.09E-01	1.09E-01	2.12E-01	U	pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Bismuth-214	EPA 901.1 Modified	1.42E+00	2.60E-01	2.70E-01	4.01E-01		pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Cobalt-60	EPA 901.1 Modified	2.28E+00	2.45E-01	2.72E-01	2.29E-01		pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Cesium-134	EPA 901.1 Modified	7.64E-03	4.93E-02	4.93E-02	1.10E-01	U	pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Cesium-137	EPA 901.1 Modified	9.65E+00	1.12E+00	1.23E+00	2.84E-01		pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Europium-152	EPA 901.1 Modified	1.57E-01	4.31E-01	4.31E-01	3.99E-01	U	pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Europium-154	EPA 901.1 Modified	1.46E-01	2.74E-01	2.74E-01	2.04E-01	U	pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Europium-155	EPA 901.1 Modified	1.27E-01	1.14E-01	1.15E-01	3.12E-01	U	pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Holmium-166m	EPA 901.1 Modified	-1.35E-01	1.74E-01	1.75E-01	1.66E-01	U	pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Iodine-129	EPA 901.1 Modified	-1.25E+01	5.20E+01	5.20E+01	6.69E+00	U	pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Potassium-40	EPA 901.1 Modified	2.28E+01	3.41E+00	3.61E+00	2.35E+00		pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Manganese-54	EPA 901.1 Modified	1.71E-01	1.15E-01	1.15E-01	2.02E-01	U	pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	7.31E-02	7.86E-02	7.87E-02	1.14E-01	U	pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Niobium-94	EPA 901.1 Modified	1.43E-03	8.63E-02	8.63E-02	1.33E-01	U	pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Lead-210	EPA 901.1 Modified	8.52E+00	4.59E+00	4.61E+00	7.14E+00		pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Lead-212	EPA 901.1 Modified	1.16E+00	2.27E-01	2.34E-01	4.30E-01		pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Lead-214	EPA 901.1 Modified	1.45E+00	3.26E-01	3.34E-01	5.07E-01		pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Promethium-145	EPA 901.1 Modified	2.00E+00	1.70E+00	1.70E+00	2.02E+00	U	pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Radium-226	EPA 901.1 Modified	1.42E+00	2.60E-01	2.70E-01	4.01E-01		pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Antimony-125	EPA 901.1 Modified	6.85E-02	2.04E-01	2.04E-01	4.86E-01	U	pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Thorium-234	EPA 901.1 Modified	2.67E+00	2.04E+00	2.05E+00	2.85E+00	U	pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Thallium-208	EPA 901.1 Modified	7.59E-01	2.02E-01	2.06E-01	1.71E-01		pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Uranium-235	EPA 901.1 Modified	3.51E-01	6.50E-01	6.50E-01	8.76E-01	U	pCi/g

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Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09014
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Actinium-228	EPA 901.1 Modified	6.33E-01	2.40E-01	2.42E-01	5.09E-01		pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Silver-108m	EPA 901.1 Modified	-8.99E-03	6.83E-02	6.83E-02	1.01E-01	U	pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Americium-241	EPA 901.1 Modified	-4.22E-02	9.58E-02	9.59E-02	1.35E-01	U	pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Barium-133	EPA 901.1 Modified	-7.34E-03	4.33E-02	4.33E-02	1.43E-01	U	pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Bismuth-214	EPA 901.1 Modified	5.90E-01	1.77E-01	1.80E-01	2.74E-01		pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Cobalt-60	EPA 901.1 Modified	1.72E-01	8.67E-02	8.71E-02	1.69E-01		pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Cesium-134	EPA 901.1 Modified	-1.14E-02	3.18E-02	3.18E-02	1.25E-01	U	pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Cesium-137	EPA 901.1 Modified	1.37E+00	1.88E-01	2.01E-01	1.22E-01		pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Europium-152	EPA 901.1 Modified	9.46E-03	2.75E-01	2.75E-01	2.14E-01	U	pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Europium-154	EPA 901.1 Modified	6.15E-02	1.63E-01	1.63E-01	1.09E-01	U	pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Europium-155	EPA 901.1 Modified	1.35E-01	9.15E-02	9.17E-02	2.03E-01	U	pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Holmium-166m	EPA 901.1 Modified	-5.77E-02	1.08E-01	1.08E-01	9.32E-02	U	pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Iodine-129	EPA 901.1 Modified	1.32E-01	2.63E-01	2.63E-01	3.91E-01	U	pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Potassium-40	EPA 901.1 Modified	1.62E+01	3.45E+00	3.55E+00	2.13E+00		pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Manganese-54	EPA 901.1 Modified	-7.46E-03	7.89E-02	7.89E-02	1.27E-01	U	pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	-5.08E-03	5.43E-02	5.43E-02	8.51E-02	U	pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Niobium-94	EPA 901.1 Modified	-3.69E-02	6.45E-02	6.45E-02	1.01E-01	U	pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Lead-210	EPA 901.1 Modified	2.12E+00	1.06E+00	1.07E+00	1.69E+00		pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Lead-212	EPA 901.1 Modified	6.07E-01	1.28E-01	1.32E-01	2.14E-01		pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Lead-214	EPA 901.1 Modified	6.31E-01	1.38E-01	1.42E-01	3.68E-01		pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Promethium-145	EPA 901.1 Modified	-1.10E-01	1.83E-01	1.83E-01	2.59E-01	U	pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Radium-226	EPA 901.1 Modified	5.90E-01	1.77E-01	1.80E-01	2.74E-01		pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Antimony-125	EPA 901.1 Modified	-2.56E-02	2.30E-01	2.30E-01	3.15E-01	U	pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Thorium-234	EPA 901.1 Modified	1.04E+00	8.23E-01	8.25E-01	1.27E+00	U	pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Thallium-208	EPA 901.1 Modified	6.29E-01	2.44E-01	2.46E-01	3.62E-01		pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Uranium-235	EPA 901.1 Modified	-4.10E-02	3.17E-01	3.17E-01	4.64E-01	U	pCi/g

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Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Actinium-228	EPA 901.1 Modified	1.52E+00	6.43E-01	6.48E-01	1.36E+00		pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Silver-108m	EPA 901.1 Modified	2.39E-02	1.36E-01	1.36E-01	2.19E-01	U	pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Americium-241	EPA 901.1 Modified	-1.83E-02	1.87E-01	1.87E-01	2.67E-01	U	pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Barium-133	EPA 901.1 Modified	5.07E-02	1.10E-01	1.10E-01	3.18E-01	U	pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Bismuth-214	EPA 901.1 Modified	1.17E+00	3.05E-01	3.11E-01	1.60E-01		pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Cobalt-60	EPA 901.1 Modified	1.90E+00	2.34E-01	2.54E-01	2.06E-01		pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Cesium-134	EPA 901.1 Modified	-2.08E-02	8.08E-02	8.08E-02	2.41E-01	U	pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Cesium-137	EPA 901.1 Modified	8.29E+00	9.80E-01	1.07E+00	4.18E-01		pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Europium-152	EPA 901.1 Modified	-7.94E-02	2.81E-01	2.81E-01	4.76E-01	U	pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Europium-154	EPA 901.1 Modified	-3.57E-01	3.84E-01	3.84E-01	2.43E-01	U	pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Europium-155	EPA 901.1 Modified	2.57E-01	2.28E-01	2.28E-01	3.78E-01	U	pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Holmium-166m	EPA 901.1 Modified	6.47E-02	2.37E-01	2.37E-01	1.66E-01	U	pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Iodine-129	EPA 901.1 Modified	2.76E-01	1.65E-01	1.66E-01	2.54E-01	U	pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Potassium-40	EPA 901.1 Modified	2.01E+01	3.19E+00	3.35E+00	1.94E+00		pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Manganese-54	EPA 901.1 Modified	1.25E-01	1.64E-01	1.64E-01	2.74E-01	U	pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	-4.00E-02	1.47E-01	1.47E-01	1.37E-01	U	pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Niobium-94	EPA 901.1 Modified	1.56E-01	1.38E-01	1.38E-01	1.79E-01	U	pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Lead-210	EPA 901.1 Modified	1.94E+00	1.81E+00	1.81E+00	3.01E+00	U	pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Lead-212	EPA 901.1 Modified	1.10E+00	2.53E-01	2.59E-01	5.51E-01		pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Lead-214	EPA 901.1 Modified	1.04E+00	3.51E-01	3.55E-01	6.40E-01		pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Promethium-145	EPA 901.1 Modified	7.61E-02	1.54E-01	1.54E-01	2.88E-01	U	pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Radium-226	EPA 901.1 Modified	1.17E+00	3.05E-01	3.11E-01	1.60E-01		pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Antimony-125	EPA 901.1 Modified	6.02E-02	5.62E-01	5.62E-01	7.65E-01	U	pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Thorium-234	EPA 901.1 Modified	9.41E-01	1.76E+00	1.76E+00	2.62E+00	U	pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Thallium-208	EPA 901.1 Modified	1.03E+00	3.54E-01	3.57E-01	4.86E-01		pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Uranium-235	EPA 901.1 Modified	-1.64E-01	6.42E-01	6.42E-01	9.20E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09014
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Actinium-228	EPA 901.1 Modified	4.27E-01	1.59E-01	1.60E-01	3.05E-01		pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Silver-108m	EPA 901.1 Modified	9.65E-04	1.67E-02	1.67E-02	4.61E-02	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Americium-241	EPA 901.1 Modified	5.99E-03	9.94E-02	9.94E-02	1.30E-01	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Barium-133	EPA 901.1 Modified	1.13E-02	2.67E-02	2.67E-02	7.36E-02	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Bismuth-214	EPA 901.1 Modified	5.19E-01	1.08E-01	1.11E-01	1.47E-01		pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Cobalt-60	EPA 901.1 Modified	6.43E-02	4.09E-02	4.10E-02	1.01E-01	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Cesium-134	EPA 901.1 Modified	7.17E-03	2.18E-02	2.18E-02	5.12E-02	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Cesium-137	EPA 901.1 Modified	4.74E-01	9.73E-02	1.00E-01	1.02E-01		pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Europium-152	EPA 901.1 Modified	1.60E-02	1.05E-01	1.05E-01	1.67E-01	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Europium-154	EPA 901.1 Modified	-5.66E-02	1.23E-01	1.23E-01	8.59E-02	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Europium-155	EPA 901.1 Modified	1.58E-01	1.03E-01	1.04E-01	1.38E-01	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Holmium-166m	EPA 901.1 Modified	-3.03E-02	6.94E-02	6.94E-02	7.04E-02	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Iodine-129	EPA 901.1 Modified	2.18E+00	9.58E+00	9.58E+00	3.02E+00	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Potassium-40	EPA 901.1 Modified	1.05E+01	1.57E+00	1.66E+00	1.07E+00		pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Manganese-54	EPA 901.1 Modified	2.56E-03	4.14E-02	4.14E-02	6.59E-02	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	-1.95E-02	3.59E-02	3.59E-02	5.05E-02	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Niobium-94	EPA 901.1 Modified	-8.36E-03	3.76E-02	3.77E-02	5.71E-02	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Lead-210	EPA 901.1 Modified	2.10E+00	1.94E+00	1.94E+00	3.18E+00	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Lead-212	EPA 901.1 Modified	4.90E-01	1.02E-01	1.05E-01	1.65E-01		pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Lead-214	EPA 901.1 Modified	6.04E-01	1.41E-01	1.45E-01	2.20E-01		pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Promethium-145	EPA 901.1 Modified	5.81E-01	6.70E-01	6.71E-01	9.29E-01	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Radium-226	EPA 901.1 Modified	5.19E-01	1.08E-01	1.11E-01	1.47E-01		pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Antimony-125	EPA 901.1 Modified	5.53E-04	9.70E-02	9.70E-02	1.63E-01	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Thorium-234	EPA 901.1 Modified	1.29E-01	1.01E+00	1.01E+00	1.32E+00	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Thallium-208	EPA 901.1 Modified	2.79E-01	8.93E-02	9.05E-02	1.30E-01		pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Uranium-235	EPA 901.1 Modified	1.82E-01	2.66E-01	2.67E-01	3.72E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09014
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Actinium-228	EPA 901.1 Modified	5.47E-01	2.15E-01	2.17E-01	4.05E-01		pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Silver-108m	EPA 901.1 Modified	-6.99E-02	6.09E-02	6.10E-02	6.92E-02	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Americium-241	EPA 901.1 Modified	-1.71E-02	7.34E-02	7.34E-02	1.04E-01	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Barium-133	EPA 901.1 Modified	1.14E-02	2.58E-02	2.58E-02	1.18E-01	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Bismuth-214	EPA 901.1 Modified	5.30E-01	1.36E-01	1.38E-01	1.41E-01		pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Cobalt-60	EPA 901.1 Modified	1.42E-01	7.86E-02	7.89E-02	1.46E-01	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Cesium-134	EPA 901.1 Modified	-1.05E-02	3.05E-02	3.05E-02	9.66E-02	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Cesium-137	EPA 901.1 Modified	6.57E-01	1.17E-01	1.22E-01	1.18E-01		pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Europium-152	EPA 901.1 Modified	-2.17E-01	2.04E-01	2.05E-01	1.69E-01	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Europium-154	EPA 901.1 Modified	-1.34E-01	2.14E-01	2.14E-01	8.59E-02	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Europium-155	EPA 901.1 Modified	5.99E-02	8.43E-02	8.43E-02	1.25E-01	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Holmium-166m	EPA 901.1 Modified	-3.25E-02	7.82E-02	7.83E-02	7.06E-02	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Iodine-129	EPA 901.1 Modified	2.52E-01	2.02E-01	2.02E-01	2.88E-01	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Potassium-40	EPA 901.1 Modified	1.22E+01	2.58E+00	2.66E+00	1.47E+00		pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Manganese-54	EPA 901.1 Modified	1.26E-02	5.53E-02	5.53E-02	9.34E-02	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	-3.55E-02	4.85E-02	4.85E-02	6.76E-02	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Niobium-94	EPA 901.1 Modified	2.39E-02	4.72E-02	4.72E-02	6.60E-02	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Lead-210	EPA 901.1 Modified	1.02E+00	9.58E-01	9.60E-01	1.59E+00	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Lead-212	EPA 901.1 Modified	4.68E-01	1.31E-01	1.33E-01	1.88E-01		pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Lead-214	EPA 901.1 Modified	4.47E-01	1.38E-01	1.40E-01	2.39E-01		pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Promethium-145	EPA 901.1 Modified	5.01E-02	1.32E-01	1.32E-01	1.97E-01	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Radium-226	EPA 901.1 Modified	5.30E-01	1.36E-01	1.38E-01	1.41E-01		pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Antimony-125	EPA 901.1 Modified	3.29E-02	1.60E-01	1.60E-01	2.27E-01	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Thorium-234	EPA 901.1 Modified	9.41E-01	6.72E-01	6.73E-01	1.04E+00	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Thallium-208	EPA 901.1 Modified	3.57E-01	2.06E-01	2.07E-01	3.43E-01		pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Uranium-235	EPA 901.1 Modified	2.35E-02	2.48E-01	2.48E-01	3.69E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
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Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09014
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Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Actinium-228	EPA 901.1 Modified	5.51E-01	2.88E-01	2.90E-01	4.95E-01		pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Silver-108m	EPA 901.1 Modified	5.46E-02	4.11E-02	4.12E-02	1.21E-01	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Americium-241	EPA 901.1 Modified	1.34E-03	1.21E-01	1.21E-01	1.75E-01	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Barium-133	EPA 901.1 Modified	8.86E-04	5.31E-02	5.31E-02	2.07E-01	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Bismuth-214	EPA 901.1 Modified	6.78E-01	1.82E-01	1.85E-01	3.07E-01		pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Cobalt-60	EPA 901.1 Modified	1.91E-01	9.78E-02	9.83E-02	2.07E-01	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Cesium-134	EPA 901.1 Modified	2.47E-02	5.54E-02	5.54E-02	1.51E-01	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Cesium-137	EPA 901.1 Modified	1.08E+00	2.06E-01	2.13E-01	2.03E-01		pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Europium-152	EPA 901.1 Modified	2.53E-01	2.71E-01	2.72E-01	2.75E-01	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Europium-154	EPA 901.1 Modified	9.06E-02	2.59E-01	2.59E-01	1.38E-01	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Europium-155	EPA 901.1 Modified	-1.06E-01	1.55E-01	1.56E-01	2.17E-01	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Holmium-166m	EPA 901.1 Modified	-5.50E-02	1.59E-01	1.59E-01	1.09E-01	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Iodine-129	EPA 901.1 Modified	1.37E-02	9.59E-02	9.59E-02	1.42E-01	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Potassium-40	EPA 901.1 Modified	1.34E+01	2.33E+00	2.43E+00	1.66E+00		pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Manganese-54	EPA 901.1 Modified	6.97E-02	8.36E-02	8.36E-02	1.53E-01	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	-1.86E-02	8.41E-02	8.41E-02	1.15E-01	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Niobium-94	EPA 901.1 Modified	-6.52E-03	7.86E-02	7.86E-02	1.28E-01	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Lead-210	EPA 901.1 Modified	9.21E-01	1.10E+00	1.10E+00	1.84E+00	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Lead-212	EPA 901.1 Modified	9.16E-01	2.20E-01	2.25E-01	3.18E-01		pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Lead-214	EPA 901.1 Modified	5.59E-01	2.00E-01	2.02E-01	3.60E-01		pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Promethium-145	EPA 901.1 Modified	-8.22E-02	1.15E-01	1.15E-01	1.62E-01	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Radium-226	EPA 901.1 Modified	6.78E-01	1.82E-01	1.85E-01	3.07E-01		pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Antimony-125	EPA 901.1 Modified	3.57E-03	2.62E-01	2.62E-01	3.64E-01	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Thorium-234	EPA 901.1 Modified	7.91E-01	1.15E+00	1.16E+00	1.74E+00	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Thallium-208	EPA 901.1 Modified	6.64E-01	2.08E-01	2.10E-01	8.14E-02		pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Uranium-235	EPA 901.1 Modified	9.02E-02	3.99E-01	3.99E-01	5.91E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09014
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Actinium-228	EPA 901.1 Modified	3.54E-01	1.71E-01	1.72E-01	3.25E-01		pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Silver-108m	EPA 901.1 Modified	-3.77E-02	4.56E-02	4.56E-02	4.80E-02	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Americium-241	EPA 901.1 Modified	-4.36E-02	1.05E-01	1.05E-01	1.31E-01	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Barium-133	EPA 901.1 Modified	2.50E-02	2.62E-02	2.63E-02	7.61E-02	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Bismuth-214	EPA 901.1 Modified	3.34E-01	9.13E-02	9.29E-02	1.50E-01		pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Cobalt-60	EPA 901.1 Modified	2.75E-01	6.17E-02	6.33E-02	1.04E-01		pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Cesium-134	EPA 901.1 Modified	1.05E-02	2.56E-02	2.56E-02	5.31E-02	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Cesium-137	EPA 901.1 Modified	1.86E-01	7.19E-02	7.25E-02	1.02E-01		pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Europium-152	EPA 901.1 Modified	-1.39E-01	1.79E-01	1.79E-01	1.65E-01	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Europium-154	EPA 901.1 Modified	-3.99E-02	8.30E-02	8.30E-02	8.28E-02	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Europium-155	EPA 901.1 Modified	1.11E-01	9.53E-02	9.55E-02	1.28E-01	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Holmium-166m	EPA 901.1 Modified	2.62E-02	7.75E-02	7.75E-02	6.55E-02	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Iodine-129	EPA 901.1 Modified	7.20E-01	4.73E+00	4.73E+00	3.10E+00	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Potassium-40	EPA 901.1 Modified	1.06E+01	1.65E+00	1.74E+00	1.07E+00		pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Manganese-54	EPA 901.1 Modified	6.03E-03	4.39E-02	4.39E-02	6.97E-02	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	-6.28E-03	3.71E-02	3.71E-02	4.22E-02	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Niobium-94	EPA 901.1 Modified	-6.51E-03	4.52E-02	4.52E-02	6.26E-02	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Lead-210	EPA 901.1 Modified	6.05E-01	1.48E+00	1.48E+00	2.27E+00	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Lead-212	EPA 901.1 Modified	3.39E-01	8.11E-02	8.30E-02	1.86E-01		pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Lead-214	EPA 901.1 Modified	3.96E-01	1.14E-01	1.15E-01	1.86E-01		pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Promethium-145	EPA 901.1 Modified	2.81E-01	6.60E-01	6.60E-01	9.71E-01	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Radium-226	EPA 901.1 Modified	3.34E-01	9.13E-02	9.29E-02	1.50E-01		pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Antimony-125	EPA 901.1 Modified	8.88E-03	9.46E-02	9.46E-02	1.61E-01	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Thorium-234	EPA 901.1 Modified	1.15E+00	9.30E-01	9.31E-01	1.32E+00	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Thallium-208	EPA 901.1 Modified	2.92E-01	1.20E-01	1.21E-01	2.42E-01	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Uranium-235	EPA 901.1 Modified	-7.50E-04	2.73E-01	2.73E-01	3.58E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

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19-09014

L2-10213A-AJC	S-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/16/2019	1234	FULL SUITE	NA	341.36g
L2-10213A-AJC	S-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/16/2019	1236	FULL SUITE	NA	403.45g
L2-10213A-AJC	S-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/16/2019	1238	FULL SUITE	NA	519.02g
L1-10221D-FSC	S-008-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/15/2019	0720	5 ROC HTD	NA	798.42g
L1-10209E-FIG	S-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/17/2019	1035	5 ROC HTD	NA	683.69g
L1-10209E-QIC	S-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/17/2019	1035	5 ROC HTD	NA	695.73g
L1-10209E-FIG	S-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/17/2019	1500	5 ROC HTD	NA	723.26g
L1-10209E-FIG	S-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/17/2019	1510	5 ROC HTD	NA	704.72g
L1-10209E-FSG	S-013-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/20/2019	0810	5 ROC HTD	NA	802.05g
L1-10209D-FSG	S-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/21/2019	0820	5 ROC HTD	NA	637.16g
L1-10209D-FSG	S-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/21/2019	0825	5 ROC HTD	NA	598.17g
L1-10209D-FSG	S-015-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/21/2019	0920	5 ROC HTD	NA	708.91g
L1-10220J-FSG	S-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/22/2019	0700	5 ROC HTD	NA	603.35g
L1-10220I-FSG	S-010-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/23/2019	0745	5 ROC HTD	NA	672.61g
L1-10209D-FSG	S-003-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/28/2019	0900	5 ROC HTD	NA	739.91g
L1-10220J-FSG	S-005-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/28/2019	1325	5 ROC HTD	NA	678.76g
L1-10220G-FSG	S-008-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/3/2019	0744	5 ROC HTD	NA	840.01g
L1-10220G-FSG	S-014-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/3/2019	0756	5 ROC HTD	NA	902.77g
L1-10220A-FSG	S-006-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/3/2019	0655	5 ROC HTD	NA	939.49g

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5	L1-10220A-FS	GS-016-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/3/2019	0715	5 ROC HTD	NA	886.43g
6	L1-10221B-FS	GS-006-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/10/2019	1335	5 ROC HTD	NA	1025.73g
7	L1-10221D-FJ	GS-007-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/18/2019	1230	5 ROC HTD	NA	671.35g
8	L1-10221C-FI	GS-101-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/24/2019	0900	5 ROC HTD	NA	864.05g
9	L1-10220I-FJ	GS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/27/2019	0940	5 ROC HTD	NA	733.33g
10	L1-10220I-FJ	GS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/27/2019	0942	5 ROC HTD	NA	956.02g
11	L1-10220I-FJ	GS-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/27/2019	0946	5 ROC HTD	NA	952.94g
12	L1-10220H-FJ	GS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/27/2019	0948	5 ROC HTD	NA	682.63g
13	L1-10221D-FI	GS-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/27/19	0936	5 ROC HTD	NA	436.83g
14	L1-10220H-FJ	GS-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/9/2019	0820	5 ROC HTD	NA	690.99g
15	L1-10221D-FI	GS-010-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/9/2019	0845	5 ROC HTD	NA	679.44g
16	L1-10221D-FI	GS-014-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/9/19	0853	5 ROC HTD	NA	775.32g
17	L1-10221D-QI	GS-013-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/9/19	0851	5 ROC HTD	N/A	762.29g
18	L1-10221D-FI	GS-013-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/9/19	0851	5 ROC HTD	NA	672.18g
19	L1-10221D-FI	GS-018-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/15/2019	1345	5 ROC HTD	NA	789.41g
	L1-10221D-FI	GS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/27/19	0920	5 ROC HTD	NA	577.68g
	L1-10221D-FI	GS-022-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/17/19	0834	5 ROC HTD	NA	731.58g
	L1-10221D-FI	GS-012-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/9/19	0849	5 ROC HTD	NA	940.60g
	L1-10221D-FI	GS-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/27/19	0934	5 ROC HTD	NA	448.91g

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LI-10221D-FI GS-021-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/17/19	0832	5 ROC HTD	NA	606.23g
LI-10221D-FIGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/27/19	0930	5 ROC HTD	NA	709.53g

Laboratory:	Date Submitted To Lab:	Ship Container No.:	Cooler Temperature: FULL SUITE	Airbill Number:
EBERLINE LABS		NA	N/A	Various for FedEx Ground

Relinquished by:	Date (mm/dd/yyyy):	Time:	Received by:	Date: (mm/dd/yyyy):	
Jack Mucia	8/28/19	0748	Richard E. Rickert	08/28/2019	0748
Relinquished by: Richard E. Rickert	Date (mm/dd/yyyy): 08/29/2019	Time: 0800	Received by: FedEx Ground	Date: (mm/dd/yyyy): 08/29/2019	0800
Relinquished by: FedEx Ground	Date (mm/dd/yyyy):	Time:	Received by: Randolph Spencer	Date: (mm/dd/yyyy): 9/3/2019	1000
Relinquished by:	Date (mm/dd/yyyy):	Time:	Received by:	Date: (mm/dd/yyyy):	

Comments

Full Suite PO# 67716 HTD PO# 67718 30 Day Turn Around

EBERLINE ANALYTICAL

EBERLINE ANALYTICAL CORPORATION
601 SCARBORO ROAD
OAK RIDGE, TENNESSEE 37830
PHONE (865) 481-0683
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EBS-OR-46309

November 6, 2019

Patricia Giza
Zion Solutions, LLC
2701 Deborah Avenue
Zion, IL 60099

CASE NARRATIVE
Work Order # 19-09131-OR

SAMPLE RECEIPT

This work order contains fifteen soil samples received 09/23/2019. Samples were analyzed for Total Strontium, Tritium, Nickel-63 and by Gamma Spectroscopy.

CLIENT ID	LAB ID	CLIENT ID	LAB ID
L1-10220H-QJGS-004-SS-A	19-09131-04	L1-10221A-FSGS-110-SS-A	19-09131-12
L1-10203D-FSGS-001-SS-A	19-09131-05	L1-10221A-FSGS-112-SS-A	19-09131-13
L1-10203D-FQGS-002-SS-A	19-09131-06	L1-10221C-FSGS-013-SB-A	19-09131-14
L1-10203E-FSGS-001-SS-A	19-09131-07	L1-10221D-FIGS-010-SB-A	19-09131-15
L1-10203E-FSGS-002-SS-A	19-09131-08	L1-10209C-FSGS-010-SS-A	19-09131-16
L1-10221A-FIGS-007-SB-A	19-09131-09	L1-10209C-FQGS-010-SS-A	19-09131-17
L1-10221A-FSGS-002-SB-A	19-09131-10	L1-10209C-FSGS-004-SB-A	19-09131-18
L1-10221A-FSGS-108-SS-A	19-09131-11		

ANALYTICAL METHODS

Total Strontium was analyzed using EIChroM Method SRW01 Modified. Tritium was performed using Method LANL ER-210 Modified. Nickel-63 was performed using Method ASTM 3500-Ni Modified. Gamma Spectroscopy was performed using EPA Method 901.1 Modified.

Laboratory qualifiers are as follows:

U - Result is less than the MDA.

ANALYTICAL RESULTS

Combined Standard Uncertainty is reported at 1-sigma value.

Minimum Detectable Activity (MDA) values for data represented in this report are sample-specific. MDA measurements are determined based on factors and conditions including instrument settings, aliquot size and matrix type.

ANALYTICAL RESULTS CONTINUED

TOTAL STRONTIUM

Samples were prepared by acid digestion as appropriate for the matrix. Digested samples were acidified and selectively extracted and precipitated. Precipitates were mounted on 47mm filters. Filters were reweighed to determine aliquot size. Sample activities were determined by gas flow proportional counting.

Samples demonstrated acceptable results for all Total Strontium analyses. Strontium-90 results are reported from Total Strontium assuming secular equilibrium. Chemical recovery was acceptable for all samples. The Total Strontium method blank demonstrated an acceptable result. Results for the Total Strontium duplicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Total Strontium laboratory control sample demonstrated an acceptable percent recovery.

TRITIUM

A representative aliquot of each sample was equilibrated with Tritium free water. Equilibrates were transferred into round-bottomed distillation flasks and attached to single stage stills. A portion of each middle distillation fraction was transferred to a liquid scintillation vial and cocktail was added. Samples were counted by beta liquid scintillation.

Samples demonstrated acceptable results for all Tritium analyses. The Tritium method blank demonstrated an acceptable result. Results for the Tritium duplicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Tritium laboratory control sample demonstrated an acceptable percent recovery.

NICKEL-63

A representative aliquot of each sample was prepared by leaching in acids. Aliquots were placed into appropriately sized beakers. Stable elemental Nickel carrier was added to each sample prior to digestion. Samples were digested in concentrated Nitric acid. After digestion, sample pH was adjusted and Nickel-63 was precipitated selectively with Dimethylglyoxime. Precipitates were selectively separated, redissolved, and residual acid was effectively neutralized. Sample residuals were placed into scintillation vials, scintillation cocktail was added and Nickel-63 activity was determined by beta liquid scintillation.

Samples demonstrated acceptable results for all Nickel-63 analyses. The Nickel-63 method blank demonstrated an acceptable result. Results for the Nickel-63 duplicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Nickel-63 laboratory control sample demonstrated an acceptable percent recovery.

GAMMA SPECTROSCOPY

Samples for Gamma Spectroscopy analysis were prepared by transferring a known mass of each homogenized sample to a standard geometry container. Samples were counted on High Purity Germanium (HPGe) gamma ray detectors.

ANALYTICAL RESULTS CONTINUED

GAMMA SPECTROSCOPY CONTINUED

Samples demonstrated acceptable results for all gamma-emitting radionuclides as reported. The method blank demonstrated acceptable results for all radionuclides as reported. Results for the Actinium-228 replicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Cobalt-60 and Potassium-40 replicate demonstrated an acceptable relative percent difference and normalized difference. Results for the Cobalt-60 and Cesium-137 laboratory control sample demonstrated an acceptable percent recovery.

CERTIFICATION OF ACCURACY

I certify that this data report is in compliance with the terms and conditions of the Purchase Order, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the cognizant project manager or his/her designee to be accurate as verified by the following signature.

M.R. McDougall
Laboratory Manager

Date: 11/6/2019

Eberline Analytical wants and encourages your feedback regarding our performance providing radioanalytical services. Please visit http://eberlineanalytical.com/ to provide us with feedback on our services.

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09131
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA		Report Units
19-09131-01	LCS	KNOWN	09/24/19 00:00	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	2.01E+02	7.25E+00				pCi/g
19-09131-01	LCS	SPIKE	09/24/19 00:00	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	2.02E+02	7.81E+00	1.38E+01	5.82E+00		pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	-1.57E+00	3.37E+00	3.37E+00	5.94E+00	U	pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	-3.73E-01	3.24E+00	3.24E+00	5.64E+00	U	pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	1.89E-01	3.31E+00	3.31E+00	5.72E+00	U	pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	5.87E-01	3.44E+00	3.44E+00	5.93E+00	U	pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	-1.29E+00	3.16E+00	3.16E+00	5.57E+00	U	pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	5.90E-01	3.45E+00	3.45E+00	5.95E+00	U	pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	6.89E+00	3.41E+00	3.43E+00	5.50E+00		pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	-1.31E+00	3.22E+00	3.22E+00	5.67E+00	U	pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	-1.88E+00	3.22E+00	3.22E+00	5.71E+00	U	pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	1.13E+00	3.34E+00	3.34E+00	5.72E+00	U	pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	-3.85E-01	3.35E+00	3.35E+00	5.83E+00	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	-1.86E+00	3.17E+00	3.18E+00	5.63E+00	U	pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	-3.87E-01	3.37E+00	3.37E+00	5.86E+00	U	pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	-1.88E-01	3.27E+00	3.27E+00	5.69E+00	U	pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	3.85E-01	3.38E+00	3.38E+00	5.84E+00	U	pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	7.75E-01	3.41E+00	3.41E+00	5.87E+00	U	pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/26/2019	19-09131	Tritium	LANL ER-210 Modified	-2.14E+00	3.31E+00	3.31E+00	5.88E+00	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

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19-09131-01	LCS	KNOWN	09/24/19 00:00	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	1.50E+03	4.50E+01				pCi/g
19-09131-01	LCS	SPIKE	09/24/19 00:00	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	1.54E+03	1.33E+01	9.15E+01	3.22E+00		pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	-8.91E-02	1.88E+00	1.88E+00	3.25E+00	U	pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	-1.82E-01	1.92E+00	1.92E+00	3.33E+00	U	pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	-1.04E+00	1.98E+00	1.98E+00	3.46E+00	U	pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	2.74E-01	1.94E+00	1.94E+00	3.33E+00	U	pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	5.54E-01	1.97E+00	1.97E+00	3.37E+00	U	pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	1.20E+00	1.86E+00	1.86E+00	3.14E+00	U	pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	1.95E-01	2.07E+00	2.07E+00	3.56E+00	U	pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	-1.06E+00	2.46E+00	2.46E+00	4.29E+00	U	pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	-9.46E-01	2.47E+00	2.48E+00	4.32E+00	U	pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	3.45E-01	1.83E+00	1.83E+00	3.15E+00	U	pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/26/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	-8.89E-02	1.88E+00	1.88E+00	3.24E+00	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/26/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	6.30E-01	1.92E+00	1.92E+00	3.29E+00	U	pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/26/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	-6.98E-01	1.83E+00	1.83E+00	3.19E+00	U	pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/26/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	-4.60E-01	1.94E+00	1.94E+00	3.36E+00	U	pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/26/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	-7.82E-01	2.05E+00	2.05E+00	3.57E+00	U	pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/26/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	7.91E-01	1.88E+00	1.89E+00	3.21E+00	U	pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/26/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	-1.10E+00	1.91E+00	1.91E+00	3.35E+00	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

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Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA		Report Units
19-09131-01	LCS	KNOWN	09/24/19 00:00	9/23/2019	10/25/2019	19-09131	Strontium-90	ElChroM SRW01 Modified	5.03E+01	2.82E-01				pCi/g
19-09131-01	LCS	SPIKE	09/24/19 00:00	9/23/2019	10/25/2019	19-09131	Strontium-90	ElChroM SRW01 Modified	5.18E+01	2.82E+00	1.82E+01	1.09E+00		pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/25/2019	19-09131	Strontium-90	ElChroM SRW01 Modified	3.07E-01	3.36E-01	3.52E-01	8.88E-01	U	pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/25/2019	19-09131	Strontium-90	ElChroM SRW01 Modified	6.81E-01	3.57E-01	4.28E-01	8.90E-01	U	pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/25/2019	19-09131	Strontium-90	ElChroM SRW01 Modified	1.97E-01	3.06E-01	3.14E-01	8.22E-01	U	pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/25/2019	19-09131	Strontium-90	ElChroM SRW01 Modified	5.77E-02	3.44E-01	3.45E-01	9.49E-01	U	pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/25/2019	19-09131	Strontium-90	ElChroM SRW01 Modified	-2.24E-01	3.60E-01	3.69E-01	1.03E+00	U	pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/25/2019	19-09131	Strontium-90	ElChroM SRW01 Modified	8.03E-01	3.37E-01	4.38E-01	8.16E-01	U	pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/25/2019	19-09131	Strontium-90	ElChroM SRW01 Modified	1.66E-01	3.75E-01	3.79E-01	1.02E+00	U	pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/25/2019	19-09131	Strontium-90	ElChroM SRW01 Modified	-1.49E-01	3.74E-01	3.78E-01	1.06E+00	U	pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/25/2019	19-09131	Strontium-90	ElChroM SRW01 Modified	9.22E-03	3.13E-01	3.13E-01	8.72E-01	U	pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/25/2019	19-09131	Strontium-90	ElChroM SRW01 Modified	1.86E-02	3.82E-01	3.82E-01	1.05E+00	U	pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/25/2019	19-09131	Strontium-90	ElChroM SRW01 Modified	-3.01E-02	3.27E-01	3.27E-01	9.18E-01	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/25/2019	19-09131	Strontium-90	ElChroM SRW01 Modified	-2.50E-01	3.24E-01	3.35E-01	9.33E-01	U	pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/25/2019	19-09131	Strontium-90	ElChroM SRW01 Modified	-3.67E-02	3.28E-01	3.28E-01	9.17E-01	U	pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/25/2019	19-09131	Strontium-90	ElChroM SRW01 Modified	3.45E-01	3.38E-01	3.59E-01	8.90E-01	U	pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/25/2019	19-09131	Strontium-90	ElChroM SRW01 Modified	5.14E-01	3.25E-01	3.71E-01	8.26E-01	U	pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/25/2019	19-09131	Strontium-90	ElChroM SRW01 Modified	3.17E-01	2.98E-01	3.18E-01	7.83E-01	U	pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/25/2019	19-09131	Strontium-90	ElChroM SRW01 Modified	8.74E-02	3.17E-01	3.18E-01	8.70E-01	U	pCi/g
19-09131-01	LCS	KNOWN	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	1.31E+02	5.10E+00				pCi/g
19-09131-01	LCS	KNOWN	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	8.26E+01	3.39E+00				pCi/g
19-09131-01	LCS	SPIKE	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	1.35E+02	8.75E+00	1.12E+01	1.35E+00		pCi/g
19-09131-01	LCS	SPIKE	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	8.81E+01	9.63E+00	1.06E+01	1.65E+00		pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

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19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	-2.25E-02	7.68E-02	7.68E-02	1.18E-01	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	-2.32E-03	2.89E-02	2.89E-02	3.62E-02	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	-3.31E-02	3.49E-02	3.49E-02	4.36E-02	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	1.36E-02	2.94E-02	2.94E-02	3.72E-02	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	1.33E-02	5.17E-02	5.17E-02	8.00E-02	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	-1.90E-02	3.18E-02	3.18E-02	3.43E-02	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	-2.45E-02	3.00E-02	3.01E-02	3.51E-02	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	1.83E-02	2.28E-02	2.28E-02	4.45E-02	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	-1.95E-02	9.16E-02	9.16E-02	6.55E-02	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	-1.83E-02	7.08E-02	7.08E-02	3.49E-02	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	2.11E-03	1.78E-02	1.78E-02	4.04E-02	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	-1.91E-02	4.37E-02	4.37E-02	2.76E-02	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	6.70E-02	1.07E-01	1.07E-01	1.61E-01	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.07E-01	1.87E-01	1.87E-01	4.67E-01	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	-2.43E-02	2.71E-02	2.71E-02	3.75E-02	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	8.85E-03	1.89E-02	1.89E-02	3.53E-02	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	3.55E-03	2.04E-02	2.04E-02	3.54E-02	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	6.16E-01	3.85E-01	3.86E-01	6.28E-01	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	1.99E-02	3.59E-02	3.59E-02	5.73E-02	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	3.78E-02	4.72E-02	4.72E-02	8.14E-02	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	5.47E-02	6.47E-02	6.48E-02	1.02E-01	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	1.33E-02	5.17E-02	5.17E-02	8.00E-02	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	1.53E-02	7.62E-02	7.62E-02	1.12E-01	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	5.02E-01	2.51E-01	2.52E-01	4.38E-01	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	6.58E-03	7.17E-02	7.17E-02	1.08E-01	U	pCi/g
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	1.56E-02	9.72E-02	9.72E-02	1.50E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09131
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA		Report Units
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	1.99E-01	1.80E-01	1.80E-01	3.18E-01	U	pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	1.50E-02	2.49E-02	2.49E-02	4.77E-02	U	pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	-4.40E-02	8.76E-02	8.76E-02	1.34E-01	U	pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	-1.01E-01	8.75E-02	8.76E-02	7.95E-02	U	pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	4.26E-01	1.25E-01	1.27E-01	2.17E-01		pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	1.30E-01	5.05E-02	5.10E-02	9.28E-02		pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	6.66E-03	2.03E-02	2.03E-02	5.00E-02	U	pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	8.90E-01	1.36E-01	1.43E-01	8.66E-02		pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	7.53E-02	1.50E-01	1.50E-01	1.67E-01	U	pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	-1.71E-01	1.56E-01	1.57E-01	8.30E-02	U	pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	1.69E-01	1.31E-01	1.31E-01	1.68E-01		pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	-1.40E-02	6.31E-02	6.31E-02	6.94E-02	U	pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	-1.40E+00	6.62E+00	6.63E+00	3.61E+00	U	pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.02E+01	1.60E+00	1.68E+00	1.03E+00		pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	-3.72E-02	5.08E-02	5.08E-02	6.63E-02	U	pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-1.94E-02	3.55E-02	3.55E-02	4.60E-02	U	pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	2.75E-02	3.39E-02	3.39E-02	5.60E-02	U	pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	1.85E+00	1.84E+00	1.84E+00	3.02E+00	U	pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	3.62E-01	8.70E-02	8.90E-02	2.15E-01		pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	4.49E-01	9.44E-02	9.72E-02	2.22E-01		pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	6.71E-01	7.55E-01	7.56E-01	1.02E+00	U	pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	4.26E-01	1.25E-01	1.27E-01	2.17E-01		pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	1.80E-02	1.05E-01	1.05E-01	1.80E-01	U	pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	8.88E-01	1.09E+00	1.09E+00	1.82E+00	U	pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	1.44E-01	6.57E-02	6.61E-02	9.95E-02		pCi/g
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	2.41E-01	2.71E-01	2.71E-01	3.83E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:		Work Order Details:	
Patricia Giza		SDG:	19-09131
Zion Solutions		Purchase Order:	677118
2701 Deborah Ave		Analysis Category:	ENVIRONMENTAL
Zion, IL 60099		Sample Matrix:	SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA		Report Units
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	3.04E-01	1.75E-01	1.76E-01	3.23E-01	U	pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	-3.20E-02	4.77E-02	4.78E-02	5.31E-02	U	pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	3.28E-02	1.08E-01	1.08E-01	1.42E-01	U	pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	1.57E-02	2.78E-02	2.78E-02	7.85E-02	U	pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	4.59E-01	1.15E-01	1.17E-01	2.00E-01		pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	1.29E-01	4.51E-02	4.56E-02	7.54E-02		pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	2.28E-03	1.80E-02	1.80E-02	5.68E-02	U	pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	8.97E-01	1.35E-01	1.43E-01	7.86E-02		pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	5.17E-02	1.85E-01	1.85E-01	1.75E-01	U	pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	5.67E-02	1.27E-01	1.27E-01	8.97E-02	U	pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	9.21E-02	8.36E-02	8.38E-02	1.33E-01	U	pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	-9.53E-03	6.75E-02	6.75E-02	6.84E-02	U	pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	-2.99E+00	1.28E+01	1.28E+01	3.52E+00	U	pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.13E+01	1.68E+00	1.78E+00	8.95E-01		pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	-4.36E-02	5.16E-02	5.16E-02	6.74E-02	U	pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-2.30E-02	3.88E-02	3.88E-02	5.27E-02	U	pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	-3.47E-02	3.96E-02	3.97E-02	5.12E-02	U	pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	3.15E+00	2.17E+00	2.17E+00	3.47E+00	U	pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	4.23E-01	9.61E-02	9.86E-02	2.18E-01		pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	3.96E-01	1.37E-01	1.39E-01	2.22E-01		pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	6.19E-01	7.53E-01	7.54E-01	1.02E+00	U	pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	4.59E-01	1.15E-01	1.17E-01	2.00E-01		pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	1.58E-02	1.06E-01	1.06E-01	1.82E-01	U	pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	1.69E+00	9.45E-01	9.49E-01	1.37E+00	U	pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	2.06E-01	8.09E-02	8.16E-02	1.35E-01		pCi/g
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	-1.59E-01	3.02E-01	3.03E-01	3.68E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09131
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA		Report Units
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	6.35E-01	2.22E-01	2.24E-01	3.65E-01		pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	6.33E-02	7.61E-02	7.62E-02	8.56E-02	U	pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	1.20E-02	5.06E-02	5.06E-02	1.48E-01	U	pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	-9.53E-03	4.12E-02	4.12E-02	1.70E-01	U	pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	6.63E-01	1.71E-01	1.75E-01	2.54E-01		pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	1.36E-01	8.24E-02	8.27E-02	1.27E-01	U	pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	-2.93E-01	1.57E-01	1.58E-01	1.42E-01	U	pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	2.30E-01	9.43E-02	9.50E-02	1.33E-01		pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	5.89E-02	1.72E-01	1.72E-01	2.32E-01	U	pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	1.12E-02	2.19E-01	2.19E-01	1.19E-01	U	pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	1.31E-01	1.11E-01	1.12E-01	1.92E-01	U	pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	2.65E-03	1.20E-01	1.20E-01	9.02E-02	U	pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	-2.49E-02	7.47E-02	7.47E-02	1.08E-01	U	pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.37E+01	2.12E+00	2.23E+00	1.00E+00		pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	8.70E-02	9.32E-02	9.33E-02	1.72E-01	U	pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	7.72E-03	7.48E-02	7.48E-02	9.11E-02	U	pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	6.47E-02	4.52E-02	4.53E-02	1.14E-01	U	pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	1.80E+00	1.41E+00	1.42E+00	2.34E+00	U	pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	7.74E-01	1.92E-01	1.96E-01	2.80E-01		pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	4.39E-01	1.63E-01	1.64E-01	2.78E-01		pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	1.62E-02	8.90E-02	8.90E-02	1.33E-01	U	pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	6.63E-01	1.71E-01	1.75E-01	2.54E-01		pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	4.20E-02	2.33E-01	2.33E-01	3.28E-01	U	pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	7.95E-01	9.99E-01	1.00E+00	1.51E+00	U	pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	5.14E-01	1.68E-01	1.70E-01	6.80E-02		pCi/g
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	1.01E-01	3.23E-01	3.23E-01	4.84E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:	Work Order Details:	
Patricia Giza	SDG:	19-09131
Zion Solutions	Purchase Order:	677118
2701 Deborah Ave	Analysis Category:	ENVIRONMENTAL
Zion, IL 60099	Sample Matrix:	SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA		Report Units
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	2.46E-01	2.05E-01	2.05E-01	3.67E-01	U	pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	-1.75E-02	5.08E-02	5.08E-02	6.13E-02	U	pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	-1.19E-01	6.96E-02	6.99E-02	9.08E-02	U	pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	3.11E-02	2.89E-02	2.90E-02	1.01E-01	U	pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	4.88E-01	1.26E-01	1.28E-01	1.81E-01		pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	7.24E-02	7.17E-02	7.18E-02	1.07E-01	U	pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	4.33E-03	2.48E-02	2.48E-02	1.02E-01	U	pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	1.16E-01	5.03E-02	5.06E-02	7.02E-02		pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	-6.77E-03	1.00E-01	1.00E-01	1.43E-01	U	pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	-1.28E-01	2.02E-01	2.02E-01	7.38E-02	U	pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	1.40E-01	9.28E-02	9.30E-02	1.32E-01		pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	2.28E-02	7.61E-02	7.61E-02	5.75E-02	U	pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	-2.41E-02	1.65E-01	1.65E-01	2.41E-01	U	pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.30E+01	2.66E+00	2.74E+00	1.50E+00		pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	-2.46E-03	2.46E-02	2.46E-02	1.08E-01	U	pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-1.87E-02	4.00E-02	4.00E-02	6.06E-02	U	pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	1.07E-02	4.06E-02	4.06E-02	6.93E-02	U	pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	2.15E+00	1.11E+00	1.11E+00	1.78E+00		pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	3.66E-01	8.57E-02	8.77E-02	1.86E-01		pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	3.11E-01	1.11E-01	1.12E-01	2.02E-01		pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	-4.40E-03	5.92E-02	5.92E-02	1.67E-01	U	pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	4.88E-01	1.26E-01	1.28E-01	1.81E-01		pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	1.11E-02	1.49E-01	1.49E-01	2.08E-01	U	pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	1.30E+00	7.81E-01	7.84E-01	1.27E+00		pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	3.92E-01	1.96E-01	1.97E-01	3.08E-01		pCi/g
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	8.16E-03	2.10E-01	2.10E-01	3.12E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09131
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA		Report Units
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	2.24E-01	2.63E-01	2.63E-01	4.72E-01	U	pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	-4.93E-03	6.09E-02	6.09E-02	8.67E-02	U	pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	-8.86E-02	9.96E-02	9.97E-02	1.36E-01	U	pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	-6.61E-03	4.42E-02	4.42E-02	1.64E-01	U	pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	3.60E-01	1.40E-01	1.41E-01	2.19E-01		pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	-4.18E-02	9.93E-02	9.93E-02	1.39E-01	U	pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	-2.65E-02	4.60E-02	4.60E-02	1.12E-01	U	pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	1.83E-01	9.94E-02	9.98E-02	1.52E-01		pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	1.48E-02	1.77E-01	1.77E-01	2.20E-01	U	pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	-6.84E-02	2.17E-01	2.17E-01	1.13E-01	U	pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	4.39E-02	1.19E-01	1.19E-01	1.78E-01	U	pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	-1.12E-02	5.86E-02	5.86E-02	8.25E-02	U	pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	-2.30E-02	7.25E-02	7.25E-02	1.05E-01	U	pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.06E+01	1.89E+00	1.97E+00	1.45E+00		pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	2.19E-02	9.40E-02	9.40E-02	1.59E-01	U	pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-2.09E-02	6.47E-02	6.47E-02	8.52E-02	U	pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	5.41E-03	3.30E-02	3.30E-02	9.37E-02	U	pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	6.78E-01	7.70E-01	7.71E-01	1.18E+00	U	pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	4.98E-01	1.51E-01	1.53E-01	2.25E-01		pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	4.15E-01	1.35E-01	1.36E-01	2.58E-01		pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	6.95E-02	8.40E-02	8.40E-02	1.30E-01	U	pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	3.60E-01	1.40E-01	1.41E-01	2.19E-01		pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	-4.87E-02	2.07E-01	2.07E-01	2.79E-01	U	pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	1.65E+00	1.31E+00	1.31E+00	2.16E+00	U	pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	3.58E-01	1.45E-01	1.46E-01	2.69E-01		pCi/g
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	2.89E-02	3.02E-01	3.02E-01	4.51E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09131
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA		Report Units
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	6.16E-01	2.01E-01	2.04E-01	3.25E-01		pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	-3.81E-02	5.49E-02	5.49E-02	5.52E-02	U	pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	4.81E-02	1.01E-01	1.02E-01	1.62E-01	U	pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	3.58E-02	4.56E-02	4.56E-02	9.36E-02	U	pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	6.34E-01	1.27E-01	1.31E-01	1.50E-01		pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	3.22E-02	6.20E-02	6.21E-02	1.06E-01	U	pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	1.11E-02	3.38E-02	3.39E-02	6.84E-02	U	pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	2.78E-01	8.15E-02	8.27E-02	1.03E-01		pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	3.27E-02	1.48E-01	1.48E-01	2.12E-01	U	pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	-1.51E-02	8.67E-02	8.67E-02	1.08E-01	U	pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	2.35E-01	1.33E-01	1.33E-01	1.76E-01	U	pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	-3.73E-02	7.59E-02	7.59E-02	8.10E-02	U	pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	-3.89E+00	1.64E+01	1.64E+01	3.83E+00	U	pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.45E+01	2.09E+00	2.22E+00	1.08E+00		pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	1.99E-03	6.86E-02	6.86E-02	1.05E-01	U	pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-1.17E-02	4.52E-02	4.52E-02	6.58E-02	U	pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	1.89E-02	4.25E-02	4.25E-02	6.34E-02	U	pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	2.34E+00	1.78E+00	1.78E+00	2.89E+00	U	pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	6.99E-01	1.29E-01	1.34E-01	2.16E-01		pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	6.56E-01	1.30E-01	1.34E-01	1.93E-01		pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	6.40E-01	8.07E-01	8.07E-01	1.11E+00	U	pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	6.34E-01	1.27E-01	1.31E-01	1.50E-01		pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	1.41E-02	1.17E-01	1.17E-01	1.98E-01	U	pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	1.06E+00	1.16E+00	1.16E+00	1.93E+00	U	pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	2.76E-01	1.02E-01	1.03E-01	1.50E-01		pCi/g
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	3.42E-01	3.09E-01	3.10E-01	4.45E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:

Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:

SDG: **19-09131**
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA		Report Units
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	4.13E-01	2.39E-01	2.40E-01	4.10E-01		pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	-5.52E-03	1.54E-02	1.55E-02	6.23E-02	U	pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	-8.23E-02	6.48E-02	6.49E-02	8.64E-02	U	pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	1.37E-02	2.01E-02	2.01E-02	9.23E-02	U	pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	2.47E-01	1.04E-01	1.05E-01	1.57E-01		pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	1.47E-03	7.19E-02	7.19E-02	1.16E-01	U	pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	2.81E-02	2.70E-02	2.70E-02	7.80E-02	U	pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	1.62E-01	6.41E-02	6.46E-02	9.11E-02		pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	1.40E-02	1.31E-01	1.31E-01	1.38E-01	U	pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	-2.78E-02	1.70E-01	1.70E-01	7.13E-02	U	pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	6.16E-02	6.24E-02	6.25E-02	1.05E-01	U	pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	6.30E-02	3.60E-02	3.62E-02	5.79E-02		pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	9.18E-02	1.68E-01	1.68E-01	2.49E-01	U	pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.18E+01	2.35E+00	2.42E+00	4.13E-01		pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	-1.38E-02	5.02E-02	5.02E-02	7.80E-02	U	pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-2.05E-02	4.00E-02	4.00E-02	5.99E-02	U	pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	-1.34E-02	4.54E-02	4.54E-02	6.69E-02	U	pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	5.39E-01	6.72E-01	6.72E-01	1.02E+00	U	pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	4.82E-01	1.28E-01	1.30E-01	1.82E-01		pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	3.14E-01	1.02E-01	1.04E-01	1.77E-01		pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	1.12E-02	1.11E-01	1.11E-01	1.63E-01	U	pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	2.47E-01	1.04E-01	1.05E-01	1.57E-01		pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	2.70E-03	1.38E-01	1.38E-01	1.93E-01	U	pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	9.31E-01	5.39E-01	5.41E-01	8.54E-01	U	pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	4.74E-01	1.43E-01	1.45E-01	1.81E-01		pCi/g
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	1.67E-01	2.08E-01	2.09E-01	3.22E-01	U	pCi/g

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Eberline Analytical
Final Report of Analysis

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Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09131
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Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA		Report Units
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	2.44E-01	1.89E-01	1.89E-01	3.38E-01	U	pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	-1.27E-02	4.97E-02	4.98E-02	7.12E-02	U	pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	-5.13E-02	7.80E-02	7.81E-02	1.08E-01	U	pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	3.81E-03	2.31E-02	2.31E-02	1.22E-01	U	pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	3.43E-01	1.17E-01	1.18E-01	3.01E-01		pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	1.51E-02	8.13E-02	8.13E-02	1.36E-01	U	pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	-1.84E-01	9.52E-02	9.57E-02	8.44E-02	U	pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	3.39E-01	7.61E-02	7.80E-02	1.48E-01		pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	-5.33E-03	1.67E-01	1.67E-01	1.87E-01	U	pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	-8.49E-02	1.74E-01	1.74E-01	9.29E-02	U	pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	3.15E-02	4.78E-02	4.78E-02	1.36E-01	U	pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	2.54E-02	9.41E-02	9.41E-02	6.83E-02	U	pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	1.88E-02	5.80E-02	5.80E-02	8.76E-02	U	pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	7.68E+00	1.37E+00	1.42E+00	5.52E-01		pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	-1.56E-02	6.93E-02	6.93E-02	1.10E-01	U	pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-1.75E-02	5.63E-02	5.63E-02	7.48E-02	U	pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	-5.43E-02	6.08E-02	6.09E-02	8.20E-02	U	pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	9.16E-01	5.91E-01	5.93E-01	9.54E-01	U	pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	2.66E-01	1.17E-01	1.18E-01	1.83E-01		pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	2.65E-01	1.18E-01	1.19E-01	2.23E-01		pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	-2.20E-02	7.05E-02	7.05E-02	1.02E-01	U	pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	3.43E-01	1.17E-01	1.18E-01	3.01E-01		pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	-6.32E-02	1.77E-01	1.77E-01	2.33E-01	U	pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	9.06E-01	7.04E-01	7.06E-01	1.10E+00	U	pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	3.19E-01	1.19E-01	1.20E-01	5.92E-02		pCi/g
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	-8.85E-02	2.53E-01	2.54E-01	3.65E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09131
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA		Report Units
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	2.88E-01	1.32E-01	1.33E-01	3.13E-01	U	pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	-1.51E-03	1.39E-02	1.39E-02	4.12E-02	U	pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	9.04E-02	8.49E-02	8.50E-02	1.21E-01	U	pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	1.73E-02	2.32E-02	2.32E-02	6.48E-02	U	pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	2.94E-01	8.56E-02	8.69E-02	1.31E-01		pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	-6.67E-03	4.95E-02	4.95E-02	5.94E-02	U	pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	1.57E-04	1.86E-02	1.86E-02	4.68E-02	U	pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	5.67E-02	4.52E-02	4.53E-02	7.23E-02	U	pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	3.51E-02	1.30E-01	1.30E-01	1.47E-01	U	pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	2.94E-02	1.06E-01	1.06E-01	7.68E-02	U	pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	1.15E-01	8.53E-02	8.55E-02	1.16E-01	U	pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	-6.53E-02	6.71E-02	6.72E-02	5.98E-02	U	pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	-3.42E-01	3.20E+00	3.20E+00	3.14E+00	U	pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.01E+01	1.52E+00	1.61E+00	8.38E-01		pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	-7.89E-04	3.86E-02	3.86E-02	6.04E-02	U	pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-9.65E-03	3.26E-02	3.26E-02	4.76E-02	U	pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	1.65E-02	3.02E-02	3.02E-02	5.15E-02	U	pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	1.62E+00	1.27E+00	1.27E+00	2.06E+00	U	pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	3.96E-01	8.55E-02	8.78E-02	1.26E-01		pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	3.63E-01	1.07E-01	1.09E-01	1.87E-01		pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	6.04E-01	6.44E-01	6.45E-01	8.60E-01	U	pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	2.94E-01	8.56E-02	8.69E-02	1.31E-01		pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	6.36E-02	8.98E-02	8.99E-02	1.62E-01	U	pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	6.04E-01	7.89E-01	7.90E-01	1.09E+00	U	pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	2.26E-01	7.58E-02	7.67E-02	9.04E-02		pCi/g
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	1.02E-01	2.23E-01	2.23E-01	3.09E-01	U	pCi/g

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Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09131
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA		Report Units
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	5.99E-01	1.84E-01	1.86E-01	3.68E-01		pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	-7.56E-03	3.79E-02	3.79E-02	7.43E-02	U	pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	-1.25E-01	7.50E-02	7.52E-02	9.82E-02	U	pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	-1.25E-02	2.03E-02	2.03E-02	1.06E-01	U	pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	3.05E-01	1.11E-01	1.12E-01	2.82E-01		pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	1.71E-01	6.76E-02	6.82E-02	1.11E-01		pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	6.02E-03	2.03E-02	2.03E-02	1.07E-01	U	pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	5.73E-01	1.11E-01	1.15E-01	1.16E-01		pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	3.05E-02	1.45E-01	1.45E-01	1.64E-01	U	pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	1.05E-01	2.13E-01	2.13E-01	8.47E-02	U	pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	2.12E-01	8.41E-02	8.48E-02	1.61E-01		pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	-2.49E-02	8.77E-02	8.77E-02	6.74E-02	U	pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	-1.51E-01	2.14E-01	2.14E-01	2.92E-01	U	pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.38E+01	2.82E+00	2.91E+00	1.28E+00		pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	-1.02E-02	5.82E-02	5.82E-02	9.33E-02	U	pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-1.14E-03	4.31E-02	4.31E-02	7.07E-02	U	pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	1.19E-02	5.25E-02	5.25E-02	7.59E-02	U	pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	7.93E-01	8.88E-01	8.89E-01	1.48E+00	U	pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	4.90E-01	1.44E-01	1.46E-01	2.10E-01		pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	2.82E-01	1.28E-01	1.29E-01	2.31E-01		pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	8.43E-02	1.36E-01	1.36E-01	2.05E-01	U	pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	3.05E-01	1.11E-01	1.12E-01	2.82E-01		pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	-7.53E-02	1.81E-01	1.81E-01	2.39E-01	U	pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	8.18E-01	6.43E-01	6.44E-01	9.98E-01	U	pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	5.42E-01	2.35E-01	2.37E-01	3.61E-01		pCi/g
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	-1.09E-01	2.44E-01	2.44E-01	3.49E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

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Zion Solutions
2701 Deborah Ave
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Work Order Details:
SDG: 19-09131
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Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA		Report Units
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	2.91E-01	2.06E-01	2.07E-01	4.28E-01	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	3.45E-02	5.55E-02	5.56E-02	7.45E-02	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	1.55E-02	7.34E-02	7.34E-02	1.08E-01	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	1.06E-01	7.57E-02	7.59E-02	1.16E-01	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	2.41E-01	1.16E-01	1.17E-01	2.09E-01		pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	1.10E-01	5.91E-02	5.94E-02	1.19E-01	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	-2.14E-02	2.84E-02	2.85E-02	8.92E-02	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	2.59E-01	8.24E-02	8.35E-02	1.02E-01		pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	-1.11E-02	1.07E-01	1.07E-01	1.84E-01	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	-1.28E-01	1.68E-01	1.69E-01	9.29E-02	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	-5.60E-03	9.77E-02	9.77E-02	1.42E-01	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	-3.26E-02	1.12E-01	1.12E-01	6.87E-02	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	1.20E-03	6.31E-02	6.31E-02	9.30E-02	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	7.27E+00	1.36E+00	1.42E+00	7.58E-01		pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	5.23E-02	6.21E-02	6.21E-02	1.15E-01	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	1.64E-03	4.90E-02	4.90E-02	7.13E-02	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	1.08E-02	5.00E-02	5.00E-02	8.41E-02	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	1.13E+00	7.17E-01	7.19E-01	1.16E+00	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	3.54E-01	9.92E-02	1.01E-01	1.40E-01		pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	2.51E-01	1.13E-01	1.14E-01	2.80E-01	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	-2.47E-02	6.89E-02	6.89E-02	9.91E-02	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	2.41E-01	1.16E-01	1.17E-01	2.09E-01		pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	6.55E-02	1.51E-01	1.51E-01	2.23E-01	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	7.96E-01	7.12E-01	7.13E-01	1.10E+00	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	2.84E-01	1.60E-01	1.60E-01	3.77E-01	U	pCi/g
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	6.90E-02	2.38E-01	2.38E-01	3.61E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09131
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA		Report Units
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	5.07E-01	1.57E-01	1.59E-01	2.55E-01		pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	-6.25E-02	5.76E-02	5.77E-02	4.55E-02	U	pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	3.57E-02	1.02E-01	1.02E-01	1.35E-01	U	pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	-1.48E-02	2.62E-02	2.62E-02	7.20E-02	U	pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	4.23E-01	1.03E-01	1.05E-01	1.43E-01		pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	5.71E-02	5.36E-02	5.36E-02	7.05E-02	U	pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	1.11E-02	2.59E-02	2.59E-02	5.16E-02	U	pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	8.93E-02	5.74E-02	5.75E-02	9.00E-02	U	pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	-1.16E-01	1.52E-01	1.52E-01	1.61E-01	U	pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	-9.80E-02	1.54E-01	1.54E-01	8.24E-02	U	pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	1.36E-01	1.00E-01	1.01E-01	1.35E-01	U	pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	1.75E-02	6.88E-02	6.88E-02	6.95E-02	U	pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	-4.29E-01	3.45E+00	3.45E+00	3.18E+00	U	pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.41E+01	1.94E+00	2.07E+00	1.01E+00		pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	3.01E-02	4.92E-02	4.93E-02	8.20E-02	U	pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-2.53E-02	4.04E-02	4.05E-02	3.89E-02	U	pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	-6.93E-03	3.72E-02	3.72E-02	5.64E-02	U	pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	7.12E-01	9.37E-01	9.38E-01	2.03E+00	U	pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	3.98E-01	9.44E-02	9.65E-02	1.78E-01		pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	6.18E-01	1.28E-01	1.32E-01	2.04E-01		pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	4.27E-01	6.32E-01	6.32E-01	8.99E-01	U	pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	4.23E-01	1.03E-01	1.05E-01	1.43E-01		pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	-3.24E-02	8.85E-02	8.85E-02	1.42E-01	U	pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	1.41E+00	9.04E-01	9.07E-01	1.29E+00	U	pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	2.91E-01	9.38E-02	9.50E-02	1.29E-01		pCi/g
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	1.82E-01	2.80E-01	2.80E-01	3.81E-01	U	pCi/g

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Eberline Analytical
Final Report of Analysis

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Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09131
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Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA		Report Units
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	2.81E-01	2.44E-01	2.44E-01	4.50E-01	U	pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	-3.78E-02	6.86E-02	6.86E-02	7.59E-02	U	pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	-1.97E-01	8.63E-02	8.69E-02	1.03E-01	U	pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	-8.45E-03	8.92E-02	8.92E-02	1.17E-01	U	pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	3.64E-01	1.39E-01	1.40E-01	1.99E-01		pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	4.32E-01	1.10E-01	1.12E-01	1.69E-01		pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	6.10E-03	3.88E-02	3.88E-02	1.09E-01	U	pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	3.53E-01	8.66E-02	8.85E-02	2.25E-01		pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	-2.01E-01	2.21E-01	2.21E-01	1.59E-01	U	pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	7.90E-02	1.29E-01	1.29E-01	8.54E-02	U	pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	5.61E-03	8.31E-02	8.31E-02	1.22E-01	U	pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	-4.42E-02	1.07E-01	1.07E-01	7.22E-02	U	pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	1.05E-01	2.22E-01	2.22E-01	3.31E-01	U	pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	9.13E+00	2.19E+00	2.24E+00	1.39E+00		pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	3.54E-02	6.29E-02	6.30E-02	1.12E-01	U	pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-3.02E-02	5.18E-02	5.18E-02	7.78E-02	U	pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	-1.01E-02	5.85E-02	5.85E-02	9.12E-02	U	pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	1.14E+00	8.78E-01	8.80E-01	1.37E+00	U	pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	3.91E-01	1.27E-01	1.29E-01	1.85E-01		pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	2.79E-01	1.28E-01	1.29E-01	2.26E-01	U	pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	-5.93E-03	1.48E-01	1.48E-01	2.17E-01	U	pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	3.64E-01	1.39E-01	1.40E-01	1.99E-01		pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	-7.98E-02	1.90E-01	1.90E-01	2.49E-01	U	pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	9.05E-01	6.80E-01	6.82E-01	1.07E+00	U	pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	3.43E-01	1.93E-01	1.94E-01	3.03E-01		pCi/g
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	-5.19E-02	2.45E-01	2.45E-01	3.56E-01	U	pCi/g

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19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Actinium-228	EPA 901.1 Modified	3.44E-01	1.28E-01	1.29E-01	2.36E-01		pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Silver-108m	EPA 901.1 Modified	-2.70E-02	4.17E-02	4.17E-02	3.88E-02	U	pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Americium-241	EPA 901.1 Modified	-7.39E-02	8.74E-02	8.74E-02	1.03E-01	U	pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Barium-133	EPA 901.1 Modified	3.11E-02	3.38E-02	3.39E-02	6.01E-02	U	pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Bismuth-214	EPA 901.1 Modified	3.55E-01	9.82E-02	9.99E-02	1.68E-01		pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Cobalt-60	EPA 901.1 Modified	4.14E-02	4.67E-02	4.67E-02	7.76E-02	U	pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Cesium-134	EPA 901.1 Modified	-4.60E-03	2.96E-02	2.96E-02	4.70E-02	U	pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Cesium-137	EPA 901.1 Modified	1.30E-01	4.87E-02	4.91E-02	6.59E-02		pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Europium-152	EPA 901.1 Modified	8.24E-02	8.68E-02	8.69E-02	1.49E-01	U	pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Europium-154	EPA 901.1 Modified	7.44E-03	1.17E-01	1.17E-01	7.59E-02	U	pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Europium-155	EPA 901.1 Modified	1.07E-01	7.94E-02	7.96E-02	1.08E-01	U	pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Holmium-166m	EPA 901.1 Modified	-4.20E-02	5.82E-02	5.82E-02	5.88E-02	U	pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Iodine-129	EPA 901.1 Modified	3.06E+00	1.27E+01	1.27E+01	1.79E+00	U	pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Potassium-40	EPA 901.1 Modified	9.25E+00	1.39E+00	1.47E+00	7.71E-01		pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Manganese-54	EPA 901.1 Modified	-2.61E-02	3.85E-02	3.85E-02	5.34E-02	U	pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	3.67E-03	3.06E-02	3.06E-02	4.78E-02	U	pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Niobium-94	EPA 901.1 Modified	8.93E-03	3.19E-02	3.19E-02	4.53E-02	U	pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Lead-210	EPA 901.1 Modified	1.33E+00	9.55E-01	9.58E-01	1.61E+00	U	pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Lead-212	EPA 901.1 Modified	3.91E-01	8.79E-02	9.02E-02	1.89E-01		pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Lead-214	EPA 901.1 Modified	3.85E-01	9.26E-02	9.47E-02	1.36E-01		pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Promethium-145	EPA 901.1 Modified	1.95E-01	3.82E-01	3.82E-01	5.76E-01	U	pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Radium-226	EPA 901.1 Modified	3.55E-01	9.82E-02	9.99E-02	1.68E-01		pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Antimony-125	EPA 901.1 Modified	-3.24E-02	7.68E-02	7.69E-02	1.24E-01	U	pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Thorium-234	EPA 901.1 Modified	6.90E-01	7.80E-01	7.81E-01	1.08E+00	U	pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Thallium-208	EPA 901.1 Modified	2.29E-01	8.12E-02	8.20E-02	1.24E-01		pCi/g
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Uranium-235	EPA 901.1 Modified	7.60E-02	2.31E-01	2.31E-01	3.11E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:

Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:

SDG: **19-09131**
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA		Report Units
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Actinium-228	EPA 901.1 Modified	4.11E-01	1.81E-01	1.82E-01	3.48E-01		pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Silver-108m	EPA 901.1 Modified	4.95E-03	2.57E-02	2.57E-02	6.45E-02	U	pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Americium-241	EPA 901.1 Modified	-7.38E-02	8.07E-02	8.08E-02	1.10E-01	U	pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Barium-133	EPA 901.1 Modified	-2.38E-03	2.31E-02	2.31E-02	1.10E-01	U	pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Bismuth-214	EPA 901.1 Modified	3.80E-01	1.12E-01	1.14E-01	1.41E-01		pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Cobalt-60	EPA 901.1 Modified	9.61E-02	5.44E-02	5.46E-02	1.19E-01	U	pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Cesium-134	EPA 901.1 Modified	7.22E-03	3.38E-02	3.38E-02	9.05E-02	U	pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Cesium-137	EPA 901.1 Modified	1.42E-01	6.97E-02	7.00E-02	1.05E-01		pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Europium-152	EPA 901.1 Modified	2.69E-02	1.66E-01	1.66E-01	1.77E-01	U	pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Europium-154	EPA 901.1 Modified	9.95E-03	1.18E-01	1.18E-01	9.11E-02	U	pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Europium-155	EPA 901.1 Modified	-1.09E-03	8.53E-02	8.53E-02	1.24E-01	U	pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Holmium-166m	EPA 901.1 Modified	-6.22E-03	7.92E-02	7.92E-02	6.90E-02	U	pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Iodine-129	EPA 901.1 Modified	-1.16E-02	1.93E-01	1.93E-01	2.82E-01	U	pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.42E+01	2.85E+00	2.94E+00	1.19E+00		pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Manganese-54	EPA 901.1 Modified	6.34E-02	5.02E-02	5.03E-02	9.66E-02	U	pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-4.13E-02	4.75E-02	4.76E-02	6.09E-02	U	pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Niobium-94	EPA 901.1 Modified	8.49E-03	4.83E-02	4.83E-02	7.44E-02	U	pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Lead-210	EPA 901.1 Modified	5.94E-01	7.90E-01	7.90E-01	1.19E+00	U	pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Lead-212	EPA 901.1 Modified	4.51E-01	1.01E-01	1.03E-01	2.89E-01		pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Lead-214	EPA 901.1 Modified	3.90E-01	1.12E-01	1.13E-01	2.23E-01		pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Promethium-145	EPA 901.1 Modified	3.27E-02	1.28E-01	1.28E-01	1.91E-01	U	pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Radium-226	EPA 901.1 Modified	3.80E-01	1.12E-01	1.14E-01	1.41E-01		pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Antimony-125	EPA 901.1 Modified	-2.42E-02	1.57E-01	1.57E-01	2.13E-01	U	pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Thorium-234	EPA 901.1 Modified	1.34E-01	7.12E-01	7.12E-01	1.05E+00	U	pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Thallium-208	EPA 901.1 Modified	5.41E-01	2.26E-01	2.28E-01	4.09E-01		pCi/g
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Uranium-235	EPA 901.1 Modified	1.23E-01	2.31E-01	2.31E-01	3.52E-01	U	pCi/g

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Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09131
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA		Report Units
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Actinium-228	EPA 901.1 Modified	1.22E+00	2.94E-01	3.00E-01	4.74E-01		pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Silver-108m	EPA 901.1 Modified	-8.47E-04	6.14E-02	6.14E-02	1.12E-01	U	pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Americium-241	EPA 901.1 Modified	9.43E-02	1.19E-01	1.19E-01	3.06E-01	U	pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Barium-133	EPA 901.1 Modified	-2.66E-02	4.69E-02	4.69E-02	2.39E-01	U	pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Bismuth-214	EPA 901.1 Modified	1.10E+00	2.24E-01	2.31E-01	2.77E-01		pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Cobalt-60	EPA 901.1 Modified	1.66E-02	1.20E-01	1.20E-01	1.68E-01	U	pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Cesium-134	EPA 901.1 Modified	-2.20E-02	7.59E-02	7.60E-02	1.66E-01	U	pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Cesium-137	EPA 901.1 Modified	3.58E-02	1.08E-01	1.08E-01	1.58E-01	U	pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Europium-152	EPA 901.1 Modified	-2.62E-02	1.60E-01	1.60E-01	3.16E-01	U	pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Europium-154	EPA 901.1 Modified	-7.58E-02	2.97E-01	2.97E-01	1.65E-01	U	pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Europium-155	EPA 901.1 Modified	3.01E-01	1.76E-01	1.77E-01	2.70E-01	U	pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Holmium-166m	EPA 901.1 Modified	-8.41E-02	1.59E-01	1.59E-01	1.21E-01	U	pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Iodine-129	EPA 901.1 Modified	1.41E-02	9.68E-02	9.68E-02	1.43E-01	U	pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.65E+01	2.87E+00	2.99E+00	2.62E+00		pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Manganese-54	EPA 901.1 Modified	-2.12E-02	1.11E-01	1.11E-01	1.75E-01	U	pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	5.40E-02	8.23E-02	8.24E-02	1.00E-01	U	pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Niobium-94	EPA 901.1 Modified	2.36E-02	8.37E-02	8.37E-02	1.30E-01	U	pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Lead-210	EPA 901.1 Modified	1.17E+00	1.27E+00	1.27E+00	2.12E+00	U	pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Lead-212	EPA 901.1 Modified	1.29E+00	2.63E-01	2.71E-01	3.68E-01		pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Lead-214	EPA 901.1 Modified	9.98E-01	2.15E-01	2.21E-01	3.37E-01		pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Promethium-145	EPA 901.1 Modified	-7.67E-02	1.24E-01	1.24E-01	1.75E-01	U	pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Radium-226	EPA 901.1 Modified	1.10E+00	2.24E-01	2.31E-01	2.77E-01		pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Antimony-125	EPA 901.1 Modified	2.01E-02	2.72E-01	2.72E-01	3.77E-01	U	pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Thorium-234	EPA 901.1 Modified	1.32E+00	1.51E+00	1.52E+00	3.00E+00	U	pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Thallium-208	EPA 901.1 Modified	8.72E-01	2.43E-01	2.47E-01	8.04E-02		pCi/g
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Uranium-235	EPA 901.1 Modified	-4.06E-01	4.61E-01	4.61E-01	6.35E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

ZION SOLUTIONS LLC
An EnergySolutions Company

REC'D SEP 23 2019
19-09131

ZS-WM-131
Revision 0
Information Use

L1-10212D-EJGS-437-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/14/2019	1248	FULL SUITE	NA	904.55g
L1-10212D-EJGS-438-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/14/2019	1251	FULL SUITE	NA	695.09g
L1-10212D-EJGS-439-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/14/2019	1254	FULL SUITE	NA	1067.15g
L1-10212D-AIGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/15/2019	1402	FULL SUITE	NA	950.44g
L1-10212D-AIGS-009-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/15/2019	1410	FULL SUITE	NA	442.50g
L1-10212D-AIGS-010-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/19/2019	0830	FULL SUITE	NA	680.74g
L1-10212D-AIGS-011-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/19/2019	0832	FULL SUITE	NA	520.22g
L1-10212D-AIGS-012-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/19/2019	0854	FULL SUITE	NA	765.73g
L1-10212D-AIGS-015-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/20/2019	0804	FULL SUITE	NA	686.49g
L1-10212D-AIGS-017-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/21/2019	0815	FULL SUITE	NA	1099.59g
L1-10212D-EJGS-451-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/19/2019	1340	FULL SUITE	NA	683.89g
L1-10212D-EJGS-452-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/19/2019	1342	FULL SUITE	NA	387.93g
L1-10212D-EJGS-453-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/19/2019	1344	FULL SUITE	NA	643.65g
L1-10212D-EJGS-454-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/19/2019	1346	FULL SUITE	NA	589.96g
L1-10212D-EJGS-455-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/19/2019	1348	FULL SUITE	NA	893.40g
L1-10212D-EJGS-456-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/19/2019	1220	FULL SUITE	NA	991.63g
L1-10212D-EJGS-459-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/19/2019	1235	FULL SUITE	NA	674.35g
4 L1-10220H-QJGS-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/9/2019	0820	5 ROC HTD	NA	780.01g
5 L1-10203D-FSGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	4/9/2019	0800	5 ROC HTD	NA	852.61g

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6	L1-10203D-FQGS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	4/9/2019	0805	5 ROC HTD	NA	868.92g
7	L1-10203E-FSGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	4/8/2019	1230	5 ROC HTD	NA	813.36g
8	L1-10203E-FSGS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	4/8/2019	1235	5 ROC HTD	NA	702.73g
9	L1-10221A-FIGS-007-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	1025	5 ROC HTD	NA	874.41g
10	L1-10221A-FSGS-002-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	1400	5 ROC HTD	NA	1109.56g
11	L1-10221A-FSGS-108-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/23/2019	1244	5 ROC HTD	NA	918.06g
12	L1-10221A-FSGS-110-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/23/2019	1248	5 ROC HTD	NA	805.48g
13	L1-10221A-FSGS-112-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/23/2019	1252	5 ROC HTD	NA	1136.57g
14	L1-10221C-FSGS-013-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	1520	5 ROC HTD	NA	825.45g
15	L1-10221D-FIGS-010-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/30/2019	0906	5 ROC HTD	NA	599.72g
16	L1-10209C-FSGS-010-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/5/2019	0820	5 ROC HTD	NA	1051.63g
17	L1-10209C-FQGS-010-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/5/2019	0820	5 ROC HTD	NA	795.39g
18	L1-10209C-FSGS-004-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/30/2019	1327	5 ROC HTD	NA	709.07g
	L1-10209C-FQGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/25/2019	1300	5 ROC HTD	NA	1062.99g
	L1-10209C-FIGS-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/25/2019	1306	5 ROC HTD	NA	945.02g
	L1-10209C-FIGS-006-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/30/2019	1240	5 ROC HTD	NA	752.63g
	L2-10213A-FSGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	0730	5 ROC HTD	NA	663.96g
	L2-10213A-FSGS-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	0734	5 ROC HTD	NA	865.77g
	L2-10213A-FSGS-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	0736	5 ROC HTD	NA	773.20g

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Laboratory: EBERLINE LABS			Date Submitted To Lab:			Ship Container No.: NA		Cooler Temperature: FULL SUITE N/A		Airbill Number: Fed Ex Ground Various		
Relinquished by: Jack Mucia			Date (mm/dd/yyyy): 9/18/19		Time: 0805	Received by: Richard F. Rickert		Date: (mm/dd/yyyy): 09/18/2019		0805		
Relinquished by: Richard F. Rickert			Date (mm/dd/yyyy): 09/19/2019		Time: 1000	Received by: Fed Ex Ground		Date: (mm/dd/yyyy): 09/19/2019		1000		
Relinquished by: Fedex - Ground			Date (mm/dd/yyyy):		Time:	Received by: Randolph Spencer		Date: (mm/dd/yyyy): 9/23/2019		1045		
Relinquished by:			Date (mm/dd/yyyy):		Time:	Received by:		Date: (mm/dd/yyyy):				
Comments												

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