ZION STATION RESTORATION PROJECT
FINAL STATUS SURVEY RELEASE RECORD

CRIB HOUSE AREA

SURVEY UNIT 12204B

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 Soil DCGLs
C/LT	Characterization/License Termination
cpm	Counts per minute
DQA	Data Quality Assessment
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
NAD	North American Datum
NaI	Sodium Iodide
OpDCGL	Operational Derived Concentration Guideline Level
OpSOF	Operational Sum of Fraction
QAPP	Quality Assurance Project Plan
QC	Quality Control
RE	Radiological Engineer
ROC	Radionuclides of Concern
SOF	Sum of Fraction
TEDE	Total Effective Dose Equivalent

TSD	Technical Support Documents
UBGR	Upper Bound of the Gray Region
UCL	Upper Confidence Level
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 12204B, "Crib House Area," 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 (L1-12204B-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 1. 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 surface area in the survey unit. No areas of elevated activity were detected during the scans. The analytical results for all soil samples taken in survey unit 12204B indicate that the Sum of Fractions (SOF) for each sample, when compared to the Operational Derived Concentration Guideline Levels (OpDCGL), was less than 1.0, with a maximum Operational SOF (OpSOF) of 0.118. The mean OpSOF for the systematic samples was 0.052. The mean SOF (BcSOF), when the analytical results were compared to the Base Case DCGLs (BcDCGL), was 0.013, which results in a dose assigned to the survey unit of 0.335 mrem/year. Therefore, the null hypothesis is rejected and survey unit 12204B is acceptable for unrestricted release.

2. SURVEY UNIT DESCRIPTION

Survey unit 12204B, "Crib House Area," is a Class 1 open land survey unit and is 1,971 m^2 in size. It is bounded on the west by survey units 12205B and 12205C; the east by survey unit 10223, the north by survey unit 12204A and the south by survey unit 12204C.

The topography of the survey unit is mainly flat with some small dips and depressions. The soil is a mixture of loam and clay. A fence runs along the eastern border of the survey unit.

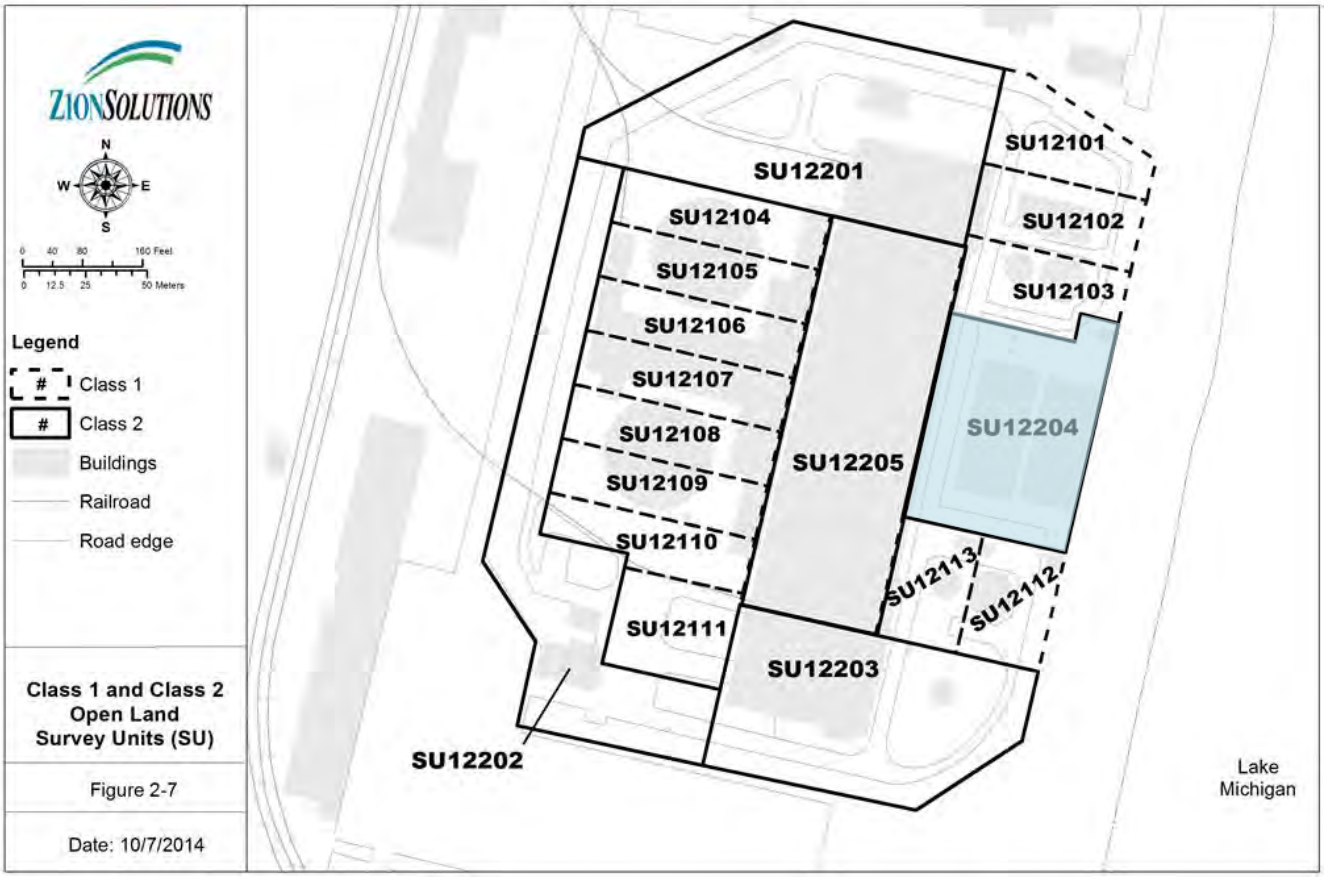
The boundary of the survey unit was defined using a Global Positioning System (GPS) based on the Illinois State Plane System North American Datum (NAD) 1983 East. The reference coordinates associated with the sample locations in this survey unit are presented in **Error! Reference source not found.**.

3. CLASSIFICATION BASIS

Survey unit 12204B 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 described as the "Crib House Area" and is located within survey unit 10111 as identified in Figure 3 of the *"Zion Station Historical Site Assessment"* (HSA) (Reference 6). Subsequently, this area was designated as survey unit 12204, "Crib House Area" in Table 2-4 of the LTP as represented in Figure 2-7 of the LTP, which is replicated below as Figure 1. Survey unit 12204 was initially classified in both the HSA and LTP as a Class 2.

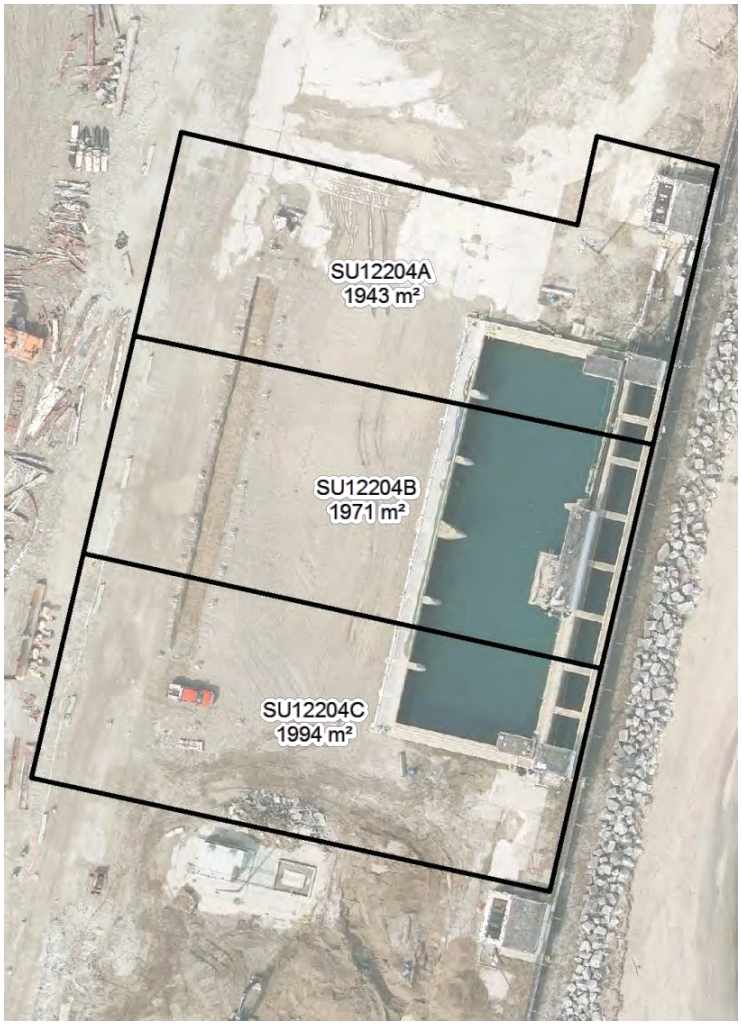
Figure 1 - Class 1 and Class 2 Open Land Survey Units from Figure 2-7 of the LTP



Characterization surveys were performed in this survey unit in September of 2012 and June of 2013. Approximately 30% of the survey unit was scanned using a Ludlum Model 2350-1 and a Model 44-10 Sodium Iodide (NaI) detector. Thirteen (13) judgmental surface soil samples were taken in locations where scan surveys showed elevated count rates or selected based on visual clues. Six (6) of the thirteen (13) surface samples had positive results for Cs-137, with the highest activity at 0.21 pCi/g. Thirty-six (36) subsurface soil samples were obtained. Two (2) of the thirty-six (36) subsurface samples had positive results for Cs-137. Both were from a single sample location, with the 1-meter depth sample at 0.12 pCi/g and the 2-meter depth sample at 0.04 pCi/g.

On July 15, 2016, due to changing radiological and operational conditions brought about by site decommissioning activities inside or adjacent to this area, survey unit 12204 was reclassified as Class 1 and divided into three (3) survey units: 12204A, 12204B and 12204C, to comply with the survey unit size recommendations from MARSSIM Section 4.6. The change in classification was a conservative response and ensured that the survey unit would be surveyed with the appropriate rigor.

Figure 2 - Three Class 1 Open Land Survey Units Created from Class 2 Survey Unit 12204



A Radiological Engineer (RE) and a Characterization/License Termination (C/LT) Supervisor performed a visual inspection and walk-down of the survey unit on December 20, 2018, 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 procedure ZS-LT-300-001-

002, "*Survey Unit Classification*" as part of the survey design for FSS. The assessment confirmed that survey unit 12204B 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 12204B 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 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 soil BcDCGLs in this Release Record).

At ZNPS, compliance is demonstrated through the summation of dose from four (4) 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 Total Effective Dose Equivalent (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 reproduced below 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 Minimum Detectable Concentration (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." 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 procedure 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 12204B. 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 12204B, 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

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

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

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

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

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

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

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

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 TSD-11-004, *"Ludlum Model 44-10 Detector Sensitivity"* (Reference 11) with the following parameters:

- background count rate of 5,000 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 procedure ZS-LT-300-001-001 "*Final Status Survey Package Development*." The relative shift (Δ/σ) for the survey unit data set is defined as shift (Δ), which is the Upper Boundary 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. 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 North American Datum (NAD) standard topographical grid coordinate system. The number of samples generated by VSP for a systematic triangular grid was seventeen (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: $A = \frac{A_{SU}}{N} = \frac{1971}{17} = 115.9\ m^2$
- 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 measures as referenced by LTP, Section 5.9 and Zion*Solutions* ZS-LT-01, "*Quality Assurance Project Plan (for Characterization and FSS)*" (QAPP) (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, L1-12204B-FQGS-004-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. Locations L1-12204-FSGS-003-SB and L1-12204-FSGS-010-SB were selected for this survey unit.

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	EASTING
L1-12204B-FSGS-001SS	641743.84	343762.13
L1-12204B-FSGS-002SS	641743.84	343773.70
L1-12204B-FSGS-003SS	641743.84	343785.28
L1-12204B-FSGS-004SS	641753.87	343733.20
L1-12204B-FSGS-005SS	641753.87	343744.78
L1-12204B-FSGS-006SS	641753.87	343756.35
L1-12204B-FSGS-007SS	641753.87	343767.92
L1-12204B-FSGS-008SS	641753.87	343779.49
L1-12204B-FSGS-009SS	641753.87	343791.06
L1-12204B-FSGS-010SS	641763.89	343738.99
L1-12204B-FSGS-011SS	641763.89	343750.56
L1-12204B-FSGS-012SS	641763.89	343762.13
L1-12204B-FSGS-013SS	641763.89	343773.70
L1-12204B-FSGS-014SS	641763.89	343785.28
L1-12204B-FSGS-015SS	641763.89	343796.85
L1-12204B-FSGS-016SS	641773.91	343744.78
L1-12204B-FSGS-017SS	641773.91	343756.35
L1-12204B-FSGS-003SB	641743.84	343785.28
L1-12204B-FSGS-010SB	641763.89	343738.99

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) samples, L1-12204B-FSGS-003-SS and L1-12204B-FSGS-010-SB, exceeded

an OpSOF of 0.1 during the FSS of survey unit 12204B.

An additional soil sample was selected to meet the requirement that 10% of the samples collected for the FSS of survey unit 12204B be analyzed for HTD ROC. Sample number L1-12204B-FSGS-015-SS was selected based on exhibiting the highest concentration of Cs-137 of all the samples. 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 12204B.

Table 9 - Synopsis of Survey Design

FEATURE	DESIGN CRITERIA	BASIS
Survey Unit Area	1,971 m^2	Global Positioning System (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	11.6 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)
Quality Control (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 3 and 10	(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 L1-12204B-F, which was developed in accordance with Zion*Solutions* procedure ZS-LT-300-001-001, "*Final Status Survey Package Development*." 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 12204B, 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. Also, if during the performance of FSS, the analysis of a surface soil sample, or the results of a surface gamma scan indicates 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. This threshold was not encountered during the FSS of survey unit 12204B.

FSS field activities were conducted under FSS sample plan L1-12204B-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 February 2, 2019, and concluding on February 9, 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-inch x 2inch) 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 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 source 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	304708/PR321892	12/10/2019
Ludlum 2350-1/Ludlum 44-10	304726/PR363452	09/06/2019
Ludlum 2350-1/Ludlum 44-10	304718/PR363311	12/13/2019
Ludlum 2350-1/Ludlum 44-10	266656/PR311750	01/08/2020
Ludlum 2350-1/Ludlum 44-10	304730/PR375273	01/16/2020
Ludlum 2350-1/Ludlum 44-10	266668/PR363489	12/19/2019
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.

Three (3) samples (L1-12204B-FSGS-003-SS, L1-12204B-FSGS-015-SS and L1-12204B-FSGS-010-SB) were selected for HTD radionuclide analysis.

7. SURVEY RESULTS

100% of the surface of the survey unit was scanned for elevated radiation levels. Sixty-eight (68) 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 scan. 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	3825	4306	None	None
Row 2	3854	4306	None	None
Row 3	3975	4473	None	None
Row 4	4017	4473	None	None
Row 5	4252	4473	None	None
Row 6	4323	4633	None	None
Row 7	4262	4633	None	None
Row 8	4339	4633	None	None
Row 9	4345	4633	None	None
Row 10	4454	4633	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 11	4074	4489	None	None
Row 12	4121	4489	None	None
Row 13	3912	4489	None	None
Row 14	4000	4489	None	None
Row 15	3769	4489	None	None
Row 16	3825	4223	None	None
Row 17	3891	4223	None	None
Row 18	3947	4223	None	None
Row 19	3648	4223	None	None
Row 20	3872	4223	None	None
Row 21	3871	4010	None	None
Row 22	3792	4010	None	None
Row 23	3803	4010	None	None
Row 24	3959	4010	None	None
Row 25	3902	4010	None	None
Row 26	3972	4158	None	None
Row 27	3908	4158	None	None
Row 28	3865	4158	None	None
Row 29	3933	4158	None	None
Row 30	3486	4158	None	None
Row 31	3516	4158	None	None
Row 32	3517	4158	None	None
Row 33	2646	2843	None	None
Row 34	2419	2843	None	None
Row 35	2411	2843	None	None
Row 36	2472	2843	None	None
Row 37	2253	2843	None	None
Row 38	2269	2590	None	None
Row 39	2391	2590	None	None
Row 40	2321	2590	None	None
Row 41	2265	2590	None	None
Row 42	2484	2590	None	None
Row 43	2053	2352	None	None
Row 44	2283	2352	None	None
Row 45	2151	2352	None	None
Row 46	2338	2352	None	None
Row 47	2205	2352	None	None
Row 48	2607	2935	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 49	2675	2935	None	None
Row 50	2666	2935	None	None
Row 51	2775	2935	None	None
Row 52	2898	2935	None	None
Row 53	2730	2927	None	None
Row 54	2903	2927	None	None
Row 55	2881	2927	None	None
Row 56	3047	3730	None	None
Row 57	3276	3730	None	None
Row 58	3589	3739	None	None
Row 59	3632	3739	None	None
Row 60	3350	3739	None	None
Row 61	3574	3739	None	None
Row 62	3510	3739	None	None
Row 63	3184	3503	None	None
Row 64	2971	3503	None	None
Row 65	3201	3503	None	None
Row 66	3060	3503	None	None
Row 67	3189	3503	None	None
Row 68	3239	3503	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 and two (2) subsurface soil samples were analyzed using the on-site gamma spectroscopy system. Summaries of the sample analysis results are provided in Tables 12 and 13, respectively. The basic statistics for the systematic sample population are summarized in Table 19. For the systematic samples, the gamma spectroscopy results revealed nine (9) samples with activity levels above MDC for Cs-137 and no samples with activity levels above the MDC for Co-60 or 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 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)
L1-12204B-FSGS-001-SS	2.40E-02	2.22E-02	**4.42E-02**	4.33E+00	8.84E-05
L1-12204B-FSGS-002-SS	2.31E-02	1.00E-02	**2.68E-02**	4.17E+00	5.36E-05
L1-12204B-FSGS-003-SS	9.18E-02	2.77E-02	0.00E+00	1.66E+01	0.00E+00
L1-12204B-FSGS-004-SS	2.32E-02	1.11E-02	**4.02E-02**	4.19E+00	8.04E-05
L1-12204B-FSGS-005-SS	1.86E-02	8.52E-03	**6.52E-02**	3.36E+00	1.30E-04
L1-12204B-FSGS-006-SS	1.25E-02	9.55E-03	3.70E-02	2.26E+00	7.40E-05
L1-12204B-FSGS-007-SS	2.33E-02	3.56E-02	**3.99E-02**	4.20E+00	7.98E-05
L1-12204B-FSGS-008-SS	2.00E-02	2.93E-02	3.39E-02	3.61E+00	6.78E-05
L1-12204B-FSGS-009-SS	4.95E-02	1.06E-02	3.99E-02	8.93E+00	7.98E-05
L1-12204B-FSGS-010-SS	0.00E+00	5.31E-03	0.00E+00	0.00E+00	0.00E+00
L1-12204B-FSGS-011-SS	2.28E-02	0.00E+00	**4.39E-02**	4.11E+00	8.78E-05
L1-12204B-FSGS-012-SS	1.70E-02	3.76E-02	**4.63E-02**	3.07E+00	9.26E-05
L1-12204B-FSGS-013-SS	1.93E-02	1.73E-02	4.76E-02	3.48E+00	9.52E-05
L1-12204B-FSGS-014-SS	1.84E-02	0.00E+00	1.38E-02	3.32E+00	2.76E-05
L1-12204B-FSGS-015-SS	3.36E-02	2.36E-02	**1.04E-01**	6.06E+00	2.08E-04
L1-12204B-FSGS-016-SS	2.44E-02	6.76E-02	3.80E-02	4.40E+00	7.60E-05
L1-12204B-FSGS-017-SS	3.06E-02	8.53E-03	**9.56E-02**	5.52E+00	1.91E-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.

Table 13 - 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)
L1-12204B-FSGS-003-SB	1.22E-02	0.00E+00	4.50E-02	2.20E+00	9.00E-05
L1-12204B-FSGS-010-SB	4.97E-02	0.00E+00	2.23E-02	8.97E+00	4.46E-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 (L1-12204B-FSGS-003-SS-A, L1-12204B-FSGS-015-SS-A and L1-12204B-FSGS-010-SB-A). 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 was positively detected in one of the samples, L1-12204B-FSGS-015-SS-A, at a concentration greater than MDC. Consequently, comparison of existing ratios versus the maximum ratios from Table 6 was not required. The off-site analysis results are provided in Table 14.

Table 14 - Off-Site Analysis Results

Sample # L1-12204B-FSGS-003-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	3.20E-02	6.28E-02	7.94E-02	No
Cs-134	-2.42E-03	2.11E-02	9.54E-02	No
Cs-137	3.15E-03	6.53E-02	9.76E-02	No
Ni-63	3.40E-01	1.76E+00	3.02E+00	No
Sr-90	0.00E+00	2.08E-01	5.36E-01	No

Sample # L1-12204B-FSGS-015-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	7.01E-02	5.25E-02	8.19E-02	No
Cs-134	-2.94E-03	2.04E-02	4.92E-02	No
Cs-137	2.34E-01	6.87E-02	8.96E-02	Yes
Ni-63	2.23E+00	1.83E+00	3.04E+00	No
Sr-90	7.94E-02	3.43E-01	8.72E-01	No

Sample # L1-12204B-FSGS-010-SB-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	-3.96E-03	1.04E-01	1.52E-01	No
Cs-134	5.04E-03	5.08E-02	1.51E-01	No
Cs-137	2.79E-02	9.44E-02	1.35E-01	No
Ni-63	-4.72E-01	2.06E+00	3.57E+00	No
Sr-90(1)	2.68E-02	3.58E-02	7.35E-02	No

(1) Sr-90 recounted March 2020 to achieve adequate MDC.

The implementation of survey specific QC measures included the collection of one (1) sample (L1-12204B-FQGS-004-SS) for "split sample" analysis. The on-site laboratory analyzed the designated QC sample using the on-site gamma spectroscopy system. Gamma spectroscopy results (summarized in Table 15) indicate that the concentrations for Co-60, Cs-134 and Cs-137 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 15 - Summary of Gamma Spectroscopy Results for QC Surface Soil Sample

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)
L1-12204B-FQGS-004-SS	0.00E+00	6.00E-02	2.63E-02	0.00E+00	5.26E-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 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

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

Where: C_n = concentration of radionuclide *n*

$DCGL_n$ = DCGL of radionuclide *n*.

The results of the unity rule calculation for the ROC in the systematic sample population when compared against the OpDCGLs for surface soils for survey unit 12204B are presented in Table 16. The results of the unity rule calculation for the ROC for the subsurface samples are presented in Table 17 and the results for the QC sample are presented in Table 18.

Table 16 - Sum of Fractions for Individual Surface Soil Samples, when compared to the OpDCGLs (Systematic)

MEASUREMENT ID	Fraction of the OpDCGLs for Surface Soils					OpSOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L1-12204B-FSGS-001-SS	2.20E-02	1.28E-02	1.22E-02	4.74E-03	2.86E-05	0.052
L1-12204B-FSGS-002-SS	2.12E-02	5.77E-03	7.38E-03	4.56E-03	1.73E-05	0.039
L1-12204B-FSGS-003-SS	8.41E-02	1.60E-02	0.00E+00	1.81E-02	0.00E+00	0.118
L1-12204B-FSGS-004-SS	2.13E-02	6.41E-03	1.11E-02	4.58E-03	2.60E-05	0.043
L1-12204B-FSGS-005-SS	1.70E-02	4.92E-03	1.80E-02	3.67E-03	4.21E-05	0.044
L1-12204B-FSGS-006-SS	1.15E-02	5.51E-03	1.02E-02	2.47E-03	2.39E-05	0.030
L1-12204B-FSGS-007-SS	2.14E-02	2.05E-02	1.10E-02	4.60E-03	2.58E-05	0.058
L1-12204B-FSGS-008-SS	1.83E-02	1.69E-02	9.34E-03	3.95E-03	2.19E-05	0.049
L1-12204B-FSGS-009-SS	4.54E-02	6.12E-03	1.10E-02	9.77E-03	2.58E-05	0.072
L1-12204B-FSGS-010-SS	0.00E+00	3.06E-03	0.00E+00	0.00E+00	0.00E+00	0.003
L1-12204B-FSGS-011-SS	2.09E-02	0.00E+00	1.21E-02	4.50E-03	2.84E-05	0.038
L1-12204B-FSGS-012-SS	1.56E-02	2.17E-02	1.28E-02	3.35E-03	2.99E-05	0.053
L1-12204B-FSGS-013-SS	1.77E-02	9.98E-03	1.31E-02	3.81E-03	3.08E-05	0.045
L1-12204B-FSGS-014-SS	1.69E-02	0.00E+00	3.80E-03	3.63E-03	8.92E-06	0.024
L1-12204B-FSGS-015-SS	3.08E-02	1.36E-02	2.87E-02	6.63E-03	6.72E-05	0.080
L1-12204B-FSGS-016-SS	2.24E-02	3.90E-02	1.05E-02	4.81E-03	2.46E-05	0.077
L1-12204B-FSGS-017-SS	2.80E-02	4.92E-03	2.63E-02	6.04E-03	6.18E-05	0.065

Systematic Measurements

Number of Systematic Measurements =	17
# of Systematic Measurements with OpSOF $\geq$ 1 =	0
# of Systematic Measurements with OpSOF > 0.1 (HTD Assessment) =	1
Max Individual Systematic Measurement OpSOF =	0.118
Mean Systematic Measurement OpSOF =	0.052

Table 17 - 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	
L1-12204B-FSGS-003-SB	1.38E-02	0.00E+00	2.27E-02	1.13E-02	2.12E-04	0.048
L1-12204B-FSGS-010-SB	5.64E-02	0.00E+00	1.12E-02	4.59E-02	1.05E-04	0.114

Table 18 - Sum of Fractions for Individual Surface Soil Samples, when compared to the OpDCGLs (QC)

MEASUREMENT ID	Fraction of the OpDCGLs for Surface Soils					OpSOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L1-12204B-FQGS-004-SS	0.00E+00	3.46E-02	7.25E-03	0.00E+00	1.70E-05	0.042

Table 19 - 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	2.66E-02	2.31E-02	9.18E-02	0.00E+00	0.020	4.26	6.24E-03	1.56E-01
Cs-134	1.91E-02	1.11E-02	6.76E-02	0.00E+00	0.017	6.77	2.82E-03	7.05E-02
Cs-137	4.21E-02	3.99E-02	1.04E-01	0.00E+00	0.027	14.18	2.97E-03	7.43E-02
Ni-63	4.80E+00	4.17E+00	1.66E+01	0.00E+00	3.531	3572.1	1.34E-03	3.36E-02
Sr-90	8.43E-05	7.98E-05	2.08E-04	0.00E+00	0.000	12.09	6.97E-06	1.74E-04

The mean BcSOF for survey unit 12204B is 0.013 which equates to a dose of 0.335 mrem/yr TEDE.

The mean of all identified isotopes are less than the Consultation Triggers for Residential Soil Concentration 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, L1-12204B-FQGS-004-SS, using gamma spectroscopy analysis. The data was evaluated using acceptance criteria specified in the QAPP. The standard sample and QC sample did not bot have positive results for gamma-emitting ROC; therefore, K-40 was used in the QC comparison. There was acceptable agreement between field split results. Refer to Attachment 5 for data and quality control analysis results.

9. INVESTIGATIONS AND RESULTS

No investigations were performed in survey unit 12204B.

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 12204B 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 and remediation was not required.

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 Operational DCGL 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 0.013, which results in a dose contribution from soil in survey unit 12204B of 0.335 mrem/year TEDE 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 12204B 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"

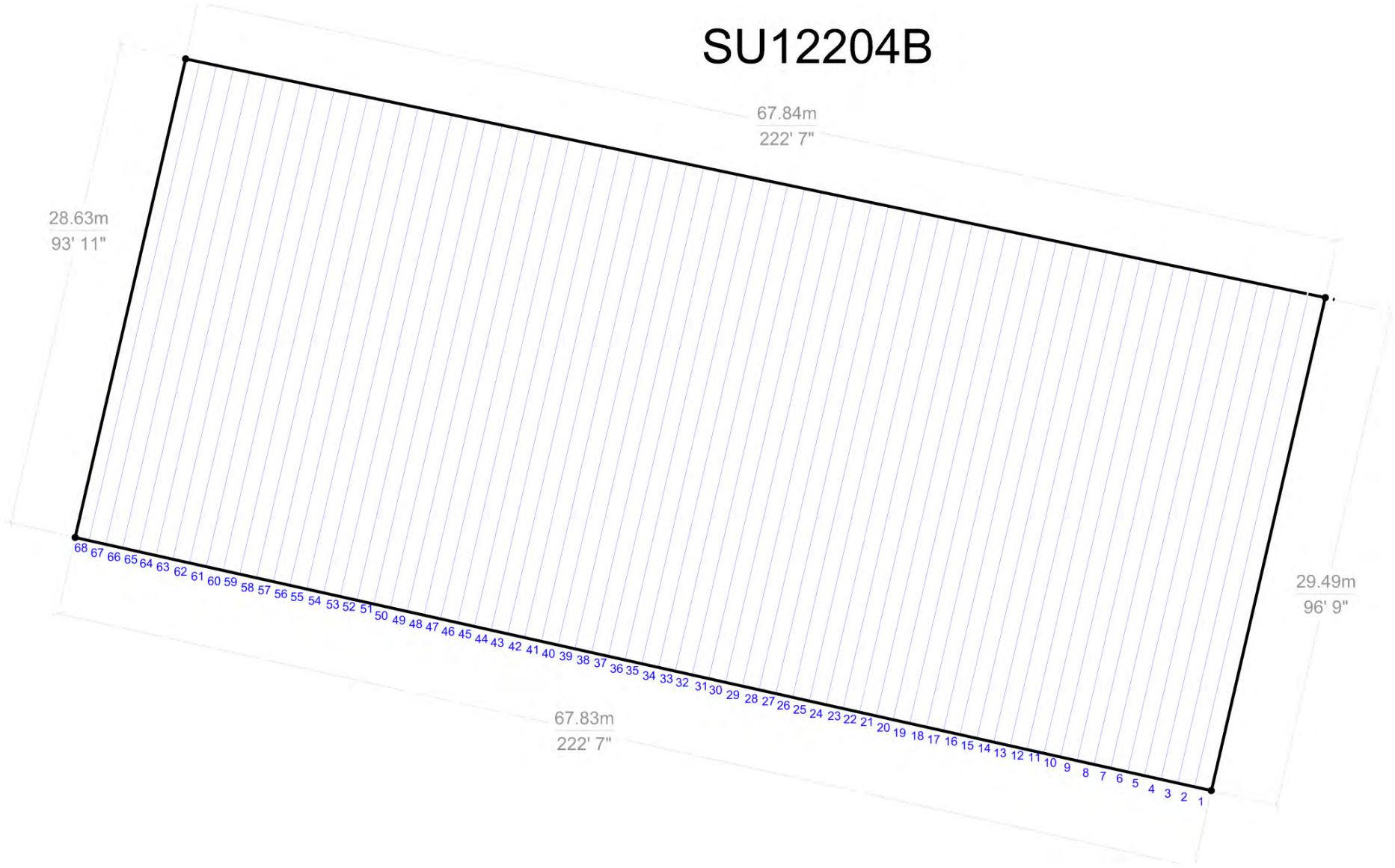
16. ATTACHMENTS

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 12204B Final Status Survey Boundaries and Systematic Sample Points

Survey Unit 12204B 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	PR363489	266668	12204B	GS003	2/2/2019 9:15	3975	3570	4473	No
44-10	PR363489	266668	12204B	GS003	2/2/2019 9:17	3878	3570	4473	No
44-10	PR363489	266668	12204B	GS003	2/2/2019 9:19	3932	3570	4473	No
44-10	PR363489	266668	12204B	GS004	2/2/2019 9:21	4017	3570	4473	No
44-10	PR363489	266668	12204B	GS004	2/2/2019 9:23	3983	3570	4473	No
44-10	PR363489	266668	12204B	GS004	2/2/2019 9:25	4012	3570	4473	No
44-10	PR363489	266668	12204B	GS005	2/2/2019 9:27	4150	3570	4473	No
44-10	PR363489	266668	12204B	GS005	2/2/2019 9:31	4252	3570	4473	No
44-10	PR363489	266668	12204B	GS005	2/2/2019 9:33	3965	3570	4473	No
44-10	PR363489	266668	12204B	GS033	2/2/2019 9:53	2332	2143	2843	No
44-10	PR363489	266668	12204B	GS033	2/2/2019 9:56	2496	2143	2843	No
44-10	PR363489	266668	12204B	GS033	2/2/2019 9:58	2646	2143	2843	No
44-10	PR363489	266668	12204B	GS034	2/2/2019 10:01	2377	2143	2843	No
44-10	PR363489	266668	12204B	GS034	2/2/2019 10:03	2419	2143	2843	No
44-10	PR363489	266668	12204B	GS034	2/2/2019 10:05	2232	2143	2843	No
44-10	PR363489	266668	12204B	GS035	2/2/2019 10:07	2258	2143	2843	No
44-10	PR363489	266668	12204B	GS035	2/2/2019 10:09	2307	2143	2843	No
44-10	PR363489	266668	12204B	GS035	2/2/2019 10:11	2411	2143	2843	No
44-10	PR363489	266668	12204B	GS036	2/2/2019 10:13	2407	2143	2843	No
44-10	PR363489	266668	12204B	GS036	2/2/2019 10:15	2277	2143	2843	No
44-10	PR363489	266668	12204B	GS036	2/2/2019 10:17	2472	2143	2843	No
44-10	PR363489	266668	12204B	GS037	2/2/2019 10:19	2253	2143	2843	No
44-10	PR363489	266668	12204B	GS037	2/2/2019 10:21	2212	2143	2843	No
44-10	PR363489	266668	12204B	GS037	2/2/2019 10:23	2251	2143	2843	No
44-10	PR375273	304730	12204B	GS006	2/2/2019 9:41	4197	3712	4633	No
44-10	PR375273	304730	12204B	GS006	2/2/2019 9:43	4204	3712	4633	No
44-10	PR375273	304730	12204B	GS006	2/2/2019 9:45	4323	3712	4633	No
44-10	PR375273	304730	12204B	GS007	2/2/2019 9:49	4262	3712	4633	No
44-10	PR375273	304730	12204B	GS007	2/2/2019 9:51	4129	3712	4633	No
44-10	PR375273	304730	12204B	GS007	2/2/2019 9:53	3987	3712	4633	No
44-10	PR375273	304730	12204B	GS008	2/2/2019 9:56	4339	3712	4633	No
44-10	PR375273	304730	12204B	GS008	2/2/2019 9:58	4044	3712	4633	No
44-10	PR375273	304730	12204B	GS008	2/2/2019 10:00	4254	3712	4633	No
44-10	PR375273	304730	12204B	GS009	2/2/2019 10:04	4100	3712	4633	No
44-10	PR375273	304730	12204B	GS009	2/2/2019 10:06	4345	3712	4633	No
44-10	PR375273	304730	12204B	GS009	2/2/2019 10:08	4084	3712	4633	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	12204B	GS010	2/2/2019 10:11	4454	3712	4633	No
44-10	PR375273	304730	12204B	GS010	2/2/2019 10:13	4212	3712	4633	No
44-10	PR375273	304730	12204B	GS010	2/2/2019 10:15	3908	3712	4633	No
44-10	PR363311	304718	12204B	GS011	2/2/2019 9:33	4074	3584	4489	No
44-10	PR363311	304718	12204B	GS011	2/2/2019 9:36	3981	3584	4489	No
44-10	PR363311	304718	12204B	GS011	2/2/2019 9:39	3956	3584	4489	No
44-10	PR363311	304718	12204B	GS012	2/2/2019 9:42	3882	3584	4489	No
44-10	PR363311	304718	12204B	GS012	2/2/2019 9:45	4107	3584	4489	No
44-10	PR363311	304718	12204B	GS012	2/2/2019 9:48	4121	3584	4489	No
44-10	PR363311	304718	12204B	GS013	2/2/2019 9:51	3912	3584	4489	No
44-10	PR363311	304718	12204B	GS013	2/2/2019 9:54	3710	3584	4489	No
44-10	PR363311	304718	12204B	GS013	2/2/2019 9:57	3898	3584	4489	No
44-10	PR363311	304718	12204B	GS014	2/2/2019 10:00	4000	3584	4489	No
44-10	PR363311	304718	12204B	GS014	2/2/2019 10:03	3755	3584	4489	No
44-10	PR363311	304718	12204B	GS014	2/2/2019 10:06	3827	3584	4489	No
44-10	PR363311	304718	12204B	GS015	2/2/2019 10:09	3716	3584	4489	No
44-10	PR363311	304718	12204B	GS015	2/2/2019 10:12	3724	3584	4489	No
44-10	PR363311	304718	12204B	GS015	2/2/2019 10:15	3769	3584	4489	No
44-10	PR311756	266669	12204B	GS016	2/2/2019 9:30	3825	3348	4223	No
44-10	PR311756	266669	12204B	GS016	2/2/2019 9:32	3700	3348	4223	No
44-10	PR311756	266669	12204B	GS016	2/2/2019 9:34	3732	3348	4223	No
44-10	PR311756	266669	12204B	GS017	2/2/2019 9:36	3627	3348	4223	No
44-10	PR311756	266669	12204B	GS017	2/2/2019 9:38	3891	3348	4223	No
44-10	PR311756	266669	12204B	GS017	2/2/2019 9:40	3546	3348	4223	No
44-10	PR311756	266669	12204B	GS018	2/2/2019 9:42	3947	3348	4223	No
44-10	PR311756	266669	12204B	GS018	2/2/2019 9:44	3689	3348	4223	No
44-10	PR311756	266669	12204B	GS018	2/2/2019 9:46	3610	3348	4223	No
44-10	PR311756	266669	12204B	GS019	2/2/2019 9:48	3512	3348	4223	No
44-10	PR311756	266669	12204B	GS019	2/2/2019 9:50	3648	3348	4223	No
44-10	PR311756	266669	12204B	GS019	2/2/2019 9:52	3597	3348	4223	No
44-10	PR311756	266669	12204B	GS020	2/2/2019 9:54	3872	3348	4223	No
44-10	PR311756	266669	12204B	GS020	2/2/2019 9:56	3484	3348	4223	No
44-10	PR311756	266669	12204B	GS020	2/2/2019 9:58	3470	3348	4223	No
44-10	PR311750	266656	12204B	GS021	2/2/2019 9:22	3871	3160	4010	No
44-10	PR311750	266656	12204B	GS021	2/2/2019 9:25	3559	3160	4010	No
44-10	PR311750	266656	12204B	GS021	2/2/2019 9:28	3535	3160	4010	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	12204B	GS022	2/2/2019 9:32	3792	3160	4010	No
44-10	PR311750	266656	12204B	GS022	2/2/2019 9:34	3628	3160	4010	No
44-10	PR311750	266656	12204B	GS022	2/2/2019 9:37	3479	3160	4010	No
44-10	PR311750	266656	12204B	GS023	2/2/2019 9:41	3803	3160	4010	No
44-10	PR311750	266656	12204B	GS023	2/2/2019 9:43	3693	3160	4010	No
44-10	PR311750	266656	12204B	GS023	2/2/2019 9:45	3184	3160	4010	No
44-10	PR311750	266656	12204B	GS024	2/2/2019 9:49	3959	3160	4010	No
44-10	PR311750	266656	12204B	GS024	2/2/2019 9:52	3644	3160	4010	No
44-10	PR311750	266656	12204B	GS024	2/2/2019 9:55	2866	3160	4010	No
44-10	PR311750	266656	12204B	GS025	2/2/2019 9:59	3902	3160	4010	No
44-10	PR311750	266656	12204B	GS025	2/2/2019 10:01	3642	3160	4010	No
44-10	PR311750	266656	12204B	GS025	2/2/2019 10:04	2863	3160	4010	No
44-10	PR363452	304726	12204B	GS026	2/2/2019 9:26	3948	3291	4158	No
44-10	PR363452	304726	12204B	GS026	2/2/2019 9:30	3655	3291	4158	No
44-10	PR363452	304726	12204B	GS026	2/2/2019 9:32	3972	3291	4158	No
44-10	PR363452	304726	12204B	GS027	2/2/2019 9:35	3908	3291	4158	No
44-10	PR363452	304726	12204B	GS027	2/2/2019 9:37	3548	3291	4158	No
44-10	PR363452	304726	12204B	GS027	2/2/2019 9:39	3368	3291	4158	No
44-10	PR363452	304726	12204B	GS028	2/2/2019 9:42	3548	3291	4158	No
44-10	PR363452	304726	12204B	GS028	2/2/2019 9:44	3664	3291	4158	No
44-10	PR363452	304726	12204B	GS028	2/2/2019 9:46	3865	3291	4158	No
44-10	PR363452	304726	12204B	GS029	2/2/2019 9:50	3933	3291	4158	No
44-10	PR363452	304726	12204B	GS029	2/2/2019 9:53	3673	3291	4158	No
44-10	PR363452	304726	12204B	GS029	2/2/2019 9:55	3551	3291	4158	No
44-10	PR363452	304726	12204B	GS030	2/2/2019 9:58	3430	3291	4158	No
44-10	PR363452	304726	12204B	GS030	2/2/2019 10:01	3421	3291	4158	No
44-10	PR363452	304726	12204B	GS030	2/2/2019 10:03	3486	3291	4158	No
44-10	PR363452	304726	12204B	GS031	2/2/2019 10:05	3312	3291	4158	No
44-10	PR363452	304726	12204B	GS031	2/2/2019 10:07	3315	3291	4158	No
44-10	PR363452	304726	12204B	GS031	2/2/2019 10:11	3516	3291	4158	No
44-10	PR363452	304726	12204B	GS032	2/2/2019 10:14	3410	3291	4158	No
44-10	PR363452	304726	12204B	GS032	2/2/2019 10:18	3422	3291	4158	No
44-10	PR363452	304726	12204B	GS032	2/2/2019 10:22	3517	3291	4158	No
44-10	PR311756	266669	12204B	GS043	2/4/2019 12:48	1961	1725	2352	No
44-10	PR311756	266669	12204B	GS043	2/4/2019 12:50	2053	1725	2352	No
44-10	PR311756	266669	12204B	GS043	2/4/2019 12:52	2016	1725	2352	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	12204B	GS044	2/4/2019 12:54	2283	1725	2352	No
44-10	PR311756	266669	12204B	GS044	2/4/2019 12:58	1946	1725	2352	No
44-10	PR311756	266669	12204B	GS044	2/4/2019 13:00	1860	1725	2352	No
44-10	PR311756	266669	12204B	GS045	2/4/2019 13:02	2049	1725	2352	No
44-10	PR311756	266669	12204B	GS045	2/4/2019 13:04	2151	1725	2352	No
44-10	PR311756	266669	12204B	GS045	2/4/2019 13:06	2133	1725	2352	No
44-10	PR311756	266669	12204B	GS046	2/4/2019 13:08	2338	1725	2352	No
44-10	PR311756	266669	12204B	GS046	2/4/2019 13:10	1942	1725	2352	No
44-10	PR311756	266669	12204B	GS046	2/4/2019 13:12	1892	1725	2352	No
44-10	PR311756	266669	12204B	GS047	2/4/2019 13:14	2073	1725	2352	No
44-10	PR311756	266669	12204B	GS047	2/4/2019 13:16	2205	1725	2352	No
44-10	PR311756	266669	12204B	GS047	2/4/2019 13:18	2167	1725	2352	No
44-10	PR363489	266668	12204B	GS038	2/4/2019 12:43	2269	1926	2590	No
44-10	PR363489	266668	12204B	GS038	2/4/2019 12:45	2220	1926	2590	No
44-10	PR363489	266668	12204B	GS038	2/4/2019 12:47	2269	1926	2590	No
44-10	PR363489	266668	12204B	GS039	2/4/2019 12:49	2170	1926	2590	No
44-10	PR363489	266668	12204B	GS039	2/4/2019 12:51	2224	1926	2590	No
44-10	PR363489	266668	12204B	GS039	2/4/2019 12:53	2391	1926	2590	No
44-10	PR363489	266668	12204B	GS040	2/4/2019 12:55	2321	1926	2590	No
44-10	PR363489	266668	12204B	GS040	2/4/2019 12:57	2077	1926	2590	No
44-10	PR363489	266668	12204B	GS040	2/4/2019 12:59	2272	1926	2590	No
44-10	PR363489	266668	12204B	GS041	2/4/2019 13:01	2265	1926	2590	No
44-10	PR363489	266668	12204B	GS041	2/4/2019 13:03	1995	1926	2590	No
44-10	PR363489	266668	12204B	GS041	2/4/2019 13:05	2245	1926	2590	No
44-10	PR363489	266668	12204B	GS042	2/4/2019 13:07	2115	1926	2590	No
44-10	PR363489	266668	12204B	GS042	2/4/2019 13:09	2183	1926	2590	No
44-10	PR363489	266668	12204B	GS042	2/4/2019 13:11	2484	1926	2590	No
44-10	PR363452	304726	12204B	GS048	2/4/2019 12:39	2607	2222	2935	No
44-10	PR363452	304726	12204B	GS048	2/4/2019 12:41	2432	2222	2935	No
44-10	PR363452	304726	12204B	GS048	2/4/2019 12:43	2480	2222	2935	No
44-10	PR363452	304726	12204B	GS049	2/4/2019 12:46	2675	2222	2935	No
44-10	PR363452	304726	12204B	GS049	2/4/2019 12:49	2431	2222	2935	No
44-10	PR363452	304726	12204B	GS049	2/4/2019 12:51	2401	2222	2935	No
44-10	PR363452	304726	12204B	GS050	2/4/2019 12:54	2360	2222	2935	No
44-10	PR363452	304726	12204B	GS050	2/4/2019 12:56	2651	2222	2935	No
44-10	PR363452	304726	12204B	GS050	2/4/2019 12:59	2666	2222	2935	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	PR363452	304726	12204B	GS051	2/4/2019 13:02	2501	2222	2935	No
44-10	PR363452	304726	12204B	GS051	2/4/2019 13:04	2459	2222	2935	No
44-10	PR363452	304726	12204B	GS051	2/4/2019 13:07	2775	2222	2935	No
44-10	PR363452	304726	12204B	GS052	2/4/2019 13:10	2898	2222	2935	No
44-10	PR363452	304726	12204B	GS052	2/4/2019 13:13	2605	2222	2935	No
44-10	PR363452	304726	12204B	GS052	2/4/2019 13:17	2548	2222	2935	No
44-10	PR321892	304708	12204B	GS001	2/5/2019 13:19	3825	3422	4306	No
44-10	PR321892	304708	12204B	GS001	2/5/2019 13:21	3528	3422	4306	No
44-10	PR321892	304708	12204B	GS001	2/5/2019 13:23	3551	3422	4306	No
44-10	PR321892	304708	12204B	GS002	2/5/2019 13:25	3763	3422	4306	No
44-10	PR321892	304708	12204B	GS002	2/5/2019 13:27	3463	3422	4306	No
44-10	PR321892	304708	12204B	GS002	2/5/2019 13:31	3854	3422	4306	No
44-10	PR363452	304726	12204B	GS063	2/9/2019 9:40	2948	2715	3503	No
44-10	PR363452	304726	12204B	GS063	2/9/2019 9:43	2938	2715	3503	No
44-10	PR363452	304726	12204B	GS063	2/9/2019 9:46	3184	2715	3503	No
44-10	PR363452	304726	12204B	GS064	2/9/2019 9:49	2971	2715	3503	No
44-10	PR363452	304726	12204B	GS064	2/9/2019 9:53	2933	2715	3503	No
44-10	PR363452	304726	12204B	GS064	2/9/2019 9:57	2961	2715	3503	No
44-10	PR363452	304726	12204B	GS065	2/9/2019 9:59	3085	2715	3503	No
44-10	PR363452	304726	12204B	GS065	2/9/2019 10:01	3083	2715	3503	No
44-10	PR363452	304726	12204B	GS065	2/9/2019 10:03	3201	2715	3503	No
44-10	PR363452	304726	12204B	GS066	2/9/2019 10:05	3060	2715	3503	No
44-10	PR363452	304726	12204B	GS066	2/9/2019 10:08	3058	2715	3503	No
44-10	PR363452	304726	12204B	GS066	2/9/2019 10:11	3042	2715	3503	No
44-10	PR363452	304726	12204B	GS067	2/9/2019 10:13	3189	2715	3503	No
44-10	PR363452	304726	12204B	GS067	2/9/2019 10:15	2970	2715	3503	No
44-10	PR363452	304726	12204B	GS067	2/9/2019 10:17	3158	2715	3503	No
44-10	PR363452	304726	12204B	GS068	2/9/2019 10:19	3239	2715	3503	No
44-10	PR363452	304726	12204B	GS068	2/9/2019 10:21	2847	2715	3503	No
44-10	PR363452	304726	12204B	GS068	2/9/2019 10:24	3081	2715	3503	No
44-10	PR363489	266668	12204B	GS053	2/9/2019 10:02	2594	2215	2927	No
44-10	PR363489	266668	12204B	GS053	2/9/2019 10:04	2541	2215	2927	No
44-10	PR363489	266668	12204B	GS053	2/9/2019 10:06	2730	2215	2927	No
44-10	PR363489	266668	12204B	GS054	2/9/2019 10:10	2591	2215	2927	No
44-10	PR363489	266668	12204B	GS054	2/9/2019 10:12	2771	2215	2927	No
44-10	PR363489	266668	12204B	GS054	2/9/2019 10:15	2903	2215	2927	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	PR363489	266668	12204B	GS055	2/9/2019 10:18	2881	2215	2927	No
44-10	PR363489	266668	12204B	GS055	2/9/2019 10:20	2679	2215	2927	No
44-10	PR363489	266668	12204B	GS055	2/9/2019 10:22	2765	2215	2927	No
44-10	PR363489	266668	12204B	GS056	2/9/2019 10:40	2970	2914	3730	No
44-10	PR363489	266668	12204B	GS056	2/9/2019 10:42	3047	2914	3730	No
44-10	PR363489	266668	12204B	GS056	2/9/2019 10:44	3003	2914	3730	No
44-10	PR363489	266668	12204B	GS057	2/9/2019 10:46	2924	2914	3730	No
44-10	PR363489	266668	12204B	GS057	2/9/2019 10:48	3276	2914	3730	No
44-10	PR363489	266668	12204B	GS057	2/9/2019 10:50	3249	2914	3730	No
44-10	PR321892	304708	12204B	GS058	2/9/2019 9:31	3302	2922	3739	No
44-10	PR321892	304708	12204B	GS058	2/9/2019 9:33	3321	2922	3739	No
44-10	PR321892	304708	12204B	GS058	2/9/2019 9:35	3589	2922	3739	No
44-10	PR321892	304708	12204B	GS059	2/9/2019 9:37	3535	2922	3739	No
44-10	PR321892	304708	12204B	GS059	2/9/2019 9:39	3632	2922	3739	No
44-10	PR321892	304708	12204B	GS059	2/9/2019 9:41	3015	2922	3739	No
44-10	PR321892	304708	12204B	GS060	2/9/2019 9:43	3119	2922	3739	No
44-10	PR321892	304708	12204B	GS060	2/9/2019 9:45	3019	2922	3739	No
44-10	PR321892	304708	12204B	GS060	2/9/2019 9:47	3350	2922	3739	No
44-10	PR321892	304708	12204B	GS061	2/9/2019 9:49	3210	2922	3739	No
44-10	PR321892	304708	12204B	GS061	2/9/2019 9:51	3528	2922	3739	No
44-10	PR321892	304708	12204B	GS061	2/9/2019 9:53	3574	2922	3739	No
44-10	PR321892	304708	12204B	GS062	2/9/2019 9:57	2983	2922	3739	No
44-10	PR321892	304708	12204B	GS062	2/9/2019 9:59	3026	2922	3739	No
44-10	PR321892	304708	12204B	GS062	2/9/2019 10:01	3510	2922	3739	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

ZION SOLUTIONS LLC
An EnergySolutions Company

Attachment 12
Sign Statistical Test

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

Survey Area: No. 12000 **Description:** Security Restricted Area Grounds
Survey Unit: No. 12204B **Description:** Crib House Area
Classification: 1 **Type I (α) Error:** 0.05 **Number of Samples:** 17

#	Fraction of the Release Criterion					Activity or SOF	Weighted Sum (W_s)	1-W_s	Sign
	Radionuclides of Concern								
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	(as applicable)			
1	2.20E-02	1.28E-02	1.22E-02	4.74E-03	2.86E-05	SOF	0.052	0.948	+
2	2.12E-02	5.77E-03	7.38E-03	4.56E-03	1.73E-05	SOF	0.039	0.961	+
3	8.41E-02	1.60E-02	0.00E+00	1.81E-02	0.00E+00	SOF	0.118	0.882	+
4	2.13E-02	6.41E-03	1.11E-02	4.58E-03	2.60E-05	SOF	0.043	0.957	+
5	1.70E-02	4.92E-03	1.80E-02	3.67E-03	4.21E-05	SOF	0.044	0.956	+
6	1.15E-02	5.51E-03	1.02E-02	2.47E-03	2.39E-05	SOF	0.030	0.970	+
7	2.14E-02	2.05E-02	1.10E-02	4.60E-03	2.58E-05	SOF	0.058	0.942	+
8	1.83E-02	1.69E-02	9.34E-03	3.95E-03	2.19E-05	SOF	0.049	0.951	+
9	4.54E-02	6.12E-03	1.10E-02	9.77E-03	2.58E-05	SOF	0.072	0.928	+
10	0.00E+00	3.06E-03	0.00E+00	0.00E+00	0.00E+00	SOF	0.003	0.997	+
11	2.09E-02	0.00E+00	1.21E-02	4.50E-03	2.84E-05	SOF	0.038	0.962	+
12	1.56E-02	2.17E-02	1.28E-02	3.35E-03	2.99E-05	SOF	0.053	0.947	+
13	1.77E-02	9.98E-03	1.31E-02	3.81E-03	3.08E-05	SOF	0.045	0.955	+
14	1.69E-02	0.00E+00	3.80E-03	3.63E-03	8.92E-06	SOF	0.024	0.976	+
15	3.08E-02	1.36E-02	2.87E-02	6.63E-03	6.72E-05	SOF	0.080	0.920	+
16	2.24E-02	3.90E-02	1.05E-02	4.81E-03	2.46E-05	SOF	0.077	0.923	+
17	2.80E-02	4.92E-03	2.63E-02	6.04E-03	6.18E-05	SOF	0.065	0.935	+

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): R. J. Mundt / [signature] 3-18-19
(Print Name) (Signature) (Date)

Peer Reviewed By (RE): G. Wood / [signature] 3-18-19
(Print Name) (Signature) (Date)

ATTACHMENT 5
QC SAMPLE ASSESSMENT

Duplicate Sample Assessment Form

Survey Area #: 12000	Survey Unit # 12204B	Survey Unit Name: Crib House Area
Sample Plan#:	L1-12204B-F	

Sample Description: Comparison of split samples collected from surface soil sample location #4 and analyzed using gamma spectroscopy by on-site HPGe system. The standard sample was L1-12204B-FSGS-004SS, the comparison sample was L1-12204B-FQGS-004SS.

	STANDARD				COMPARISON			
Radionuclide	Activity Value	Standard Error	Resolution	Agreement Range	Activity Value	Standard Error	Comparison Ratio	Acceptable (Y/N)
K-40	1.42E+01	7.18E-01	19.78	0.75-1.33	1.54E+01	8.17E-01	0.92	Y

Comments/Corrective Actions:
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.

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

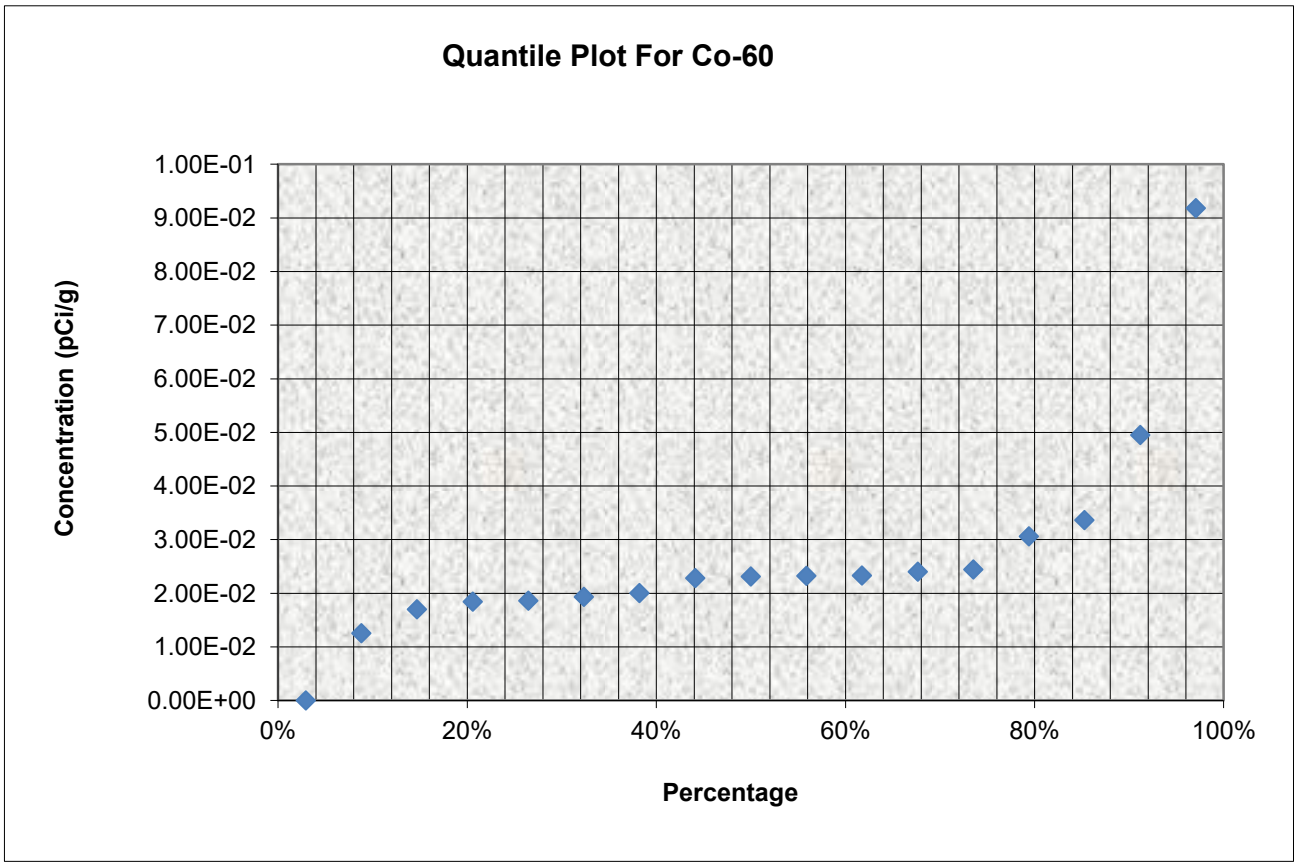
Performed by: R.J. Mundia	Date: 3-18-19	Reveiwed by: C.L. Wood	Date: 3-18-19

ATTACHMENT 6
GRAPHICAL PRESENTATIONS

Posting Plot

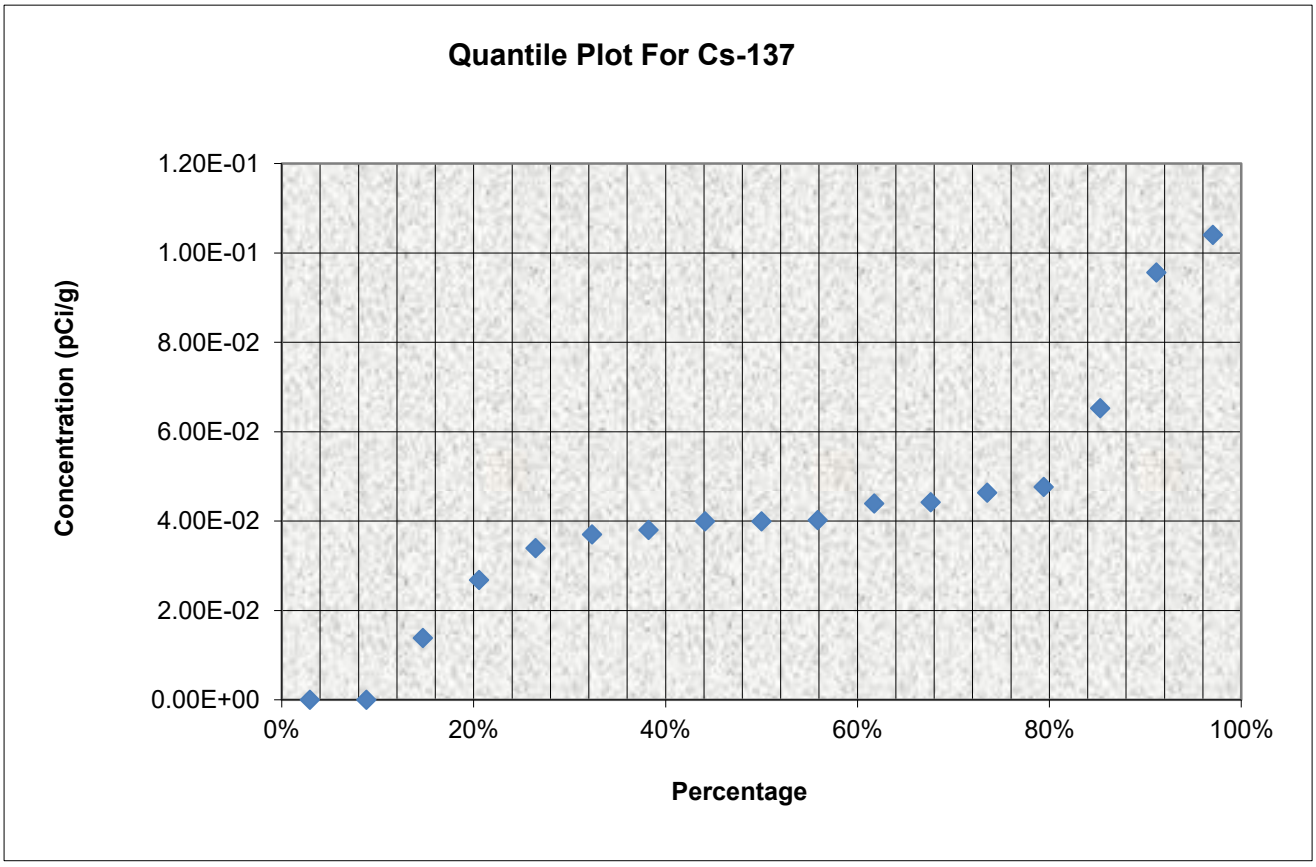
QUANTILE PLOT FOR Co-60

Survey Unit: 12204B
Survey Unit Name: Crib House Area
Mean: 2.66E-02 pCi/g



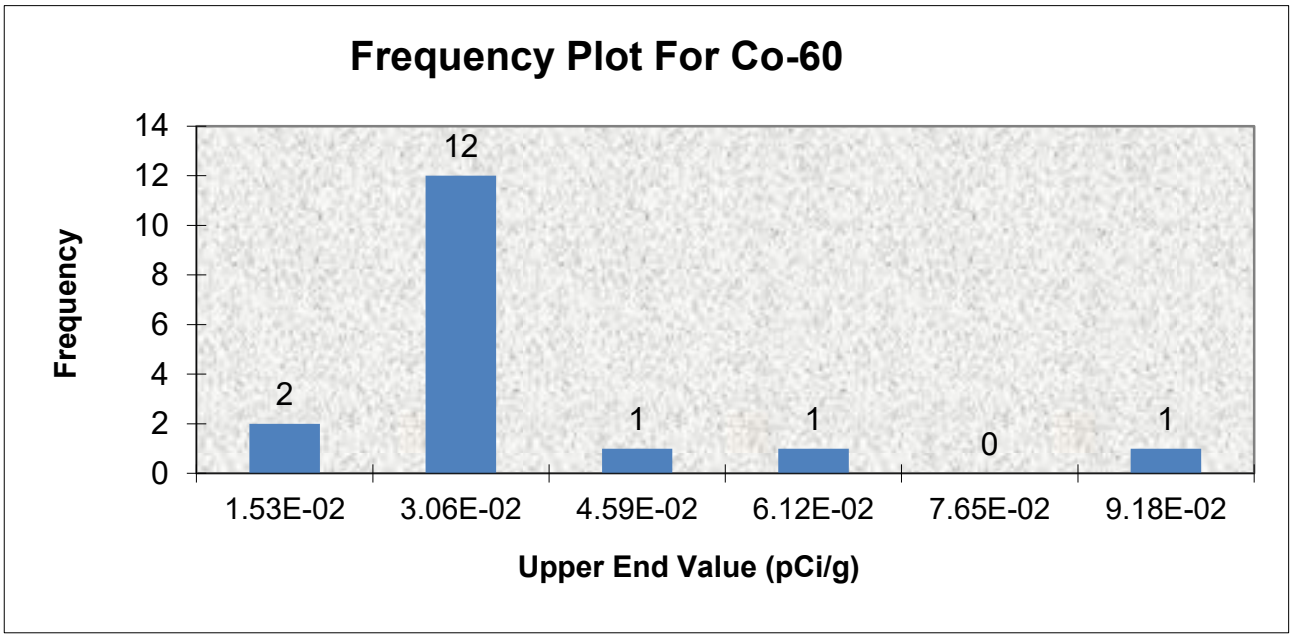
QUANTILE PLOT FOR Cs-137

Survey Unit: 12204B
Survey Unit Name: Crib House Area
Mean: 4.21E-02 pCi/g



HISTOGRAM FOR Co-60

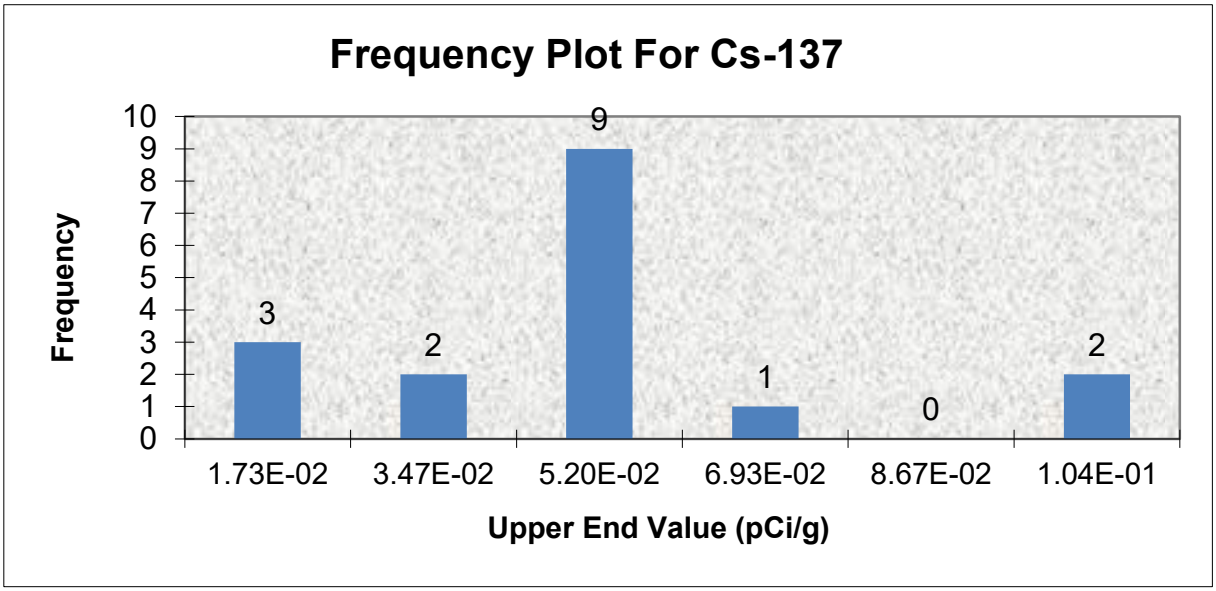
Survey Unit: 12204B
Survey Unit Name: Crib House Area
Mean: 2.66E-02 pCi/g
Median: 2.31E-02 pCi/g
ST DEV: 0.020
Skew: 2.507



Upper Value	Observation Frequency	Observation %
1.53E-02	2	12%
3.06E-02	12	71%
4.59E-02	1	6%
6.12E-02	1	6%
7.65E-02	0	0%
9.18E-02	1	6%
TOTAL	17	100%

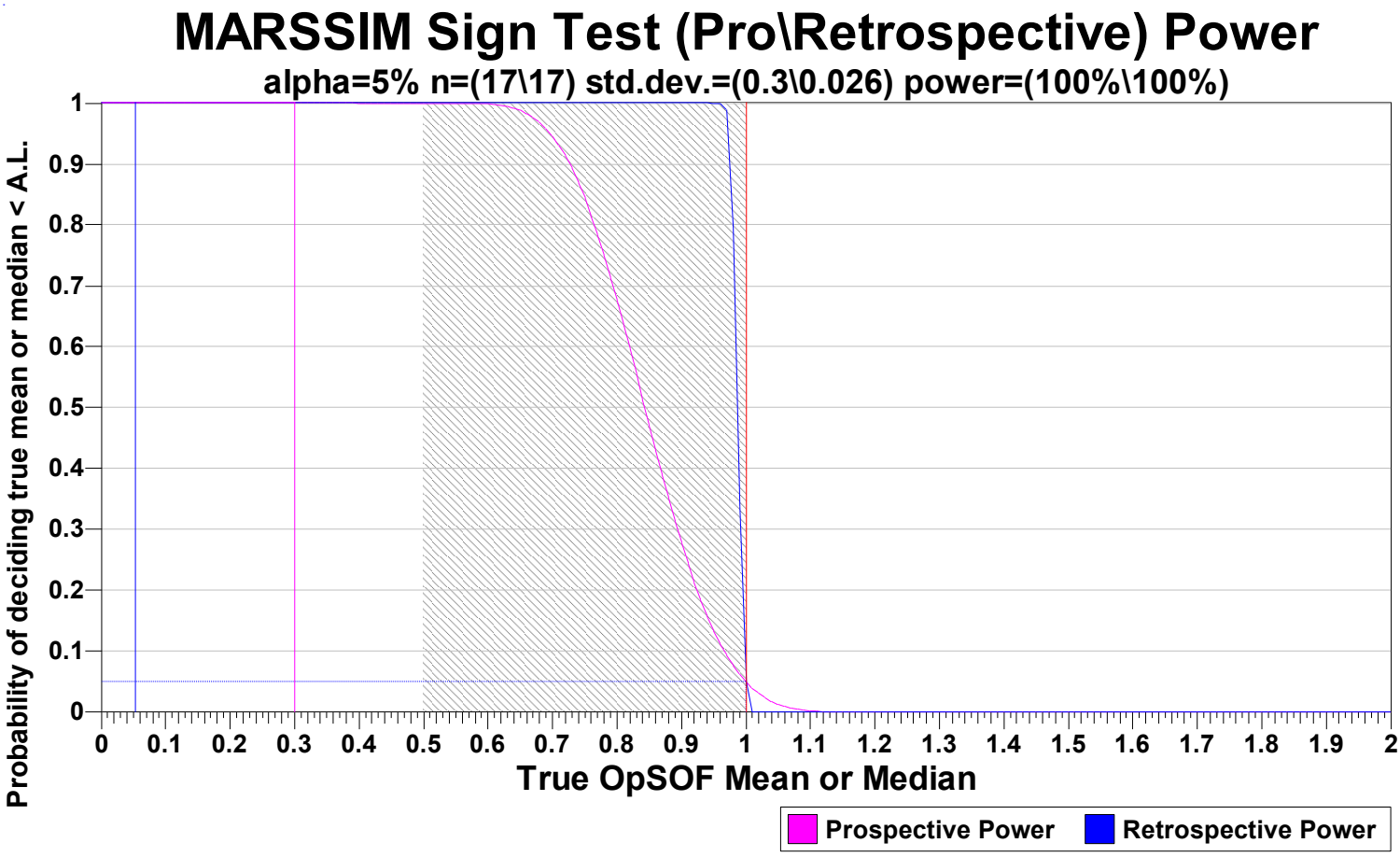
HISTOGRAM FOR Cs-137

Survey Unit: 12204B
Survey Unit Name: Crib House Area
Mean: 4.21E-02 pCi/g
Median: 3.99E-02 pCi/g
ST DEV: 0.027
Skew: 0.779



Upper Value	Observation Frequency	Observation %
1.73E-02	3	18%
3.47E-02	2	12%
5.20E-02	9	53%
6.93E-02	1	6%
8.67E-02	0	0%
1.04E-01	2	12%
TOTAL	17	100%

Prospective and Retrospective Power Curves for Survey Unit 12204B



ATTACHMENT 7
SAMPLE ANALYTICAL REPORTS

Apex-Gamma

Analysis Report for 05-Feb-19-10009

L1-12204B-FSGS-001SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 05-Feb-19-10009
Sample Description	: L1-12204B-FSGS-001SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.404E+03 grams
Facility	: Default
Sample Taken On	: 2/4/2019 8:02:00AM
Acquisition Started	: 2/5/2019 11:51:09AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 324
Geometry	: 130G_SOIL_1
Live Time	: 1800.0 seconds
Real Time	: 1802.2 seconds
Dead Time	: 0.12 %
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	: 2/5/2019
Efficiency Calibration Description	:
Sample Number	: 63842
Fill Height	: 1403.92 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 2/5/2019 12:21:14PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated 0700 2-7-19

Analysis Report for 05-Feb-19-10009
L1-12204B-FSGS-001SS

	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	1.28E+02	27.00	2.91E+02	0.86
	2	186.04	368 -	376	372.39	1.15E+02	24.47	2.24E+02	1.02
M	3	238.64	473 -	487	477.46	3.91E+02	22.58	1.75E+02	1.11
m	4	241.69	473 -	487	483.56	8.34E+01	11.80	1.35E+02	1.12
	5	295.13	586 -	594	590.31	1.42E+02	19.60	1.14E+02	1.36
	6	338.25	672 -	681	676.48	8.99E+01	17.21	9.11E+01	1.17
	7	351.83	699 -	708	703.61	2.82E+02	21.67	8.34E+01	1.30
	8	583.09	1161 -	1171	1165.78	1.27E+02	16.07	5.53E+01	1.70
	9	609.23	1212 -	1223	1218.03	2.23E+02	18.80	5.22E+01	1.46
	10	661.73	1318 -	1327	1322.99	6.19E+01	12.84	4.41E+01	1.47
	11	911.31	1816 -	1827	1822.07	9.10E+01	12.60	2.70E+01	1.45
	12	968.88	1932 -	1940	1937.23	4.36E+01	11.25	3.84E+01	0.79
	13	1460.44	2913 -	2928	2920.93	7.45E+02	27.95	1.20E+01	1.73
	14	1764.22	3524 -	3534	3529.29	2.66E+01	7.09	9.42E+00	1.81

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	7.18E+00	4.12E-01
Cs-137	0.99	661.66	*	85.10	4.42E-02	9.55E-03
Tl-208	0.99	583.19	*	85.00	8.34E-02	1.17E-02

Analysis Report for 05-Feb-19-10009

L1-12204B-FSGS-001SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.79E-01	2.77E-02
		300.09		3.30		
Pb212-XR	0.99	74.82		10.28		
		77.11	*	17.10	4.21E-01	9.88E-02
		87.35		3.97		
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	2.82E-01	2.92E-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	2.06E-01	5.56E-02
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	3.60E-01	5.85E-02
		295.22	*	18.42	2.71E-01	4.32E-02
		351.93	*	35.60	3.14E-01	3.49E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	7.43E-01	1.78E-01
		87.35		2.24		
		89.78		0.82		
Ra-226	0.99	186.21	*	3.64	8.64E-01	1.97E-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	3.08E-01	6.42E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.65E-01	3.84E-02
		964.77		4.99		
		968.97	*	15.80	2.16E-01	5.65E-02
		1588.20		3.22		
U-235	0.98	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	5.50E-02	1.26E-02
		202.11		1.08		
		205.31		5.01		

Analysis Report for 05-Feb-19-10009

L1-12204B-FSGS-001SS

* = 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	0.977	7.18E+00	4.12E-01	
	Cs-137	0.999	4.42E-02	9.55E-03	
	Tl-208	0.998	8.34E-02	1.17E-02	
X	Bi-211	0.911			
	Pb-212	1.000	2.79E-01	2.77E-02	
?	Pb212-XR	0.999	4.21E-01	9.88E-02	
	Bi-214	0.998	2.66E-01	2.59E-02	
	Pb-214	0.997	3.08E-01	2.46E-02	
?	Pb214-XR	0.999	7.43E-01	1.78E-01	
?	Ra-226	0.995	8.64E-01	1.97E-01	
	Ac-228	0.999	2.61E-01	2.85E-02	
?	U-235	0.988	5.50E-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 05-Feb-19-10009

L1-12204B-FSGS-001SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 2/5/2019 12:21:14PM
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	6.51E-02	3.69E-02	3.69E-02
	BE-7	477.60		10.44	2.17E-01	2.56E-01	2.56E-01
+	K-40	1460.82	*	10.66	7.18E+00	2.24E-01	2.24E-01
	Co-60	1173.23		99.85	-2.05E-02	3.30E-02	3.86E-02
		1332.49		99.98	2.40E-02		3.30E-02
	Nb-94	702.65		99.81	-6.43E-03	2.45E-02	2.60E-02
		871.09		99.89	3.33E-03		2.45E-02
	Ag-108m	79.13		6.60	-3.28E-01	2.44E-02	7.90E-01
		433.94		90.50	-1.67E-02		2.44E-02
		614.28		89.80	-4.07E-02		4.12E-02
		722.94		90.80	-5.64E-03		3.27E-02
	Sb-125	176.31		6.84	-1.08E-01	8.28E-02	3.63E-01
		380.45		1.52	-1.91E-01		1.47E+00
		427.87		29.60	1.10E-02		8.28E-02
		463.36		10.49	2.42E-01		2.60E-01
		600.60		17.65	-1.42E-02		1.40E-01
		606.71		4.98	-8.43E-02		9.81E-01
		635.95		11.22	-1.19E-02		2.27E-01
		671.44		1.79	-7.31E-01		1.53E+00

Analysis Report for 05-Feb-19-10009

L1-12204B-FSGS-001SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Ba-133	79.61		2.65	-8.78E-01	5.29E-02	1.87E+00
		81.00		32.90	-1.45E-01		1.24E-01
		276.40		7.16	-3.57E-02		3.31E-01
		302.85		18.34	-2.53E-03		1.36E-01
		356.01		62.05	-5.02E-02		5.29E-02
		383.85		8.94	3.69E-02		2.55E-01
	Cs-134	475.36		1.48	-2.90E-01	3.36E-02	1.64E+00
		563.25		8.34	-1.45E-01		2.75E-01
		569.33		15.37	4.42E-02		1.56E-01
		604.72		97.62	-1.35E-02		4.17E-02
		795.86		85.46	2.22E-02		3.36E-02
		801.95		8.69	-2.12E-01		3.03E-01
		1038.61		0.99	5.17E-01		3.26E+00
		1167.97		1.79	-3.66E-01		2.13E+00
		1365.19		3.02	1.54E-01		1.13E+00
+	Cs-137	661.66	*	85.10	4.42E-02	2.66E-02	2.66E-02
	Eu-152	121.78		28.67	1.18E-02	8.47E-02	8.47E-02
		244.70		7.61	-2.27E-01		3.43E-01
		295.94		0.45	6.77E+00		6.81E+00
		344.28		26.60	-5.80E-03		8.77E-02
		367.79		0.86	2.24E-01		2.67E+00
		411.12		2.24	4.41E-01		1.07E+00
		443.96		2.83	-2.92E-01		8.41E-01
		488.68		0.42	9.69E-01		5.64E+00
		563.99		0.49	-3.80E+00		4.57E+00
		586.26		0.46	-3.34E+00		8.78E+00
		678.62		0.47	-1.08E+00		5.37E+00
		688.67		0.86	2.06E-01		3.11E+00
		719.35		0.28	9.35E-01		9.77E+00
		778.90		12.96	7.30E-02		2.11E-01
		810.45		0.32	-3.26E+00		8.25E+00
		867.37		4.26	-2.89E-01		5.66E-01
		919.33		0.43	-4.43E+00		5.80E+00
		964.08		14.65	-3.97E-03		2.84E-01
		1085.87		10.24	1.79E-01		3.67E-01
		1089.74		1.73	1.00E+00		2.04E+00
		1112.07		13.69	-2.00E-02		2.56E-01
		1212.95		1.43	5.48E-01		2.92E+00
		1249.94		0.19	6.81E+00		1.98E+01
		1299.14		1.63	-1.23E-01		2.10E+00
		1408.01		21.07	-5.29E-02		1.23E-01
		1457.64		0.50	-1.28E+00		2.76E+01
		1528.10		0.28	-1.23E+00		6.20E+00
	Eu-154	123.07		40.40	-8.17E-04	5.89E-02	5.89E-02
		247.93		6.89	3.21E-02		3.33E-01
		591.76		4.95	3.06E-01		5.50E-01
		692.42		1.78	7.03E-01		1.59E+00
		723.30		20.06	7.07E-02		1.55E-01
		756.80		4.52	3.99E-01		5.70E-01
		873.18		12.08	-1.34E-01		1.96E-01
		996.29		10.48	5.20E-02		2.97E-01

Analysis Report for 05-Feb-19-10009

L1-12204B-FSGS-001SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	1004.76		18.01	-9.31E-02	5.89E-02	1.81E-01
		1274.43		34.80	-8.27E-02		1.01E-01
		1596.48		1.80	-1.77E-01		1.46E+00
	Eu-155	45.30		1.31	3.73E+00	1.33E-01	8.40E+00
		60.01		1.22	-1.84E+00		8.88E+00
		86.55		30.70	7.06E-02		1.33E-01
		105.31		21.10	6.07E-02		1.36E-01
+	Ra-226	186.21	*	3.64	8.64E-01	5.85E-01	5.85E-01
	Pa-231	27.36		10.30	5.16E-01	7.73E-01	7.73E-01
		283.69		1.70	-8.71E-01		1.22E+00
		300.07		2.47	-1.25E+00		9.77E-01
		302.65		2.20	-2.11E-02		1.13E+00
		330.06		1.40	1.31E+00		1.86E+00
+	U-235	143.76		10.96	6.84E-02	3.72E-02	2.11E-01
		163.33		5.08	-5.30E-02		4.95E-01
		185.71	*	57.20	5.50E-02		3.72E-02
		202.11		1.08	1.08E-01		2.28E+00
		205.31		5.01	-4.77E-01		4.79E-01
	Am-241	59.54		35.90	-1.06E-01	3.01E-01	3.01E-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-Feb-19-10010

L1-12204B-FSGS-002SS

GAMMA SPECTRUM ANALYSIS

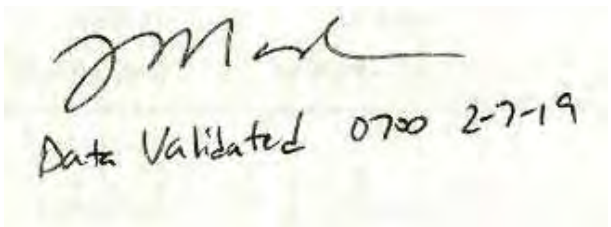
Sample Identification	: 05-Feb-19-10010
Sample Description	: L1-12204B-FSGS-002SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.070E+03 grams
Facility	: Default
Sample Taken On	: 2/4/2019 8:03:00AM
Acquisition Started	: 2/5/2019 2:11:34PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 4500.0 seconds
Real Time	: 4511.1 seconds
Dead Time	: 0.25 %
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	: 2/5/2019
Efficiency Calibration Description	:
Sample Number	: 63855
Fill Height	: 1069.79 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 2/5/2019 3:29:09PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192



Analysis Report for 05-Feb-19-10010

L1-12204B-FSGS-002SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.85	294 -	314	300.14	2.33E+02	23.69	5.80E+02	0.90
m	2	77.12	294 -	314	309.19	4.14E+02	28.23	6.58E+02	0.90
	3	143.45	572 -	581	574.24	7.71E+01	33.47	4.59E+02	0.54
	4	154.34	612 -	621	617.77	6.01E+01	33.39	4.66E+02	0.73
	5	186.03	736 -	752	744.41	4.35E+02	50.18	6.66E+02	1.08
	6	209.30	832 -	844	837.40	1.57E+02	36.64	4.49E+02	1.15
M	7	238.61	947 -	974	954.53	1.66E+03	44.02	4.91E+02	0.99
m	8	241.82	947 -	974	967.36	3.31E+02	23.07	3.99E+02	0.99
M	9	295.15	1173 -	1205	1180.51	6.72E+02	74.99	3.21E+02	1.10
m	10	300.01	1173 -	1205	1199.92	8.49E+01	18.10	3.19E+02	1.11
	11	327.81	1304 -	1317	1311.04	7.45E+01	27.19	2.41E+02	0.82
	12	338.24	1343 -	1360	1352.75	3.67E+02	36.56	2.98E+02	1.14
	13	351.88	1398 -	1416	1407.26	1.15E+03	44.38	2.44E+02	1.04
	14	462.73	1846 -	1857	1850.37	8.23E+01	20.71	1.37E+02	1.39
	15	510.58	2035 -	2051	2041.65	2.50E+02	29.78	2.03E+02	1.47
	16	583.09	2323 -	2342	2331.55	5.10E+02	33.40	1.72E+02	1.38
	17	609.13	2424 -	2446	2435.70	8.73E+02	37.36	1.35E+02	1.48
M	18	661.55	2636 -	2667	2645.31	6.51E+01	10.87	8.25E+01	1.22
m	19	665.02	2636 -	2667	2659.19	3.21E+01	9.05	9.14E+01	1.22
	20	727.13	2901 -	2913	2907.56	1.17E+02	17.93	7.77E+01	0.79
	21	794.69	3169 -	3183	3177.74	6.12E+01	15.62	6.28E+01	0.78
	22	860.57	3434 -	3448	3441.24	3.21E+01	17.84	9.59E+01	0.54
	23	910.92	3633 -	3653	3642.64	3.54E+02	26.37	9.41E+01	1.24
	24	950.21	3794 -	3805	3799.80	2.73E+01	12.12	4.77E+01	0.69
M	25	964.53	3850 -	3884	3857.07	6.34E+01	17.29	7.81E+01	1.40
m	26	968.75	3850 -	3884	3873.97	2.12E+02	44.12	1.24E+02	1.40
	27	1119.93	4467 -	4487	4478.81	1.71E+02	24.08	1.13E+02	1.32
	28	1237.87	4944 -	4959	4950.77	5.85E+01	19.47	1.06E+02	0.90
	29	1376.91	5500 -	5516	5507.25	3.58E+01	12.22	3.62E+01	0.38
	30	1460.38	5827 -	5854	5841.36	2.89E+03	56.03	5.62E+01	1.95
	31	1630.22	6515 -	6528	6521.31	2.16E+01	7.10	1.04E+01	0.33
	32	1729.01	6909 -	6923	6916.90	2.58E+01	7.62	1.13E+01	0.52
	33	1764.12	7046 -	7067	7057.50	1.38E+02	13.69	1.34E+01	1.66
	34	1846.71	7382 -	7395	7388.25	2.05E+01	6.19	6.46E+00	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.

Analysis Report for 05-Feb-19-10010

L1-12204B-FSGS-002SS

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	7.44E-02	1.02E-02
K-40	0.97	1460.82	*	10.66	1.66E+01	7.89E-01
Cs-137	0.99	661.66	*	85.10	2.68E-02	4.76E-03
Tl-208	0.99	583.19	*	85.00	1.93E-01	1.71E-02
Bi-212	0.99	39.86		1.06		
		727.33	*	6.67	6.59E-01	1.08E-01
		785.37		1.10		
		1620.50		1.47		
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	6.58E-01	5.60E-02
		300.09	*	3.30	5.08E-01	1.16E-01
Pb212-XR	1.00	74.82	*	10.28	1.15E+00	1.66E-01
		77.11	*	17.10	1.08E+00	1.33E-01
		87.35		3.97		
		89.78		1.46		
Bi-214	0.98	609.32	*	45.49	6.35E-01	4.69E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	5.81E-01	8.50E-02
		1155.21		1.63		
		1238.12	*	5.83	5.44E-01	1.82E-01
		1280.98		1.43		
		1377.67	*	3.99	5.25E-01	1.80E-01
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59	*	2.88	6.26E-01	1.87E-01
		1764.49	*	15.30	6.40E-01	6.86E-02
		1847.43	*	2.03	7.43E-01	2.26E-01
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	7.95E-01	8.44E-02
		295.22	*	18.42	7.15E-01	9.81E-02
		351.93	*	35.60	7.20E-01	6.40E-02
		785.96		1.06		
Ac-228	0.99	129.07		2.42		
		209.25	*	3.89	6.56E-01	1.62E-01
		270.24		3.46		

Analysis Report for 05-Feb-19-10010

L1-12204B-FSGS-002SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Ac-228	0.99	328.00	*	2.95	5.35E-01	2.01E-01
		338.32	*	11.27	7.05E-01	9.09E-02
		409.46		1.92		
		463.00	*	4.40	5.11E-01	1.34E-01
		794.95	*	4.25	5.74E-01	1.50E-01
		911.20	*	25.80	6.02E-01	5.19E-02
		964.77	*	4.99	5.80E-01	1.60E-01
		968.97	*	15.80	6.14E-01	1.31E-01
		1588.20		3.22		
U-235	0.98	143.76	*	10.96	1.11E-01	4.95E-02
		163.33		5.08		
		185.71	*	57.20	1.17E-01	1.65E-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

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.972	7.44E-02	1.02E-02	
	K-40	0.970	1.66E+01	7.89E-01	
	Cs-137	0.998	2.68E-02	4.76E-03	
	Tl-208	0.998	1.93E-01	1.71E-02	
X	Bi-211	0.900			
	Bi-212	0.996	6.59E-01	1.08E-01	
	Pb-212	1.000	6.30E-01	5.04E-02	
	Pb212-XR	1.000	1.11E+00	1.04E-01	
	Bi-214	0.985	6.24E-01	3.31E-02	
	Pb-214	0.999	7.41E-01	4.53E-02	
X	Pb214-XR	1.000			
X	Ra-226	0.995			
	Ac-228	0.993	6.10E-01	3.64E-02	

Analysis Report for 05-Feb-19-10010

L1-12204B-FSGS-002SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
X	Pa-231	1.000			
	U-235	0.986	1.16E-01	1.56E-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-Feb-19-10010

L1-12204B-FSGS-002SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 2/5/2019 3:29:09PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
	4	154.34	1.33583E-02	55.54	Sum	
m	19	665.02	7.13441E-03	28.19		
	22	860.57	7.12934E-03	55.59		
	24	950.21	6.06222E-03	44.44	S-Esc	
	31	1630.22	4.80208E-03	32.88	Sum	

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	7.44E-02	2.64E-02	2.64E-02
	BE-7	477.60		10.44	-8.76E-02	2.51E-01	2.51E-01
+	K-40	1460.82	*	10.66	1.66E+01	3.27E-01	3.27E-01
	Co-60	1173.23		99.85	2.31E-02	3.43E-02	4.19E-02
		1332.49		99.98	1.90E-02		3.43E-02
	Nb-94	702.65		99.81	1.82E-03	3.02E-02	3.02E-02
		871.09		99.89	1.10E-02		3.17E-02
	Ag-108m	79.13		6.60	-5.02E-01	2.70E-02	1.15E+00
		433.94		90.50	-1.30E-02		2.70E-02
		614.28		89.80	-1.50E-02		4.41E-02
		722.94		90.80	-1.84E-02		3.85E-02
	Sb-125	176.31		6.84	5.42E-02	8.52E-02	3.46E-01
		380.45		1.52	-7.04E-01		1.59E+00

Analysis Report for 05-Feb-19-10010

L1-12204B-FSGS-002SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	427.87		29.60	-1.16E-02	8.52E-02	8.52E-02
		463.36		10.49	4.53E-01		2.78E-01
		600.60		17.65	8.77E-02		1.59E-01
		606.71		4.98	-2.53E-01		1.09E+00
		635.95		11.22	3.68E-02		2.47E-01
		671.44		1.79	2.47E-01		1.57E+00
	Ba-133	79.61		2.65	-2.25E+00	5.30E-02	2.66E+00
		81.00		32.90	-3.12E-01		1.80E-01
		276.40		7.16	7.97E-02		3.47E-01
		302.85		18.34	-8.74E-02		1.34E-01
		356.01		62.05	-2.77E-02		5.30E-02
		383.85		8.94	1.27E-01		2.82E-01
	Cs-134	475.36		1.48	-7.33E-01	3.72E-02	1.69E+00
		563.25		8.34	-1.64E-01		3.16E-01
		569.33		15.37	-3.39E-02		1.78E-01
		604.72		97.62	-4.28E-03		5.13E-02
		795.86		85.46	1.00E-02		3.72E-02
		801.95		8.69	3.72E-01		3.45E-01
		1038.61		0.99	3.28E-01		3.62E+00
		1167.97		1.79	3.51E-01		2.31E+00
		1365.19		3.02	2.89E-01		1.06E+00
+	Cs-137	661.66	*	85.10	2.68E-02	1.92E-02	1.92E-02
	Eu-152	121.78		28.67	-9.99E-03	8.99E-02	9.69E-02
		244.70		7.61	-6.28E-03		3.79E-01
		295.94		0.45	-4.12E-01		7.55E+00
		344.28		26.60	-1.41E-02		8.99E-02
		367.79		0.86	1.41E+00		2.73E+00
		411.12		2.24	2.86E-01		1.15E+00
		443.96		2.83	-2.56E-01		9.21E-01
		488.68		0.42	4.16E-01		6.14E+00
		563.99		0.49	-3.26E+00		5.39E+00
		586.26		0.46	-1.10E+00		9.77E+00
		678.62		0.47	7.70E-01		6.06E+00
		688.67		0.86	-1.07E+00		3.29E+00
		719.35		0.28	-4.94E+00		1.06E+01
		778.90		12.96	-3.05E-01		2.23E-01
		810.45		0.32	1.62E-02		8.69E+00
		867.37		4.26	3.67E-01		7.40E-01
		919.33		0.43	-1.02E+00		7.38E+00
		964.08		14.65	-4.88E-02		3.34E-01
		1085.87		10.24	-4.93E-01		3.55E-01
		1089.74		1.73	6.03E-01		2.13E+00
		1112.07		13.69	-6.81E-02		3.10E-01
		1212.95		1.43	-1.16E+00		3.31E+00
		1249.94		0.19	1.81E+00		2.26E+01
		1299.14		1.63	2.16E-01		2.27E+00
		1408.01		21.07	1.13E-01		1.54E-01
		1457.64		0.50	3.50E+02		3.22E+01
		1528.10		0.28	2.85E-01		8.21E+00
	Eu-154	123.07		40.40	-8.67E-03	6.85E-02	6.85E-02
		247.93		6.89	2.79E-01		3.43E-01

Analysis Report for 05-Feb-19-10010

L1-12204B-FSGS-002SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	591.76		4.95	-9.75E-02	6.85E-02	5.52E-01
		692.42		1.78	4.91E-01		1.67E+00
		723.30		20.06	-3.66E-02		1.76E-01
		756.80		4.52	-1.22E-01		6.61E-01
		873.18		12.08	-1.22E-01		2.56E-01
		996.29		10.48	-1.02E-01		3.25E-01
		1004.76		18.01	6.58E-02		1.90E-01
		1274.43		34.80	1.12E-01		1.22E-01
		1596.48		1.80	1.09E-01		1.42E+00
	Eu-155	45.30		1.31	-2.55E+00	1.69E-01	1.85E+01
		60.01		1.22	2.43E+00		1.92E+01
		86.55		30.70	8.77E-02		1.79E-01
		105.31		21.10	-3.60E-02		1.69E-01
	Ra-226	186.21	*	3.64	1.84E+00	6.66E-01	6.66E-01
	Pa-231	27.36		10.30	4.32E+00	7.08E-01	2.10E+00
		283.69		1.70	1.64E-01		1.39E+00
		300.07	*	2.47	6.78E-01		7.08E-01
		302.65		2.20	-6.81E-01		1.11E+00
		330.06		1.40	-2.95E-01		1.85E+00
+	U-235	143.76	*	10.96	1.11E-01	4.24E-02	1.62E-01
		163.33		5.08	1.38E-01		4.98E-01
		185.71	*	57.20	1.17E-01		4.24E-02
		202.11		1.08	7.84E-01		2.20E+00
		205.31		5.01	-4.20E-01		4.70E-01
	Am-241	59.54		35.90	6.21E-01	6.89E-01	6.89E-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-Feb-19-10011

L1-12204B-FSGS-003SS

GAMMA SPECTRUM ANALYSIS

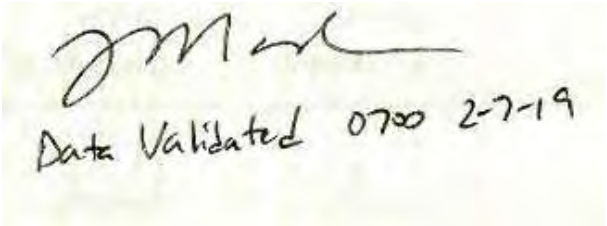
Sample Identification	: 05-Feb-19-10011
Sample Description	: L1-12204B-FSGS-003SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 9.966E+02 grams
Facility	: Default
Sample Taken On	: 2/4/2019 8:04:00AM
Acquisition Started	: 2/5/2019 11:51:22AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P11314
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 - 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	: 2/5/2019
Efficiency Calibration Description	:
Sample Number	: 63844
Fill Height	: 996.60 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 2/5/2019 12:21:43PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192



Analysis Report for 05-Feb-19-10011

L1-12204B-FSGS-003SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	75.09	295 -	315	300.91	1.73E+02	38.49	2.65E+02	0.79
m	2	77.22	295 -	315	309.40	2.84E+02	59.66	2.80E+02	0.79
	3	186.15	738 -	752	744.46	2.27E+02	29.86	2.31E+02	1.06
M	4	238.84	947 -	975	954.96	7.45E+02	28.76	2.19E+02	1.09
m	5	241.93	947 -	975	967.29	1.79E+02	15.45	1.64E+02	1.10
	6	270.47	1078 -	1085	1081.27	2.79E+01	15.11	9.81E+01	0.33
	7	295.34	1175 -	1188	1180.66	3.14E+02	25.32	1.17E+02	1.05
	8	338.45	1344 -	1358	1352.86	1.56E+02	20.95	9.68E+01	1.09
	9	352.01	1398 -	1414	1407.03	5.73E+02	29.34	9.17E+01	1.22
	10	360.25	1436 -	1443	1439.96	1.82E+01	9.38	3.48E+01	0.72
	11	510.74	2031 -	2050	2041.33	1.27E+02	19.60	7.29E+01	1.03
	12	583.10	2324 -	2341	2330.51	2.54E+02	21.67	6.39E+01	1.18
	13	609.29	2426 -	2445	2435.21	3.80E+02	24.87	6.77E+01	1.30
	14	727.29	2901 -	2914	2906.91	5.37E+01	13.35	4.53E+01	0.43
	15	768.50	3066 -	3077	3071.66	2.63E+01	10.41	3.27E+01	0.30
	16	806.20	3217 -	3227	3222.38	1.45E+01	8.95	2.75E+01	0.42
	17	911.12	3634 -	3651	3641.93	1.47E+02	17.69	5.11E+01	1.49
	18	968.83	3865 -	3880	3872.75	1.23E+02	15.61	4.01E+01	1.33
	19	1120.46	4470 -	4488	4479.23	9.40E+01	14.94	3.80E+01	0.62
	20	1460.65	5826 -	5853	5840.52	1.32E+03	37.48	1.77E+01	1.73
	21	1764.01	7047 -	7066	7055.09	6.45E+01	10.52	1.35E+01	0.67

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

Analysis Report for 05-Feb-19-10011

L1-12204B-FSGS-003SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.98	511.00	*	100.00	8.80E-02	1.48E-02
K-40	0.99	1460.82	*	10.66	1.77E+01	9.19E-01
Tl-208	0.99	583.19	*	85.00	2.24E-01	2.33E-02
Bi-212	1.00	39.86		1.06		
		727.33	*	6.67	7.04E-01	1.80E-01
		785.37		1.10		
		1620.50		1.47		
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	6.77E-01	6.06E-02
		300.09		3.30		
Pb212-XR	0.99	74.82	*	10.28	1.20E+00	2.94E-01
		77.11	*	17.10	1.09E+00	2.55E-01
		87.35		3.97		
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	6.45E-01	5.73E-02
		768.36	*	4.89	4.88E-01	1.95E-01
		806.18	*	1.26	1.08E+00	6.68E-01
		934.06		3.11		
		1120.29	*	14.92	7.44E-01	1.22E-01
		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	6.99E-01	1.17E-01
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	9.85E-01	1.16E-01
		295.22	*	18.42	7.72E-01	8.77E-02
		351.93	*	35.60	8.34E-01	7.92E-02
		785.96		1.06		
Ra-226	0.99	186.21	*	3.64	2.16E+00	3.33E-01
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24	*	3.46	3.45E-01	1.89E-01
		328.00		2.95		
		338.32	*	11.27	6.97E-01	1.09E-01
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	5.83E-01	7.46E-02
		964.77		4.99		
		968.97	*	15.80	8.32E-01	1.12E-01
		1588.20		3.22		
U-235	0.97	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	1.37E-01	2.12E-02
		202.11		1.08		

Analysis Report for 05-Feb-19-10011

L1-12204B-FSGS-003SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
U-235	0.97	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	0.989	8.80E-02	1.48E-02	
	K-40	0.995	1.77E+01	9.19E-01	
	Tl-208	0.999	2.24E-01	2.33E-02	
X	Bi-211	0.869			
	Bi-212	1.000	7.04E-01	1.80E-01	
	Pb-212	0.993	6.77E-01	6.06E-02	
	Pb212-XR	0.995	1.14E+00	1.93E-01	
	Bi-214	0.994	6.61E-01	4.60E-02	
	Pb-214	0.999	8.43E-01	5.24E-02	
X	Pb214-XR	0.995			
X	Rn-219	0.944			
?	Ra-226	0.999	2.16E+00	3.33E-01	
	Ac-228	0.998	6.44E-01	5.19E-02	
?	U-235	0.979	1.37E-01	2.12E-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 05-Feb-19-10011

L1-12204B-FSGS-003SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 2/5/2019 12:21:43PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
10	360.25	1.01179E-02	51.51		

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	8.80E-02	3.97E-02	3.97E-02
	BE-7	477.60		10.44	3.36E-01	3.82E-01	3.82E-01
+	K-40	1460.82	*	10.66	1.77E+01	4.46E-01	4.46E-01
	Co-60	1173.23		99.85	9.18E-02	5.40E-02	7.13E-02
		1332.49		99.98	1.03E-02		5.40E-02
	Nb-94	702.65		99.81	-1.71E-03	4.64E-02	4.64E-02
		871.09		99.89	-1.36E-03		4.70E-02
	Ag-108m	79.13		6.60	-1.84E-01	3.99E-02	1.28E+00
		433.94		90.50	-3.13E-02		3.99E-02
		614.28		89.80	-1.24E-02		7.44E-02
		722.94		90.80	-1.06E-02		6.09E-02
	Sb-125	176.31		6.84	1.92E-01	1.26E-01	4.85E-01
		380.45		1.52	1.75E+00		2.54E+00
		427.87		29.60	4.42E-02		1.26E-01
		463.36		10.49	4.74E-01		4.30E-01
		600.60		17.65	9.42E-02		2.46E-01
		606.71		4.98	-1.48E-01		1.70E+00
		635.95		11.22	-2.14E-01		3.76E-01

Analysis Report for 05-Feb-19-10011

L1-12204B-FSGS-003SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-2.02E+00	1.26E-01	2.58E+00
Ba-133	79.61	2.65	7.15E-02	8.30E-02	3.13E+00
	81.00	32.90	-3.25E-01		1.87E-01
	276.40	7.16	-1.32E-01		4.96E-01
	302.85	18.34	1.58E-01		2.15E-01
	356.01	62.05	-4.66E-02		8.30E-02
	383.85	8.94	-4.99E-01		4.19E-01
Cs-134	475.36	1.48	-1.29E+00	6.02E-02	2.51E+00
	563.25	8.34	-4.28E-01		5.16E-01
	569.33	15.37	-7.43E-02		2.59E-01
	604.72	97.62	-1.97E-02		7.10E-02
	795.86	85.46	2.77E-02		6.02E-02
	801.95	8.69	-1.80E-01		5.62E-01
	1038.61	0.99	1.89E+00		6.09E+00
	1167.97	1.79	-6.49E+00		3.70E+00
	1365.19	3.02	-1.01E+00		1.68E+00
Cs-137	661.66	85.10	-5.14E-02	5.37E-02	5.37E-02
Eu-152	121.78	28.67	3.90E-02	1.24E-01	1.24E-01
	244.70	7.61	-1.04E-01		5.60E-01
	295.94	0.45	2.27E+01		1.18E+01
	344.28	26.60	-4.89E-02		1.33E-01
	367.79	0.86	6.06E-01		4.01E+00
	411.12	2.24	7.41E-01		1.82E+00
	443.96	2.83	4.13E-02		1.31E+00
	488.68	0.42	6.18E+00		9.09E+00
	563.99	0.49	-7.36E+00		8.54E+00
	586.26	0.46	8.61E-01		1.57E+01
	678.62	0.47	1.16E+00		9.34E+00
	688.67	0.86	-2.82E-01		5.19E+00
	719.35	0.28	2.93E+00		1.54E+01
	778.90	12.96	-3.81E-01		3.58E-01
	810.45	0.32	-5.75E+00		1.47E+01
	867.37	4.26	-1.17E+00		1.10E+00
	919.33	0.43	-4.81E+00		1.14E+01
	964.08	14.65	2.51E-01		5.58E-01
	1085.87	10.24	-1.53E-01		5.47E-01
	1089.74	1.73	-4.66E+00		3.21E+00
	1112.07	13.69	2.66E-01		4.29E-01
	1212.95	1.43	-3.82E+00		5.21E+00
	1249.94	0.19	-1.86E+00		3.76E+01
	1299.14	1.63	6.03E-01		3.77E+00
	1408.01	21.07	3.75E-02		2.38E-01
	1457.64	0.50	-2.16E+00		5.10E+01
	1528.10	0.28	2.84E+00		1.58E+01
Eu-154	123.07	40.40	-3.98E-02	8.74E-02	8.74E-02
	247.93	6.89	-1.11E-01		4.82E-01
	591.76	4.95	-5.00E-01		8.36E-01
	692.42	1.78	-8.91E-01		2.51E+00
	723.30	20.06	-7.92E-02		2.77E-01
	756.80	4.52	3.10E-01		1.03E+00
	873.18	12.08	-1.53E-01		3.96E-01

Analysis Report for 05-Feb-19-10011

L1-12204B-FSGS-003SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	-5.05E-01	8.74E-02	5.56E-01
		1004.76		18.01	1.49E-01		3.08E-01
		1274.43		34.80	-7.62E-02		2.00E-01
		1596.48		1.80	-2.16E+00		1.98E+00
	Eu-155	45.30		1.31	-8.10E-01	1.99E-01	1.14E+01
		60.01		1.22	-1.32E+00		1.31E+01
		86.55		30.70	1.89E-01		2.06E-01
		105.31		21.10	1.25E-03		1.99E-01
+	Ra-226	186.21	*	3.64	2.16E+00	8.57E-01	8.57E-01
	Pa-231	27.36		10.30	1.93E+00	1.27E+00	1.27E+00
		283.69		1.70	-7.56E-01		2.02E+00
		300.07		2.47	5.13E-01		1.61E+00
		302.65		2.20	7.58E-01		1.78E+00
		330.06		1.40	3.45E+00		2.92E+00
+	U-235	143.76		10.96	-1.87E-02	5.45E-02	3.26E-01
		163.33		5.08	9.10E-02		6.82E-01
		185.71	*	57.20	1.37E-01		5.45E-02
		202.11		1.08	-8.56E-01		2.95E+00
		205.31		5.01	-7.40E-01		6.34E-01
	Am-241	59.54		35.90	1.67E-01	4.58E-01	4.58E-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-Feb-19-10012

L1-12204B-FSGS-004SS

GAMMA SPECTRUM ANALYSIS

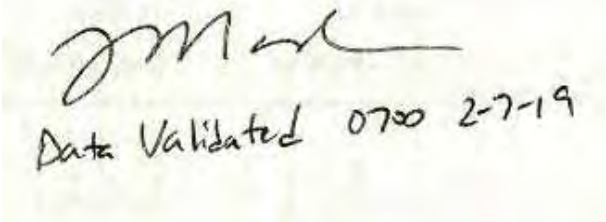
Sample Identification	: 05-Feb-19-10012
Sample Description	: L1-12204B-FSGS-004SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 9.656E+02 grams
Facility	: Default
Sample Taken On	: 2/4/2019 8:05:00AM
Acquisition Started	: 2/5/2019 11:51:33AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 2700.0 seconds
Real Time	: 2701.1 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	: 9/29/2018
Efficiency Calibration Used Done On	: 2/5/2019
Efficiency Calibration Description	:
Sample Number	: 63845
Fill Height	: 965.58 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 2/5/2019 1:29:28PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192



Analysis Report for 05-Feb-19-10012

L1-12204B-FSGS-004SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.77	295 -	316	300.41	1.31E+02	23.53	3.02E+02	0.92
m	2	77.08	295 -	316	309.62	2.11E+02	30.36	3.38E+02	0.93
	3	87.24	343 -	357	350.21	8.68E+01	34.52	3.83E+02	0.94
	4	92.57	366 -	378	371.49	1.07E+02	31.94	3.47E+02	1.07
	5	186.01	738 -	753	744.75	2.20E+02	33.20	2.93E+02	0.86
	6	209.47	829 -	847	838.47	1.12E+02	34.23	3.11E+02	1.04
M	7	238.70	945 -	974	955.27	9.66E+02	77.21	2.72E+02	1.03
m	8	241.76	945 -	974	967.51	1.90E+02	21.48	2.68E+02	1.04
	9	277.42	1105 -	1114	1109.99	4.10E+01	17.41	1.14E+02	0.59
M	10	295.27	1171 -	1207	1181.30	3.87E+02	56.81	1.66E+02	1.17
m	11	300.14	1171 -	1207	1200.75	7.56E+01	16.24	1.72E+02	1.18
	12	328.02	1305 -	1317	1312.18	3.30E+01	18.46	1.16E+02	1.11
	13	338.24	1347 -	1361	1352.99	1.74E+02	24.42	1.44E+02	1.12
	14	351.98	1397 -	1415	1407.92	6.02E+02	33.11	1.46E+02	1.17
	15	463.07	1840 -	1858	1851.89	7.29E+01	18.75	8.11E+01	0.80
	16	510.64	2033 -	2053	2042.03	2.15E+02	23.63	9.45E+01	1.37
	17	583.10	2322 -	2341	2331.72	3.10E+02	24.81	8.74E+01	1.22
	18	609.42	2426 -	2447	2436.95	5.13E+02	29.22	9.08E+01	1.67
	19	661.76	2638 -	2653	2646.20	6.60E+01	14.77	5.00E+01	1.05
	20	727.20	2900 -	2917	2907.88	7.41E+01	15.26	4.79E+01	1.47
	21	768.64	3066 -	3080	3073.63	5.58E+01	12.99	3.92E+01	0.80
	22	860.40	3434 -	3446	3440.63	2.85E+01	11.65	4.05E+01	0.54
	23	911.27	3636 -	3653	3644.13	2.04E+02	20.20	6.27E+01	1.25
	24	969.26	3868 -	3885	3876.12	1.31E+02	17.58	5.47E+01	0.69
	25	1120.38	4474 -	4490	4480.80	1.08E+02	16.39	5.10E+01	0.99
	26	1187.96	4746 -	4757	4751.26	2.24E+01	10.45	3.46E+01	0.47
	27	1460.94	5828 -	5859	5844.14	1.70E+03	43.54	3.98E+01	2.03
	28	1764.55	7053 -	7068	7060.26	6.02E+01	9.46	9.79E+00	1.25

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.

Analysis Report for 05-Feb-19-10012

L1-12204B-FSGS-004SS

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	9.53E-02	1.23E-02
K-40	0.99	1460.82	*	10.66	1.42E+01	7.18E-01
Cs-137	0.99	661.66	*	85.10	4.02E-02	9.32E-03
Tl-208	0.99	583.19	*	85.00	1.73E-01	1.74E-02
Bi-212	0.99	39.86		1.06		
		727.33	*	6.67	6.14E-01	1.32E-01
		785.37		1.10		
		1620.50		1.47		
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	5.79E-01	6.59E-02
		300.09	*	3.30	6.83E-01	1.57E-01
Pb212-XR	1.00	74.82	*	10.28	8.46E-01	1.75E-01
		77.11	*	17.10	7.33E-01	1.29E-01
		87.35	*	3.97	9.13E-01	3.75E-01
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	5.53E-01	4.58E-02
		768.36	*	4.89	6.55E-01	1.57E-01
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	5.37E-01	8.43E-02
		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	4.07E-01	6.60E-02
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	6.90E-01	9.56E-02
		295.22	*	18.42	6.19E-01	1.04E-01
		351.93	*	35.60	5.66E-01	5.50E-02
		785.96		1.06		
Ra-226	0.99	186.21	*	3.64	1.40E+00	2.40E-01
Ac-228	0.99	129.07		2.42		
		209.25	*	3.89	7.08E-01	2.23E-01
		270.24		3.46		
		328.00	*	2.95	3.56E-01	2.02E-01

Analysis Report for 05-Feb-19-10012

L1-12204B-FSGS-004SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Ac-228	0.99	338.32	*	11.27	5.03E-01	8.16E-02
		409.46		1.92		
		463.00	*	4.40	6.75E-01	1.81E-01
		794.95		4.25		
		911.20	*	25.80	5.11E-01	5.51E-02
		964.77		4.99		
		968.97	*	15.80	5.59E-01	7.89E-02
		1588.20		3.22		
Ac228-XR	0.94	89.96		1.90		
		93.35	*	3.10	1.26E+00	4.30E-01
Th-234	0.99	92.38	*	2.13	1.90E+00	6.25E-01
		92.80		2.10		
		112.81		0.21		
U-235	0.99	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	8.94E-02	1.53E-02
		202.11		1.08		
		205.31		5.01		
U235-XR	0.94	89.96		3.47		
		93.35	*	5.60	6.98E-01	2.21E-01
		105.60		1.32		

* = 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	0.979	9.53E-02	1.23E-02	
	K-40	0.998	1.42E+01	7.18E-01	
X	Cd-109	0.904			
	Cs-137	0.998	4.02E-02	9.32E-03	
X	Eu-155	0.958			
	Tl-208	0.999	1.73E-01	1.74E-02	

Analysis Report for 05-Feb-19-10012

L1-12204B-FSGS-004SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
X	Bi-211	0.876			
	Bi-212	0.998	6.14E-01	1.32E-01	
	Pb-212	0.999	5.95E-01	6.07E-02	
	Pb212-XR	1.000	7.83E-01	1.00E-01	
	Bi-214	0.999	5.18E-01	3.36E-02	
	Pb-214	0.999	6.01E-01	4.33E-02	
X	Pb214-XR	1.000			
?	Ra-226	0.993	1.40E+00	2.40E-01	
	Ac-228	0.997	5.27E-01	3.74E-02	
?	Ac228-XR	0.941	1.26E+00	4.30E-01	
X	Pa-231	1.000			
?	Th-234	0.997	1.90E+00	6.25E-01	
?	U-235	0.990	8.94E-02	1.53E-02	
?	U235-XR	0.948	6.98E-01	2.21E-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 05-Feb-19-10012

L1-12204B-FSGS-004SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 2/5/2019 1:29:28PM
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	277.42	1.51744E-02	42.49		
22	860.40	1.05462E-02	40.92	Sum	
26	1187.96	8.29922E-03	46.65		

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	9.53E-02	2.90E-02	2.90E-02
	BE-7	477.60		10.44	2.20E-02	3.00E-01	3.00E-01
+	K-40	1460.82	*	10.66	1.42E+01	4.25E-01	4.25E-01
	Co-60	1173.23		99.85	2.32E-02	4.48E-02	5.08E-02
		1332.49		99.98	5.26E-03		4.48E-02
	Nb-94	702.65		99.81	-1.61E-02	3.45E-02	3.45E-02
		871.09		99.89	-7.34E-03		3.50E-02
	Ag-108m	79.13		6.60	3.93E-02	3.20E-02	1.16E+00
		433.94		90.50	-1.54E-02		3.20E-02
		614.28		89.80	8.71E-04		6.93E-02
		722.94		90.80	4.85E-03		4.46E-02
	Sb-125	176.31		6.84	-6.68E-02	1.00E-01	4.07E-01
		380.45		1.52	-5.53E-01		1.83E+00
		427.87		29.60	4.95E-02		1.00E-01
		463.36		10.49	1.23E-01		3.09E-01
		600.60		17.65	1.24E-01		1.99E-01

Analysis Report for 05-Feb-19-10012

L1-12204B-FSGS-004SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	606.71		4.98	4.21E+00	1.00E-01	1.28E+00
		635.95		11.22	-3.61E-03		2.88E-01
		671.44		1.79	1.66E-01		1.94E+00
	Ba-133	79.61		2.65	2.42E-01	7.06E-02	2.81E+00
		81.00		32.90	-2.60E-02		1.84E-01
		276.40		7.16	-9.48E-02		4.07E-01
		302.85		18.34	2.74E-02		1.67E-01
		356.01		62.05	-9.03E-04		7.06E-02
		383.85		8.94	-3.49E-02		3.17E-01
	Cs-134	475.36		1.48	1.74E-01	4.62E-02	2.06E+00
		563.25		8.34	3.29E-01		3.91E-01
		569.33		15.37	-1.44E-01		1.92E-01
		604.72		97.62	1.11E-02		5.87E-02
		795.86		85.46	-4.24E-04		4.62E-02
		801.95		8.69	-8.99E-01		4.23E-01
		1038.61		0.99	1.29E+00		4.04E+00
		1167.97		1.79	2.55E-01		2.90E+00
		1365.19		3.02	-3.38E-01		1.10E+00
+	Cs-137	661.66	*	85.10	4.02E-02	2.73E-02	2.73E-02
	Eu-152	121.78		28.67	-2.71E-02	1.05E-01	1.06E-01
		244.70		7.61	-1.40E-02		4.52E-01
		295.94		0.45	1.82E-01		8.96E+00
		344.28		26.60	2.51E-02		1.05E-01
		367.79		0.86	-3.91E-01		3.10E+00
		411.12		2.24	-8.04E-01		1.35E+00
		443.96		2.83	4.40E-01		1.08E+00
		488.68		0.42	-4.76E+00		6.82E+00
		563.99		0.49	4.18E+00		6.58E+00
		586.26		0.46	-6.55E-01		1.13E+01
		678.62		0.47	-1.57E+00		7.23E+00
		688.67		0.86	-2.82E-01		3.85E+00
		719.35		0.28	3.79E+00		1.27E+01
		778.90		12.96	-5.38E-01		2.77E-01
		810.45		0.32	-4.57E+00		1.10E+01
		867.37		4.26	-7.04E-02		8.73E-01
		919.33		0.43	-1.16E+01		8.44E+00
		964.08		14.65	1.20E-01		4.11E-01
		1085.87		10.24	-3.38E-01		4.42E-01
		1089.74		1.73	1.79E-01		2.76E+00
		1112.07		13.69	-4.15E-01		3.24E-01
		1212.95		1.43	-3.36E+00		3.70E+00
		1249.94		0.19	-4.05E+01		2.59E+01
		1299.14		1.63	4.47E-02		2.63E+00
		1408.01		21.07	4.78E-02		1.83E-01
		1457.64		0.50	-4.03E+00		3.63E+01
		1528.10		0.28	-1.44E+00		9.13E+00
	Eu-154	123.07		40.40	-4.43E-02	7.45E-02	7.45E-02
		247.93		6.89	-2.46E-01		4.05E-01
		591.76		4.95	-2.41E-01		6.34E-01
		692.42		1.78	-8.70E-01		1.83E+00
		723.30		20.06	3.30E-02		2.05E-01

Analysis Report for 05-Feb-19-10012

L1-12204B-FSGS-004SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	756.80		4.52	-5.98E-01	7.45E-02	7.65E-01
		873.18		12.08	1.28E-01		2.89E-01
		996.29		10.48	-9.42E-02		3.94E-01
		1004.76		18.01	-2.05E-02		2.39E-01
		1274.43		34.80	1.29E-01		1.39E-01
		1596.48		1.80	-9.43E-01		1.89E+00
	Eu-155	45.30		1.31	-3.57E+00	1.57E-01	1.56E+01
		60.01		1.22	-5.74E+00		1.65E+01
		86.55	*	30.70	1.18E-01		1.57E-01
		105.31		21.10	6.18E-02		1.68E-01
+	Ra-226	186.21	*	3.64	1.40E+00	6.61E-01	6.61E-01
	Pa-231	27.36		10.30	2.31E+00	7.94E-01	1.68E+00
		283.69		1.70	3.18E-01		1.59E+00
		300.07	*	2.47	9.12E-01		7.94E-01
		302.65		2.20	1.47E-01		1.38E+00
		330.06		1.40	-5.88E-01		2.06E+00
+	U-235	143.76		10.96	-1.21E-01	4.20E-02	2.74E-01
		163.33		5.08	1.04E-01		5.50E-01
		185.71	*	57.20	8.94E-02		4.20E-02
		202.11		1.08	4.58E-01		2.61E+00
		205.31		5.01	-1.07E-01		5.67E-01
	Am-241	59.54		35.90	-5.89E-01	5.81E-01	5.81E-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-Feb-19-10013

L1-12204B-FQGS-004SS

GAMMA SPECTRUM ANALYSIS

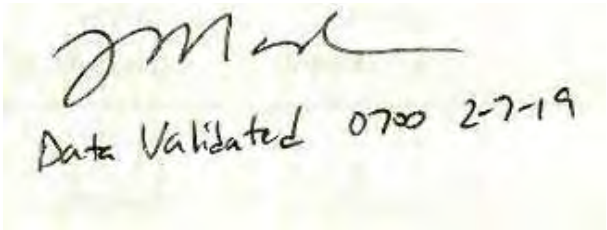
Sample Identification	: 05-Feb-19-10013
Sample Description	: L1-12204B-FQGS-004SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 9.100E+02 grams
Facility	: Default
Sample Taken On	: 2/4/2019 8:05:00AM
Acquisition Started	: 2/5/2019 12:26:56PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
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 - 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	: 2/5/2019
Efficiency Calibration Description	:
Sample Number	: 63846
Fill Height	: 910.03 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 2/5/2019 12:57:06PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192



Analysis Report for 05-Feb-19-10013

L1-12204B-FQGS-004SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.67	296 -	314	300.02	1.00E+02	15.34	2.05E+02	0.84
m	2	77.07	296 -	314	309.60	1.45E+02	16.82	2.11E+02	0.84
	3	92.49	367 -	378	371.20	1.21E+02	24.04	1.82E+02	0.84
	4	185.97	736 -	752	744.61	1.53E+02	28.95	2.19E+02	0.60
	5	209.29	833 -	846	837.79	1.19E+02	21.60	1.26E+02	1.15
M	6	238.68	948 -	976	955.17	6.56E+02	26.85	1.71E+02	1.17
m	7	241.79	948 -	976	967.63	1.72E+02	14.92	1.43E+02	1.18
M	8	295.22	1174 -	1207	1181.10	2.32E+02	49.38	1.04E+02	0.97
m	9	300.35	1174 -	1207	1201.59	3.41E+01	11.13	1.14E+02	0.98
	10	338.27	1346 -	1360	1353.14	1.16E+02	20.31	1.03E+02	1.07
	11	351.83	1398 -	1417	1407.29	4.65E+02	25.96	5.97E+01	1.24
	12	463.14	1847 -	1857	1852.18	2.38E+01	12.27	5.32E+01	0.35
	13	510.49	2033 -	2052	2041.46	1.08E+02	19.18	7.43E+01	0.87
	14	583.16	2326 -	2340	2331.95	1.83E+02	18.97	6.10E+01	1.22
	15	609.36	2429 -	2445	2436.70	3.48E+02	22.00	4.29E+01	1.72
	16	727.50	2903 -	2916	2909.08	3.98E+01	11.15	3.02E+01	0.56
	17	911.41	3633 -	3654	3644.70	1.57E+02	18.49	4.95E+01	1.18
	18	934.24	3731 -	3742	3736.01	2.28E+01	8.90	2.22E+01	0.45
	19	969.18	3867 -	3884	3875.81	6.01E+01	14.02	4.19E+01	1.83
	20	1120.20	4472 -	4489	4480.07	6.31E+01	14.73	4.69E+01	1.32
	21	1460.89	5829 -	5858	5843.94	1.18E+03	36.12	2.60E+01	1.94
	22	1764.71	7050 -	7070	7060.91	6.77E+01	10.01	8.35E+00	0.93

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

Analysis Report for 05-Feb-19-10013

L1-12204B-FQGS-004SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.96	511.00	*	100.00	7.37E-02	1.41E-02
K-40	0.99	1460.82	*	10.66	1.54E+01	8.17E-01
Tl-208	1.00	583.19	*	85.00	1.59E-01	1.90E-02
Bi-212	0.99	39.86		1.06		
		727.33	*	6.67	5.12E-01	1.46E-01
		785.37		1.10		
		1620.50		1.47		
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	6.08E-01	5.51E-02
		300.09	*	3.30	4.76E-01	1.60E-01
Pb212-XR	0.99	74.82	*	10.28	1.00E+00	1.85E-01
		77.11	*	17.10	7.78E-01	1.20E-01
		87.35		3.97		
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	5.81E-01	5.07E-02
		768.36		4.89		
		806.18		1.26		
		934.06	*	3.11	7.46E-01	2.93E-01
		1120.29	*	14.92	4.86E-01	1.15E-01
		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	7.10E-01	1.09E-01
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	9.68E-01	1.14E-01
		295.22	*	18.42	5.74E-01	1.31E-01
		351.93	*	35.60	6.77E-01	6.60E-02
		785.96		1.06		
Ra-226	0.99	186.21	*	3.64	1.51E+00	3.10E-01
Ac-228	0.91	129.07		2.42		
		209.25	*	3.89	1.16E+00	2.31E-01
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	5.18E-01	1.00E-01
		409.46		1.92		
		463.00	*	4.40	3.41E-01	1.78E-01
		794.95		4.25		
		911.20	*	25.80	6.07E-01	7.63E-02
		964.77		4.99		
		968.97	*	15.80	3.97E-01	9.42E-02
		1588.20		3.22		
Ac228-XR	0.93	89.96		1.90		
		93.35	*	3.10	2.21E+00	5.69E-01

Analysis Report for 05-Feb-19-10013

L1-12204B-FQGS-004SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
U-235	0.99	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	9.59E-02	1.97E-02
		202.11		1.08		
		205.31		5.01		
U235-XR	0.93	89.96		3.47		
		93.35	*	5.60	1.22E+00	2.74E-01
		105.60		1.32		

* = 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	0.960	7.37E-02	1.41E-02	
	K-40	0.999	1.54E+01	8.17E-01	
X	Sb-125	0.419			
	Tl-208	1.000	1.59E-01	1.90E-02	
X	Bi-211	0.913			
	Bi-212	0.997	5.12E-01	1.46E-01	
	Pb-212	0.999	5.94E-01	5.21E-02	
	Pb212-XR	0.999	8.45E-01	1.01E-01	
	Bi-214	0.999	5.91E-01	4.22E-02	
	Pb-214	0.998	7.22E-01	5.24E-02	
X	Pb214-XR	0.999			
?	Ra-226	0.991	1.51E+00	3.10E-01	
	Ac-228	0.910	5.36E-01	4.79E-02	
?	Ac228-XR	0.930	2.21E+00	5.69E-01	
X	Pa-231	0.998			
?	U-235	0.992	9.59E-02	1.97E-02	
?	U235-XR	0.939	1.22E+00	2.74E-01	

Analysis Report for 05-Feb-19-10013

L1-12204B-FQGS-004SS

? = 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-Feb-19-10013

L1-12204B-FQGS-004SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 2/5/2019 12:57:06PM
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	7.37E-02	3.94E-02	3.94E-02
	BE-7	477.60		10.44	-1.24E-01	3.77E-01	3.77E-01
+	K-40	1460.82	*	10.66	1.54E+01	5.26E-01	5.26E-01
	Co-60	1173.23		99.85	-1.53E-02	4.98E-02	6.53E-02
		1332.49		99.98	-1.16E-02		4.98E-02
	Nb-94	702.65		99.81	-1.90E-02	4.98E-02	4.98E-02
		871.09		99.89	2.04E-02		5.22E-02
	Ag-108m	79.13		6.60	-5.71E-01	4.14E-02	1.52E+00
		433.94		90.50	7.22E-03		4.14E-02
		614.28		89.80	-1.15E-02		8.58E-02
		722.94		90.80	-2.68E-02		5.45E-02
	Sb-125	176.31		6.84	3.84E-01	1.29E-01	5.08E-01
		380.45		1.52	-9.21E-01		2.26E+00
		427.87		29.60	-1.09E-01		1.29E-01
		463.36	*	10.49	1.43E-01		2.47E-01
		600.60		17.65	3.56E-01		2.63E-01
		606.71		4.98	5.59E+00		1.66E+00
		635.95		11.22	-2.88E-02		3.83E-01
		671.44		1.79	-2.81E+00		2.27E+00

Analysis Report for 05-Feb-19-10013

L1-12204B-FQGS-004SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Ba-133	79.61	2.65	-1.80E+00	8.76E-02	3.72E+00
	81.00	32.90	-3.22E-01		2.41E-01
	276.40	7.16	-1.21E-01		5.42E-01
	302.85	18.34	3.73E-02		2.09E-01
	356.01	62.05	8.99E-03		8.76E-02
	383.85	8.94	-7.41E-02		4.07E-01
Cs-134	475.36	1.48	-5.63E-01	6.45E-02	2.49E+00
	563.25	8.34	7.18E-03		5.14E-01
	569.33	15.37	-1.22E-01		2.70E-01
	604.72	97.62	-2.22E-02		7.64E-02
	795.86	85.46	6.00E-02		6.45E-02
	801.95	8.69	-9.34E-01		5.68E-01
	1038.61	0.99	-4.01E+00		5.03E+00
	1167.97	1.79	1.45E+00		3.53E+00
	1365.19	3.02	-4.70E-01		1.67E+00
Cs-137	661.66	85.10	2.63E-02	5.42E-02	5.42E-02
Eu-152	121.78	28.67	-4.68E-02	1.33E-01	1.38E-01
	244.70	7.61	1.32E-02		5.69E-01
	295.94	0.45	3.08E-01		1.14E+01
	344.28	26.60	4.55E-02		1.33E-01
	367.79	0.86	-2.12E+00		4.00E+00
	411.12	2.24	6.86E-01		1.74E+00
	443.96	2.83	-5.62E-01		1.24E+00
	488.68	0.42	-6.98E+00		8.60E+00
	563.99	0.49	-6.63E+00		8.63E+00
	586.26	0.46	3.01E+01		1.43E+01
	678.62	0.47	-7.27E+00		9.37E+00
	688.67	0.86	-8.06E-01		5.16E+00
	719.35	0.28	7.50E+00		1.54E+01
	778.90	12.96	-2.26E-01		3.55E-01
	810.45	0.32	3.52E+00		1.58E+01
	867.37	4.26	-2.86E+00		1.25E+00
	919.33	0.43	-4.18E+00		1.17E+01
	964.08	14.65	-3.86E-03		4.88E-01
	1085.87	10.24	-1.64E-01		5.21E-01
	1089.74	1.73	-8.18E-01		3.22E+00
	1112.07	13.69	-5.59E-01		4.62E-01
	1212.95	1.43	2.79E+00		5.14E+00
	1249.94	0.19	-7.58E-01		3.45E+01
	1299.14	1.63	-4.25E+00		3.45E+00
	1408.01	21.07	1.68E-01		2.48E-01
	1457.64	0.50	-6.28E+00		4.71E+01
	1528.10	0.28	9.31E+00		1.51E+01
Eu-154	123.07	40.40	5.72E-02	9.85E-02	9.85E-02
	247.93	6.89	-2.12E-01		4.85E-01
	591.76	4.95	-5.98E-01		8.14E-01
	692.42	1.78	-1.50E+00		2.51E+00
	723.30	20.06	-1.36E-01		2.51E-01
	756.80	4.52	9.69E-01		1.13E+00
	873.18	12.08	2.90E-01		4.41E-01
	996.29	10.48	1.74E-01		5.08E-01

Analysis Report for 05-Feb-19-10013

L1-12204B-FQGS-004SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	1004.76		18.01	6.62E-02	9.85E-02	3.10E-01
		1274.43		34.80	-2.06E-02		1.80E-01
		1596.48		1.80	-8.06E-02		2.41E+00
	Eu-155	45.30		1.31	-8.32E+00	2.25E-01	2.05E+01
		60.01		1.22	-1.01E+01		2.19E+01
		86.55		30.70	7.72E-02		2.38E-01
		105.31		21.10	1.02E-01		2.25E-01
+	Ra-226	186.21	*	3.64	1.51E+00	9.02E-01	9.02E-01
	Pa-231	27.36		10.30	4.01E+00	1.01E+00	2.34E+00
		283.69		1.70	-1.43E+00		2.09E+00
		300.07	*	2.47	6.36E-01		1.01E+00
		302.65		2.20	4.00E-01		1.74E+00
		330.06		1.40	5.76E-01		2.69E+00
+	U-235	143.76		10.96	5.75E-03	5.74E-02	3.58E-01
		163.33		5.08	-5.15E-01		6.82E-01
		185.71	*	57.20	9.59E-02		5.74E-02
		202.11		1.08	3.56E-01		3.55E+00
		205.31		5.01	-2.99E-01		7.55E-01
	Am-241	59.54		35.90	-7.05E-02	7.66E-01	7.66E-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-Feb-19-10014

L1-12204B-FSGS-005SS

GAMMA SPECTRUM ANALYSIS

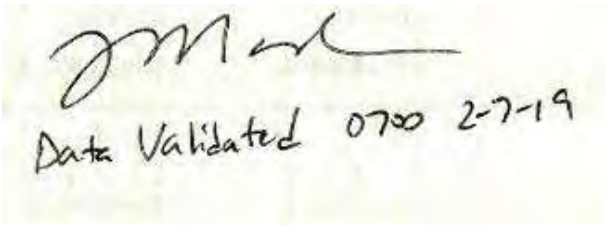
Sample Identification	: 05-Feb-19-10014
Sample Description	: L1-12204B-FSGS-005SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.027E+03 grams
Facility	: Default
Sample Taken On	: 2/4/2019 8:06:00AM
Acquisition Started	: 2/5/2019 12:27:03PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 324
Geometry	: 130G_SOIL_1
Live Time	: 1800.0 seconds
Real Time	: 1801.8 seconds
Dead Time	: 0.10 %
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	: 2/5/2019
Efficiency Calibration Description	:
Sample Number	: 63847
Fill Height	: 1027.44 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 2/5/2019 12:57:08PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096



Analysis Report for 05-Feb-19-10014
L1-12204B-FSGS-005SS

	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	1.54E+02	25.44	2.39E+02	0.83
	2	185.96	368 -	376	372.23	1.62E+02	23.99	1.94E+02	0.97
	3	238.63	472 -	481	477.44	3.40E+02	31.11	2.76E+02	1.22
M	4	295.27	585 -	603	590.60	1.48E+02	29.07	9.69E+01	0.79
m	5	300.11	585 -	603	600.28	4.12E+01	10.07	1.12E+02	0.80
	6	338.25	673 -	680	676.47	5.98E+01	14.87	8.02E+01	1.24
	7	351.84	698 -	708	703.62	2.81E+02	22.14	8.79E+01	1.29
	8	582.99	1161 -	1171	1165.58	1.14E+02	14.96	4.50E+01	1.33
	9	609.23	1213 -	1223	1218.04	2.13E+02	17.43	3.84E+01	1.48
	10	661.48	1316 -	1327	1322.49	8.14E+01	15.48	6.16E+01	1.12
	11	911.21	1815 -	1828	1821.86	9.29E+01	12.84	2.61E+01	2.13
	12	968.44	1933 -	1941	1936.35	3.78E+01	10.69	3.52E+01	1.17
	13	1120.03	2234 -	2245	2239.62	4.96E+01	10.99	2.84E+01	2.00
	14	1460.64	2914 -	2928	2921.33	7.74E+02	28.48	1.29E+01	1.77

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	8.48E+00	4.82E-01
Cs-137	0.99	661.66	*	85.10	6.52E-02	1.30E-02
Tl-208	0.99	583.19	*	85.00	8.39E-02	1.21E-02

Analysis Report for 05-Feb-19-10014

L1-12204B-FSGS-005SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.67E-01	3.26E-02
		300.09	*	3.30	4.90E-01	1.26E-01
Pb212-XR	0.99	74.82		10.28		
		77.11	*	17.10	5.42E-01	1.05E-01
		87.35		3.97		
		89.78		1.46		
Bi-214	0.82	609.32	*	45.49	3.01E-01	3.06E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	3.23E-01	7.27E-02
		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	3.11E-01	6.61E-02
		351.93	*	35.60	3.48E-01	3.91E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	9.56E-01	1.91E-01
		87.35		2.24		
		89.78		0.82		
Ra-226	0.99	186.21	*	3.64	1.34E+00	2.26E-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	2.27E-01	5.94E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	3.05E-01	4.41E-02
		964.77		4.99		
		968.97	*	15.80	2.11E-01	6.04E-02
		1588.20		3.22		
Pa-231	1.00	27.36		10.30		
		283.69		1.70		
		300.07	*	2.47	6.54E-01	1.73E-01
		302.65		2.20		
		330.06		1.40		
U-235	0.99	143.76		10.96		
		163.33		5.08		

Analysis Report for 05-Feb-19-10014

L1-12204B-FSGS-005SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
U-235	0.99	185.71	*	57.20	8.52E-02	1.44E-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

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.995	8.48E+00	4.82E-01	
	Cs-137	0.995	6.52E-02	1.30E-02	
	Tl-208	0.994	8.39E-02	1.21E-02	
X	Bi-211	0.910			
	Pb-212	1.000	2.67E-01	3.25E-02	
?	Pb212-XR	0.999	5.42E-01	1.05E-01	
	Bi-214	0.823	3.04E-01	2.82E-02	
	Pb-214	0.999	3.38E-01	3.36E-02	
?	Pb214-XR	0.999	9.56E-01	1.91E-01	
?	Ra-226	0.990	1.34E+00	2.26E-01	
	Ac-228	0.992	2.60E-01	3.05E-02	
	Pa-231	1.000	2.97E-01	1.74E-01	
?	U-235	0.993	8.52E-02	1.44E-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-Feb-19-10014

L1-12204B-FSGS-005SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 2/5/2019 12:57:08PM
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	7.60E-02	4.23E-02	4.23E-02
	BE-7	477.60		10.44	-9.90E-03	2.57E-01	2.57E-01
+	K-40	1460.82	*	10.66	8.48E+00	2.57E-01	2.57E-01
	Co-60	1173.23		99.85	-1.04E-02	3.89E-02	4.72E-02
		1332.49		99.98	1.86E-02		3.89E-02
	Nb-94	702.65		99.81	1.88E-02	2.84E-02	3.14E-02
		871.09		99.89	-2.87E-03		2.84E-02
	Ag-108m	79.13		6.60	-4.95E-01	2.74E-02	8.03E-01
		433.94		90.50	-6.94E-03		2.74E-02
		614.28		89.80	-3.64E-02		4.36E-02
		722.94		90.80	8.69E-03		3.81E-02
	Sb-125	176.31		6.84	-6.63E-02	8.78E-02	3.89E-01
		380.45		1.52	-5.23E-02		1.58E+00
		427.87		29.60	2.19E-02		8.78E-02
		463.36		10.49	2.43E-01		2.87E-01
		600.60		17.65	-1.90E-02		1.51E-01
		606.71		4.98	-2.61E-01		1.06E+00
		635.95		11.22	-2.02E-02		2.63E-01
		671.44		1.79	-1.33E+00		1.62E+00

Analysis Report for 05-Feb-19-10014

L1-12204B-FSGS-005SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Ba-133	79.61		2.65	-1.60E+00	5.93E-02	1.89E+00
		81.00		32.90	-2.32E-01		1.26E-01
		276.40		7.16	7.09E-02		3.66E-01
		302.85		18.34	-3.34E-02		1.48E-01
		356.01		62.05	-3.62E-02		5.93E-02
		383.85		8.94	-3.78E-02		2.79E-01
	Cs-134	475.36		1.48	1.06E+00	3.53E-02	1.82E+00
		563.25		8.34	3.05E-02		3.18E-01
		569.33		15.37	-6.08E-02		1.65E-01
		604.72		97.62	-1.61E-02		4.58E-02
		795.86		85.46	8.52E-03		3.53E-02
		801.95		8.69	-2.78E-01		3.35E-01
		1038.61		0.99	3.13E-01		3.68E+00
		1167.97		1.79	2.20E-01		2.52E+00
		1365.19		3.02	-7.25E-01		1.04E+00
+	Cs-137	661.66	*	85.10	6.52E-02	3.65E-02	3.65E-02
	Eu-152	121.78		28.67	-1.66E-02	8.75E-02	8.88E-02
		244.70		7.61	-2.00E-01		3.66E-01
		295.94		0.45	6.32E+00		7.50E+00
		344.28		26.60	-1.15E-01		8.75E-02
		367.79		0.86	-9.29E-01		2.85E+00
		411.12		2.24	-3.50E-02		1.18E+00
		443.96		2.83	-5.91E-01		8.68E-01
		488.68		0.42	-1.32E-01		6.74E+00
		563.99		0.49	-1.26E+00		5.21E+00
		586.26		0.46	-6.20E-01		9.68E+00
		678.62		0.47	1.58E+00		6.80E+00
		688.67		0.86	-3.44E-01		3.34E+00
		719.35		0.28	-1.30E+00		1.08E+01
		778.90		12.96	-2.19E-01		2.14E-01
		810.45		0.32	1.88E+00		9.74E+00
		867.37		4.26	-1.21E-01		6.79E-01
		919.33		0.43	-7.93E-01		7.18E+00
		964.08		14.65	-2.10E-01		3.20E-01
		1085.87		10.24	-1.58E-01		3.26E-01
		1089.74		1.73	-5.39E-01		2.19E+00
		1112.07		13.69	-6.53E-02		2.76E-01
		1212.95		1.43	-1.62E+00		3.24E+00
		1249.94		0.19	1.38E+01		2.39E+01
		1299.14		1.63	-8.46E-01		2.26E+00
		1408.01		21.07	-1.41E-02		1.57E-01
		1457.64		0.50	-2.78E+00		3.20E+01
		1528.10		0.28	-2.87E+00		7.05E+00
	Eu-154	123.07		40.40	2.72E-03	6.32E-02	6.32E-02
		247.93		6.89	-1.29E-01		3.45E-01
		591.76		4.95	3.23E-01		6.15E-01
		692.42		1.78	-4.78E-01		1.48E+00
		723.30		20.06	7.85E-02		1.77E-01
		756.80		4.52	4.89E-01		7.19E-01
		873.18		12.08	1.07E-02		2.43E-01
		996.29		10.48	1.05E-01		3.35E-01

Analysis Report for 05-Feb-19-10014

L1-12204B-FSGS-005SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	1004.76		18.01	-9.06E-02	6.32E-02	1.85E-01
		1274.43		34.80	-1.14E-02		1.12E-01
		1596.48		1.80	-7.34E-01		1.49E+00
	Eu-155	45.30		1.31	-1.95E-01	1.34E-01	7.97E+00
		60.01		1.22	-5.97E+00		8.80E+00
		86.55		30.70	3.60E-02		1.34E-01
		105.31		21.10	9.80E-02		1.43E-01
+	Ra-226	186.21	*	3.64	1.34E+00	5.95E-01	5.95E-01
+	Pa-231	27.36		10.30	6.11E-01	8.18E-01	8.18E-01
		283.69		1.70	3.13E-01		1.44E+00
		300.07	*	2.47	6.54E-01		8.50E-01
		302.65		2.20	-2.78E-01		1.23E+00
		330.06		1.40	2.18E-01		1.91E+00
+	U-235	143.76		10.96	5.34E-02	3.78E-02	2.34E-01
		163.33		5.08	1.42E-01		5.27E-01
		185.71	*	57.20	8.52E-02		3.78E-02
		202.11		1.08	2.43E-01		2.40E+00
		205.31		5.01	-2.97E-01		5.10E-01
	Am-241	59.54		35.90	-1.09E-01	3.16E-01	3.16E-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-Feb-19-10015

L1-12204B-FSGS-006SS

GAMMA SPECTRUM ANALYSIS

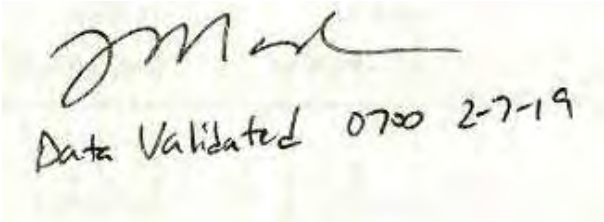
Sample Identification	: 05-Feb-19-10015
Sample Description	: L1-12204B-FSGS-006SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 9.845E+02 grams
Facility	: Default
Sample Taken On	: 2/4/2019 8:07:00AM
Acquisition Started	: 2/5/2019 12:27:10PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 2700.0 seconds
Real Time	: 2705.7 seconds
Dead Time	: 0.21 %
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	: 2/5/2019
Efficiency Calibration Description	:
Sample Number	: 63848
Fill Height	: 984.50 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 2/5/2019 1:28:31PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192



Analysis Report for 05-Feb-19-10015

L1-12204B-FSGS-006SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.94	294 -	315	300.50	1.18E+02	16.25	2.88E+02	0.96
m	2	77.20	294 -	315	309.51	2.31E+02	19.10	2.69E+02	0.96
	3	186.07	740 -	751	744.55	1.48E+02	28.86	2.71E+02	0.50
M	4	238.62	947 -	975	954.57	8.00E+02	30.33	2.12E+02	1.06
m	5	241.81	947 -	975	967.31	1.77E+02	16.25	1.92E+02	1.06
	6	277.36	1106 -	1113	1109.41	3.34E+01	14.02	8.06E+01	0.90
	7	295.15	1173 -	1187	1180.51	2.71E+02	26.61	1.52E+02	0.87
	8	328.03	1307 -	1317	1311.93	5.30E+01	16.23	8.80E+01	1.10
	9	338.31	1345 -	1359	1353.01	1.51E+02	23.49	1.39E+02	1.19
	10	351.84	1398 -	1416	1407.08	5.37E+02	30.97	1.24E+02	1.16
	11	462.66	1841 -	1854	1850.07	5.21E+01	15.28	6.49E+01	0.74
	12	510.89	2036 -	2053	2042.89	1.35E+02	21.66	1.02E+02	0.94
	13	583.03	2324 -	2340	2331.32	2.56E+02	22.52	8.06E+01	1.13
	14	609.12	2424 -	2443	2435.64	3.92E+02	24.07	5.46E+01	1.18
	15	726.96	2902 -	2913	2906.87	4.76E+01	13.02	4.74E+01	0.36
	16	768.11	3066 -	3076	3071.45	2.33E+01	10.87	3.97E+01	0.50
	17	794.75	3172 -	3184	3177.96	3.33E+01	11.19	3.47E+01	1.14
	18	859.92	3433 -	3446	3438.63	2.22E+01	11.18	3.68E+01	0.34
	19	910.92	3633 -	3653	3642.63	2.17E+02	19.38	4.28E+01	1.64
M	20	964.49	3850 -	3882	3856.93	2.50E+01	7.71	5.06E+01	1.35
m	21	968.60	3850 -	3882	3873.39	8.24E+01	10.94	5.27E+01	1.35
	22	1120.03	4471 -	4486	4479.22	8.03E+01	14.54	4.37E+01	0.80
	23	1460.37	5827 -	5854	5841.31	1.44E+03	39.33	2.46E+01	1.72
	24	1763.89	7049 -	7065	7056.57	8.05E+01	10.35	8.50E+00	1.15

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

Analysis Report for 05-Feb-19-10015

L1-12204B-FSGS-006SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.99	511.00	*	100.00	6.95E-02	1.21E-02
K-40	0.96	1460.82	*	10.66	1.44E+01	7.39E-01
Tl-208	0.99	583.19	*	85.00	1.68E-01	1.79E-02
Bi-212	0.98	39.86		1.06		
		727.33	*	6.67	4.65E-01	1.30E-01
		785.37		1.10		
		1620.50		1.47		
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	5.50E-01	4.91E-02
		300.09		3.30		
Bi-214	0.98	609.32	*	45.49	4.96E-01	4.26E-02
		768.36	*	4.89	3.22E-01	1.51E-01
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	4.75E-01	8.81E-02
		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	6.53E-01	8.80E-02
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	7.37E-01	8.97E-02
		295.22	*	18.42	4.99E-01	6.32E-02
		351.93	*	35.60	5.84E-01	5.76E-02
		785.96		1.06		
Pb214-XR	0.99	74.82	*	5.80	1.76E+00	3.12E-01
		77.11	*	9.70	1.82E+00	2.54E-01
		87.35		2.24		
		89.78		0.82		
Ra-226	0.99	186.21	*	3.64	1.08E+00	2.28E-01
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00	*	2.95	6.60E-01	2.11E-01
		338.32	*	11.27	5.04E-01	8.85E-02
		409.46		1.92		
		463.00	*	4.40	5.61E-01	1.70E-01
		794.95	*	4.25	5.44E-01	1.85E-01
		911.20	*	25.80	6.43E-01	6.39E-02
		964.77	*	4.99	3.98E-01	1.24E-01
		968.97	*	15.80	4.16E-01	5.82E-02
		1588.20		3.22		
U-235	0.98	143.76		10.96		
		163.33		5.08		

Analysis Report for 05-Feb-19-10015

L1-12204B-FSGS-006SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
U-235	0.98	185.71	*	57.20	6.87E-02	1.45E-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

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.998	6.95E-02	1.21E-02	
	K-40	0.968	1.44E+01	7.39E-01	
	Tl-208	0.996	1.68E-01	1.79E-02	
X	Bi-211	0.910			
	Bi-212	0.986	4.65E-01	1.30E-01	
	Pb-212	1.000	5.50E-01	4.91E-02	
X	Pb212-XR	0.999			
	Bi-214	0.988	5.08E-01	3.43E-02	
	Pb-214	0.998	5.81E-01	3.85E-02	
	Pb214-XR	0.999	1.79E+00	1.97E-01	
?	Ra-226	0.997	1.08E+00	2.28E-01	
	Ac-228	0.990	5.13E-01	3.49E-02	
?	U-235	0.986	6.87E-02	1.45E-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-Feb-19-10015

L1-12204B-FSGS-006SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 2/5/2019 1:28:31PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
6	277.36	1.23733E-02	41.95	Tol.	Ba-133
18	859.92	8.22348E-03	50.36		

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	6.95E-02	3.35E-02	3.35E-02
	BE-7	477.60		10.44	4.38E-02	3.39E-01	3.39E-01
+	K-40	1460.82	*	10.66	1.44E+01	3.87E-01	3.87E-01
	Co-60	1173.23		99.85	-2.44E-02	4.45E-02	5.31E-02
		1332.49		99.98	1.25E-02		4.45E-02
	Nb-94	702.65		99.81	-7.60E-03	3.68E-02	3.68E-02
		871.09		99.89	2.26E-03		3.73E-02
	Ag-108m	79.13		6.60	-3.82E-01	3.47E-02	1.37E+00
		433.94		90.50	2.32E-02		3.47E-02
		614.28		89.80	-3.33E-02		5.28E-02
		722.94		90.80	3.24E-03		4.98E-02
	Sb-125	176.31		6.84	-2.32E-03	1.05E-01	4.27E-01
		380.45		1.52	2.22E-02		2.02E+00
		427.87		29.60	4.76E-02		1.05E-01
		463.36		10.49	3.83E-01		3.39E-01
		600.60		17.65	1.45E-01		1.95E-01
		606.71		4.98	4.27E+00		1.28E+00

Analysis Report for 05-Feb-19-10015

L1-12204B-FSGS-006SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	635.95	11.22	1.65E-01	1.05E-01	3.06E-01
	671.44	1.79	-1.02E+00		2.03E+00
Ba-133	79.61	2.65	-1.49E+00	6.45E-02	3.23E+00
	81.00	32.90	-3.38E-01		2.17E-01
	276.40	7.16	-9.25E-02		4.13E-01
	302.85	18.34	1.49E-01		1.75E-01
	356.01	62.05	-6.05E-03		6.45E-02
	383.85	8.94	-2.26E-01		3.45E-01
Cs-134	475.36	1.48	1.76E-02	4.68E-02	2.29E+00
	563.25	8.34	2.59E-01		4.04E-01
	569.33	15.37	2.64E-01		2.28E-01
	604.72	97.62	-7.30E-03		6.09E-02
	795.86	85.46	9.55E-03		4.68E-02
	801.95	8.69	6.46E-02		4.26E-01
	1038.61	0.99	-7.54E-02		4.45E+00
	1167.97	1.79	-1.13E+00		2.92E+00
	1365.19	3.02	3.98E-02		1.31E+00
Cs-137	661.66	85.10	3.70E-02	4.80E-02	4.80E-02
Eu-152	121.78	28.67	-2.29E-02	1.11E-01	1.19E-01
	244.70	7.61	-4.39E-02		4.62E-01
	295.94	0.45	1.06E+01		8.93E+00
	344.28	26.60	6.06E-03		1.11E-01
	367.79	0.86	-9.04E-01		3.51E+00
	411.12	2.24	1.15E-01		1.43E+00
	443.96	2.83	2.19E-01		1.12E+00
	488.68	0.42	-2.87E+00		7.44E+00
	563.99	0.49	-4.51E-01		6.71E+00
	586.26	0.46	1.27E+00		1.22E+01
	678.62	0.47	-4.47E-01		6.85E+00
	688.67	0.86	-1.07E-01		4.03E+00
	719.35	0.28	-3.08E+00		1.39E+01
	778.90	12.96	-1.20E-01		2.75E-01
	810.45	0.32	-3.84E+00		1.14E+01
	867.37	4.26	3.27E-01		8.46E-01
	919.33	0.43	-6.03E+00		9.68E+00
	964.08	14.65	-2.03E-02		4.09E-01
	1085.87	10.24	-1.65E-02		4.71E-01
	1089.74	1.73	-2.51E-01		2.75E+00
	1112.07	13.69	-4.62E-01		3.68E-01
	1212.95	1.43	3.10E-01		4.20E+00
	1249.94	0.19	-3.32E+01		2.82E+01
	1299.14	1.63	-1.80E+00		2.72E+00
	1408.01	21.07	8.53E-02		1.81E-01
	1457.64	0.50	3.09E+02		3.97E+01
	1528.10	0.28	1.34E-01		9.97E+00
Eu-154	123.07	40.40	-3.03E-02	8.43E-02	8.43E-02
	247.93	6.89	-2.81E-01		4.20E-01
	591.76	4.95	-4.95E-01		6.73E-01
	692.42	1.78	5.00E-01		2.09E+00
	723.30	20.06	8.16E-02		2.31E-01
	756.80	4.52	4.72E-01		8.51E-01

Analysis Report for 05-Feb-19-10015

L1-12204B-FSGS-006SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	873.18		12.08	-3.11E-02	8.43E-02	3.15E-01
		996.29		10.48	-1.69E-02		3.87E-01
		1004.76		18.01	1.31E-01		2.45E-01
		1274.43		34.80	-1.57E-01		1.42E-01
		1596.48		1.80	-7.53E-01		1.62E+00
	Eu-155	45.30		1.31	1.37E+01	2.11E-01	2.37E+01
		60.01		1.22	-6.68E-01		2.27E+01
		86.55		30.70	-1.62E-02		2.11E-01
		105.31		21.10	9.79E-03		2.11E-01
+	Ra-226	186.21	*	3.64	1.08E+00	6.68E-01	6.68E-01
	Pa-231	27.36		10.30	3.70E+00	1.31E+00	2.50E+00
		283.69		1.70	3.30E-01		1.75E+00
		300.07		2.47	1.22E+00		1.31E+00
		302.65		2.20	6.71E-01		1.46E+00
		330.06		1.40	3.15E+00		2.32E+00
+	U-235	143.76		10.96	2.70E-02	4.25E-02	3.17E-01
		163.33		5.08	2.03E-01		6.03E-01
		185.71	*	57.20	6.87E-02		4.25E-02
		202.11		1.08	-1.98E+00		2.75E+00
		205.31		5.01	-7.92E-01		6.14E-01
	Am-241	59.54		35.90	-4.24E-02	8.13E-01	8.13E-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-Feb-19-10016

L1-12204B-FSGS-007SS

GAMMA SPECTRUM ANALYSIS

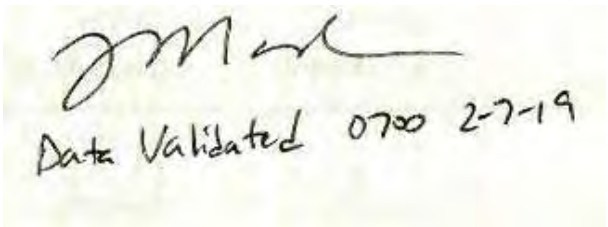
Sample Identification	: 05-Feb-19-10016
Sample Description	: L1-12204B-FSGS-007SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.017E+03 grams
Facility	: Default
Sample Taken On	: 2/4/2019 8:08:00AM
Acquisition Started	: 2/5/2019 12:27:16PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P11314
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 - 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	: 2/5/2019
Efficiency Calibration Description	:
Sample Number	: 63849
Fill Height	: 1016.99 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 2/5/2019 12:57:34PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192



Analysis Report for 05-Feb-19-10016

L1-12204B-FSGS-007SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	75.04	294 -	316	300.69	1.00E+02	13.67	1.74E+02	0.88
m	2	77.33	294 -	316	309.85	2.11E+02	17.40	1.89E+02	0.89
	3	186.20	738 -	752	744.68	1.34E+02	23.55	1.46E+02	0.95
	4	209.42	832 -	845	837.41	8.94E+01	18.43	9.06E+01	0.87
	5	238.84	946 -	960	954.95	4.67E+02	30.53	1.63E+02	1.22
	6	295.43	1175 -	1188	1181.02	2.02E+02	20.60	7.95E+01	1.10
	7	338.62	1347 -	1360	1353.57	7.46E+01	17.04	7.84E+01	0.90
	8	352.08	1398 -	1414	1407.34	3.30E+02	22.39	5.49E+01	1.04
	9	510.94	2035 -	2050	2042.13	9.74E+01	15.51	4.76E+01	1.56
	10	558.49	2225 -	2239	2232.17	4.91E+01	11.41	2.79E+01	1.01
	11	583.24	2322 -	2341	2331.09	1.82E+02	16.72	2.76E+01	1.60
	12	609.32	2427 -	2442	2435.32	2.19E+02	18.42	4.00E+01	1.29
	13	661.73	2639 -	2650	2644.81	4.20E+01	8.92	1.50E+01	0.63
	14	727.47	2902 -	2915	2907.63	4.08E+01	9.54	1.82E+01	0.57
	15	911.10	3632 -	3651	3641.87	1.07E+02	15.41	3.73E+01	1.10
	16	1460.63	5827 -	5853	5840.46	8.36E+02	30.15	1.67E+01	1.71
	17	1764.23	7049 -	7062	7056.00	2.20E+01	6.42	7.00E+00	0.75

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

Analysis Report for 05-Feb-19-10016

L1-12204B-FSGS-007SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.99	511.00	*	100.00	6.68E-02	1.16E-02
K-40	0.99	1460.82	*	10.66	1.11E+01	6.25E-01
Cs-137	0.99	661.66	*	85.10	3.99E-02	8.82E-03
Tl-208	0.99	583.19	*	85.00	1.59E-01	1.74E-02
Bi-212	0.99	39.86		1.06		
		727.33	*	6.67	5.29E-01	1.28E-01
		785.37		1.10		
		1620.50		1.47		
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	4.20E-01	4.37E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	3.67E-01	3.80E-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	2.36E-01	6.95E-02
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	4.91E-01	6.37E-02
		351.93	*	35.60	4.76E-01	4.99E-02
		785.96		1.06		
Pb214-XR	0.99	74.82	*	5.80	1.22E+00	2.16E-01
		77.11	*	9.70	1.41E+00	1.97E-01
		87.35		2.24		
		89.78		0.82		
Ra-226	1.00	186.21	*	3.64	1.26E+00	2.44E-01
Ac-228	0.65	129.07		2.42		
		209.25	*	3.89	8.37E-01	1.86E-01
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	3.30E-01	8.00E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	4.19E-01	6.31E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		
U-235	0.97	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	8.02E-02	1.55E-02

Analysis Report for 05-Feb-19-10016

L1-12204B-FSGS-007SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
U-235	0.97	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
	An Pk	0.999	6.68E-02	1.16E-02	
	K-40	0.994	1.11E+01	6.25E-01	
	Cs-137	0.999	3.99E-02	8.82E-03	
	Tl-208	0.999	1.59E-01	1.74E-02	
	Bi-212	0.998	5.29E-01	1.28E-01	
	Pb-212	0.994	4.20E-01	4.37E-02	
X	Pb212-XR	0.993			
	Bi-214	0.999	3.37E-01	3.33E-02	
	Pb-214	0.996	4.81E-01	3.93E-02	
	Pb214-XR	0.993	1.33E+00	1.46E-01	
?	Ra-226	1.000	1.26E+00	2.44E-01	
	Ac-228	0.653	4.15E-01	4.79E-02	
?	U-235	0.973	8.02E-02	1.55E-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-Feb-19-10016

L1-12204B-FSGS-007SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 2/5/2019 12:57:34PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
10	558.49	2.72926E-02	23.23		

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	6.68E-02	2.98E-02	2.98E-02
	BE-7	477.60		10.44	7.88E-02	3.42E-01	3.42E-01
+	K-40	1460.82	*	10.66	1.11E+01	4.22E-01	4.22E-01
	Co-60	1173.23		99.85	2.33E-02	4.61E-02	6.22E-02
		1332.49		99.98	-9.74E-03		4.61E-02
	Nb-94	702.65		99.81	2.46E-02	3.83E-02	3.83E-02
		871.09		99.89	-6.85E-03		3.84E-02
	Ag-108m	79.13		6.60	2.64E-01	3.38E-02	1.06E+00
		433.94		90.50	-2.89E-02		3.38E-02
		614.28		89.80	-5.40E-02		5.72E-02
		722.94		90.80	-9.85E-03		5.13E-02
	Sb-125	176.31		6.84	-6.22E-02	1.01E-01	3.82E-01
		380.45		1.52	9.97E-01		2.14E+00
		427.87		29.60	4.12E-02		1.01E-01
		463.36		10.49	1.53E-01		3.34E-01
		600.60		17.65	-2.44E-02		2.14E-01
		606.71		4.98	3.26E+00		1.36E+00
		635.95		11.22	2.09E-01		2.90E-01

Analysis Report for 05-Feb-19-10016

L1-12204B-FSGS-007SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	2.96E-01	1.01E-01	2.03E+00
	Ba-133	79.61		2.65	6.00E-01	6.85E-02	2.58E+00
		81.00		32.90	-5.76E-02		1.59E-01
		276.40		7.16	2.40E-02		4.02E-01
		302.85		18.34	2.64E-02		1.74E-01
		356.01		62.05	-2.05E-02		6.85E-02
		383.85		8.94	1.48E-01		3.72E-01
	Cs-134	475.36		1.48	-1.19E+00	4.76E-02	2.26E+00
		563.25		8.34	1.54E-01		4.88E-01
		569.33		15.37	-1.10E-01		2.07E-01
		604.72		97.62	-3.97E-03		5.85E-02
		795.86		85.46	3.56E-02		4.76E-02
		801.95		8.69	2.21E-01		4.65E-01
		1038.61		0.99	-1.04E+00		4.86E+00
		1167.97		1.79	3.69E+00		3.60E+00
		1365.19		3.02	-1.55E-01		1.17E+00
+	Cs-137	661.66	*	85.10	3.99E-02	2.25E-02	2.25E-02
	Eu-152	121.78		28.67	3.48E-02	9.56E-02	9.56E-02
		244.70		7.61	4.05E-01		4.67E-01
		295.94		0.45	1.47E+01		9.44E+00
		344.28		26.60	-8.41E-02		1.06E-01
		367.79		0.86	-1.01E+00		3.40E+00
		411.12		2.24	1.81E-01		1.44E+00
		443.96		2.83	-1.08E+00		1.11E+00
		488.68		0.42	-3.89E-02		7.76E+00
		563.99		0.49	-3.43E-01		7.63E+00
		586.26		0.46	-3.41E+00		1.23E+01
		678.62		0.47	1.50E+00		7.20E+00
		688.67		0.86	-5.96E-02		4.38E+00
		719.35		0.28	3.13E+00		1.40E+01
		778.90		12.96	-7.14E-02		2.76E-01
		810.45		0.32	-7.33E-01		1.22E+01
		867.37		4.26	-3.87E-01		8.52E-01
		919.33		0.43	-1.12E+01		1.02E+01
		964.08		14.65	-1.94E-01		4.32E-01
		1085.87		10.24	-5.00E-02		4.64E-01
		1089.74		1.73	3.16E+00		3.09E+00
		1112.07		13.69	1.87E-01		3.63E-01
		1212.95		1.43	-1.74E-01		4.58E+00
		1249.94		0.19	2.58E+00		2.86E+01
		1299.14		1.63	3.46E+00		3.37E+00
		1408.01		21.07	-9.49E-03		2.19E-01
		1457.64		0.50	-3.93E+00		4.05E+01
		1528.10		0.28	2.35E+00		1.18E+01
	Eu-154	123.07		40.40	2.31E-02	6.96E-02	6.96E-02
		247.93		6.89	-1.33E-01		3.99E-01
		591.76		4.95	1.58E-01		6.46E-01
		692.42		1.78	4.95E-01		2.15E+00
		723.30		20.06	-2.22E-02		2.37E-01
		756.80		4.52	1.95E-01		9.37E-01
		873.18		12.08	-1.45E-03		3.33E-01

Analysis Report for 05-Feb-19-10016

L1-12204B-FSGS-007SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	-1.65E-01	6.96E-02	4.02E-01
		1004.76		18.01	-1.27E-01		2.36E-01
		1274.43		34.80	6.80E-02		1.49E-01
		1596.48		1.80	-2.24E-01		2.01E+00
	Eu-155	45.30		1.31	2.47E-01	1.61E-01	9.55E+00
		60.01		1.22	3.16E+00		1.07E+01
		86.55		30.70	2.80E-02		1.62E-01
		105.31		21.10	-1.41E-02		1.61E-01
+	Ra-226	186.21	*	3.64	1.26E+00	6.81E-01	6.81E-01
	Pa-231	27.36		10.30	6.58E-01	1.00E+00	1.00E+00
		283.69		1.70	-9.12E-01		1.67E+00
		300.07		2.47	2.42E-01		1.30E+00
		302.65		2.20	-3.64E-02		1.45E+00
		330.06		1.40	1.30E+00		2.39E+00
+	U-235	143.76		10.96	-1.37E-01	4.34E-02	2.71E-01
		163.33		5.08	2.20E-01		5.63E-01
		185.71	*	57.20	8.02E-02		4.34E-02
		202.11		1.08	1.89E+00		2.65E+00
		205.31		5.01	4.96E-02		5.45E-01
	Am-241	59.54		35.90	1.03E-01	3.80E-01	3.80E-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-Feb- 19- 10017

L1-12204B-FSGS-008SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	:05-Feb- 19- 10017
Sample Description	:L1-12204B-FSGS-008SS
Sample Type	:Soil
Unit	:
Sample Point	:
Sample Size	: 9.278E+02 grams
Facility	Default
Sample Taken On	:2/ 4/2019 8:09:00AM
Acquisition Started	:2/ 5/2019 1:12:43PM
Procedure	:130G_SOIL_1
Operator	Administrator
Detector Name	:324
Geometry	:130G_SOIL_1
Live Time	:1800.0 seconds
Real Time	:1802.1 seconds
Dead Time	: 0.11 %
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	:2/ 5/2019
Efficiency Calibration Description	:
Sample Number	: 63850
Fill Height	: 927.82 gram
Certificate Name	:Eu155-Na22
Certificate Date	:1/ 30/ 2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 2/ 5/2019 2:05:23PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated 0700 2-7-19

Analysis Report for 05-Feb-19-10017

L1-12204B-FSGS-008SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.89	146 -	158	150.39	1.57E+02	18.38	3.69E+02	1.01
m	2	77.17	146 -	158	154.94	2.59E+02	21.62	3.08E+02	1.02
	3	185.97	368 -	376	372.25	1.49E+02	28.09	3.00E+02	1.29
M	4	238.64	473 -	488	477.47	7.50E+02	29.42	2.23E+02	1.15
m	5	241.65	473 -	488	483.47	1.59E+02	15.63	2.07E+02	1.15
	6	295.23	585 -	595	590.52	2.71E+02	25.75	1.65E+02	1.25
	7	327.92	652 -	660	655.83	5.89E+01	17.82	1.21E+02	1.08
	8	338.24	671 -	681	676.45	1.65E+02	21.50	1.25E+02	1.36
	9	351.82	698 -	708	703.58	4.61E+02	28.01	1.36E+02	1.23
	10	463.01	920 -	931	925.77	8.65E+01	16.75	7.75E+01	1.03
	11	510.57	1015 -	1026	1020.84	9.60E+01	18.56	9.90E+01	1.44
	12	583.18	1160 -	1171	1165.97	2.52E+02	20.73	7.07E+01	1.54
	13	609.25	1212 -	1223	1218.07	3.27E+02	21.50	5.40E+01	1.58
	14	726.97	1450 -	1458	1453.44	3.78E+01	12.13	4.72E+01	1.28
	15	768.86	1531 -	1540	1537.19	2.88E+01	13.28	6.52E+01	1.19
	16	911.07	1815 -	1828	1821.59	1.75E+02	18.00	5.41E+01	1.79
	17	968.63	1932 -	1943	1936.72	7.88E+01	17.00	8.22E+01	1.57
	18	1001.32	1995 -	2008	2002.12	3.01E+01	10.94	3.19E+01	0.85
	19	1120.13	2234 -	2246	2239.82	9.35E+01	15.55	5.65E+01	1.61
	20	1460.59	2913 -	2928	2921.23	1.27E+03	36.36	1.61E+01	2.14
	21	1764.07	3524 -	3534	3529.00	6.32E+01	9.04	7.81E+00	2.05

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

No background subtract performed on this spectrum

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Analysis Report for 05-Feb- 19- 10017

L1-12204B-FSGS-008SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.97	511.00	*	100.00	5.88E-02	1.20E-02
K-40	0.99	1460.82	*	10.66	1.47E+01	7.66E-01
Tl-208	1.00	583.19	*	85.00	1.95E-01	1.99E-02
Bi-212	0.98	39.86		1.06		
		727.33	*	6.67	4.34E-01	1.41E-01
		785.37		1.10		
		1620.50		1.47		
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	6.17E-01	5.55E-02
		300.09		3.30		
Pb212-XR	0.99	74.82	*	10.28	1.04E+00	1.62E-01
		77.11	*	17.10	9.47E-01	1.25E-01
		87.35		3.97		
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	4.88E-01	4.34E-02
		768.36	*	4.89	4.67E-01	2.17E-01
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	6.43E-01	1.10E-01
		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	5.89E-01	8.76E-02
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	7.91E-01	1.00E-01
		295.22	*	18.42	5.99E-01	7.44E-02
		351.93	*	35.60	5.99E-01	6.02E-02
		785.96		1.06		
Ra-226	0.99	186.21	*	3.64	1.29E+00	2.65E-01
Ac-228	0.89	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00	*	2.95	8.77E-01	2.77E-01
		338.32	*	11.27	6.60E-01	1.01E-01
		409.46		1.92		
		463.00	*	4.40	1.11E+00	2.30E-01
		794.95		4.25		
		911.20	*	25.80	6.05E-01	6.74E-02
		964.77		4.99		
		968.97	*	15.80	4.63E-01	1.02E-01
		1588.20		3.22		
U-235	0.99	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	8.22E-02	1.69E-02
		202.11		1.08		

Analysis Report for 05-Feb-19-10017

L1-12204B-FSGS-008SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
U-235	0.99	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 1.000 sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.971	5.88E-02	1.20E-02	
	K-40	0.991	1.47E+01	7.66E-01	
	Tl-208	1.000	1.95E-01	1.99E-02	
X	Bi-211	0.914			
	Bi-212	0.987	4.34E-01	1.41E-01	
	Pb-212	1.000	6.17E-01	5.55E-02	
	Pb212-XR	0.999	9.83E-01	9.93E-02	
	Bi-214	0.994	5.21E-01	3.62E-02	
	Pb-214	0.997	6.33E-01	4.24E-02	
X	Pb214-XR	0.999			
?	Ra-226	0.991	1.29E+00	2.65E-01	
	Ac-228	0.891	6.16E-01	4.74E-02	
?	U-235	0.993	8.22E-02	1.69E-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 1.000 sigma

Analysis Report for 05-Feb-19-10017

L1-12204B-FSGS-008SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 2/ 5/2019 2:05:23PM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
18	1001.32	1.67070E-02	36.38		

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

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	5.88E-02	3.45E-02	3.45E-02
	BE-7	477.60		10.44	4.04E-02	3.19E-01	3.19E-01
+	K-40	1460.82	*	10.66	1.47E+01	3.06E-01	3.06E-01
	Co-60	1173.23		99.85	2.00E-02	4.92E-02	5.55E-02
		1332.49		99.98	7.48E-03		4.92E-02
	Nb-94	702.65		99.81	-5.20E-04	3.74E-02	3.95E-02
		871.09		99.89	-1.78E-02		3.74E-02
	Ag-108m	79.13		6.60	-5.52E-01	3.19E-02	1.10E+00
		433.94		90.50	-6.47E-03		3.19E-02
		614.28		89.80	-4.06E-02		5.64E-02
		722.94		90.80	-2.52E-02		4.72E-02
	Sb-125	176.31		6.84	-1.83E-02	1.05E-01	4.76E-01
		380.45		1.52	-5.69E-01		1.93E+00
		427.87		29.60	5.00E-02		1.05E-01
		463.36		10.49	4.57E-01		3.65E-01
		600.60		17.65	-1.74E-01		1.91E-01
		606.71		4.98	-1.89E-02		1.38E+00
		635.95		11.22	-2.11E-01		3.24E-01

Analysis Report for 05-Feb- 19- 10017

L1-12204B-FSGS-008SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.03E+00	1.05E-01	2.01E+00
Ba-133	79.61	2.65	-1.62E+00	7.70E-02	2.56E+00
	81.00	32.90	-3.55E-01		1.61E-01
	276.40	7.16	-4.95E-02		4.23E-01
	302.85	18.34	7.38E-02		1.71E-01
	356.01	62.05	-5.36E-02		7.70E-02
	383.85	8.94	-2.95E-02		3.35E-01
Cs-134	475.36	1.48	3.69E-01	5.05E-02	2.14E+00
	563.25	8.34	-6.09E-02		3.80E-01
	569.33	15.37	1.79E-02		2.08E-01
	604.72	97.62	-2.33E-03		6.01E-02
	795.86	85.46	2.93E-02		5.05E-02
	801.95	8.69	-3.15E-01		4.53E-01
	1038.61	0.99	-2.14E-01		4.30E+00
	1167.97	1.79	-4.62E-01		3.01E+00
	1365.19	3.02	-1.92E-02		1.20E+00
Cs-137	661.66	85.10	3.39E-02	5.03E-02	5.03E-02
Eu-152	121.78	28.67	-1.46E-02	1.02E-01	1.02E-01
	244.70	7.61	2.65E-02		4.89E-01
	295.94	0.45	-2.00E+00		9.67E+00
	344.28	26.60	-5.65E-02		1.10E-01
	367.79	0.86	1.01E-01		3.52E+00
	411.12	2.24	1.20E+00		1.43E+00
	443.96	2.83	-5.65E-02		1.07E+00
	488.68	0.42	3.20E+00		8.36E+00
	563.99	0.49	-1.21E+00		6.48E+00
	586.26	0.46	-2.65E+00		1.37E+01
	678.62	0.47	2.76E+00		7.72E+00
	688.67	0.86	2.68E-02		4.28E+00
	719.35	0.28	4.98E+00		1.32E+01
	778.90	12.96	-2.88E-01		2.93E-01
	810.45	0.32	-3.27E+00		1.22E+01
	867.37	4.26	-8.07E-01		8.70E-01
	919.33	0.43	3.98E+00		9.77E+00
	964.08	14.65	-1.54E-01		4.17E-01
	1085.87	10.24	2.41E-01		4.87E-01
	1089.74	1.73	1.63E+00		2.92E+00
	1112.07	13.69	-4.30E-01		3.33E-01
	1212.95	1.43	-6.62E-01		4.06E+00
	1249.94	0.19	-1.41E+01		2.75E+01
	1299.14	1.63	3.84E-01		3.07E+00
	1408.01	21.07	5.83E-02		2.00E-01
	1457.64	0.50	-4.93E+00		4.31E+01
	1528.10	0.28	-3.65E+00		1.00E+01
Eu-154	123.07	40.40	1.13E-02	7.36E-02	7.36E-02
	247.93	6.89	-3.26E-02		4.32E-01
	591.76	4.95	5.87E-01		7.71E-01
	692.42	1.78	-5.38E-01		2.18E+00
	723.30	20.06	-1.18E-01		2.19E-01
	756.80	4.52	7.11E-01		8.89E-01
	873.18	12.08	1.21E-01		3.30E-01

Analysis Report for 05-Feb-19-10017

L1-12204B-FSGS-008SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	2.02E-02	7.36E-02	4.42E-01
		1004.76		18.01	1.97E-02		2.45E-01
		1274.43		34.80	-1.91E-01		1.37E-01
		1596.48		1.80	-4.55E-01		2.01E+00
	Eu-155	45.30		1.31	1.60E+00	1.72E-01	1.03E+01
		60.01		1.22	-1.67E+00		1.16E+01
		86.55		30.70	1.01E-01		1.72E-01
		105.31		21.10	8.90E-02		1.77E-01
+	Ra-226	186.21	*	3.64	1.29E+00	7.69E-01	7.69E-01
	Pa-231	27.36		10.30	1.26E+00	1.09E+00	1.09E+00
		283.69		1.70	-9.29E-01		1.67E+00
		300.07		2.47	-2.03E-01		1.28E+00
		302.65		2.20	6.15E-01		1.42E+00
		330.06		1.40	-3.18E-01		2.61E+00
+	U-235	143.76		10.96	2.82E-02	4.89E-02	2.66E-01
		163.33		5.08	-5.69E-02		6.40E-01
		185.71	*	57.20	8.22E-02		4.89E-02
		202.11		1.08	2.86E-01		2.91E+00
		205.31		5.01	-9.71E-01		6.10E-01
	Am-241	59.54		35.90	6.76E-02	4.11E-01	4.11E-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-Feb-19-10018

L1-12204B-FSGS-009SS

GAMMA SPECTRUM ANALYSIS

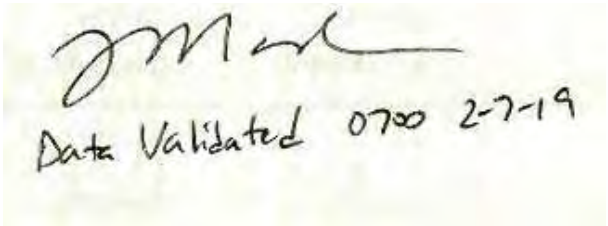
Sample Identification	: 05-Feb-19-10018
Sample Description	: L1-12204B-FSGS-009SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.070E+03 grams
Facility	: Default
Sample Taken On	: 2/4/2019 8:10:00AM
Acquisition Started	: 2/5/2019 1:12:49PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P11314
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 - 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	: 2/5/2019
Efficiency Calibration Description	:
Sample Number	: 63851
Fill Height	: 1069.74 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 2/5/2019 2:06:17PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192



Analysis Report for 05-Feb-19-10018

L1-12204B-FSGS-009SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	77.30	305 -	315	309.72	1.63E+02	31.07	3.28E+02	0.83
	2	186.19	741 -	752	744.62	1.91E+02	23.80	1.47E+02	1.22
M	3	238.82	947 -	973	954.84	6.79E+02	27.82	2.24E+02	1.06
m	4	241.84	947 -	973	966.91	1.13E+02	14.10	1.92E+02	1.06
	5	270.41	1076 -	1088	1081.05	4.69E+01	19.72	1.29E+02	0.34
M	6	295.43	1175 -	1206	1181.02	2.62E+02	52.35	1.15E+02	0.95
m	7	300.39	1175 -	1206	1200.82	3.46E+01	10.56	1.30E+02	0.96
	8	338.44	1343 -	1361	1352.82	1.38E+02	23.57	1.24E+02	1.03
	9	352.03	1400 -	1416	1407.15	5.06E+02	27.61	8.24E+01	1.28
	10	510.71	2031 -	2051	2041.20	1.42E+02	21.12	8.39E+01	1.25
	11	583.27	2320 -	2339	2331.19	2.07E+02	21.85	7.60E+01	1.69
	12	609.30	2426 -	2444	2435.22	3.47E+02	22.86	5.21E+01	1.30
	13	727.51	2901 -	2914	2907.77	4.00E+01	11.21	3.10E+01	0.84
	14	768.36	3065 -	3076	3071.10	3.90E+01	10.69	3.00E+01	0.44
	15	911.05	3633 -	3651	3641.66	1.54E+02	16.60	3.57E+01	1.41
	16	969.02	3865 -	3882	3873.51	8.36E+01	15.26	4.54E+01	1.39
	17	1120.47	4471 -	4489	4479.28	8.29E+01	15.55	4.71E+01	1.34
	18	1377.67	5503 -	5514	5508.43	1.87E+01	6.08	7.31E+00	0.56
	19	1460.60	5827 -	5854	5840.33	1.27E+03	36.92	2.07E+01	1.78
	20	1763.93	7047 -	7064	7054.78	5.60E+01	9.23	9.00E+00	1.15

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

Analysis Report for 05-Feb-19-10018

L1-12204B-FSGS-009SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.98	511.00	*	100.00	9.51E-02	1.56E-02
K-40	0.99	1460.82	*	10.66	1.64E+01	8.57E-01
Tl-208	0.99	583.19	*	85.00	1.76E-01	2.14E-02
Bi-212	0.99	39.86		1.06		
		727.33	*	6.67	5.06E-01	1.45E-01
		785.37		1.10		
		1620.50		1.47		
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	5.98E-01	5.42E-02
		300.09	*	3.30	4.65E-01	1.47E-01
Pb212-XR	0.99	74.82		10.28		
		77.11	*	17.10	6.10E-01	1.32E-01
		87.35		3.97		
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	5.68E-01	5.07E-02
		768.36	*	4.89	6.99E-01	1.95E-01
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	6.33E-01	1.21E-01
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67	*	3.99	6.16E-01	2.02E-01
		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	5.84E-01	9.91E-02
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	6.05E-01	8.95E-02
		295.22	*	18.42	6.24E-01	1.34E-01
		351.93	*	35.60	7.12E-01	6.90E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	1.07E+00	2.38E-01
		87.35		2.24		
		89.78		0.82		
Ra-226	1.00	186.21	*	3.64	1.76E+00	2.61E-01
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24	*	3.46	5.61E-01	2.41E-01
		328.00		2.95		
		338.32	*	11.27	5.98E-01	1.13E-01
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	5.91E-01	6.84E-02
		964.77		4.99		
		968.97	*	15.80	5.46E-01	1.03E-01
		1588.20		3.22		

Analysis Report for 05-Feb-19-10018

L1-12204B-FSGS-009SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
U-235	0.97	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	1.12E-01	1.67E-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

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.987	9.51E-02	1.56E-02	
	K-40	0.992	1.64E+01	8.57E-01	
	Tl-208	0.999	1.76E-01	2.14E-02	
X	Bi-211	0.862			
	Bi-212	0.997	5.06E-01	1.45E-01	
	Pb-212	0.994	5.82E-01	5.09E-02	
?	Pb212-XR	0.997	6.10E-01	1.32E-01	
	Bi-214	0.992	5.86E-01	4.05E-02	
	Pb-214	0.997	6.65E-01	5.06E-02	
?	Pb214-XR	0.997	1.07E+00	2.38E-01	
X	Rn-219	0.935			
?	Ra-226	1.000	1.76E+00	2.61E-01	
	Ac-228	0.998	5.80E-01	4.97E-02	
X	Pa-231	0.998			
?	U-235	0.975	1.12E-01	1.67E-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-Feb-19-10018

L1-12204B-FSGS-009SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 2/5/2019 2:06:17PM
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	9.51E-02	4.15E-02	4.15E-02
	BE-7	477.60		10.44	1.53E-01	3.40E-01	3.40E-01
+	K-40	1460.82	*	10.66	1.64E+01	4.57E-01	4.57E-01
	Co-60	1173.23		99.85	4.95E-02	5.28E-02	6.04E-02
		1332.49		99.98	1.64E-02		5.28E-02
	Nb-94	702.65		99.81	4.17E-03	4.28E-02	4.33E-02
		871.09		99.89	-1.52E-02		4.28E-02
	Ag-108m	79.13		6.60	-6.27E-01	3.71E-02	1.18E+00
		433.94		90.50	-2.41E-02		3.71E-02
		614.28		89.80	-2.45E-02		6.77E-02
		722.94		90.80	-4.72E-03		5.41E-02
	Sb-125	176.31		6.84	3.51E-01	1.16E-01	4.65E-01
		380.45		1.52	7.07E-01		2.24E+00
		427.87		29.60	1.66E-02		1.16E-01
		463.36		10.49	1.25E-02		3.61E-01
		600.60		17.65	-2.25E-02		1.96E-01
		606.71		4.98	-2.81E-01		1.55E+00
		635.95		11.22	3.46E-02		3.28E-01
		671.44		1.79	-1.97E+00		2.14E+00

Analysis Report for 05-Feb-19-10018

L1-12204B-FSGS-009SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Ba-133	79.61	2.65	-1.14E+00	7.69E-02	2.88E+00
	81.00	32.90	-3.18E-01		1.76E-01
	276.40	7.16	-3.82E-02		4.84E-01
	302.85	18.34	1.52E-03		1.88E-01
	356.01	62.05	-1.42E-02		7.69E-02
	383.85	8.94	-3.27E-01		3.85E-01
Cs-134	475.36	1.48	-3.10E-01	5.57E-02	2.26E+00
	563.25	8.34	-7.89E-01		4.43E-01
	569.33	15.37	1.48E-01		2.61E-01
	604.72	97.62	-2.47E-02		6.24E-02
	795.86	85.46	1.06E-02		5.57E-02
	801.95	8.69	-2.86E-01		5.19E-01
	1038.61	0.99	-4.16E+00		4.98E+00
	1167.97	1.79	1.04E+00		3.39E+00
	1365.19	3.02	-3.24E-01		1.26E+00
Cs-137	661.66	85.10	3.99E-02	5.55E-02	5.55E-02
Eu-152	121.78	28.67	6.52E-02	1.15E-01	1.15E-01
	244.70	7.61	-1.41E-01		5.25E-01
	295.94	0.45	-2.69E+00		1.12E+01
	344.28	26.60	-5.38E-02		1.23E-01
	367.79	0.86	-6.79E-01		3.49E+00
	411.12	2.24	-1.05E+00		1.53E+00
	443.96	2.83	7.22E-02		1.23E+00
	488.68	0.42	1.32E-01		9.22E+00
	563.99	0.49	-9.31E+00		7.38E+00
	586.26	0.46	-3.49E+00		1.43E+01
	678.62	0.47	-2.47E+00		7.75E+00
	688.67	0.86	5.13E-01		4.53E+00
	719.35	0.28	-7.63E+00		1.50E+01
	778.90	12.96	-1.82E-01		3.25E-01
	810.45	0.32	1.24E+01		1.43E+01
	867.37	4.26	-1.04E+00		1.01E+00
	919.33	0.43	-9.88E+00		1.17E+01
	964.08	14.65	-1.21E-02		4.95E-01
	1085.87	10.24	-5.17E-02		5.59E-01
	1089.74	1.73	7.34E-01		3.29E+00
	1112.07	13.69	-5.57E-01		4.27E-01
	1212.95	1.43	2.86E+00		4.87E+00
	1249.94	0.19	-2.69E+01		3.36E+01
	1299.14	1.63	4.63E-01		3.73E+00
	1408.01	21.07	-7.45E-02		2.38E-01
	1457.64	0.50	-3.08E+00		4.81E+01
	1528.10	0.28	1.90E+00		1.15E+01
Eu-154	123.07	40.40	2.59E-02	8.21E-02	8.21E-02
	247.93	6.89	-5.92E-02		4.76E-01
	591.76	4.95	1.33E-01		7.91E-01
	692.42	1.78	-1.05E+00		2.21E+00
	723.30	20.06	-2.03E-02		2.50E-01
	756.80	4.52	-4.72E-01		9.86E-01
	873.18	12.08	7.53E-02		3.56E-01
	996.29	10.48	1.07E-01		5.15E-01

Analysis Report for 05-Feb-19-10018

L1-12204B-FSGS-009SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	1004.76		18.01	-4.85E-03	8.21E-02	2.78E-01
		1274.43		34.80	8.92E-03		1.74E-01
		1596.48		1.80	-2.46E+00		2.00E+00
	Eu-155	45.30		1.31	-2.03E+00	1.83E-01	1.03E+01
		60.01		1.22	-4.05E+00		1.21E+01
		86.55		30.70	2.57E-01		1.92E-01
		105.31		21.10	-4.12E-02		1.83E-01
+	Ra-226	186.21	*	3.64	1.76E+00	6.32E-01	6.32E-01
	Pa-231	27.36		10.30	9.93E-01	1.03E+00	1.18E+00
		283.69		1.70	8.70E-01		1.91E+00
		300.07	*	2.47	6.22E-01		1.03E+00
		302.65		2.20	1.48E-01		1.59E+00
		330.06		1.40	3.31E+00		2.73E+00
+	U-235	143.76		10.96	-8.12E-03	4.02E-02	3.08E-01
		163.33		5.08	-7.51E-02		5.87E-01
		185.71	*	57.20	1.12E-01		4.02E-02
		202.11		1.08	-5.04E-01		2.95E+00
		205.31		5.01	-2.76E-01		6.23E-01
	Am-241	59.54		35.90	-8.39E-02	4.23E-01	4.23E-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-Feb-19-10019
L1-12204B-FSGS-010SS

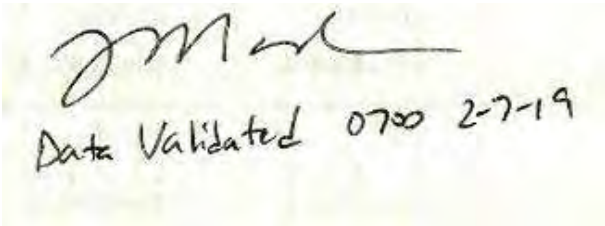
GAMMA SPECTRUM ANALYSIS

Sample Identification	: 05-Feb-19-10019
Sample Description	: L1-12204B-FSGS-010SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.056E+03 grams
Facility	Default
Sample Taken On	: 2/4/2019 8:11:00AM
Acquisition Started	: 2/5/2019 1:47:54PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
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 - 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	: 2/5/2019
Efficiency Calibration Description	:
Sample Number	: 63852
Fill Height	: 1055.74 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 2/5/2019 2:17:58PM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192



Analysis Report for 05-Feb-19-10019

L1-12204B-FSGS-010SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.85	294	316	300.74	8.48E+01	34.03	2.12E+02	0.85
m	2	76.98	294	316	309.24	1.29E+02	48.72	2.46E+02	0.85
M	3	90.10	357	378	361.65	4.74E+01	13.04	1.91E+02	0.98
m	4	92.86	357	378	372.65	1.10E+02	15.14	2.15E+02	0.99
	5	186.07	739	753	744.99	1.90E+02	26.70	1.81E+02	0.85
M	6	238.71	948	978	955.30	5.99E+02	25.76	1.64E+02	1.17
m	7	241.97	948	978	968.33	1.25E+02	13.50	1.46E+02	1.17
	8	295.21	1174	1186	1181.05	2.38E+02	21.29	8.20E+01	1.32
	9	327.85	1306	1318	1311.49	3.29E+01	15.26	7.61E+01	0.87
	10	338.34	1344	1361	1353.41	1.34E+02	19.75	7.87E+01	1.15
	11	351.96	1401	1416	1407.85	4.25E+02	26.67	9.49E+01	1.08
	12	463.01	1846	1858	1851.68	3.83E+01	11.84	3.87E+01	0.56
	13	511.01	2032	2049	2043.51	9.35E+01	19.28	8.55E+01	1.17
	14	583.19	2324	2341	2332.09	1.96E+02	19.58	5.75E+01	0.97
	15	609.25	2426	2448	2436.27	3.13E+02	23.42	5.90E+01	1.18
	16	727.14	2900	2915	2907.64	5.63E+01	10.46	1.77E+01	0.56
	17	911.30	3635	3652	3644.22	1.47E+02	16.47	3.82E+01	1.09
	18	969.23	3868	3883	3876.01	9.24E+01	13.90	3.36E+01	1.31
	19	1120.56	4474	4488	4481.51	6.13E+01	12.59	3.37E+01	0.82
	20	1238.51	4947	4961	4953.61	3.29E+01	11.06	2.91E+01	0.70
	21	1460.91	5829	5857	5843.99	1.18E+03	35.76	2.18E+01	2.16
	22	1764.62	7053	7069	7060.55	4.49E+01	8.74	1.01E+01	0.34

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

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

Analysis Report for 05-Feb-19-10019

L1-12204B-FSGS-010SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	1.00	511.00	*	100.00	5.96E-02	1.29E-02
K-40	0.99	1460.82	*	10.66	1.41E+01	7.50E-01
Tl-208	1.00	583.19	*	85.00	1.58E-01	1.84E-02
Bi-212	0.99	39.86		1.06		
		727.33	*	6.67	6.71E-01	1.31E-01
		785.37		1.10		
		1620.50		1.47		
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	5.19E-01	4.75E-02
		300.09		3.30		
Pb212-XR	0.99	74.82	*	10.28	7.89E-01	3.27E-01
		77.11	*	17.10	6.50E-01	2.55E-01
		87.35		3.97		
		89.78	*	1.46	1.82E+00	5.36E-01
Bi-214	0.99	609.32	*	45.49	4.85E-01	4.66E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	4.37E-01	9.15E-02
		1155.21		1.63		
		1238.12	*	5.83	6.41E-01	2.17E-01
		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	4.35E-01	8.64E-02
		1847.43		2.03		
		2118.51		1.16		
Pb-214	1.00	241.99	*	7.25	6.55E-01	8.81E-02
		295.22	*	18.42	5.50E-01	6.60E-02
		351.93	*	35.60	5.77E-01	5.86E-02
		785.96		1.06		
Ra-226	0.99	186.21	*	3.64	1.75E+00	2.84E-01
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00	*	2.95	5.12E-01	2.42E-01
		338.32	*	11.27	5.60E-01	9.41E-02
		409.46		1.92		
		463.00	*	4.40	5.10E-01	1.62E-01
		794.95		4.25		
		911.20	*	25.80	5.27E-01	6.33E-02
		964.77		4.99		
		968.97	*	15.80	5.65E-01	8.86E-02
		1588.20		3.22		
Ac228-XR	0.97	89.96	*	1.90	1.40E+00	4.66E-01
		93.35	*	3.10	1.87E+00	3.99E-01

Analysis Report for 05-Feb-19-10019

L1-12204B-FSGS-010SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Th-234	1.00	92.38		2.13		
		92.80	*	2.10	2.86E+00	5.58E-01
		112.81		0.21		
U-235	0.98	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	1.11E-01	1.81E-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 1.000 sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	1.000	5.96E-02	1.29E-02	
	K-40	0.999	1.41E+01	7.50E-01	
X	Sb-125	0.418			
	Tl-208	1.000	1.58E-01	1.84E-02	
X	Bi-211	0.880			
	Bi-212	0.996	6.71E-01	1.31E-01	
	Pb-212	0.999	5.19E-01	4.75E-02	
	Pb212-XR	0.998	7.03E-01	2.01E-01	
	Bi-214	0.997	4.73E-01	3.69E-02	
	Pb-214	1.000	5.83E-01	3.92E-02	
X	Pb214-XR	0.998			
?	Ra-226	0.997	1.75E+00	2.84E-01	
	Ac-228	0.997	5.41E-01	4.29E-02	
	Ac228-XR	0.975	8.61E-01	4.39E-01	
	Th-234	1.000	1.54E+00	8.29E-01	
?	U-235	0.986	1.11E-01	1.81E-02	
X	U235-XR	0.978			

Analysis Report for 05-Feb-19-10019

L1-12204B-FSGS-010SS

? = 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 1.000 sigma

Analysis Report for 05-Feb-19-10019
L1-12204B-FSGS-010SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 2/5/2019 2:17:58PM
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 1.000 sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ION 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	5.96E-02	3.79E-02	3.79E-02
	BE-7	477.60		10.44	1.62E-01	3.51E-01	3.51E-01
+	K-40	1460.82	*	10.66	1.41E+01	4.45E-01	4.45E-01
	Co-60	1173.23		99.85	-1.47E-02	4.28E-02	6.18E-02
		1332.49		99.98	-4.44E-03		4.28E-02
	Nb-94	702.65		99.81	-2.24E-03	4.23E-02	4.23E-02
		871.09		99.89	3.33E-02		4.34E-02
	Ag-108m	79.13		6.60	4.63E-01	3.96E-02	1.40E+00
		433.94		90.50	-1.44E-02		3.96E-02
		614.28		89.80	-6.02E-03		7.69E-02
		722.94		90.80	-4.00E-03		5.00E-02
	Sb-125	176.31		6.84	5.66E-03	1.20E-01	4.61E-01
		380.45		1.52	-6.95E-01		2.14E+00
		427.87		29.60	1.61E-02		1.20E-01
		463.36	*	10.49	2.14E-01		2.08E-01
		600.60		17.65	7.36E-02		2.26E-01
		606.71		4.98	2.54E-01		1.45E+00
		635.95		11.22	1.96E-01		3.43E-01
		671.44		1.79	-1.37E+00		2.16E+00

Analysis Report for 05-Feb-19-10019

L1-12204B-FSGS-010SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Ba-133	79.61	2.65	3.43E-01	8.42E-02	3.39E+00
	81.00	32.90	-6.30E-02		2.30E-01
	276.40	7.16	3.32E-01		4.95E-01
	302.85	18.34	1.54E-01		1.87E-01
	356.01	62.05	-2.43E-02		8.42E-02
	383.85	8.94	-2.58E-01		3.57E-01
Cs-134	475.36	1.48	1.94E-01	5.26E-02	2.48E+00
	563.25	8.34	-3.95E-01		4.29E-01
	569.33	15.37	-1.76E-02		2.42E-01
	604.72	97.62	5.31E-03		6.79E-02
	795.86	85.46	-2.00E-02		5.26E-02
	801.95	8.69	-4.65E-01		4.76E-01
	1038.61	0.99	-3.65E+00		4.82E+00
	1167.97	1.79	-5.81E-01		3.40E+00
	1365.19	3.02	-5.31E-01		1.40E+00
Cs-137	661.66	85.10	-2.85E-03	5.12E-02	5.12E-02
Eu-152	121.78	28.67	-1.15E-02	1.25E-01	1.29E-01
	244.70	7.61	-1.60E-01		5.07E-01
	295.94	0.45	1.89E+01		1.03E+01
	344.28	26.60	3.70E-02		1.25E-01
	367.79	0.86	3.06E+00		3.91E+00
	411.12	2.24	4.39E-01		1.62E+00
	443.96	2.83	-7.38E-01		1.23E+00
	488.68	0.42	6.63E+00		8.58E+00
	563.99	0.49	1.48E+00		7.32E+00
	586.26	0.46	-2.21E+00		1.29E+01
	678.62	0.47	-3.66E+00		8.22E+00
	688.67	0.86	-8.26E-01		4.89E+00
	719.35	0.28	-2.60E+00		1.30E+01
	778.90	12.96	-2.21E-01		2.98E-01
	810.45	0.32	5.34E+00		1.33E+01
	867.37	4.26	-1.99E+00		1.10E+00
	919.33	0.43	-1.50E+01		1.00E+01
	964.08	14.65	1.71E-01		4.90E-01
	1085.87	10.24	-2.62E-01		4.90E-01
	1089.74	1.73	-1.36E+00		3.06E+00
	1112.07	13.69	-6.12E-02		3.92E-01
	1212.95	1.43	-1.03E+00		4.54E+00
	1249.94	0.19	-1.27E+01		3.21E+01
	1299.14	1.63	4.17E+00		3.42E+00
	1408.01	21.07	4.31E-02		2.01E-01
	1457.64	0.50	3.01E+02		4.34E+01
	1528.10	0.28	-8.66E+00		1.09E+01
Eu-154	123.07	40.40	3.95E-02	9.24E-02	9.24E-02
	247.93	6.89	-5.07E-01		4.39E-01
	591.76	4.95	-3.51E-01		7.27E-01
	692.42	1.78	7.04E-01		2.38E+00
	723.30	20.06	-7.90E-02		2.26E-01
	756.80	4.52	1.99E-01		9.40E-01
	873.18	12.08	-2.79E-01		3.50E-01
	996.29	10.48	-1.64E-03		4.52E-01

Analysis Report for 05-Feb-19-10019

L1-12204B-FSGS-010SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	1004.76		18.01	8.29E-02	9.24E-02	2.57E-01
		1274.43		34.80	-1.46E-01		1.53E-01
		1596.48		1.80	-9.07E-01		2.39E+00
	Eu-155	45.30		1.31	-1.94E+00	1.95E-01	1.80E+01
		60.01		1.22	-2.06E+01		1.91E+01
		86.55		30.70	2.21E-01		2.25E-01
		105.31		21.10	5.69E-02		1.95E-01
+	Ra-226	186.21	*	3.64	1.75E+00	7.43E-01	7.43E-01
	Pa-231	27.36		10.30	3.03E+00	1.55E+00	2.08E+00
		283.69		1.70	-9.61E-01		1.86E+00
		300.07		2.47	-2.78E+00		1.56E+00
		302.65		2.20	9.29E-01		1.55E+00
		330.06		1.40	9.28E-01		2.54E+00
+	U-235	143.76		10.96	3.39E-01	4.73E-02	3.32E-01
		163.33		5.08	1.65E-01		6.42E-01
		185.71	*	57.20	1.11E-01		4.73E-02
		202.11		1.08	-1.12E+00		3.09E+00
		205.31		5.01	-8.66E-01		6.64E-01
	Am-241	59.54		35.90	-3.62E-01	6.76E-01	6.76E-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-Feb-19-10020

L1-12204B-FSGS-011SS

GAMMA SPECTRUM ANALYSIS

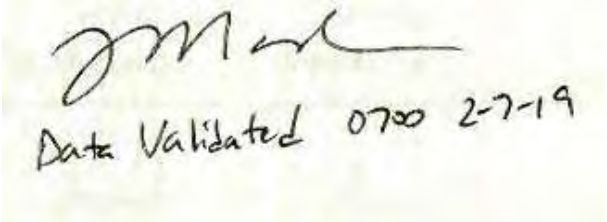
Sample Identification	: 05-Feb-19-10020
Sample Description	: L1-12204B-FSGS-011SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.231E+03 grams
Facility	: Default
Sample Taken On	: 2/4/2019 8:12:00AM
Acquisition Started	: 2/5/2019 2:09:44PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 324
Geometry	: 130G_SOIL_1
Live Time	: 1800.0 seconds
Real Time	: 1802.1 seconds
Dead Time	: 0.11 %
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	: 2/5/2019
Efficiency Calibration Description	:
Sample Number	: 63853
Fill Height	: 1230.66 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 2/5/2019 2:39:50PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096



Analysis Report for 05-Feb-19-10020

L1-12204B-FSGS-011SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	77.20	152 -	158	155.00	1.04E+02	26.67	3.05E+02	0.68
	2	185.96	368 -	376	372.22	1.33E+02	25.78	2.49E+02	1.28
M	3	238.62	473 -	488	477.42	5.40E+02	25.24	1.99E+02	1.20
m	4	241.86	473 -	488	483.89	1.22E+02	13.65	1.73E+02	1.21
	5	295.20	585 -	595	590.46	2.09E+02	22.55	1.26E+02	1.22
	6	338.21	671 -	681	676.39	7.96E+01	19.69	1.29E+02	1.46
	7	351.92	698 -	708	703.79	3.29E+02	24.31	1.10E+02	1.38
	8	462.88	920 -	930	925.52	4.72E+01	14.36	6.38E+01	0.97
	9	583.08	1160 -	1170	1165.76	1.59E+02	18.37	7.40E+01	1.63
	10	609.26	1213 -	1223	1218.10	2.81E+02	20.00	5.00E+01	1.38
	11	661.77	1317 -	1326	1323.07	5.89E+01	13.29	5.21E+01	0.83
	12	727.50	1448 -	1459	1454.49	3.70E+01	13.64	5.60E+01	1.10
	13	911.22	1815 -	1827	1821.88	1.13E+02	15.23	4.55E+01	1.24
	14	968.76	1934 -	1943	1936.99	5.59E+01	11.89	3.71E+01	1.26
	15	1120.00	2235 -	2244	2239.54	6.05E+01	12.34	3.95E+01	2.00
	16	1460.52	2913 -	2928	2921.10	9.17E+02	31.45	2.41E+01	1.85
	17	1763.77	3523 -	3535	3528.39	4.68E+01	7.86	5.24E+00	1.23

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

Analysis Report for 05-Feb-19-10020

L1-12204B-FSGS-011SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.82	*	10.66	9.26E+00	5.13E-01
Cs-137	0.99	661.66	*	85.10	4.39E-02	1.02E-02
Tl-208	0.99	583.19	*	85.00	1.09E-01	1.42E-02
Bi-212	0.99	39.86		1.06		
		727.33	*	6.67	3.75E-01	1.40E-01
		785.37		1.10		
		1620.50		1.47		
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	3.98E-01	3.71E-02
		300.09		3.30		
Pb212-XR	0.99	74.82		10.28		
		77.11	*	17.10	3.49E-01	9.65E-02
		87.35		3.97		
		89.78		1.46		
Bi-214	0.98	609.32	*	45.49	3.70E-01	3.45E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	3.64E-01	7.57E-02
		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	3.80E-01	6.56E-02
		1847.43		2.03		
		2118.51		1.16		
Pb-214	1.00	241.99	*	7.25	5.46E-01	7.50E-02
		295.22	*	18.42	4.12E-01	5.54E-02
		351.93	*	35.60	3.81E-01	4.15E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	6.16E-01	1.72E-01
		87.35		2.24		
		89.78		0.82		
Ra-226	0.99	186.21	*	3.64	1.04E+00	2.18E-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	2.83E-01	7.37E-02
		409.46		1.92		
		463.00	*	4.40	5.36E-01	1.68E-01
		794.95		4.25		
		911.20	*	25.80	3.42E-01	4.86E-02
		964.77		4.99		
		968.97	*	15.80	2.89E-01	6.28E-02
		1588.20		3.22		

Analysis Report for 05-Feb-19-10020

L1-12204B-FSGS-011SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
U-235	0.99	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	6.60E-02	1.39E-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

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.986	9.26E+00	5.13E-01	
	Cs-137	0.998	4.39E-02	1.02E-02	
	Tl-208	0.998	1.09E-01	1.42E-02	
X	Bi-211	0.891			
	Bi-212	0.997	3.75E-01	1.40E-01	
	Pb-212	1.000	3.98E-01	3.71E-02	
?	Pb212-XR	0.999	3.49E-01	9.65E-02	
	Bi-214	0.987	3.71E-01	2.83E-02	
	Pb-214	1.000	4.17E-01	3.04E-02	
?	Pb214-XR	0.999	6.16E-01	1.72E-01	
?	Ra-226	0.990	1.04E+00	2.18E-01	
	Ac-228	0.998	3.23E-01	3.34E-02	
?	U-235	0.993	6.60E-02	1.39E-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-Feb-19-10020

L1-12204B-FSGS-011SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 2/5/2019 2:39:50PM
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	7.48E-02	4.07E-02	4.07E-02
	BE-7	477.60		10.44	2.26E-01	2.99E-01	2.99E-01
+	K-40	1460.82	*	10.66	9.26E+00	3.20E-01	3.20E-01
	Co-60	1173.23		99.85	2.28E-02	3.73E-02	4.88E-02
		1332.49		99.98	1.36E-02		3.73E-02
	Nb-94	702.65		99.81	1.06E-02	2.86E-02	2.86E-02
		871.09		99.89	7.08E-04		3.00E-02
	Ag-108m	79.13		6.60	-4.06E-01	3.10E-02	8.57E-01
		433.94		90.50	1.24E-02		3.10E-02
		614.28		89.80	-5.72E-02		4.67E-02
		722.94		90.80	-9.44E-03		3.87E-02
	Sb-125	176.31		6.84	5.78E-02	8.50E-02	3.93E-01
		380.45		1.52	1.05E-02		1.71E+00
		427.87		29.60	-1.90E-02		8.50E-02
		463.36		10.49	1.98E-01		2.82E-01
		600.60		17.65	1.74E-02		1.70E-01
		606.71		4.98	-2.99E-01		1.14E+00
		635.95		11.22	-4.37E-02		2.56E-01
		671.44		1.79	-7.73E-01		1.70E+00

Analysis Report for 05-Feb-19-10020

L1-12204B-FSGS-011SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Ba-133	79.61		2.65	-1.05E+00	6.03E-02	2.07E+00
		81.00		32.90	-2.51E-01		1.34E-01
		276.40		7.16	-5.21E-02		3.77E-01
		302.85		18.34	7.27E-02		1.41E-01
		356.01		62.05	-4.10E-02		6.03E-02
		383.85		8.94	-8.04E-02		2.89E-01
	Cs-134	475.36		1.48	1.35E+00	3.61E-02	2.08E+00
		563.25		8.34	-4.29E-02		3.18E-01
		569.33		15.37	-8.24E-02		1.66E-01
		604.72		97.62	-2.20E-02		4.90E-02
		795.86		85.46	-3.79E-03		3.61E-02
		801.95		8.69	-1.58E-01		3.42E-01
		1038.61		0.99	-1.67E+00		3.57E+00
		1167.97		1.79	-5.05E-01		2.41E+00
		1365.19		3.02	-7.47E-01		1.00E+00
+	Cs-137	661.66	*	85.10	4.39E-02	2.95E-02	2.95E-02
	Eu-152	121.78		28.67	1.05E-02	9.27E-02	9.27E-02
		244.70		7.61	-9.36E-02		3.93E-01
		295.94		0.45	-1.44E+00		7.57E+00
		344.28		26.60	-3.63E-02		9.66E-02
		367.79		0.86	7.77E-01		3.01E+00
		411.12		2.24	4.19E-01		1.25E+00
		443.96		2.83	2.45E-01		9.39E-01
		488.68		0.42	4.95E+00		6.64E+00
		563.99		0.49	-6.70E-01		5.40E+00
		586.26		0.46	-4.52E+00		1.08E+01
		678.62		0.47	2.54E+00		6.50E+00
		688.67		0.86	-4.33E-01		3.78E+00
		719.35		0.28	-9.58E+00		1.05E+01
		778.90		12.96	-1.40E-02		2.25E-01
		810.45		0.32	1.95E+00		9.90E+00
		867.37		4.26	-9.74E-01		6.95E-01
		919.33		0.43	-2.97E+00		8.04E+00
		964.08		14.65	-2.01E-01		3.28E-01
		1085.87		10.24	2.61E-02		3.82E-01
		1089.74		1.73	4.20E-01		2.29E+00
		1112.07		13.69	-2.87E-01		2.90E-01
		1212.95		1.43	4.09E+00		3.63E+00
		1249.94		0.19	1.11E+01		2.41E+01
		1299.14		1.63	7.62E-01		2.47E+00
		1408.01		21.07	-4.09E-02		1.51E-01
		1457.64		0.50	-4.77E-01		3.23E+01
		1528.10		0.28	1.17E+00		9.83E+00
	Eu-154	123.07		40.40	-1.05E-03	6.44E-02	6.44E-02
		247.93		6.89	-1.53E-02		3.64E-01
		591.76		4.95	-2.55E-01		6.21E-01
		692.42		1.78	1.80E+00		1.90E+00
		723.30		20.06	-6.38E-02		1.84E-01
		756.80		4.52	6.05E-02		6.60E-01
		873.18		12.08	3.15E-02		2.56E-01
		996.29		10.48	7.69E-02		3.86E-01

Analysis Report for 05-Feb-19-10020

L1-12204B-FSGS-011SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	1004.76		18.01	1.21E-01	6.44E-02	2.20E-01
		1274.43		34.80	-3.91E-02		1.29E-01
		1596.48		1.80	-1.02E+00		1.29E+00
	Eu-155	45.30		1.31	-2.90E+00	1.45E-01	8.66E+00
		60.01		1.22	-3.94E+00		9.74E+00
		86.55		30.70	1.01E-01		1.45E-01
		105.31		21.10	9.66E-02		1.53E-01
+	Ra-226	186.21	*	3.64	1.04E+00	6.31E-01	6.31E-01
	Pa-231	27.36		10.30	9.60E-01	8.99E-01	8.99E-01
		283.69		1.70	-8.87E-01		1.45E+00
		300.07		2.47	-1.38E-01		1.06E+00
		302.65		2.20	6.05E-01		1.17E+00
		330.06		1.40	1.66E+00		2.05E+00
+	U-235	143.76		10.96	8.42E-02	4.02E-02	2.28E-01
		163.33		5.08	-2.57E-01		5.42E-01
		185.71	*	57.20	6.60E-02		4.02E-02
		202.11		1.08	6.42E-01		2.54E+00
		205.31		5.01	-4.37E-01		5.46E-01
	Am-241	59.54		35.90	-1.45E-01	3.42E-01	3.42E-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-Feb-19-10021

L1-12204B-FSGS-012SS

GAMMA SPECTRUM ANALYSIS

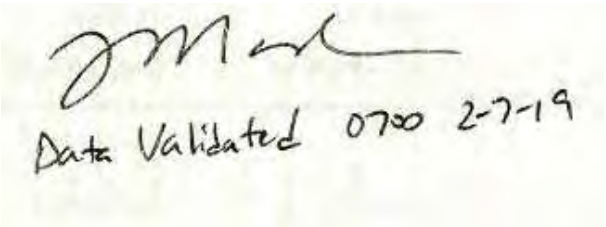
Sample Identification	: 05-Feb-19-10021
Sample Description	: L1-12204B-FSGS-012SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.190E+03 grams
Facility	: Default
Sample Taken On	: 2/4/2019 8:13:00AM
Acquisition Started	: 2/5/2019 2:09:50PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P11314
Geometry	: 130G_SOIL_1
Live Time	: 1800.0 seconds
Real Time	: 1800.5 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	: 2/5/2019
Efficiency Calibration Description	:
Sample Number	: 63854
Fill Height	: 1189.60 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 2/5/2019 2:39:55PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192



Analysis Report for 05-Feb-19-10021

L1-12204B-FSGS-012SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	77.30	306 -	315	309.72	1.13E+02	19.26	1.13E+02	0.79
	2	186.18	736 -	752	744.60	1.22E+02	20.84	9.98E+01	1.40
M	3	238.81	948 -	975	954.80	3.01E+02	17.74	7.66E+01	1.18
m	4	241.92	948 -	975	967.22	7.55E+01	10.45	9.25E+01	1.18
	5	295.46	1173 -	1189	1181.12	9.87E+01	16.13	5.13E+01	1.34
	6	338.34	1345 -	1358	1352.42	7.09E+01	13.69	4.21E+01	0.89
	7	351.94	1399 -	1415	1406.77	2.13E+02	19.46	5.30E+01	0.96
	8	510.48	2032 -	2046	2040.29	6.37E+01	14.96	5.43E+01	0.39
	9	558.69	2227 -	2239	2232.96	2.63E+01	9.64	2.47E+01	0.77
	10	583.33	2323 -	2339	2331.44	1.32E+02	13.15	1.29E+01	1.15
	11	609.42	2426 -	2442	2435.70	1.47E+02	15.21	2.72E+01	1.23
	12	661.55	2638 -	2651	2644.10	5.22E+01	9.72	1.48E+01	0.61
	13	911.13	3635 -	3651	3641.98	7.65E+01	10.17	8.50E+00	0.40
	14	969.14	3867 -	3881	3873.99	4.05E+01	9.97	2.05E+01	1.13
	15	1460.65	5828 -	5852	5840.56	5.62E+02	25.03	1.56E+01	1.64

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	0.95	511.00	*	100.00	4.08E-02	9.98E-03
K-40	0.99	1460.82	*	10.66	6.90E+00	4.29E-01

Analysis Report for 05-Feb-19-10021

L1-12204B-FSGS-012SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Cs-137	0.99	661.66	*	85.10	4.63E-02	9.05E-03
Tl-208	0.99	583.19	*	85.00	1.07E-01	1.25E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	2.55E-01	2.55E-02
		300.09		3.30		
Pb212-XR	0.99	74.82		10.28		
		77.11	*	17.10	4.11E-01	8.19E-02
		87.35		3.97		
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	2.30E-01	2.75E-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	3.87E-01	6.19E-02
		295.22	*	18.42	2.26E-01	4.11E-02
		351.93	*	35.60	2.88E-01	3.49E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	7.24E-01	1.48E-01
		87.35		2.24		
		89.78		0.82		
Ra-226	1.00	186.21	*	3.64	1.08E+00	2.04E-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	2.93E-01	6.15E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.80E-01	3.90E-02
		964.77		4.99		
		968.97	*	15.80	2.52E-01	6.31E-02
		1588.20		3.22		
U-235	0.97	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	6.90E-02	1.30E-02
		202.11		1.08		
		205.31		5.01		

Analysis Report for 05-Feb-19-10021

L1-12204B-FSGS-012SS

* = 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	0.958	4.08E-02	9.98E-03	
	K-40	0.996	6.90E+00	4.29E-01	
	Cs-137	0.998	4.63E-02	9.05E-03	
	Tl-208	0.997	1.07E-01	1.25E-02	
X	Bi-211	0.886			
	Pb-212	0.996	2.55E-01	2.55E-02	
?	Pb212-XR	0.997	4.11E-01	8.19E-02	
	Bi-214	0.999	2.30E-01	2.75E-02	
	Pb-214	0.997	2.81E-01	2.44E-02	
?	Pb214-XR	0.997	7.24E-01	1.48E-01	
?	Ra-226	1.000	1.08E+00	2.04E-01	
	Ac-228	0.999	2.77E-01	2.92E-02	
?	U-235	0.975	6.90E-02	1.30E-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-Feb-19-10021

L1-12204B-FSGS-012SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 2/5/2019 2:39:55PM
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	558.69	1.46296E-02	36.60		

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	4.08E-02	2.93E-02	2.93E-02
	BE-7	477.60		10.44	3.36E-01	2.74E-01	2.74E-01
+	K-40	1460.82	*	10.66	6.90E+00	3.69E-01	3.69E-01
	Co-60	1173.23		99.85	1.13E-02	3.96E-02	4.98E-02
		1332.49		99.98	1.70E-02		3.96E-02
	Nb-94	702.65		99.81	-1.06E-02	2.76E-02	2.76E-02
		871.09		99.89	2.19E-02		3.00E-02
	Ag-108m	79.13		6.60	-1.60E-01	2.77E-02	8.05E-01
		433.94		90.50	1.17E-02		2.77E-02
		614.28		89.80	-2.77E-02		4.61E-02
		722.94		90.80	-2.41E-02		3.90E-02
	Sb-125	176.31		6.84	1.53E-01	8.64E-02	3.32E-01
		380.45		1.52	-4.50E-01		1.55E+00
		427.87		29.60	-2.23E-02		8.64E-02
		463.36		10.49	1.80E-01		2.82E-01
		600.60		17.65	4.61E-02		1.78E-01
		606.71		4.98	1.91E+00		1.04E+00
		635.95		11.22	6.66E-02		2.32E-01

Analysis Report for 05-Feb-19-10021

L1-12204B-FSGS-012SS

	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	8.64E-02	1.54E+00
	Ba-133	79.61		2.65	-4.14E-01	5.02E-02	1.97E+00
		81.00		32.90	-1.25E-01		1.17E-01
		276.40		7.16	1.34E-01		3.40E-01
		302.85		18.34	5.66E-02		1.31E-01
		356.01		62.05	-4.44E-03		5.02E-02
		383.85		8.94	6.49E-02		2.47E-01
	Cs-134	475.36		1.48	1.04E+00	3.96E-02	1.84E+00
		563.25		8.34	-7.68E-02		3.39E-01
		569.33		15.37	2.91E-02		1.50E-01
		604.72		97.62	4.53E-03		4.42E-02
		795.86		85.46	3.76E-02		3.96E-02
		801.95		8.69	-4.02E-01		3.26E-01
		1038.61		0.99	2.06E+00		3.54E+00
		1167.97		1.79	-8.40E-01		2.50E+00
		1365.19		3.02	1.75E-01		9.33E-01
+	Cs-137	661.66	*	85.10	4.63E-02	2.21E-02	2.21E-02
	Eu-152	121.78		28.67	8.33E-04	7.88E-02	7.88E-02
		244.70		7.61	3.94E-02		3.64E-01
		295.94		0.45	7.38E+00		6.51E+00
		344.28		26.60	1.66E-02		9.08E-02
		367.79		0.86	-1.16E+00		2.68E+00
		411.12		2.24	1.91E-01		1.09E+00
		443.96		2.83	2.35E-01		9.06E-01
		488.68		0.42	5.67E-01		6.38E+00
		563.99		0.49	-1.75E+00		5.15E+00
		586.26		0.46	-3.16E+00		9.47E+00
		678.62		0.47	-1.15E+00		5.76E+00
		688.67		0.86	1.82E-01		3.44E+00
		719.35		0.28	1.60E+00		1.07E+01
		778.90		12.96	-2.21E-01		2.26E-01
		810.45		0.32	7.75E+00		1.12E+01
		867.37		4.26	-4.00E-01		7.25E-01
		919.33		0.43	-7.02E+00		7.85E+00
		964.08		14.65	-7.95E-02		3.24E-01
		1085.87		10.24	2.98E-02		3.78E-01
		1089.74		1.73	6.92E-01		2.18E+00
		1112.07		13.69	-2.86E-02		2.76E-01
		1212.95		1.43	1.44E+00		3.52E+00
		1249.94		0.19	1.11E+00		2.23E+01
		1299.14		1.63	-3.49E-01		2.64E+00
		1408.01		21.07	-2.20E-01		1.47E-01
		1457.64		0.50	1.53E+02		3.11E+01
		1528.10		0.28	-2.52E+00		7.91E+00
	Eu-154	123.07		40.40	-6.43E-03	5.52E-02	5.52E-02
		247.93		6.89	-2.71E-01		3.05E-01
		591.76		4.95	-9.94E-02		4.84E-01
		692.42		1.78	4.32E-01		1.86E+00
		723.30		20.06	-7.13E-02		1.77E-01
		756.80		4.52	4.58E-02		7.56E-01
		873.18		12.08	-1.15E-01		2.54E-01

Analysis Report for 05-Feb-19-10021

L1-12204B-FSGS-012SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	-4.54E-02	5.52E-02	3.62E-01
		1004.76		18.01	6.64E-02		2.17E-01
		1274.43		34.80	-1.70E-02		1.12E-01
		1596.48		1.80	-1.05E+00		1.81E+00
	Eu-155	45.30		1.31	9.81E-01	1.26E-01	7.84E+00
		60.01		1.22	-7.03E+00		7.94E+00
		86.55		30.70	4.73E-02		1.26E-01
		105.31		21.10	8.76E-02		1.37E-01
+	Ra-226	186.21	*	3.64	1.08E+00	5.57E-01	5.57E-01
	Pa-231	27.36		10.30	9.39E-01	8.49E-01	8.49E-01
		283.69		1.70	4.50E-01		1.42E+00
		300.07		2.47	3.44E-01		9.45E-01
		302.65		2.20	2.84E-01		1.08E+00
		330.06		1.40	1.58E+00		1.82E+00
+	U-235	143.76		10.96	1.41E-01	3.54E-02	2.13E-01
		163.33		5.08	-8.18E-02		4.01E-01
		185.71	*	57.20	6.90E-02		3.54E-02
		202.11		1.08	1.91E+00		2.12E+00
		205.31		5.01	1.15E-01		4.60E-01
	Am-241	59.54		35.90	-1.59E-01	2.78E-01	2.78E-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-Feb-19-10022

L1-12204B-FSGS-013SS

GAMMA SPECTRUM ANALYSIS

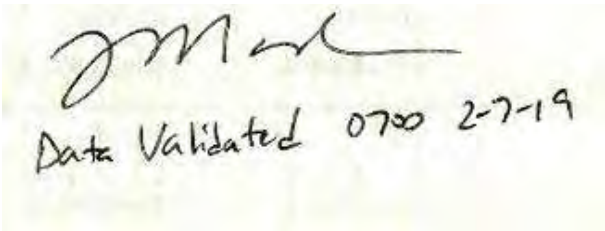
Sample Identification	: 05-Feb-19-10022
Sample Description	: L1-12204B-FSGS-013SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.097E+03 grams
Facility	: Default
Sample Taken On	: 2/4/2019 8:14:00AM
Acquisition Started	: 2/5/2019 2:38:02PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
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 - 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	: 2/5/2019
Efficiency Calibration Description	:
Sample Number	: 63856
Fill Height	: 1097.46 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 2/5/2019 3:08:06PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192



Analysis Report for 05-Feb-19-10022

L1-12204B-FSGS-013SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.83	296 -	316	300.65	6.97E+01	13.48	1.80E+02	0.84
m	2	77.07	296 -	316	309.59	1.22E+02	14.98	1.62E+02	0.84
	3	92.57	357 -	379	371.52	1.54E+02	38.82	3.48E+02	1.14
	4	186.02	737 -	753	744.82	1.77E+02	25.68	1.54E+02	0.99
	5	209.49	830 -	844	838.55	8.54E+01	21.56	1.32E+02	0.58
M	6	238.70	945 -	975	955.26	6.44E+02	66.93	1.52E+02	1.21
m	7	241.79	945 -	975	967.60	1.50E+02	20.36	1.40E+02	1.21
	8	295.21	1174 -	1189	1181.05	1.99E+02	23.03	1.10E+02	0.93
	9	338.27	1344 -	1362	1353.12	1.17E+02	21.30	9.96E+01	1.35
	10	352.00	1401 -	1418	1407.99	3.58E+02	25.40	8.85E+01	0.96
	11	462.99	1843 -	1857	1851.58	3.14E+01	13.42	5.16E+01	0.85
	12	510.82	2038 -	2054	2042.78	8.64E+01	18.26	7.66E+01	0.74
	13	583.22	2324 -	2341	2332.21	1.71E+02	19.42	6.36E+01	1.27
	14	609.40	2427 -	2445	2436.86	2.31E+02	21.15	6.41E+01	1.52
	15	727.32	2899 -	2915	2908.40	5.70E+01	12.32	3.00E+01	0.50
	16	911.17	3636 -	3653	3643.71	1.59E+02	17.45	4.45E+01	1.32
	17	968.96	3867 -	3884	3874.92	9.75E+01	14.59	3.55E+01	1.63
	18	1120.34	4471 -	4487	4480.63	5.27E+01	11.74	2.73E+01	0.90
	19	1460.97	5831 -	5854	5844.24	1.15E+03	36.00	3.69E+01	2.17
	20	1764.54	7050 -	7067	7060.21	4.63E+01	9.69	1.47E+01	0.33

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

Analysis Report for 05-Feb-19-10022

L1-12204B-FSGS-013SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.99	511.00	*	100.00	5.42E-02	1.20E-02
K-40	0.99	1460.82	*	10.66	1.35E+01	7.24E-01
Tl-208	1.00	583.19	*	85.00	1.36E-01	1.74E-02
Bi-212	1.00	39.86		1.06		
		727.33	*	6.67	6.68E-01	1.50E-01
		785.37		1.10		
		1620.50		1.47		
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	5.49E-01	7.24E-02
		300.09		3.30		
Pb212-XR	1.00	74.82	*	10.28	6.42E-01	1.41E-01
		77.11	*	17.10	6.04E-01	9.69E-02
		87.35		3.97		
		89.78		1.46		
Bi-214	1.00	609.32	*	45.49	3.52E-01	3.86E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	3.70E-01	8.37E-02
		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	4.40E-01	9.38E-02
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	7.75E-01	1.22E-01
		295.22	*	18.42	4.53E-01	6.37E-02
		351.93	*	35.60	4.78E-01	5.11E-02
		785.96		1.06		
Ra-226	0.99	186.21	*	3.64	1.61E+00	2.67E-01
Ac-228	0.99	129.07		2.42		
		209.25	*	3.89	7.67E-01	2.03E-01
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	4.81E-01	9.58E-02
		409.46		1.92		
		463.00	*	4.40	4.12E-01	1.79E-01
		794.95		4.25		
		911.20	*	25.80	5.63E-01	6.62E-02
		964.77		4.99		
		968.97	*	15.80	5.86E-01	9.14E-02
		1588.20		3.22		
Ac228-XR	0.94	89.96		1.90		
		93.35	*	3.10	2.60E+00	7.81E-01
U-235	0.98	143.76		10.96		
		163.33		5.08		

Analysis Report for 05-Feb-19-10022

L1-12204B-FSGS-013SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
U-235	0.98	185.71	*	57.20	1.02E-01	1.70E-02
		202.11		1.08		
		205.31		5.01		
U235-XR	0.94	89.96		3.47		
		93.35	*	5.60	1.44E+00	3.92E-01
		105.60		1.32		

* = 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	5.42E-02	1.20E-02	
	K-40	0.997	1.35E+01	7.24E-01	
X	Sb-125	0.417			
	Tl-208	1.000	1.36E-01	1.74E-02	
X	Bi-211	0.871			
	Bi-212	1.000	6.68E-01	1.50E-01	
	Pb-212	0.999	5.49E-01	7.24E-02	
	Pb212-XR	1.000	6.17E-01	7.98E-02	
	Bi-214	1.000	3.66E-01	3.28E-02	
	Pb-214	0.999	4.98E-01	3.79E-02	
X	Pb214-XR	1.000			
?	Ra-226	0.994	1.61E+00	2.67E-01	
	Ac-228	0.999	5.51E-01	4.42E-02	
?	Ac228-XR	0.942	2.60E+00	7.81E-01	
?	U-235	0.989	1.02E-01	1.70E-02	
?	U235-XR	0.949	1.44E+00	3.92E-01	

Analysis Report for 05-Feb-19-10022

L1-12204B-FSGS-013SS

? = 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-Feb-19-10022

L1-12204B-FSGS-013SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 2/5/2019 3:08:06PM
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	5.42E-02	3.52E-02	3.52E-02
	BE-7	477.60		10.44	5.55E-02	3.63E-01	3.63E-01
+	K-40	1460.82	*	10.66	1.35E+01	5.26E-01	5.26E-01
	Co-60	1173.23		99.85	-1.95E-02	4.36E-02	5.30E-02
		1332.49		99.98	1.93E-02		4.36E-02
	Nb-94	702.65		99.81	-4.98E-04	3.98E-02	3.98E-02
		871.09		99.89	2.98E-02		4.38E-02
	Ag-108m	79.13		6.60	-1.52E-01	3.36E-02	1.27E+00
		433.94		90.50	-3.71E-02		3.36E-02
		614.28		89.80	-1.38E-02		7.13E-02
		722.94		90.80	-3.98E-02		5.18E-02
	Sb-125	176.31		6.84	1.34E-01	1.07E-01	4.74E-01
		380.45		1.52	-9.35E-01		2.09E+00
		427.87		29.60	2.10E-02		1.07E-01
		463.36	*	10.49	1.73E-01		2.44E-01
		600.60		17.65	-1.19E-01		2.05E-01
		606.71		4.98	4.25E+00		1.32E+00
		635.95		11.22	-1.60E-01		3.11E-01
		671.44		1.79	-1.16E+00		2.12E+00

Analysis Report for 05-Feb-19-10022

L1-12204B-FSGS-013SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Ba-133	79.61	2.65	1.66E-02	7.95E-02	3.11E+00
	81.00	32.90	-1.02E-01		2.13E-01
	276.40	7.16	-2.68E-01		4.63E-01
	302.85	18.34	9.24E-03		1.73E-01
	356.01	62.05	-1.18E-02		7.95E-02
	383.85	8.94	1.71E-01		3.69E-01
Cs-134	475.36	1.48	2.04E-01	4.95E-02	2.46E+00
	563.25	8.34	-8.03E-05		4.43E-01
	569.33	15.37	-1.07E-01		2.35E-01
	604.72	97.62	5.66E-03		5.85E-02
	795.86	85.46	1.73E-02		4.95E-02
	801.95	8.69	-5.79E-01		4.58E-01
	1038.61	0.99	-2.26E-01		4.79E+00
	1167.97	1.79	1.61E+00		3.12E+00
	1365.19	3.02	1.27E+00		1.40E+00
Cs-137	661.66	85.10	4.76E-02	5.04E-02	5.04E-02
Eu-152	121.78	28.67	5.29E-02	1.21E-01	1.27E-01
	244.70	7.61	-1.98E-01		4.99E-01
	295.94	0.45	1.69E+01		9.79E+00
	344.28	26.60	-6.89E-02		1.21E-01
	367.79	0.86	-9.02E-01		3.53E+00
	411.12	2.24	-6.92E-01		1.50E+00
	443.96	2.83	1.08E+00		1.24E+00
	488.68	0.42	-1.31E-01		8.12E+00
	563.99	0.49	3.74E+00		7.58E+00
	586.26	0.46	2.66E+00		1.26E+01
	678.62	0.47	3.87E+00		7.73E+00
	688.67	0.86	3.16E-01		4.31E+00
	719.35	0.28	-5.51E+00		1.37E+01
	778.90	12.96	-5.86E-03		3.37E-01
	810.45	0.32	8.28E+00		1.23E+01
	867.37	4.26	-1.29E+00		1.04E+00
	919.33	0.43	-3.92E+00		1.08E+01
	964.08	14.65	8.89E-02		4.75E-01
	1085.87	10.24	1.91E-02		5.14E-01
	1089.74	1.73	-8.04E-01		3.00E+00
	1112.07	13.69	-9.45E-02		3.54E-01
	1212.95	1.43	2.20E+00		4.57E+00
	1249.94	0.19	4.41E+00		3.01E+01
	1299.14	1.63	-1.35E+00		3.01E+00
	1408.01	21.07	1.18E-01		1.97E-01
	1457.64	0.50	2.91E+02		4.24E+01
	1528.10	0.28	-4.10E+00		1.15E+01
Eu-154	123.07	40.40	-5.90E-02	8.94E-02	8.94E-02
	247.93	6.89	-3.91E-01		4.38E-01
	591.76	4.95	-1.15E-01		7.71E-01
	692.42	1.78	-1.45E+00		2.18E+00
	723.30	20.06	-9.99E-02		2.36E-01
	756.80	4.52	-2.28E-01		9.29E-01
	873.18	12.08	-5.29E-02		3.67E-01
	996.29	10.48	-3.54E-02		4.23E-01

Analysis Report for 05-Feb-19-10022

L1-12204B-FSGS-013SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	1004.76		18.01	-4.41E-02	8.94E-02	2.61E-01
		1274.43		34.80	-2.45E-03		1.39E-01
		1596.48		1.80	-1.79E+00		2.28E+00
	Eu-155	45.30		1.31	9.19E+00	1.95E-01	1.79E+01
		60.01		1.22	-2.23E+01		1.85E+01
		86.55		30.70	1.54E-01		2.16E-01
		105.31		21.10	1.36E-02		1.95E-01
+	Ra-226	186.21	*	3.64	1.61E+00	7.04E-01	7.04E-01
	Pa-231	27.36		10.30	2.55E+00	1.42E+00	1.97E+00
		283.69		1.70	-1.49E+00		1.78E+00
		300.07		2.47	2.29E-01		1.42E+00
		302.65		2.20	2.27E-02		1.43E+00
		330.06		1.40	2.18E+00		2.55E+00
+	U-235	143.76		10.96	1.53E-01	4.48E-02	3.27E-01
		163.33		5.08	-5.11E-01		6.33E-01
		185.71	*	57.20	1.02E-01		4.48E-02
		202.11		1.08	2.20E+00		3.15E+00
		205.31		5.01	1.24E-01		6.54E-01
	Am-241	59.54		35.90	-5.93E-01	6.43E-01	6.43E-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 05-Feb-19-10023

L1-12204B-FSGS-014SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 05-Feb-19-10023
Sample Description	: L1-12204B-FSGS-014SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.028E+03 grams
Facility	: Default
Sample Taken On	: 2/4/2019 8:15:00AM
Acquisition Started	: 2/5/2019 2:42:31PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 324
Geometry	: 130G_SOIL_1
Live Time	: 1800.0 seconds
Real Time	: 1802.2 seconds
Dead Time	: 0.12 %
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	: 2/5/2019
Efficiency Calibration Description	:
Sample Number	: 63857
Fill Height	: 1027.81 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 2/5/2019 3:12:36PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated 0700 2-7-19

Analysis Report for 05-Feb-19-10023

L1-12204B-FSGS-014SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.94	146 -	158	150.49	1.99E+02	61.11	3.60E+02	1.02
m	2	77.13	146 -	158	154.85	2.90E+02	84.48	3.04E+02	1.03
	3	92.70	183 -	189	185.96	7.88E+01	28.09	3.73E+02	0.98
	4	186.08	368 -	376	372.48	1.82E+02	28.37	2.91E+02	1.25
	5	209.22	414 -	423	418.69	6.51E+01	27.11	2.95E+02	0.84
M	6	238.61	472 -	488	477.40	7.67E+02	30.36	2.31E+02	1.10
m	7	241.89	472 -	488	483.96	1.69E+02	15.40	1.77E+02	1.10
	8	295.12	586 -	594	590.29	2.82E+02	25.11	1.64E+02	1.28
	9	338.29	671 -	681	676.55	1.35E+02	23.13	1.68E+02	1.25
	10	351.88	700 -	708	703.71	5.35E+02	28.44	1.26E+02	1.45
	11	462.90	920 -	930	925.55	7.04E+01	17.39	9.76E+01	1.31
	12	510.58	1015 -	1026	1020.86	1.54E+02	19.96	9.75E+01	2.02
	13	583.13	1160 -	1171	1165.87	2.33E+02	21.51	9.16E+01	1.00
	14	609.23	1212 -	1223	1218.04	3.90E+02	24.25	7.92E+01	1.17
	15	911.13	1815 -	1828	1821.71	1.75E+02	18.45	5.97E+01	1.33
	16	968.87	1932 -	1943	1937.21	9.03E+01	16.24	6.77E+01	1.88
	17	1120.30	2235 -	2244	2240.16	6.37E+01	13.61	5.33E+01	1.57
	18	1401.13	2798 -	2807	2802.20	1.24E+01	6.17	1.06E+01	0.60
	19	1460.65	2913 -	2928	2921.35	1.34E+03	37.55	2.22E+01	2.08
	20	1729.12	3454 -	3462	3458.98	1.56E+01	4.78	3.37E+00	0.86
	21	1764.27	3522 -	3535	3529.39	7.60E+01	9.76	6.98E+00	2.03

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

Analysis Report for 05-Feb-19-10023

L1-12204B-FSGS-014SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.97	511.00	*	100.00	8.99E-02	1.31E-02
K-40	0.99	1460.82	*	10.66	1.47E+01	7.59E-01
Tl-208	1.00	583.19	*	85.00	1.72E-01	1.89E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	6.02E-01	5.42E-02
		300.09		3.30		
Pb212-XR	0.99	74.82	*	10.28	1.27E+00	4.11E-01
		77.11	*	17.10	1.02E+00	3.16E-01
		87.35		3.97		
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	5.52E-01	4.77E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	4.15E-01	9.01E-02
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52	*	1.33	1.05E+00	5.26E-01
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59	*	2.88	7.21E-01	2.23E-01
		1764.49	*	15.30	6.70E-01	9.02E-02
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	8.05E-01	9.76E-02
		295.22	*	18.42	5.94E-01	7.11E-02
		351.93	*	35.60	6.62E-01	6.36E-02
		785.96		1.06		
Ra-226	0.99	186.21	*	3.64	1.51E+00	2.65E-01
Ac-228	0.99	129.07		2.42		
		209.25	*	3.89	5.35E-01	2.27E-01
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	5.13E-01	9.73E-02
		409.46		1.92		
		463.00	*	4.40	8.56E-01	2.21E-01
		794.95		4.25		
		911.20	*	25.80	5.75E-01	6.53E-02
		964.77		4.99		
		968.97	*	15.80	5.04E-01	9.33E-02
		1588.20		3.22		
Ac228-XR	0.96	89.96		1.90		
		93.35	*	3.10	1.05E+00	4.10E-01
Th-234	0.99	92.38		2.13		
		92.80	*	2.10	1.60E+00	6.12E-01
		112.81		0.21		
U-235	0.98	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	9.60E-02	1.69E-02

Analysis Report for 05-Feb-19-10023

L1-12204B-FSGS-014SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
U-235	0.98	202.11		1.08		
		205.31		5.01		
U235-XR	0.96	89.96		3.47		
		93.35	*	5.60	5.79E-01	2.15E-01
		105.60		1.32		

* = 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	0.973	8.99E-02	1.31E-02	
	K-40	0.995	1.47E+01	7.59E-01	
	Tl-208	1.000	1.72E-01	1.89E-02	
X	Bi-211	0.900			
	Pb-212	1.000	6.02E-01	5.42E-02	
	Pb212-XR	0.999	1.11E+00	2.50E-01	
	Bi-214	0.997	5.56E-01	3.76E-02	
	Pb-214	0.999	6.65E-01	4.26E-02	
X	Pb214-XR	0.999			
?	Ra-226	0.997	1.51E+00	2.65E-01	
	Ac-228	0.999	5.55E-01	4.50E-02	
?	Ac228-XR	0.960	1.05E+00	4.10E-01	
?	Th-234	0.999	1.60E+00	6.12E-01	
?	U-235	0.984	9.60E-02	1.69E-02	
?	U235-XR	0.965	5.79E-01	2.15E-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 05-Feb-19-10023

L1-12204B-FSGS-014SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 2/5/2019 3:12:36PM
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	8.99E-02	3.25E-02	3.25E-02
	BE-7	477.60		10.44	2.74E-02	3.13E-01	3.13E-01
+	K-40	1460.82	*	10.66	1.47E+01	3.35E-01	3.35E-01
	Co-60	1173.23		99.85	-5.06E-02	4.59E-02	5.37E-02
		1332.49		99.98	1.84E-02		4.59E-02
	Nb-94	702.65		99.81	1.53E-02	3.88E-02	3.89E-02
		871.09		99.89	-1.80E-02		3.88E-02
	Ag-108m	79.13		6.60	-7.33E-01	3.46E-02	1.09E+00
		433.94		90.50	1.50E-02		3.46E-02
		614.28		89.80	-4.50E-02		5.60E-02
		722.94		90.80	2.90E-02		4.97E-02
	Sb-125	176.31		6.84	3.09E-01	1.05E-01	4.75E-01
		380.45		1.52	-2.12E-01		2.02E+00
		427.87		29.60	-1.43E-02		1.05E-01
		463.36		10.49	3.69E-01		3.64E-01
		600.60		17.65	-1.51E-01		1.93E-01
		606.71		4.98	-6.99E-02		1.46E+00
		635.95		11.22	8.04E-02		2.98E-01
		671.44		1.79	-1.07E+00		2.05E+00

Analysis Report for 05-Feb-19-10023

L1-12204B-FSGS-014SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Ba-133	79.61	2.65	-2.15E+00	7.82E-02	2.51E+00
	81.00	32.90	-3.30E-01		1.62E-01
	276.40	7.16	-9.01E-02		4.23E-01
	302.85	18.34	1.44E-01		1.68E-01
	356.01	62.05	-8.06E-02		7.82E-02
	383.85	8.94	-9.85E-02		3.48E-01
Cs-134	475.36	1.48	-3.47E-01	4.50E-02	2.10E+00
	563.25	8.34	-8.68E-02		3.84E-01
	569.33	15.37	1.06E-02		2.09E-01
	604.72	97.62	-2.05E-03		6.46E-02
	795.86	85.46	-3.39E-03		4.50E-02
	801.95	8.69	-6.05E-02		4.50E-01
	1038.61	0.99	-1.55E+00		4.73E+00
	1167.97	1.79	2.91E-01		3.09E+00
	1365.19	3.02	3.68E-01		1.15E+00
Cs-137	661.66	85.10	1.38E-02	4.30E-02	4.30E-02
Eu-152	121.78	28.67	-3.09E-03	1.05E-01	1.05E-01
	244.70	7.61	-2.32E-01		4.68E-01
	295.94	0.45	1.84E+01		9.71E+00
	344.28	26.60	-5.82E-02		1.15E-01
	367.79	0.86	6.09E-01		3.49E+00
	411.12	2.24	5.73E-01		1.43E+00
	443.96	2.83	6.03E-02		1.00E+00
	488.68	0.42	-2.82E+00		7.73E+00
	563.99	0.49	-4.75E-01		6.60E+00
	586.26	0.46	-6.42E-01		1.33E+01
	678.62	0.47	6.73E-01		8.01E+00
	688.67	0.86	-1.86E+00		4.16E+00
	719.35	0.28	-1.29E+01		1.24E+01
	778.90	12.96	-1.98E-01		2.72E-01
	810.45	0.32	-4.32E+00		1.14E+01
	867.37	4.26	-5.56E-01		9.23E-01
	919.33	0.43	-3.77E+00		9.77E+00
	964.08	14.65	-4.53E-02		4.00E-01
	1085.87	10.24	-9.24E-02		4.52E-01
	1089.74	1.73	1.24E+00		2.80E+00
	1112.07	13.69	-9.84E-02		3.82E-01
	1212.95	1.43	2.47E-01		4.33E+00
	1249.94	0.19	-2.91E+00		2.72E+01
	1299.14	1.63	-4.80E-02		2.85E+00
	1408.01	21.07	1.02E-01		2.00E-01
	1457.64	0.50	-1.33E+00		4.19E+01
	1528.10	0.28	1.24E-01		8.64E+00
Eu-154	123.07	40.40	-2.13E-02	7.34E-02	7.34E-02
	247.93	6.89	-2.13E-02		4.14E-01
	591.76	4.95	3.29E-01		7.46E-01
	692.42	1.78	-6.77E-01		2.00E+00
	723.30	20.06	3.61E-01		2.39E-01
	756.80	4.52	1.81E-01		8.66E-01
	873.18	12.08	1.18E-01		3.30E-01
	996.29	10.48	1.82E-01		4.36E-01

Analysis Report for 05-Feb-19-10023

L1-12204B-FSGS-014SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	1004.76		18.01	-1.05E-01	7.34E-02	2.28E-01
		1274.43		34.80	-7.96E-02		1.48E-01
		1596.48		1.80	-1.29E+00		1.83E+00
	Eu-155	45.30		1.31	1.68E+00	1.66E-01	1.02E+01
		60.01		1.22	4.42E-01		1.17E+01
		86.55		30.70	1.46E-02		1.69E-01
		105.31		21.10	3.40E-02		1.66E-01
+	Ra-226	186.21	*	3.64	1.51E+00	7.25E-01	7.25E-01
	Pa-231	27.36		10.30	5.97E-01	9.92E-01	9.92E-01
		283.69		1.70	-2.90E-01		1.65E+00
		300.07		2.47	-1.51E+00		1.31E+00
		302.65		2.20	1.20E+00		1.40E+00
		330.06		1.40	1.20E+00		2.34E+00
+	U-235	143.76		10.96	7.70E-02	4.62E-02	2.71E-01
		163.33		5.08	1.18E-01		6.18E-01
		185.71	*	57.20	9.60E-02		4.62E-02
		202.11		1.08	5.62E-01		2.96E+00
		205.31		5.01	-3.23E-01		6.28E-01
	Am-241	59.54		35.90	-1.97E-02	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 05-Feb-19-10024
L1-12204B-FSGS-015SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	:05-Feb-19-10024
Sample Description	:L1-12204B-FSGS-015SS
Sample Type	:Soil
Unit	:
Sample Point	:
Sample Size	: 1.234E+03 grams
Facility	Default
Sample TakenOn	:2/4/2019 8:16:00AM
AcquisitionStarted	:2/5/2019 2:42:37PM
Procedure	: 130G_SOIL_1
Operator	:Administrator
Detector Name	:P11314
Geometry	:130G_SOIL_1
Live Time	:1800.0 seconds
Real Time	:1800.8 seconds
Dead Time	: 0.05 %
Peak Locate Threshold	:3.00
Peak Locate Range (inchannels)	:120 - 8192
Peak Area Range (in channels)	:120 - 8192
IdentificationEnergy Tolerance	:1.000 keV
Energy Calibration Used Done On	:1/24/2019
Efficiency Calibration Used Done On	:2/5/2019
Efficiency Calibration Description	:
Sample Number	: 63858
Fill Height	: 1233.95 gram
Certificate Name	:Eu155-Na22
Certificate Date	:12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 2/5/2019 3:12:42PM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192

Data Validated 0700 2-7-19

Analysis Report for 05-Feb- 19- 10024

L1-12204B-FSGS-015SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.95	295 -	316	300.33	1.26E+02	16.78	2.92E+02	0.98
m	2	77.40	295 -	316	310.12	2.46E+02	19.52	3.24E+02	0.99
	3	93.11	369 -	379	372.87	1.22E+02	25.76	2.25E+02	0.70
	4	186.10	738 -	752	744.29	1.78E+02	27.49	2.01E+02	1.33
	5	209.50	831 -	842	837.75	9.75E+01	20.77	1.33E+02	0.59
M	6	238.81	949 -	973	954.83	6.37E+02	67.61	1.31E+02	1.06
m	7	241.94	949 -	973	967.30	1.78E+02	23.21	1.30E+02	1.06
M	8	295.43	1173 -	1206	1181.00	2.55E+02	51.22	1.16E+02	1.05
m	9	300.30	1173 -	1206	1200.45	5.30E+01	13.65	9.84E+01	1.05
	10	338.33	1347 -	1358	1352.38	1.59E+02	18.26	6.94E+01	1.01
	11	352.00	1399 -	1416	1407.02	4.91E+02	28.73	1.03E+02	1.14
	12	387.91	1545 -	1555	1550.48	1.82E+01	11.07	4.38E+01	0.37
	13	510.60	2034 -	2050	2040.77	1.19E+02	17.86	6.39E+01	0.53
	14	558.52	2227 -	2238	2232.27	2.29E+01	10.27	3.21E+01	0.38
	15	583.25	2324 -	2338	2331.11	2.08E+02	19.29	5.73E+01	1.34
	16	609.36	2427 -	2446	2435.46	3.72E+02	22.63	4.14E+01	1.51
	17	661.63	2638 -	2653	2644.42	1.19E+02	15.01	3.55E+01	1.42
	18	727.16	2899 -	2913	2906.38	5.29E+01	11.69	2.91E+01	0.90
	19	911.23	3632 -	3652	3642.38	1.46E+02	17.67	4.52E+01	1.97
M	20	964.49	3849 -	3883	3855.39	3.59E+01	7.21	2.25E+01	1.58
m	21	968.92	3849 -	3883	3873.07	9.49E+01	10.08	2.60E+01	1.59
	22	1120.35	4470 -	4487	4478.80	5.00E+01	14.03	4.50E+01	0.38
	23	1460.71	5826 -	5854	5840.79	1.16E+03	35.03	1.45E+01	1.91
	24	1764.19	7048 -	7063	7055.83	4.40E+01	8.61	1.00E+01	0.38

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Analysis Report for 05-Feb- 19- 10024

L1-12204B-FSGS-015SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.97	511.00	*	100.00	7.54E-02	1.24E-02
K-40	0.99	1460.82	*	10.66	1.40E+01	7.42E-01
Cs-137	1.00	661.66	*	85.10	1.04E-01	1.45E-02
Tl-208	0.99	583.19	*	85.00	1.67E-01	1.84E-02
Bi-212	0.99	39.86		1.06		
		727.33	*	6.67	6.30E-01	1.44E-01
		785.37		1.10		
		1620.50		1.47		
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	5.33E-01	7.11E-02
		300.09	*	3.30	6.76E-01	1.82E-01
Bi-214	0.99	609.32	*	45.49	5.74E-01	4.91E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	3.58E-01	1.02E-01
		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	4.30E-01	8.58E-02
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	9.04E-01	1.38E-01
		295.22	*	18.42	5.77E-01	1.25E-01
		351.93	*	35.60	6.55E-01	6.50E-02
		785.96		1.06		
Pb214-XR	0.99	74.82	*	5.80	1.47E+00	2.56E-01
		77.11	*	9.70	1.56E+00	2.15E-01
		87.35		2.24		
		89.78		0.82		
Ra-226	0.99	186.21	*	3.64	1.56E+00	2.72E-01
Ac-228	0.90	129.07		2.42		
		209.25	*	3.89	8.50E-01	1.94E-01
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	6.49E-01	9.16E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	5.25E-01	6.75E-02
		964.77	*	4.99	6.96E-01	1.43E-01
		968.97	*	15.80	5.82E-01	6.70E-02
		1588.20		3.22		
Ac228-XR	0.99	89.96		1.90		

Analysis Report for 05-Feb- 19- 10024

L1-12204B-FSGS-015SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Ac228-XR	0.99	93.35	*	3.10	1.67E+00	4.45E-01
Th-234	0.99	92.38		2.13		
		92.80	*	2.10	2.55E+00	6.45E-01
		112.81		0.21		
U-235	0.98	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	9.95E-02	1.73E-02
		202.11		1.08		
		205.31		5.01		
U235-XR	0.99	89.96		3.47		
		93.35	*	5.60	9.23E-01	2.17E-01
		105.60		1.32		

* = 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 1.000 sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.975	7.54E-02	1.24E-02	
	K-40	0.998	1.40E+01	7.42E-01	
	Cs-137	1.000	1.04E-01	1.45E-02	
	Tl-208	0.999	1.67E-01	1.84E-02	
X	Bi-211	0.871			
	Bi-212	0.997	6.30E-01	1.44E-01	
	Pb-212	0.995	5.52E-01	6.63E-02	
X	Pb212-XR	0.992			
	Bi-214	0.998	5.12E-01	3.93E-02	
	Pb-214	0.997	6.78E-01	5.32E-02	
	Pb214-XR	0.992	1.52E+00	1.65E-01	
?	Ra-226	0.998	1.56E+00	2.72E-01	
	Ac-228	0.907	5.95E-01	3.96E-02	
?	Ac228-XR	0.994	1.67E+00	4.45E-01	
X	Pa-231	0.999			

Analysis Report for 05-Feb-19-10024

L1-12204B-FSGS-015SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
?	Th-234	0.993	2.55E+00	6.45E-01	
?	U-235	0.983	9.95E-02	1.73E-02	
?	U235-XR	0.995	9.23E-01	2.17E-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 1.000 sigma

Analysis Report for 05-Feb-19-10024
L1-12204B-FSGS-015SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 2/5/2019 3:12:42PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
12	387.91	1.01254E-02	60.75	Sum	
14	558.52	1.27222E-02	44.84		

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

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	7.54E-02	3.22E-02	3.22E-02
	BE-7	477.60		10.44	1.48E-01	3.40E-01	3.40E-01
+	K-40	1460.82	*	10.66	1.40E+01	3.71E-01	3.71E-01
	Co-60	1173.23		99.85	-2.74E-02	5.47E-02	5.72E-02
		1332.49		99.98	3.36E-02		5.47E-02
	Nb-94	702.65		99.81	1.35E-02	3.87E-02	3.95E-02
		871.09		99.89	-2.48E-02		3.87E-02
	Ag-108m	79.13		6.60	-9.30E-03	3.52E-02	1.13E+00
		433.94		90.50	3.13E-03		3.52E-02
		614.28		89.80	1.66E-02		6.59E-02
		722.94		90.80	-2.89E-02		5.32E-02
	Sb-125	176.31		6.84	5.48E-02	1.18E-01	4.28E-01
		380.45		1.52	-1.28E+00		1.97E+00
		427.87		29.60	1.09E-02		1.18E-01
		463.36		10.49	-3.05E-02		3.43E-01
		600.60		17.65	-8.62E-02		1.95E-01
		606.71		4.98	-4.23E-02		1.51E+00

Analysis Report for 05-Feb- 19- 10024

L1-12204B-FSGS-015SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	635.95		11.22	-1.20E-01	1.18E-01	3.17E-01
		671.44		1.79	-4.31E+00		2.12E+00
	Ba-133	79.61		2.65	2.99E-01	7.19E-02	2.78E+00
		81.00		32.90	-1.22E-01		1.73E-01
		276.40		7.16	3.95E-01		4.59E-01
		302.85		18.34	6.92E-02		1.80E-01
		356.01		62.05	-1.78E-02		7.19E-02
		383.85		8.94	-1.60E-02		3.55E-01
	Cs-134	475.36		1.48	4.56E-01	5.13E-02	2.34E+00
		563.25		8.34	4.41E-01		4.75E-01
		569.33		15.37	-9.49E-02		2.25E-01
		604.72		97.62	7.90E-03		6.12E-02
		795.86		85.46	2.36E-02		5.13E-02
		801.95		8.69	1.56E-01		5.16E-01
		1038.61		0.99	1.80E+00		4.68E+00
		1167.97		1.79	-2.18E-01		3.24E+00
		1365.19		3.02	4.85E-01		1.32E+00
+	Cs-137	661.66	*	85.10	1.04E-01	3.32E-02	3.32E-02
	Eu-152	121.78		28.67	1.73E-02	1.10E-01	1.10E-01
		244.70		7.61	-4.49E-01		5.00E-01
		295.94		0.45	2.92E-01		9.90E+00
		344.28		26.60	1.09E-02		1.23E-01
		367.79		0.86	-1.22E+00		3.20E+00
		411.12		2.24	5.96E-01		1.49E+00
		443.96		2.83	-1.63E-01		1.14E+00
		488.68		0.42	-3.13E+00		7.83E+00
		563.99		0.49	5.62E+00		7.61E+00
		586.26		0.46	-3.02E+00		1.33E+01
		678.62		0.47	-2.50E+00		8.05E+00
		688.67		0.86	7.03E-01		4.66E+00
		719.35		0.28	-8.75E-01		1.44E+01
		778.90		12.96	-3.46E-01		3.27E-01
		810.45		0.32	3.86E-01		1.30E+01
		867.37		4.26	-5.15E-01		9.23E-01
		919.33		0.43	-6.79E+00		9.58E+00
		964.08		14.65	-8.90E-02		4.42E-01
		1085.87		10.24	2.46E-01		5.23E-01
		1089.74		1.73	3.91E+00		3.10E+00
		1112.07		13.69	7.67E-02		3.88E-01
		1212.95		1.43	4.25E+00		5.08E+00
		1249.94		0.19	-6.82E+00		3.00E+01
		1299.14		1.63	3.03E+00		3.21E+00
		1408.01		21.07	9.56E-04		2.31E-01
		1457.64		0.50	7.04E-01		4.31E+01
		1528.10		0.28	-2.42E+00		1.18E+01
	Eu-154	123.07		40.40	1.16E-03	7.79E-02	7.79E-02
		247.93		6.89	-1.13E-02		4.13E-01
		591.76		4.95	-9.09E-02		6.77E-01
		692.42		1.78	1.96E+00		2.35E+00
		723.30		20.06	-1.72E-01		2.41E-01
		756.80		4.52	3.53E-01		8.32E-01

Analysis Report for 05-Feb-19-10024

L1-12204B-FSGS-015SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	873.18		12.08	9.11E-02	7.79E-02	3.51E-01
		996.29		10.48	7.59E-02		4.47E-01
		1004.76		18.01	-1.48E-02		2.71E-01
		1274.43		34.80	-2.08E-01		1.51E-01
		1596.48		1.80	3.01E-01		1.79E+00
	Eu-155	45.30		1.31	2.22E+00	1.70E-01	1.07E+01
		60.01		1.22	-2.24E+00		1.19E+01
		86.55		30.70	2.16E-01		1.85E-01
		105.31		21.10	2.83E-02		1.70E-01
+	Ra-226	186.21	*	3.64	1.56E+00	7.40E-01	7.40E-01
	Pa-231	27.36		10.30	1.82E+00	8.59E-01	1.23E+00
		283.69		1.70	6.30E-01		1.84E+00
		300.07	*	2.47	9.03E-01		8.59E-01
		302.65		2.20	6.35E-01		1.50E+00
		330.06		1.40	2.09E+00		2.46E+00
+	U-235	143.76		10.96	1.31E-01	4.71E-02	2.96E-01
		163.33		5.08	-1.31E-01		5.99E-01
		185.71	*	57.20	9.95E-02		4.71E-02
		202.11		1.08	-2.56E+00		2.65E+00
		205.31		5.01	2.34E-02		5.76E-01
	Am-241	59.54		35.90	-6.58E-02	4.15E-01	4.15E-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-Feb-19-10025

L1-12204B-FSGS-016SS

GAMMA SPECTRUM ANALYSIS

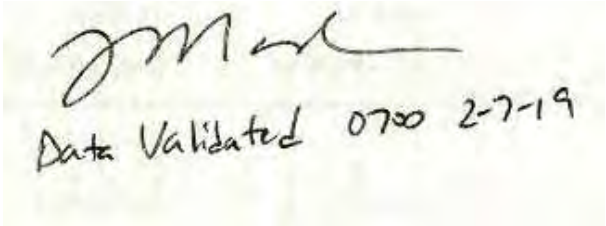
Sample Identification	: 05-Feb-19-10025
Sample Description	: L1-12204B-FSGS-016SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.036E+03 grams
Facility	: Default
Sample Taken On	: 2/4/2019 8:17:00AM
Acquisition Started	: 2/5/2019 3:09:41PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
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 - 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	: 2/5/2019
Efficiency Calibration Description	:
Sample Number	: 63859
Fill Height	: 1036.10 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 2/5/2019 3:39:46PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192



Analysis Report for 05-Feb-19-10025

L1-12204B-FSGS-016SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.88	295 -	314	300.87	9.12E+01	13.50	1.64E+02	0.93
m	2	76.94	295 -	314	309.06	1.10E+02	14.48	1.86E+02	0.93
	3	185.98	737 -	751	744.66	1.26E+02	24.03	1.56E+02	1.07
M	4	238.73	945 -	974	955.40	4.83E+02	60.83	1.66E+02	1.16
m	5	241.89	945 -	974	968.03	9.95E+01	16.70	1.53E+02	1.16
	6	295.30	1173 -	1191	1181.42	2.25E+02	23.30	9.40E+01	0.90
	7	338.32	1347 -	1360	1353.31	8.92E+01	18.27	8.88E+01	1.09
	8	351.97	1399 -	1415	1407.89	3.29E+02	24.63	8.89E+01	1.20
	9	510.60	2033 -	2050	2041.88	9.58E+01	17.43	6.32E+01	1.01
	10	583.22	2324 -	2339	2332.20	1.80E+02	17.66	4.40E+01	1.46
	11	609.39	2427 -	2445	2436.82	2.69E+02	21.09	5.22E+01	1.37
	12	727.20	2902 -	2913	2907.89	2.45E+01	9.46	2.55E+01	0.49
	13	860.95	3437 -	3449	3442.82	2.83E+01	8.54	1.67E+01	0.91
	14	911.44	3635 -	3654	3644.80	1.49E+02	15.94	3.00E+01	1.64
	15	969.10	3865 -	3882	3875.46	6.87E+01	13.76	3.73E+01	1.35
	16	1120.53	4475 -	4487	4481.39	3.29E+01	10.53	2.91E+01	0.81
	17	1460.90	5830 -	5858	5843.95	1.03E+03	32.96	1.37E+01	2.12
	18	1764.26	7053 -	7067	7059.10	4.22E+01	7.72	5.83E+00	0.65

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

Analysis Report for 05-Feb-19-10025

L1-12204B-FSGS-016SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.97	511.00	*	100.00	6.16E-02	1.20E-02
K-40	0.99	1460.82	*	10.66	1.24E+01	6.72E-01
Tl-208	1.00	583.19	*	85.00	1.46E-01	1.68E-02
Bi-212	0.99	39.86		1.06		
		727.33	*	6.67	2.95E-01	1.15E-01
		785.37		1.10		
		1620.50		1.47		
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	4.22E-01	6.31E-02
		300.09		3.30		
Pb212-XR	0.99	74.82	*	10.28	8.54E-01	1.54E-01
		77.11	*	17.10	5.58E-01	9.34E-02
		87.35		3.97		
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	4.20E-01	4.15E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	2.37E-01	7.64E-02
		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	4.12E-01	7.72E-02
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	5.26E-01	9.77E-02
		295.22	*	18.42	5.24E-01	6.86E-02
		351.93	*	35.60	4.50E-01	4.93E-02
		785.96		1.06		
Ra-226	0.99	186.21	*	3.64	1.17E+00	2.42E-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	3.74E-01	8.26E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	5.40E-01	6.22E-02
		964.77		4.99		
		968.97	*	15.80	4.24E-01	8.69E-02
		1588.20		3.22		
U-235	0.99	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	7.43E-02	1.54E-02
		202.11		1.08		

Analysis Report for 05-Feb-19-10025

L1-12204B-FSGS-016SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
U-235	0.99	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	0.975	6.16E-02	1.20E-02	
	K-40	0.999	1.24E+01	6.72E-01	
	Tl-208	1.000	1.46E-01	1.68E-02	
X	Bi-211	0.877			
	Bi-212	0.998	2.95E-01	1.15E-01	
	Pb-212	0.998	4.22E-01	6.31E-02	
	Pb212-XR	0.997	6.38E-01	7.98E-02	
	Bi-214	0.997	3.85E-01	3.30E-02	
	Pb-214	0.999	4.82E-01	3.70E-02	
X	Pb214-XR	0.997			
?	Ra-226	0.992	1.17E+00	2.42E-01	
	Ac-228	0.997	4.66E-01	4.31E-02	
?	U-235	0.992	7.43E-02	1.54E-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-Feb-19-10025

L1-12204B-FSGS-016SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 2/5/2019 3:39:46PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
13	860.95	1.57407E-02	30.15		

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	6.16E-02	3.33E-02	3.33E-02
	BE-7	477.60		10.44	2.77E-01	3.43E-01	3.43E-01
+	K-40	1460.82	*	10.66	1.24E+01	3.56E-01	3.56E-01
	Co-60	1173.23		99.85	1.84E-02	4.94E-02	5.61E-02
		1332.49		99.98	2.44E-02		4.94E-02
	Nb-94	702.65		99.81	-2.23E-02	3.85E-02	4.14E-02
		871.09		99.89	2.24E-02		3.85E-02
	Ag-108m	79.13		6.60	-5.46E-01	3.64E-02	1.29E+00
		433.94		90.50	-4.72E-02		3.64E-02
		614.28		89.80	1.59E-02		7.57E-02
		722.94		90.80	1.03E-02		4.80E-02
	Sb-125	176.31		6.84	-1.10E-01	1.12E-01	4.32E-01
		380.45		1.52	6.74E-01		2.06E+00
		427.87		29.60	-4.38E-03		1.12E-01
		463.36		10.49	1.10E-01		3.50E-01
		600.60		17.65	-4.26E-02		2.02E-01
		606.71		4.98	3.74E+00		1.38E+00
		635.95		11.22	-4.68E-01		3.08E-01

Analysis Report for 05-Feb-19-10025

L1-12204B-FSGS-016SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	8.12E-01	1.12E-01	2.31E+00
Ba-133	79.61	2.65	-1.53E+00	7.90E-02	3.13E+00
	81.00	32.90	-1.78E-01		2.10E-01
	276.40	7.16	2.27E-01		4.65E-01
	302.85	18.34	7.87E-02		1.73E-01
	356.01	62.05	-3.39E-02		7.90E-02
	383.85	8.94	-2.43E-01		3.59E-01
Cs-134	475.36	1.48	1.76E-01	5.54E-02	2.30E+00
	563.25	8.34	-7.22E-02		3.88E-01
	569.33	15.37	-4.57E-02		2.10E-01
	604.72	97.62	-2.64E-03		6.45E-02
	795.86	85.46	6.76E-02		5.54E-02
	801.95	8.69	-5.93E-02		4.83E-01
	1038.61	0.99	9.09E-01		4.41E+00
	1167.97	1.79	9.40E-01		3.12E+00
	1365.19	3.02	5.85E-01		1.27E+00
Cs-137	661.66	85.10	3.80E-02	4.82E-02	4.82E-02
Eu-152	121.78	28.67	9.51E-02	1.12E-01	1.28E-01
	244.70	7.61	-1.58E-01		4.89E-01
	295.94	0.45	1.40E+01		9.65E+00
	344.28	26.60	-6.60E-02		1.12E-01
	367.79	0.86	-1.37E+00		3.56E+00
	411.12	2.24	-8.73E-04		1.54E+00
	443.96	2.83	-9.98E-01		1.13E+00
	488.68	0.42	2.69E+00		7.70E+00
	563.99	0.49	-3.49E+00		6.37E+00
	586.26	0.46	-7.48E+00		1.27E+01
	678.62	0.47	1.02E+01		8.55E+00
	688.67	0.86	-6.65E+00		4.22E+00
	719.35	0.28	2.56E+00		1.40E+01
	778.90	12.96	-2.35E-01		3.15E-01
	810.45	0.32	-1.68E+00		1.20E+01
	867.37	4.26	-1.82E-01		9.24E-01
	919.33	0.43	-1.10E+00		1.07E+01
	964.08	14.65	2.04E-01		4.34E-01
	1085.87	10.24	-2.16E-01		4.92E-01
	1089.74	1.73	-9.14E-01		2.96E+00
	1112.07	13.69	1.58E-01		4.21E-01
	1212.95	1.43	9.50E-01		4.31E+00
	1249.94	0.19	2.53E+01		2.91E+01
	1299.14	1.63	1.42E+00		3.40E+00
	1408.01	21.07	2.46E-01		2.18E-01
	1457.64	0.50	-9.22E+00		4.07E+01
	1528.10	0.28	-6.97E-01		1.05E+01
Eu-154	123.07	40.40	3.77E-02	8.90E-02	8.90E-02
	247.93	6.89	-2.29E-01		4.56E-01
	591.76	4.95	1.68E-01		7.30E-01
	692.42	1.78	5.48E-01		2.19E+00
	723.30	20.06	2.19E-01		2.17E-01
	756.80	4.52	-7.15E-01		9.05E-01
	873.18	12.08	-1.31E-01		3.19E-01

Analysis Report for 05-Feb-19-10025

L1-12204B-FSGS-016SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	-2.18E-01	8.90E-02	3.85E-01
		1004.76		18.01	1.01E-01		2.57E-01
		1274.43		34.80	2.43E-02		1.38E-01
		1596.48		1.80	-2.09E+00		1.79E+00
	Eu-155	45.30		1.31	-5.36E+00	1.92E-01	1.66E+01
		60.01		1.22	-1.21E+01		1.80E+01
		86.55		30.70	-6.36E-02		2.01E-01
		105.31		21.10	5.62E-02		1.92E-01
+	Ra-226	186.21	*	3.64	1.17E+00	6.96E-01	6.96E-01
	Pa-231	27.36		10.30	2.96E+00	1.43E+00	2.09E+00
		283.69		1.70	-1.77E+00		1.74E+00
		300.07		2.47	7.04E-01		1.46E+00
		302.65		2.20	2.61E-01		1.43E+00
		330.06		1.40	-5.85E-01		2.40E+00
+	U-235	143.76		10.96	6.62E-02	4.43E-02	3.21E-01
		163.33		5.08	5.12E-02		5.92E-01
		185.71	*	57.20	7.43E-02		4.43E-02
		202.11		1.08	-1.41E-01		2.96E+00
		205.31		5.01	-8.99E-01		6.08E-01
	Am-241	59.54		35.90	-1.66E-01	6.29E-01	6.29E-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-Feb-19-10026
L1-12204B-FSGS-017SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 05-Feb-19-10026
Sample Description	: L1-12204B-FSGS-017SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.205E+03 grams
Facility	Default
Sample TakenOn	: 2/4/2019 8:18:00AM
AcquisitionStarted	: 2/5/2019 3:15:46PM
Procedure	: 130G_SOIL_1
Operator	Administrator
Detector Name	: 324
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 (inchannels)	: 120 - 4096
Peak Area Range (in channels)	: 120 - 4096
IdentificationEnergy Tolerance	: 1.000 keV
EnergyCalibration Used Done On	: 9/29/2018
EfficiencyCalibration Used Done On	: 2/5/2019
EfficiencyCalibration Description	:
Sample Number	: 63860
Fill Height	: 1204.93 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 2/5/2019 3:30:49PM

Peak Analysis FromChannel : 120
Peak Analysis To Channel : 4096

Data Validated 0700 2-7-19

Analysis Report for 05-Feb-19-10026

L1-12204B-FSGS-017SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.58	472 - 480		477.33	1.21E+02	18.53	1.04E+02	1.27
2	295.17	585 - 595		590.40	4.77E+01	13.57	5.73E+01	0.75
3	351.69	699 - 708		703.32	9.11E+01	13.62	4.09E+01	1.47
4	583.30	1161 - 1170		1166.20	3.73E+01	8.91	1.87E+01	1.24
5	609.16	1212 - 1223		1217.89	7.46E+01	10.17	1.14E+01	1.47
6	661.59	1319 - 1328		1322.71	6.37E+01	10.18	1.63E+01	1.84
7	911.23	1816 - 1827		1821.92	4.02E+01	9.52	1.98E+01	1.83
8	1460.47	2913 - 2928		2921.00	3.05E+02	18.14	8.02E+00	1.93

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

No background subtract performed on this spectrum

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.82	*	10.66	6.21E+00	4.58E-01
Cs-137	0.99	661.66	*	85.10	9.56E-02	1.63E-02
Tl-208	0.99	583.19	*	85.00	5.15E-02	1.27E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.80E-01	3.11E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.98E-01	2.95E-02
		768.36		4.89		
		806.18		1.26		

Analysis Report for 05-Feb-19-10026

L1-12204B-FSGS-017SS

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	1.89E-01	5.60E-02
		351.93	*	35.60	2.12E-01	3.60E-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	2.47E-01	5.93E-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
EnergyTolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000 sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 05-Feb-19-10026

L1-12204B-FSGS-017SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.981	6.21E+00	4.58E-01	
	Cs-137	0.999	9.56E-02	1.63E-02	
	Tl-208	0.998	5.15E-02	1.27E-02	
X	Bi-211	0.941			
	Pb-212	1.000	1.80E-01	3.11E-02	
	Bi-214	0.998	1.98E-01	2.95E-02	
	Pb-214	0.994	2.06E-01	3.03E-02	
	Ac-228	1.000	2.47E-01	5.93E-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 1.000 sigma

Analysis Report for 05-Feb-19-10026
L1-12204B-FSGS-017SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 2/5/2019 3:30:49PM
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 1.000 sigma

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	6.08E-02	5.47E-02	5.47E-02
	BE-7	477.60		10.44	3.36E-02	3.50E-01	3.50E-01
+	K-40	1460.82	*	10.66	6.21E+00	3.98E-01	3.98E-01
	Co-60	1173.23		99.85	3.04E-02	4.71E-02	5.91E-02
		1332.49		99.98	3.06E-02		4.71E-02
	Nb-94	702.65		99.81	9.28E-03	4.04E-02	4.05E-02
		871.09		99.89	1.14E-02		4.04E-02
	Ag-108m	79.13		6.60	4.05E-01	3.18E-02	1.12E+00
		433.94		90.50	-1.97E-02		3.18E-02
		614.28		89.80	-1.99E-02		4.39E-02
		722.94		90.80	-8.35E-03		4.95E-02
	Sb-125	176.31		6.84	-4.77E-03	1.04E-01	5.23E-01
		380.45		1.52	-1.66E-01		2.19E+00
		427.87		29.60	-2.09E-02		1.04E-01
		463.36		10.49	-5.59E-03		3.36E-01
		600.60		17.65	-6.24E-02		1.95E-01
		606.71		4.98	-1.31E-01		1.21E+00
		635.95		11.22	-3.36E-02		2.87E-01
		671.44		1.79	-1.17E+00		1.90E+00

Analysis Report for 05-Feb-19-10026

L1-12204B-FSGS-017SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Ba-133	79.61		2.65	8.92E-01	7.20E-02	2.64E+00
		81.00		32.90	-1.47E-01		1.75E-01
		276.40		7.16	-1.13E-01		4.45E-01
		302.85		18.34	1.70E-02		1.74E-01
		356.01		62.05	-1.03E-02		7.20E-02
		383.85		8.94	-1.96E-02		3.60E-01
	Cs-134	475.36		1.48	3.15E-01	4.54E-02	2.40E+00
		563.25		8.34	3.42E-02		4.36E-01
		569.33		15.37	6.00E-02		2.55E-01
		604.72		97.62	-1.16E-02		5.61E-02
		795.86		85.46	8.53E-03		4.54E-02
		801.95		8.69	-8.70E-03		4.41E-01
		1038.61		0.99	1.23E+00		5.08E+00
		1167.97		1.79	1.91E+00		3.29E+00
		1365.19		3.02	6.85E-01		1.24E+00
+	Cs-137	661.66	*	85.10	9.56E-02	3.64E-02	3.64E-02
	Eu-152	121.78		28.67	-2.93E-02	1.13E-01	1.13E-01
		244.70		7.61	1.38E-01		4.74E-01
		295.94		0.45	-1.31E+00		8.74E+00
		344.28		26.60	-5.33E-02		1.30E-01
		367.79		0.86	3.68E-01		4.10E+00
		411.12		2.24	-2.39E-01		1.46E+00
		443.96		2.83	-1.28E-01		1.16E+00
		488.68		0.42	-2.91E+00		7.44E+00
		563.99		0.49	3.16E-01		7.49E+00
		586.26		0.46	-6.36E+00		1.09E+01
		678.62		0.47	4.00E+00		8.26E+00
		688.67		0.86	-1.08E+00		3.71E+00
		719.35		0.28	7.21E+00		1.49E+01
		778.90		12.96	-1.73E-01		3.25E-01
		810.45		0.32	5.06E+00		1.31E+01
		867.37		4.26	-5.30E-01		8.12E-01
		919.33		0.43	-1.46E+00		9.43E+00
		964.08		14.65	2.09E-02		3.68E-01
		1085.87		10.24	-1.93E-01		3.49E-01
		1089.74		1.73	1.02E+00		2.76E+00
		1112.07		13.69	5.39E-02		3.83E-01
		1212.95		1.43	-1.07E+00		3.52E+00
		1249.94		0.19	1.13E+01		2.66E+01
		1299.14		1.63	1.89E+00		3.05E+00
		1408.01		21.07	-1.49E-01		1.36E-01
		1457.64		0.50	4.67E-01		3.82E+01
		1528.10		0.28	-3.87E+00		1.08E+01
	Eu-154	123.07		40.40	9.36E-03	8.19E-02	8.19E-02
		247.93		6.89	-4.49E-02		4.42E-01
		591.76		4.95	2.75E-01		7.95E-01
		692.42		1.78	-4.81E-01		1.88E+00
		723.30		20.06	-2.45E-02		2.27E-01
		756.80		4.52	1.08E-01		9.27E-01
		873.18		12.08	-6.99E-02		3.29E-01
		996.29		10.48	-6.85E-02		3.53E-01

Analysis Report for 05-Feb-19-10026

L1-12204B-FSGS-017SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	1004.76	18.01	1.38E-01	8.19E-02	2.97E-01
	1274.43	34.80	-4.27E-02		1.44E-01
	1596.48	1.80	-4.27E-01		1.76E+00
Eu-155	45.30	1.31	2.53E+00	1.76E-01	1.15E+01
	60.01	1.22	-3.64E+00		1.25E+01
	86.55	30.70	8.90E-02		1.89E-01
	105.31	21.10	1.05E-02		1.76E-01
Ra-226	186.21	3.64	4.09E-01	1.03E+00	1.03E+00
Pa-231	27.36	10.30	5.58E-01	1.11E+00	1.11E+00
	283.69	1.70	2.69E-01		1.95E+00
	300.07	2.47	-4.42E-01		1.20E+00
	302.65	2.20	1.41E-01		1.45E+00
	330.06	1.40	1.03E+00		2.67E+00
U-235	143.76	10.96	1.01E-03	6.62E-02	3.02E-01
	163.33	5.08	5.40E-01		7.37E-01
	185.71	57.20	3.36E-02		6.62E-02
	202.11	1.08	1.51E+00		3.27E+00
	205.31	5.01	-3.71E-01		6.79E-01
Am-241	59.54	35.90	-8.84E-02	4.33E-01	4.33E-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 14-Feb-19-10018

L1-12204B-FSGS-003SB

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 14-Feb-19-10018
Sample Description	: L1-12204B-FSGS-003SB
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.114E+03 grams
Facility	: Default
Sample Taken On	: 2/9/2019 1:35:00PM
Acquisition Started	: 2/14/2019 10:04:51AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P11314
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	: 1/24/2019
Efficiency Calibration Used Done On	: 2/14/2019
Efficiency Calibration Description	:
Sample Number	: 64092
Fill Height	: 1114.29 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 2/14/2019 10:35:13AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

DATA VALIDATED 2/14/19 1330

T Graham

Analysis Report for 14-Feb-19-10018

L1-12204B-FSGS-003SB

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.93	295 -	316	300.26	7.10E+01	13.27	1.89E+02	0.89
m	2	77.40	295 -	316	310.12	1.57E+02	16.14	2.03E+02	0.89
	3	209.75	834 -	842	838.74	4.41E+01	14.27	7.49E+01	0.86
	4	238.81	949 -	961	954.80	3.70E+02	27.91	1.49E+02	1.12
	5	295.35	1174 -	1187	1180.68	1.55E+02	18.97	7.39E+01	0.85
	6	338.52	1348 -	1358	1353.14	6.29E+01	14.38	6.01E+01	0.82
	7	352.02	1400 -	1415	1407.11	2.91E+02	21.19	5.27E+01	1.10
	8	582.90	2323 -	2339	2329.73	1.33E+02	14.42	2.43E+01	1.55
	9	609.39	2427 -	2446	2435.60	1.97E+02	18.29	4.00E+01	0.96
	10	911.12	3633 -	3650	3641.93	6.99E+01	14.15	4.01E+01	1.76
	11	968.91	3864 -	3880	3873.04	5.06E+01	12.28	3.14E+01	0.50
	12	1460.53	5826 -	5853	5840.08	8.87E+02	30.57	1.05E+01	1.76

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	0.98	1460.82	*	10.66	1.12E+01	6.22E-01
Tl-208	0.98	583.19	*	85.00	1.11E-01	1.38E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	3.20E-01	3.54E-02
		300.09		3.30		

Analysis Report for 14-Feb-19-10018

L1-12204B-FSGS-003SB

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	609.32	*	45.49	3.17E-01	3.51E-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	3.63E-01	5.31E-02
		351.93	*	35.60	4.03E-01	4.36E-02
		785.96		1.06		
Pb214-XR	0.99	74.82	*	5.80	8.47E-01	1.85E-01
		77.11	*	9.70	1.02E+00	1.56E-01
		87.35		2.24		
		89.78		0.82		
Ac-228	0.99	129.07		2.42		
		209.25	*	3.89	3.98E-01	1.33E-01
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	2.67E-01	6.48E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.63E-01	5.44E-02
		964.77		4.99		
		968.97	*	15.80	3.24E-01	7.99E-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 14-Feb-19-10018

L1-12204B-FSGS-003SB

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.987	1.12E+01	6.22E-01	
	Tl-208	0.987	1.11E-01	1.38E-02	
X	Bi-211	0.864			
	Pb-212	0.996	3.20E-01	3.54E-02	
X	Pb212-XR	0.992			
	Bi-214	1.000	3.17E-01	3.51E-02	
	Pb-214	0.998	3.87E-01	3.37E-02	
	Pb214-XR	0.992	9.50E-01	1.19E-01	
	Ac-228	0.997	2.86E-01	3.56E-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 14-Feb-19-10018

L1-12204B-FSGS-003SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 2/14/2019 10:35:13AM
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	7.73E-02	4.92E-02	4.92E-02
	BE-7	477.60		10.44	-4.42E-02	3.10E-01	3.10E-01
+	K-40	1460.82	*	10.66	1.12E+01	3.31E-01	3.31E-01
	Co-60	1173.23		99.85	1.29E-03	4.27E-02	5.56E-02
		1332.49		99.98	1.22E-02		4.27E-02
	Nb-94	702.65		99.81	-2.49E-02	3.75E-02	3.75E-02
		871.09		99.89	1.42E-02		3.76E-02
	Ag-108m	79.13		6.60	-1.84E-01	3.46E-02	9.52E-01
		433.94		90.50	5.97E-03		3.46E-02
		614.28		89.80	-1.40E-02		5.39E-02
		722.94		90.80	1.85E-02		4.51E-02
	Sb-125	176.31		6.84	-2.51E-02	1.03E-01	3.61E-01
		380.45		1.52	-3.14E-01		1.84E+00
		427.87		29.60	-1.83E-02		1.03E-01
		463.36		10.49	1.45E-01		3.08E-01
		600.60		17.65	7.48E-02		1.83E-01
		606.71		4.98	-1.03E-02		1.23E+00
		635.95		11.22	-1.29E-01		2.96E-01
		671.44		1.79	-2.88E-01		1.72E+00

Analysis Report for 14-Feb-19-10018

L1-12204B-FSGS-003SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Ba-133	79.61	2.65	-1.50E-01	5.82E-02	2.32E+00
	81.00	32.90	-3.25E-02		1.47E-01
	276.40	7.16	2.58E-01		3.89E-01
	302.85	18.34	1.13E-01		1.45E-01
	356.01	62.05	-1.41E-03		5.82E-02
	383.85	8.94	-2.50E-02		3.04E-01
Cs-134	475.36	1.48	-5.61E-02	4.45E-02	2.06E+00
	563.25	8.34	-6.21E-01		4.10E-01
	569.33	15.37	2.06E-01		2.17E-01
	604.72	97.62	-1.21E-02		5.08E-02
	795.86	85.46	-5.41E-03		4.45E-02
	801.95	8.69	-5.17E-02		3.84E-01
	1038.61	0.99	-6.96E-02		4.07E+00
	1167.97	1.79	9.23E-01		3.10E+00
	1365.19	3.02	1.05E+00		1.26E+00
Cs-137	661.66	85.10	4.50E-02	4.70E-02	4.70E-02
Eu-152	121.78	28.67	3.17E-02	9.47E-02	9.47E-02
	244.70	7.61	3.90E-01		4.21E-01
	295.94	0.45	1.01E+01		8.21E+00
	344.28	26.60	-2.64E-02		1.07E-01
	367.79	0.86	1.22E+00		3.16E+00
	411.12	2.24	5.98E-01		1.30E+00
	443.96	2.83	-3.34E-01		1.07E+00
	488.68	0.42	-7.94E-01		7.02E+00
	563.99	0.49	-1.22E+01		6.65E+00
	586.26	0.46	4.75E-01		1.10E+01
	678.62	0.47	1.96E+00		7.24E+00
	688.67	0.86	1.98E+00		3.86E+00
	719.35	0.28	1.90E+00		1.25E+01
	778.90	12.96	2.91E-02		2.62E-01
	810.45	0.32	-1.78E+01		8.69E+00
	867.37	4.26	-1.30E+00		8.52E-01
	919.33	0.43	-4.16E+00		8.47E+00
	964.08	14.65	3.47E-02		3.66E-01
	1085.87	10.24	1.71E-01		4.37E-01
	1089.74	1.73	-7.12E-01		2.63E+00
	1112.07	13.69	2.96E-02		3.25E-01
	1212.95	1.43	-2.27E+00		4.10E+00
	1249.94	0.19	-5.52E+00		2.86E+01
	1299.14	1.63	-2.17E+00		2.97E+00
	1408.01	21.07	3.93E-02		1.64E-01
	1457.64	0.50	-4.98E+00		3.95E+01
	1528.10	0.28	2.12E+00		9.31E+00
Eu-154	123.07	40.40	1.24E-02	6.71E-02	6.71E-02
	247.93	6.89	2.70E-01		3.96E-01
	591.76	4.95	1.35E-01		6.44E-01
	692.42	1.78	-3.47E-01		1.87E+00
	723.30	20.06	1.54E-01		2.08E-01
	756.80	4.52	-1.32E-01		7.49E-01
	873.18	12.08	2.87E-01		3.39E-01
	996.29	10.48	2.64E-01		3.94E-01

Analysis Report for 14-Feb-19-10018

L1-12204B-FSGS-003SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	1004.76	18.01	2.19E-01	6.71E-02	2.56E-01
	1274.43	34.80	-2.70E-02		1.53E-01
	1596.48	1.80	9.67E-01		1.57E+00
Eu-155	45.30	1.31	6.55E-01	1.53E-01	9.01E+00
	60.01	1.22	4.18E+00		9.57E+00
	86.55	30.70	7.19E-02		1.54E-01
	105.31	21.10	7.80E-02		1.53E-01
Ra-226	186.21	3.64	8.11E-01	8.35E-01	8.35E-01
Pa-231	27.36	10.30	9.03E-01	9.95E-01	9.95E-01
	283.69	1.70	9.66E-02		1.50E+00
	300.07	2.47	-7.28E-01		1.05E+00
	302.65	2.20	5.48E-01		1.20E+00
	330.06	1.40	-2.40E-02		2.05E+00
U-235	143.76	10.96	-1.66E-02	5.34E-02	2.54E-01
	163.33	5.08	-7.69E-02		5.07E-01
	185.71	57.20	8.32E-02		5.34E-02
	202.11	1.08	-2.21E+00		2.24E+00
	205.31	5.01	-1.42E-01		5.10E-01
Am-241	59.54	35.90	9.30E-02	3.29E-01	3.29E-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 21-Mar-19-10019

L1-12204B-FSGS-010SB

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 21-Mar-19-10019
Sample Description	: L1-12204B-FSGS-010SB
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.118E+03 grams
Facility	: Default
Sample Taken On	: 2/9/2019 2:07:00PM
Acquisition Started	: 3/21/2019 9:32:50AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 1800.0 seconds
Real Time	: 1804.3 seconds
Dead Time	: 0.24 %
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	: 3/21/2019
Efficiency Calibration Description	:
Sample Number	: 64950
Fill Height	: 1118.06 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 3/21/2019 10:02:58AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

1230 3-21-19

Analysis Report for 21-Mar-19-10019

L1-12204B-FSGS-010SB

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.92	295 -	316	300.42	6.43E+01	13.96	2.39E+02	0.80
m	2	77.17	295 -	316	309.42	1.15E+02	15.96	2.17E+02	0.80
	3	87.26	344 -	355	349.70	7.37E+01	25.91	2.37E+02	0.67
	4	185.82	735 -	751	743.56	1.71E+02	30.25	2.38E+02	0.87
M	5	238.57	948 -	974	954.38	5.72E+02	26.28	1.73E+02	1.01
m	6	241.88	948 -	974	967.61	1.05E+02	14.25	1.88E+02	1.01
	7	295.14	1175 -	1189	1180.45	3.17E+02	24.24	9.34E+01	0.94
	8	328.21	1307 -	1321	1312.63	5.78E+01	17.93	9.12E+01	1.12
	9	338.27	1343 -	1360	1352.85	9.99E+01	22.36	1.20E+02	1.25
	10	351.83	1398 -	1415	1407.04	5.06E+02	28.78	9.91E+01	1.13
	11	510.45	2035 -	2051	2041.15	1.15E+02	18.02	6.70E+01	1.48
	12	583.02	2323 -	2341	2331.30	2.00E+02	19.63	5.53E+01	0.89
	13	608.99	2427 -	2445	2435.12	4.51E+02	23.80	3.54E+01	1.31
	14	727.09	2902 -	2914	2907.38	2.66E+01	12.37	4.74E+01	0.41
	15	910.81	3634 -	3652	3642.19	1.44E+02	15.53	2.74E+01	0.71
	16	968.66	3864 -	3882	3873.63	9.94E+01	14.81	3.56E+01	0.80
	17	1119.89	4470 -	4487	4478.67	6.40E+01	13.50	3.60E+01	0.48
	18	1460.22	5827 -	5854	5840.70	9.73E+02	31.19	0.00E+00	1.79
	19	1763.64	7047 -	7065	7055.56	6.13E+01	8.79	4.75E+00	1.99

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

Analysis Report for 21-Mar-19-10019

L1-12204B-FSGS-010SB

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.95	511.00	*	100.00	1.38E-01	2.36E-02
K-40	0.94	1460.82	*	10.66	1.37E+01	7.38E-01
Tl-208	0.99	583.19	*	85.00	1.85E-01	2.13E-02
Bi-212	0.99	39.86		1.06		
		727.33	*	6.67	3.67E-01	1.72E-01
		785.37		1.10		
		1620.50		1.47		
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	5.58E-01	5.19E-02
		300.09		3.30		
Pb212-XR	0.99	74.82	*	10.28	7.78E-01	1.87E-01
		77.11	*	17.10	7.42E-01	1.28E-01
		87.35	*	3.97	1.38E+00	5.05E-01
		89.78		1.46		
Bi-214	0.97	609.32	*	45.49	8.04E-01	6.43E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	5.31E-01	1.14E-01
		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	6.96E-01	1.04E-01
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	6.22E-01	9.78E-02
		295.22	*	18.42	8.27E-01	9.15E-02
		351.93	*	35.60	7.79E-01	7.65E-02
		785.96		1.06		
Ra-226	0.97	186.21	*	3.64	1.78E+00	3.46E-01
Ac-228	0.79	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00	*	2.95	1.02E+00	3.29E-01
		338.32	*	11.27	4.71E-01	1.12E-01
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	5.98E-01	6.98E-02
		964.77		4.99		
		968.97	*	15.80	7.06E-01	1.10E-01
		1588.20		3.22		
U-235	0.99	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	1.13E-01	2.20E-02
		202.11		1.08		

Analysis Report for 21-Mar-19-10019

L1-12204B-FSGS-010SB

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
U-235	0.99	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	0.950	1.38E-01	2.36E-02	
	K-40	0.943	1.37E+01	7.38E-01	
X	Cd-109	0.908			
X	Eu-155	0.956			
	Tl-208	0.996	1.85E-01	2.13E-02	
X	Bi-211	0.913			
	Bi-212	0.994	3.67E-01	1.72E-01	
	Pb-212	0.999	5.58E-01	5.19E-02	
	Pb212-XR	0.999	7.80E-01	1.03E-01	
	Bi-214	0.974	7.29E-01	4.93E-02	
	Pb-214	0.998	7.52E-01	5.03E-02	
X	Pb214-XR	0.999			
?	Ra-226	0.976	1.78E+00	3.46E-01	
	Ac-228	0.793	6.05E-01	5.15E-02	
?	U-235	0.999	1.13E-01	2.20E-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 21-Mar-19-10019

L1-12204B-FSGS-010SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 3/21/2019 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	1.38E-01	6.26E-02	6.26E-02
	BE-7	477.60		10.44	1.33E-02	6.65E-01	6.65E-01
+	K-40	1460.82	*	10.66	1.37E+01	4.04E-02	4.04E-02
	Co-60	1173.23		99.85	4.97E-02	5.62E-02	7.20E-02
		1332.49		99.98	2.13E-02		5.62E-02
	Nb-94	702.65		99.81	-2.68E-02	4.23E-02	4.82E-02
		871.09		99.89	2.39E-04		4.23E-02
	Ag-108m	79.13		6.60	3.11E-01	4.30E-02	1.64E+00
		433.94		90.50	-1.02E-02		4.30E-02
		614.28		89.80	-3.72E-03		6.43E-02
		722.94		90.80	-4.70E-02		6.03E-02
	Sb-125	176.31		6.84	4.99E-02	1.43E-01	5.83E-01
		380.45		1.52	-1.69E-02		2.58E+00
		427.87		29.60	-4.40E-03		1.43E-01
		463.36		10.49	2.34E-01		4.26E-01
		600.60		17.65	-1.16E-01		2.46E-01
		606.71		4.98	-1.73E-01		1.92E+00
		635.95		11.22	-9.98E-02		3.78E-01
		671.44		1.79	4.11E-01		2.49E+00

Analysis Report for 21-Mar-19-10019

L1-12204B-FSGS-010SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Ba-133	79.61	2.65	1.19E+00	8.47E-02	3.86E+00
	81.00	32.90	-7.80E-02		2.61E-01
	276.40	7.16	1.71E-01		5.41E-01
	302.85	18.34	7.18E-02		2.05E-01
	356.01	62.05	-2.53E-02		8.47E-02
	383.85	8.94	-1.43E-01		4.33E-01
Cs-134	475.36	1.48	-1.32E+00	6.11E-02	2.71E+00
	563.25	8.34	-6.94E-02		5.08E-01
	569.33	15.37	-7.71E-02		2.59E-01
	604.72	97.62	-2.42E-02		9.27E-02
	795.86	85.46	-3.68E-02		6.11E-02
	801.95	8.69	-2.49E-01		5.52E-01
	1038.61	0.99	1.89E+00		5.65E+00
	1167.97	1.79	6.89E-01		4.08E+00
	1365.19	3.02	3.62E-01		1.47E+00
Cs-137	661.66	85.10	2.23E-02	5.39E-02	5.39E-02
Eu-152	121.78	28.67	-2.80E-02	1.45E-01	1.48E-01
	244.70	7.61	-8.18E-03		6.02E-01
	295.94	0.45	1.49E+01		1.20E+01
	344.28	26.60	2.13E-02		1.45E-01
	367.79	0.86	-2.25E+00		4.20E+00
	411.12	2.24	-4.05E-01		1.74E+00
	443.96	2.83	1.02E-01		1.44E+00
	488.68	0.42	-3.26E+00		9.41E+00
	563.99	0.49	5.36E-01		8.34E+00
	586.26	0.46	-9.33E-01		1.48E+01
	678.62	0.47	4.32E+00		9.48E+00
	688.67	0.86	-4.67E+00		4.66E+00
	719.35	0.28	-6.10E+00		1.65E+01
	778.90	12.96	1.75E-01		3.71E-01
	810.45	0.32	5.05E-01		1.37E+01
	867.37	4.26	-7.14E-02		1.04E+00
	919.33	0.43	2.34E+00		1.18E+01
	964.08	14.65	2.04E-01		5.36E-01
	1085.87	10.24	-6.38E-01		5.80E-01
	1089.74	1.73	1.13E+00		3.35E+00
	1112.07	13.69	1.95E-01		4.45E-01
	1212.95	1.43	2.64E+00		5.01E+00
	1249.94	0.19	-2.23E+00		3.47E+01
	1299.14	1.63	2.76E+00		3.34E+00
	1408.01	21.07	1.46E-01		2.31E-01
	1457.64	0.50	2.89E+02		4.60E+01
	1528.10	0.28	-1.29E+01		1.29E+01
Eu-154	123.07	40.40	4.39E-02	1.06E-01	1.06E-01
	247.93	6.89	-1.01E-02		5.53E-01
	591.76	4.95	4.54E-01		8.47E-01
	692.42	1.78	5.46E-01		2.70E+00
	723.30	20.06	-1.27E-01		2.81E-01
	756.80	4.52	-1.01E-01		1.03E+00
	873.18	12.08	-2.68E-01		3.61E-01
	996.29	10.48	2.63E-01		4.89E-01

Analysis Report for 21-Mar-19-10019

L1-12204B-FSGS-010SB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	1004.76		18.01	-9.81E-02	1.06E-01	2.75E-01
		1274.43		34.80	-8.74E-03		1.81E-01
		1596.48		1.80	2.38E+00		2.71E+00
	Eu-155	45.30		1.31	1.06E+01	2.11E-01	2.89E+01
		60.01		1.22	1.45E+00		2.93E+01
		86.55	*	30.70	1.81E-01		2.11E-01
		105.31		21.10	-1.75E-01		2.54E-01
+	Ra-226	186.21	*	3.64	1.78E+00	9.91E-01	9.91E-01
	Pa-231	27.36		10.30	5.31E+00	1.50E+00	3.33E+00
		283.69		1.70	-1.06E+00		2.07E+00
		300.07		2.47	3.05E-01		1.50E+00
		302.65		2.20	1.20E+00		1.72E+00
		330.06		1.40	4.83E-01		2.94E+00
+	U-235	143.76		10.96	-1.16E-01	6.31E-02	3.72E-01
		163.33		5.08	1.92E-01		7.89E-01
		185.71	*	57.20	1.13E-01		6.31E-02
		202.11		1.08	-1.49E+00		3.48E+00
		205.31		5.01	-8.66E-01		7.47E-01
	Am-241	59.54		35.90	-1.75E-01	1.02E+00	1.02E+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

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-46838

February 26, 2020

Jeffrey Graham
Zion Solutions, LLC
2701 Deborah Avenue
Zion, IL 60099

CASE NARRATIVE
Work Order # 20-02088-OR

SAMPLE RECEIPT

This work order contains sixteen soil samples relogged 02/18/2020 per client request. Samples were analyzed for Total Strontium.

CLIENT ID	LAB ID	CLIENT ID	LAB ID
L1-10209D-FSGS-003-SB-A	20-02088-04	L1-10221A-FIGS-007-SB-A	20-02088-12
L1-10220J-FSGS-005-SB-A	20-02088-05	L1-10221A-FSGS-002-SB-A	20-02088-13
L1-10221A-FIGS-001-SB-A	20-02088-06	L1-10221C-FSGS-013-SB-A	20-02088-14
L1-10221A-QIGS-001-SB-A	20-02088-07	L1-10221D-FIGS-010-SB-A	20-02088-15
L1-10221A-FIGS-002-SB-A	20-02088-08	L1-12204B-FSGS-010-SB-A	20-02088-16
L1-10221A-FIGS-003-SB-A	20-02088-09	L1-12202C-FSGS-013-SB-A	20-02088-17
L1-10221A-FIGS-004-SB-A	20-02088-10	L1-12202D-FSGS-015-SB-A	20-02088-18
L1-10209C-FSGS-004-SB-A	20-02088-11	L1-12107A-FSGS-010-SB-A	20-02088-19

ANALYTICAL METHODS

Total Strontium was analyzed using EIChroM Method SRW01 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. Chemical separations were conducted by selective precipitations. Strontium was precipitated and mounted on filter media and then attached to planchets. Chemical recovery was determined by use of a stable Strontium carrier and subsequent mass measurements. Samples were counted by gas flow proportional counting and corrected for Yttrium-90 ingrowth.

Large aliquots were analyzed to improve method detection limits as best possible. Samples demonstrated acceptable results for all Total Strontium determinations. Strontium-90 results are reported from Total Strontium assuming secular equilibrium. Chemical recovery was acceptable for all samples. Results for the Total Strontium method blank demonstrated acceptable results. 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.

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: 2/26/2020

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:
Jeffrey Graham
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 20-02088
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
20-02088-01	LCS	KNOWN	02/18/20 00:00	2/18/2020	2/19/2020	20-02088	Strontium-90	ElChroM SRW01 Modified	5.02E+01	2.81E-01				pCi/g
20-02088-01	LCS	SPIKE	02/18/20 00:00	2/18/2020	2/19/2020	20-02088	Strontium-90	ElChroM SRW01 Modified	4.84E+01	1.34E+00	1.69E+01	6.16E-01		pCi/g
20-02088-02	MBL	BLANK	02/18/20 00:00	2/18/2020	2/19/2020	20-02088	Strontium-90	ElChroM SRW01 Modified	3.15E-01	4.09E-01	4.23E-01	8.39E-01	U	pCi/g
20-02088-03	DUP	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	2/18/2020	2/19/2020	20-02088	Strontium-90	ElChroM SRW01 Modified	2.01E-02	3.84E-02	3.90E-02	7.98E-02	U	pCi/g
20-02088-04	DO	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	2/18/2020	2/19/2020	20-02088	Strontium-90	ElChroM SRW01 Modified	3.36E-02	3.74E-02	3.92E-02	7.63E-02	U	pCi/g
20-02088-05	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	2/18/2020	2/19/2020	20-02088	Strontium-90	ElChroM SRW01 Modified	1.88E-02	3.50E-02	3.56E-02	7.27E-02	U	pCi/g
20-02088-06	TRG	L1-10221A-FIGS-001-SB-A	06/26/19 10:00	2/18/2020	2/19/2020	20-02088	Strontium-90	ElChroM SRW01 Modified	4.56E-02	3.80E-02	4.12E-02	7.63E-02	U	pCi/g
20-02088-07	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	2/18/2020	2/19/2020	20-02088	Strontium-90	ElChroM SRW01 Modified	5.69E-02	3.92E-02	4.39E-02	7.78E-02	U	pCi/g
20-02088-08	TRG	L1-10221A-FIGS-002-SB-A	06/26/19 10:02	2/18/2020	2/19/2020	20-02088	Strontium-90	ElChroM SRW01 Modified	6.72E-02	3.55E-02	4.25E-02	6.84E-02	U	pCi/g
20-02088-09	TRG	L1-10221A-FIGS-003-SB-A	06/26/19 10:04	2/18/2020	2/19/2020	20-02088	Strontium-90	ElChroM SRW01 Modified	2.21E-02	3.26E-02	3.35E-02	6.73E-02	U	pCi/g
20-02088-10	TRG	L1-10221A-FIGS-004-SB-A	06/26/19 10:06	2/18/2020	2/19/2020	20-02088	Strontium-90	ElChroM SRW01 Modified	3.49E-02	3.24E-02	3.46E-02	6.53E-02	U	pCi/g
20-02088-11	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	2/18/2020	2/19/2020	20-02088	Strontium-90	ElChroM SRW01 Modified	2.09E-02	3.85E-02	3.92E-02	8.00E-02	U	pCi/g
20-02088-12	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	2/18/2020	2/19/2020	20-02088	Strontium-90	ElChroM SRW01 Modified	2.17E-02	2.86E-02	2.96E-02	5.87E-02	U	pCi/g
20-02088-13	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	2/18/2020	2/19/2020	20-02088	Strontium-90	ElChroM SRW01 Modified	5.80E-02	3.46E-02	4.00E-02	6.75E-02	U	pCi/g
20-02088-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	2/18/2020	2/19/2020	20-02088	Strontium-90	ElChroM SRW01 Modified	4.90E-02	3.43E-02	3.83E-02	6.77E-02	U	pCi/g
20-02088-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	2/18/2020	2/19/2020	20-02088	Strontium-90	ElChroM SRW01 Modified	2.11E-02	3.05E-02	3.14E-02	6.29E-02	U	pCi/g
20-02088-16	TRG	L1-12204B-FSGS-010-SB-A	02/09/19 14:07	2/18/2020	2/19/2020	20-02088	Strontium-90	ElChroM SRW01 Modified	2.68E-02	3.58E-02	3.70E-02	7.35E-02	U	pCi/g
20-02088-17	TRG	L1-12202C-FSGS-013-SB-A	09/16/19 08:30	2/18/2020	2/19/2020	20-02088	Strontium-90	ElChroM SRW01 Modified	4.02E-02	3.73E-02	3.98E-02	7.51E-02	U	pCi/g
20-02088-18	TRG	L1-12202D-FSGS-015-SB-A	09/16/19 13:00	2/18/2020	2/19/2020	20-02088	Strontium-90	ElChroM SRW01 Modified	3.09E-02	3.64E-02	3.80E-02	7.44E-02	U	pCi/g
20-02088-19	TRG	L1-12107A-FSGS-010-SB-A	09/30/19 12:25	2/18/2020	2/19/2020	20-02088	Strontium-90	ElChroM SRW01 Modified	6.44E-02	4.08E-02	4.65E-02	7.95E-02	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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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-FIC 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-FIC S-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/17/2019	1500	5 ROC HTD	NA	723.26g
L1-10209E-FIC S-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/17/2019	1510	5 ROC HTD	NA	704.72g
L1-10209E-FSC S-013-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/20/2019	0810	5 ROC HTD	NA	802.05g
L1-10209D-FSC S-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/21/2019	0820	5 ROC HTD	NA	637.16g
L1-10209D-FSC S-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/21/2019	0825	5 ROC HTD	NA	598.17g
L1-10209D-FSC S-015-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/21/2019	0920	5 ROC HTD	NA	708.91g
L1-10220J-FSC S-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/22/2019	0700	5 ROC HTD	NA	603.35g
L1-10220I-FSC S-010-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/23/2019	0745	5 ROC HTD	NA	672.61g
L1-10209D-FSC S-003-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/28/2019	0900	5 ROC HTD	NA	739.91g
L1-10220J-FSC S-005-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/28/2019	1325	5 ROC HTD	NA	678.76g
L1-10220G-FSC S-008-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/3/2019	0744	5 ROC HTD	NA	840.01g
L1-10220G-FSC S-014-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/3/2019	0756	5 ROC HTD	NA	902.77g
L1-10220A-FSC 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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L1-10221A-FIGS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/11/2019	1217	5 ROC HTD	NA	922.34g
L1-10221A-FIGS-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/11/2019	1219	5 ROC HTD	NA	929.16g
L1-10221A-FIGS-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/11/2019	1221	5 ROC HTD	NA	925.96g
L1-10220I-FJGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/9/2019	0830	5 ROC HTD	NA	572.09g
L1-10220I-QJGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/9/2019	0830	5 ROC HTD	NA	648.58g
L1-10221A-FIGS-003-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/26/2019	1004	5 ROC HTD	NA	812.22g
L1-10221A-FIGS-001-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/26/2019	1000	5 ROC HTD	NA	677.47g
L1-10221A-FIGS-004-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/26/2019	1006	5 ROC HTD	NA	757.61g
L1-10221A-FIGS-002-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/26/2019	1002	5 ROC HTD	NA	756.86g
L1-10221A-QIGS-001-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/26/2019	1000	5 ROC HTD	NA	614.42g
L1-10221A-FJGS-007-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/17/2019	0856	5 ROC HTD	NA	710.95g
L1-10221B-FJGS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/17/2019	0830	5 ROC HTD	NA	714.12g
L1-10221A-FJGS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/17/2019	0846	5 ROC HTD	NA	771.65g
L1-10221A-FJGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/17/2019	0844	5 ROC HTD	NA	707.40g
L1-10221A-FIGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/13/2019	0745	5 ROC HTD	NA	774.76g
L1-10221A-FIGS-006-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/13/2019	0747	5 ROC HTD	NA	783.08g
L1-10221A-FIGS-007-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/13/2019	0749	5 ROC HTD	NA	708.49g
L1-10221A-FIGS-008-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/13/2019	0751	5 ROC HTD	NA	794.16g
L1-10221A-FIGS-009-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/13/2019	0753	5 ROC HTD	NA	774.52g

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L1-10221A-FIGS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/11/2019	1217	5 ROC HTD	NA	922.34g
L1-10221A-FIGS-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/11/2019	1219	5 ROC HTD	NA	929.16g
L1-10221A-FIGS-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/11/2019	1221	5 ROC HTD	NA	925.96g
L1-10220I-FJGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/9/2019	0830	5 ROC HTD	NA	572.09g
L1-10220I-QJGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/9/2019	0830	5 ROC HTD	NA	648.58g
L1-10221A-FIGS-003-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/26/2019	1004	5 ROC HTD	NA	812.22g
L1-10221A-FIGS-001-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/26/2019	1000	5 ROC HTD	NA	677.47g
L1-10221A-FIGS-004-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/26/2019	1006	5 ROC HTD	NA	757.61g
L1-10221A-FIGS-002-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/26/2019	1002	5 ROC HTD	NA	756.86g
L1-10221A-QIGS-001-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/26/2019	1000	5 ROC HTD	NA	614.42g
L1-10221A-FJGS-007-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/17/2019	0856	5 ROC HTD	NA	710.95g
L1-10221B-FJGS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/17/2019	0830	5 ROC HTD	NA	714.12g
L1-10221A-FJGS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/17/2019	0846	5 ROC HTD	NA	771.65g
L1-10221A-FJGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/17/2019	0844	5 ROC HTD	NA	707.40g
L1-10221A-FIGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/13/2019	0745	5 ROC HTD	NA	774.76g
L1-10221A-FIGS-006-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/13/2019	0747	5 ROC HTD	NA	783.08g
L1-10221A-FIGS-007-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/13/2019	0749	5 ROC HTD	NA	708.49g
L1-10221A-FIGS-008-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/13/2019	0751	5 ROC HTD	NA	794.16g
L1-10221A-FIGS-009-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/13/2019	0753	5 ROC HTD	NA	774.52g

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L1-10203D-FQGS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	4/9/2019	0805	5 ROC HTD	NA	868.92g
L1-10203E-FSGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	4/8/2019	1230	5 ROC HTD	NA	813.36g
L1-10203E-FSGS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	4/8/2019	1235	5 ROC HTD	NA	702.73g
L1-10221A-FIGS-007-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	1025	5 ROC HTD	NA	874.41g
L1-10221A-FSGS-002-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	1400	5 ROC HTD	NA	1109.56g
L1-10221A-FSGS-108-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/23/2019	1244	5 ROC HTD	NA	918.06g
L1-10221A-FSGS-110-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/23/2019	1248	5 ROC HTD	NA	805.48g
L1-10221A-FSGS-112-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/23/2019	1252	5 ROC HTD	NA	1136.57g
L1-10221C-FSGS-013-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	1520	5 ROC HTD	NA	825.45g
L1-10221D-FIGS-010-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/30/2019	0906	5 ROC HTD	NA	599.72g
L1-10209C-FSGS-010-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/5/2019	0820	5 ROC HTD	NA	1051.63g
L1-10209C-FQGS-010-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/5/2019	0820	5 ROC HTD	NA	795.39g
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

Rec RB 9-23-19 © 10 DAYS

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ZION SOLUTIONS LLC
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20-02088

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2-18-20

19-10018

2-18-20

Attachment 1 – Chain-of-Custody Form

Sample ID	Sample Log	Matrix	Sample Type	Sample Container Vol	Unit	Type	Qty	Sample Date	Sample Time	Analysis Type	Preservative	Remarks
L1-12204-B-FSGS-010-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	2/9/19	1407	5 ROC HTD	NA	889.81 g
L1-12202-E-FSGS-007-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/10/19	0942	5 ROC HTD	NA	1202.80 g
L1-12202-E-FSGS-012-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/10/19	0952	5 ROC HTD	NA	1189.10 g
L1-12202-F-FSGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/10/19	1308	5 ROC HTD	NA	1045.64 g
L1-12202-F-FSGS-010-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/10/19	1318	5 ROC HTD	NA	1107.70 g
L1-12202-C-FSGS-007-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/11/19	0912	5 ROC HTD	NA	1054.03 g
L1-12202-D-FSGS-013-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/11/19	0836	5 ROC HTD	NA	913.68 g
L1-12110-A-FSGS-013-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/16/19	1324	5 ROC HTD	NA	958.11 g
L1-12110-A-FSGS-014-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/16/19	1326	5 ROC HTD	NA	1084.06 g
L1-12202-C-FSGS-013-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/16/19	0830	5 ROC HTD	NA	1082.40 g
L1-12202-D-FSGS-015-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/16/19	1300	5 ROC HTD	NA	922.89 g
L1-12109-A-FSGS-008-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/17/19	0914	5 ROC HTD	NA	1030.30 g
L1-12109-A-FSGS-013-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/17/19	0924	5 ROC HTD	NA	968.97 g
L1-12202-F-FJGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/17/19	0952	5 ROC HTD	NA	1017.40 g
L1-10220-I-FIGS-011-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/17/19	0838	5 ROC HTD	NA	749.70 g
L1-12108-A-FSGS-015-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/18/19	1328	5 ROC HTD	NA	948.00 g
L1-12108-A-FSGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/18/19	1308	5 ROC HTD	NA	935.70 g

Rec BS 0743 10-4-19

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REC'D OCT 04 2019

ZS-WM-131
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Information Use

19-10019

Attachment 1 – Chain-of-Custody Form

Sample ID	Sample Log	Matrix	Sample Type	Sample Container Vol	Unit	Type	Qty	Sample Date	Sample Time	Analysis Type	Preservative	Remarks
L1-12204-B-FSGS-010-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	2/9/19	1407	5 ROC HTD	NA	889.81 g
L1-12202-E-FSGS-007-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/10/19	0942	5 ROC HTD	NA	1202.80 g
L1-12202-E-FSGS-012-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/10/19	0952	5 ROC HTD	NA	1189.10 g
L1-12202-F-FSGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/10/19	1308	5 ROC HTD	NA	1045.64 g
L1-12202-F-FSGS-010-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/10/19	1318	5 ROC HTD	NA	1107.70 g
L1-12202-C-FSGS-007-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/11/19	0912	5 ROC HTD	NA	1054.03 g
L1-12202-D-FSGS-013-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/11/19	0836	5 ROC HTD	NA	913.68 g
L1-12110-A-FSGS-013-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/16/19	1324	5 ROC HTD	NA	958.11 g
L1-12110-A-FSGS-014-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/16/19	1326	5 ROC HTD	NA	1084.06 g
L1-12202-C-FSGS-013-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/16/19	0830	5 ROC HTD	NA	1082.40 g
L1-12202-D-FSGS-015-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/16/19	1300	5 ROC HTD	NA	922.89 g
L1-12109-A-FSGS-008-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/17/19	0914	5 ROC HTD	NA	1030.30 g
L1-12109-A-FSGS-013-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/17/19	0924	5 ROC HTD	NA	968.97 g
L1-12202-F-FJGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/17/19	0952	5 ROC HTD	NA	1017.40 g
L1-10220-I-FIGS-011-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/17/19	0838	5 ROC HTD	NA	749.70 g
L1-12108-A-FSGS-015-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/18/19	1328	5 ROC HTD	NA	948.00 g
L1-12108-A-FSGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/18/19	1308	5 ROC HTD	NA	935.70 g

Rec BS 0743 10-4-19

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REC'D OCT 21 2019

ZS-WM-131
- Revision 0
Information Use

~~19-10093~~ 2-18-20

20-02088

Attachment 1 – Chain-of-Custody Form

Sample ID	Sample Log	Matrix	Sample Type	Sample Container Vol	Unit	Type	Qty	Sample Date	Sample Time	Analysis Type	Preservative	Remarks
L1-12107-A-FSGS-012-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/26/2019	0722	5 ROC HTD	NA	939.51
L1-12105-A-FSGS-016-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/30/2019	1330	5 ROC HTD	NA	1026.88
L1-12105-A-FSGS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/30/2019	1302	5 ROC HTD	NA	969.33
L1-12107-A-FSGS-010-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/30/2019	1225	5 ROC HTD	NA	923.24
L1-12205-A-FSGS-111-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/25/2019	1305	5 ROC HTD	NA	952.09
L1-12104-A-FSGS-011-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	10/1/2019	0920	5 ROC HTD	NA	1013.10
L1-12104-A-FSGS-013-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	10/1/2019	0924	5 ROC HTD	NA	975.70
L1-12205-A-FSGS-101-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	10/1/2019	0825	5 ROC HTD	NA	859.10
L1-12109-A-FSGS-012-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/17/2019	0922	5 ROC HTD	NA	1013.58
L1-12205-C-FSGS-105-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/24/2019	1308	5 ROC HTD	NA	979.04
L1-12111-A-FSGS-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/16/2019	0806	5 ROC HTD	NA	1122.70
L1-12205-D-FSGS-111-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/16/2019	1400	5 ROC HTD	NA	974.36
L1-12205-E-FSGS-104-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/9/2019	1306	5 ROC HTD	NA	1087.82
L1-12205-E-QCGS-101-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/11/2019	0900	5 ROC HTD	NA	829.86
L1-12205-D-FSGS-117-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/9/2019	1022	5 ROC HTD	NA	1028.72
L1-12205-E-FSGS-117-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/9/2019	1332	5 ROC HTD	NA	1106.09
L1-12205-A-FSGS-116-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/25/2019	1315	5 ROC HTD	NA	1078.92

Rec'd 10-21-19 @1100

EBERLINE ANALYTICAL

EBERLINE ANALYTICAL CORPORATION
601 SCARBORO ROAD
OAK RIDGE, TENNESSEE 37830
PHONE (865) 481-0683
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EBS-OR-45306

April 11, 2019

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

CASE NARRATIVE
Work Order # 19-03041-OR

SAMPLE RECEIPT

This work order contains fifteen soil samples received 03/12/2019. Samples were analyzed for Total Strontium, Tritium, Nickel-63 and by Gamma Spectroscopy.

CLIENT ID	LAB ID	CLIENT ID	LAB ID
L1-12204B-FSGS-003-SS-A	19-03041-04	L1-12113A-FSGS-006-SS-A	19-03041-12
L1-12113A-FSGS-003-SS-A	19-03041-05	L1-12204A-FSGS-008-SS-A	19-03041-13
L1-10201D-FSGS-005-SS-A	19-03041-06	L1-10201C-FSGS-012-SS-A	19-03041-14
L1-10201D-FSGS-006-SS-A	19-03041-07	L1-12204C-FQGS-001-SB-A	19-03041-15
L1-12204C-FSGS-003-SS-A	19-03041-08	L1-12112A-FQGS-014-SS-A	19-03041-16
L1-12204A-FSGS-004-SS-A	19-03041-09	L1-12112A-FSGS-013-SS-A	19-03041-17
L1-12204B-FSGS-015-SS-A	19-03041-10	L1-12112A-FSGS-010-SS-A	19-03041-18
L1-10201C-FQGS-012-SS-A	19-03041-11		

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 aliquoting as appropriate and adding Strontium recovery carriers to each sample. Chemical separations were conducted using selective extractions. Strontium precipitates were mounted on tared filter media. Chemical recovery was determined by Strontium carrier mass determinations. Samples were counted by gas flow proportional counting and corrected for Yttrium-90 ingrowth.

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 then counted by beta liquid scintillation.

Samples demonstrated acceptable results for all Tritium analyses. In this case the method blank was used as the process blank. 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 placed into an appropriately sized beaker. 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

1st Analytical Run

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, Bismuth-214 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.

2nd Analytical Run

Laboratory fraction -16 (Client ID: L1-12112A-FQGS-014-SS-A) was reanalyzed upon client's request. Sample demonstrated acceptable results for all gamma-emitting radionuclides as reported. In this case results agree with the first analytical attempt. The method blank demonstrated acceptable results for all radionuclides as reported. Results for the Cobalt-60, Cesium-137 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: 4/11/2019

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: 19-03041
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
19-03041-01	LCS	KNOWN	03/12/19 00:00	3/12/2019	4/2/2019	19-03041	Tritium	LANL ER-210 Modified	2.07E+02	7.46E+00				pCi/g
19-03041-01	LCS	SPIKE	03/12/19 00:00	3/12/2019	4/2/2019	19-03041	Tritium	LANL ER-210 Modified	1.87E+02	7.49E+00	1.29E+01	5.41E+00		pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	4/2/2019	19-03041	Tritium	LANL ER-210 Modified	0.00E+00	3.11E+00	3.11E+00	5.42E+00	U	pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	4/2/2019	19-03041	Tritium	LANL ER-210 Modified	1.86E+00	3.05E+00	3.05E+00	5.18E+00	U	pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	4/2/2019	19-03041	Tritium	LANL ER-210 Modified	2.62E+00	3.09E+00	3.10E+00	5.20E+00	U	pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	4/2/2019	19-03041	Tritium	LANL ER-210 Modified	1.11E+00	3.02E+00	3.02E+00	5.17E+00	U	pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	4/2/2019	19-03041	Tritium	LANL ER-210 Modified	2.28E+00	3.14E+00	3.14E+00	5.30E+00	U	pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	4/2/2019	19-03041	Tritium	LANL ER-210 Modified	2.22E+00	3.05E+00	3.06E+00	5.16E+00	U	pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	4/2/2019	19-03041	Tritium	LANL ER-210 Modified	3.48E+00	3.07E+00	3.07E+00	5.10E+00	U	pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	4/2/2019	19-03041	Tritium	LANL ER-210 Modified	1.15E+00	3.11E+00	3.11E+00	5.33E+00	U	pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	4/2/2019	19-03041	Tritium	LANL ER-210 Modified	4.16E+00	3.19E+00	3.20E+00	5.27E+00	U	pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	4/2/2019	19-03041	Tritium	LANL ER-210 Modified	2.34E+00	2.98E+00	2.98E+00	5.02E+00	U	pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	4/2/2019	19-03041	Tritium	LANL ER-210 Modified	2.73E+00	3.02E+00	3.02E+00	5.07E+00	U	pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	4/2/2019	19-03041	Tritium	LANL ER-210 Modified	3.42E+00	3.02E+00	3.02E+00	5.02E+00	U	pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	4/2/2019	19-03041	Tritium	LANL ER-210 Modified	2.92E+00	3.04E+00	3.04E+00	5.08E+00	U	pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	4/2/2019	19-03041	Tritium	LANL ER-210 Modified	5.51E-01	2.96E+00	2.96E+00	5.11E+00	U	pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	4/2/2019	19-03041	Tritium	LANL ER-210 Modified	7.53E-01	3.04E+00	3.04E+00	5.24E+00	U	pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	4/2/2019	19-03041	Tritium	LANL ER-210 Modified	2.46E+00	3.13E+00	3.13E+00	5.28E+00	U	pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	4/2/2019	19-03041	Tritium	LANL ER-210 Modified	3.11E+00	3.05E+00	3.05E+00	5.09E+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: 19-03041
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
19-03041-01	LCS	KNOWN	03/12/19 00:00	3/12/2019	3/30/2019	19-03041	Nickel-63	ASTM 3500-Ni Modified	1.53E+03	4.59E+01				pCi/g
19-03041-01	LCS	SPIKE	03/12/19 00:00	3/12/2019	3/30/2019	19-03041	Nickel-63	ASTM 3500-Ni Modified	1.49E+03	1.29E+01	8.88E+01	3.04E+00		pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/30/2019	19-03041	Nickel-63	ASTM 3500-Ni Modified	5.15E-01	1.78E+00	1.78E+00	3.05E+00	U	pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/30/2019	19-03041	Nickel-63	ASTM 3500-Ni Modified	1.37E+00	1.81E+00	1.81E+00	3.04E+00	U	pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/30/2019	19-03041	Nickel-63	ASTM 3500-Ni Modified	3.40E-01	1.76E+00	1.76E+00	3.02E+00	U	pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/30/2019	19-03041	Nickel-63	ASTM 3500-Ni Modified	2.24E+00	1.77E+00	1.78E+00	2.94E+00	U	pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/30/2019	19-03041	Nickel-63	ASTM 3500-Ni Modified	1.54E+00	1.80E+00	1.81E+00	3.03E+00	U	pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/30/2019	19-03041	Nickel-63	ASTM 3500-Ni Modified	1.49E+01	2.23E+00	2.39E+00	3.13E+00		pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/30/2019	19-03041	Nickel-63	ASTM 3500-Ni Modified	1.71E+00	1.81E+00	1.81E+00	3.04E+00	U	pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/30/2019	19-03041	Nickel-63	ASTM 3500-Ni Modified	4.14E-01	1.71E+00	1.71E+00	2.94E+00	U	pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/30/2019	19-03041	Nickel-63	ASTM 3500-Ni Modified	2.23E+00	1.83E+00	1.84E+00	3.04E+00	U	pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/30/2019	19-03041	Nickel-63	ASTM 3500-Ni Modified	1.55E+00	1.81E+00	1.82E+00	3.05E+00	U	pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/30/2019	19-03041	Nickel-63	ASTM 3500-Ni Modified	1.52E+00	1.79E+00	1.79E+00	3.00E+00	U	pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/30/2019	19-03041	Nickel-63	ASTM 3500-Ni Modified	1.45E+00	1.70E+00	1.70E+00	2.86E+00	U	pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/30/2019	19-03041	Nickel-63	ASTM 3500-Ni Modified	3.50E-01	1.81E+00	1.81E+00	3.10E+00	U	pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/30/2019	19-03041	Nickel-63	ASTM 3500-Ni Modified	-2.53E-01	1.72E+00	1.72E+00	2.99E+00	U	pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/30/2019	19-03041	Nickel-63	ASTM 3500-Ni Modified	8.17E-01	1.71E+00	1.71E+00	2.90E+00	U	pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/30/2019	19-03041	Nickel-63	ASTM 3500-Ni Modified	1.43E+00	1.77E+00	1.77E+00	2.98E+00	U	pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/30/2019	19-03041	Nickel-63	ASTM 3500-Ni Modified	8.30E-01	1.73E+00	1.73E+00	2.95E+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: 19-03041
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
19-03041-01	LCS	KNOWN	03/12/19 00:00	3/12/2019	4/4/2019	19-03041	Strontium-90	ElChroM SRW01 Modified	4.93E+01	2.76E-01				pCi/g
19-03041-01	LCS	SPIKE	03/12/19 00:00	3/12/2019	4/4/2019	19-03041	Strontium-90	ElChroM SRW01 Modified	5.26E+01	2.84E+00	1.85E+01	1.37E+00		pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	4/4/2019	19-03041	Strontium-90	ElChroM SRW01 Modified	4.36E-01	4.01E-01	4.28E-01	9.71E-01	U	pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	4/4/2019	19-03041	Strontium-90	ElChroM SRW01 Modified	-6.59E-02	3.69E-01	3.70E-01	9.53E-01	U	pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	4/4/2019	19-03041	Strontium-90	ElChroM SRW01 Modified	0.00E+00	2.08E-01	2.08E-01	5.36E-01	U	pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	4/4/2019	19-03041	Strontium-90	ElChroM SRW01 Modified	1.40E-01	2.70E-01	2.74E-01	6.75E-01	U	pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	4/4/2019	19-03041	Strontium-90	ElChroM SRW01 Modified	1.45E-01	2.81E-01	2.86E-01	7.03E-01	U	pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	4/4/2019	19-03041	Strontium-90	ElChroM SRW01 Modified	5.31E-01	2.72E-01	3.29E-01	6.27E-01	U	pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	4/4/2019	19-03041	Strontium-90	ElChroM SRW01 Modified	4.88E-01	3.40E-01	3.80E-01	8.08E-01	U	pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	4/4/2019	19-03041	Strontium-90	ElChroM SRW01 Modified	4.37E-01	2.19E-01	2.67E-01	4.94E-01	U	pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	4/4/2019	19-03041	Strontium-90	ElChroM SRW01 Modified	7.94E-02	3.43E-01	3.45E-01	8.72E-01	U	pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	4/4/2019	19-03041	Strontium-90	ElChroM SRW01 Modified	4.23E-01	2.57E-01	2.96E-01	5.96E-01	U	pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	4/4/2019	19-03041	Strontium-90	ElChroM SRW01 Modified	1.75E-01	3.75E-01	3.79E-01	9.38E-01	U	pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	4/4/2019	19-03041	Strontium-90	ElChroM SRW01 Modified	5.82E-01	3.67E-01	4.19E-01	8.66E-01	U	pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	4/4/2019	19-03041	Strontium-90	ElChroM SRW01 Modified	1.30E-01	2.52E-01	2.56E-01	6.28E-01	U	pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	4/4/2019	19-03041	Strontium-90	ElChroM SRW01 Modified	3.71E-02	2.22E-02	2.57E-02	5.20E-02	U	pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	4/4/2019	19-03041	Strontium-90	ElChroM SRW01 Modified	5.86E-02	2.22E-01	2.23E-01	5.62E-01	U	pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	4/4/2019	19-03041	Strontium-90	ElChroM SRW01 Modified	-3.14E-01	2.87E-01	3.07E-01	7.75E-01	U	pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	4/4/2019	19-03041	Strontium-90	ElChroM SRW01 Modified	2.67E-01	2.76E-01	2.91E-01	6.73E-01	U	pCi/g

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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
19-03041-01	LCS	KNOWN	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Cobalt-60	EPA 901.1 Modified	1.31E+02	5.10E+00				pCi/g
19-03041-01	LCS	KNOWN	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Cesium-137	EPA 901.1 Modified	8.26E+01	3.39E+00				pCi/g
19-03041-01	LCS	SPIKE	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Cobalt-60	EPA 901.1 Modified	1.64E+02	1.38E+01	1.61E+01	1.57E+00		pCi/g
19-03041-01	LCS	SPIKE	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Cesium-137	EPA 901.1 Modified	8.74E+01	7.97E+00	9.14E+00	1.45E+00		pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Actinium-228	EPA 901.1 Modified	-1.21E-01	1.50E-01	1.50E-01	1.81E-01	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Silver-108m	EPA 901.1 Modified	5.08E-02	3.27E-02	3.28E-02	4.03E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Americium-241	EPA 901.1 Modified	-1.51E-02	4.19E-02	4.19E-02	6.10E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Barium-133	EPA 901.1 Modified	-1.39E-02	4.31E-02	4.31E-02	5.59E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Bismuth-214	EPA 901.1 Modified	2.81E-02	6.79E-02	6.79E-02	1.05E-01	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Cobalt-60	EPA 901.1 Modified	8.89E-03	2.53E-02	2.53E-02	5.19E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Cesium-134	EPA 901.1 Modified	-1.56E-02	3.89E-02	3.89E-02	5.13E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Cesium-137	EPA 901.1 Modified	9.29E-03	4.14E-02	4.14E-02	6.32E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Europium-152	EPA 901.1 Modified	-6.01E-02	1.11E-01	1.11E-01	8.78E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Europium-154	EPA 901.1 Modified	3.61E-02	7.99E-02	7.99E-02	4.50E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Europium-155	EPA 901.1 Modified	1.91E-02	3.16E-02	3.16E-02	6.37E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Holmium-166m	EPA 901.1 Modified	0.00E+00	1.37E-02	1.37E-02	3.66E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Iodine-129	EPA 901.1 Modified	-9.00E-03	3.66E-02	3.66E-02	5.33E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Potassium-40	EPA 901.1 Modified	0.00E+00	3.62E-01	3.62E-01	6.49E-01	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Manganese-54	EPA 901.1 Modified	-2.80E-03	3.35E-02	3.35E-02	5.58E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Molybdenum-93	EPA 901.1 Modified	1.74E-02	2.75E-02	2.75E-02	4.74E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Niobium-94	EPA 901.1 Modified	-3.97E-03	2.61E-02	2.61E-02	4.20E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Lead-210	EPA 901.1 Modified	2.09E-01	3.34E-01	3.34E-01	5.35E-01	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Lead-212	EPA 901.1 Modified	3.35E-02	3.83E-02	3.84E-02	6.57E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Lead-214	EPA 901.1 Modified	3.54E-02	5.34E-02	5.35E-02	9.13E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Promethium-145	EPA 901.1 Modified	-2.49E-02	4.06E-02	4.06E-02	5.71E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Radium-226	EPA 901.1 Modified	2.81E-02	6.79E-02	6.79E-02	1.05E-01	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Antimony-125	EPA 901.1 Modified	2.60E-02	8.85E-02	8.85E-02	1.29E-01	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Thorium-234	EPA 901.1 Modified	7.85E-01	3.35E-01	3.38E-01	6.10E-01	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Thallium-208	EPA 901.1 Modified	-4.57E-03	1.10E-01	1.10E-01	1.57E-01	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/14/2019	19-03041	Uranium-235	EPA 901.1 Modified	4.32E-02	1.19E-01	1.19E-01	2.07E-01	U	pCi/g

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19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Actinium-228	EPA 901.1 Modified	1.11E+00	2.64E-01	2.71E-01	5.68E-01		pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Silver-108m	EPA 901.1 Modified	6.66E-03	3.80E-02	3.80E-02	7.72E-02	U	pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Americium-241	EPA 901.1 Modified	-1.66E-01	1.43E-01	1.43E-01	2.14E-01	U	pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Barium-133	EPA 901.1 Modified	9.47E-02	1.62E-01	1.62E-01	1.76E-01	U	pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Bismuth-214	EPA 901.1 Modified	1.38E+00	2.25E-01	2.36E-01	3.51E-01		pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Cobalt-60	EPA 901.1 Modified	1.47E-02	2.95E-02	2.95E-02	8.08E-02	U	pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Cesium-134	EPA 901.1 Modified	2.25E-03	2.24E-02	2.24E-02	9.70E-02	U	pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Cesium-137	EPA 901.1 Modified	-1.07E-02	6.06E-02	6.06E-02	8.77E-02	U	pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Europium-152	EPA 901.1 Modified	-1.04E-02	1.25E-01	1.25E-01	2.64E-01	U	pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Europium-154	EPA 901.1 Modified	-1.52E-01	2.15E-01	2.15E-01	1.34E-01	U	pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Europium-155	EPA 901.1 Modified	1.74E-01	1.51E-01	1.51E-01	2.49E-01	U	pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Holmium-166m	EPA 901.1 Modified	4.76E-02	9.66E-02	9.66E-02	1.01E-01	U	pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Iodine-129	EPA 901.1 Modified	5.29E-02	2.17E-01	2.17E-01	2.85E-01	U	pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Potassium-40	EPA 901.1 Modified	2.81E+01	3.15E+00	3.47E+00	1.99E+00		pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Manganese-54	EPA 901.1 Modified	1.48E-02	5.91E-02	5.91E-02	9.12E-02	U	pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Molybdenum-93	EPA 901.1 Modified	-4.41E-03	4.99E-02	4.99E-02	6.22E-02	U	pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Niobium-94	EPA 901.1 Modified	-4.87E-03	4.80E-02	4.80E-02	7.30E-02	U	pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Lead-210	EPA 901.1 Modified	1.99E+00	1.31E+00	1.31E+00	2.17E+00	U	pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Lead-212	EPA 901.1 Modified	1.31E+00	2.11E-01	2.21E-01	2.56E-01		pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Lead-214	EPA 901.1 Modified	1.55E+00	2.35E-01	2.48E-01	3.59E-01		pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Promethium-145	EPA 901.1 Modified	-1.46E-02	2.04E-01	2.04E-01	2.61E-01	U	pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Radium-226	EPA 901.1 Modified	1.38E+00	2.25E-01	2.36E-01	3.51E-01		pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Antimony-125	EPA 901.1 Modified	9.21E-02	1.57E-01	1.57E-01	2.47E-01	U	pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Thorium-234	EPA 901.1 Modified	2.55E+00	1.33E+00	1.33E+00	2.21E+00	U	pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Thallium-208	EPA 901.1 Modified	8.15E-01	1.90E-01	1.95E-01	2.37E-01		pCi/g
19-03041-03	DUP	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Uranium-235	EPA 901.1 Modified	2.75E-01	3.33E-01	3.34E-01	5.55E-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: 19-03041
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
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Actinium-228	EPA 901.1 Modified	1.08E+00	2.30E-01	2.36E-01	5.44E-01		pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Silver-108m	EPA 901.1 Modified	2.51E-02	3.28E-02	3.29E-02	7.33E-02	U	pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Americium-241	EPA 901.1 Modified	-2.16E-01	1.45E-01	1.45E-01	2.13E-01	U	pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Barium-133	EPA 901.1 Modified	1.85E-02	3.25E-02	3.25E-02	1.69E-01	U	pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Bismuth-214	EPA 901.1 Modified	1.53E+00	2.17E-01	2.31E-01	2.91E-01		pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Cobalt-60	EPA 901.1 Modified	3.20E-02	6.28E-02	6.28E-02	7.94E-02	U	pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Cesium-134	EPA 901.1 Modified	-2.42E-03	2.11E-02	2.11E-02	9.54E-02	U	pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Cesium-137	EPA 901.1 Modified	3.15E-03	6.53E-02	6.53E-02	9.76E-02	U	pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Europium-152	EPA 901.1 Modified	-4.52E-01	2.85E-01	2.86E-01	2.64E-01	U	pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Europium-154	EPA 901.1 Modified	-1.16E-01	2.03E-01	2.03E-01	1.31E-01	U	pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Europium-155	EPA 901.1 Modified	9.01E-02	1.30E-01	1.30E-01	2.49E-01	U	pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Holmium-166m	EPA 901.1 Modified	1.57E-02	9.43E-02	9.43E-02	9.68E-02	U	pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Iodine-129	EPA 901.1 Modified	-1.61E-02	2.15E-01	2.15E-01	2.78E-01	U	pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Potassium-40	EPA 901.1 Modified	2.93E+01	3.31E+00	3.63E+00	1.84E+00		pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Manganese-54	EPA 901.1 Modified	4.70E-03	6.17E-02	6.17E-02	9.12E-02	U	pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Molybdenum-93	EPA 901.1 Modified	-5.75E-03	5.33E-02	5.33E-02	5.79E-02	U	pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Niobium-94	EPA 901.1 Modified	2.90E-02	5.06E-02	5.06E-02	7.47E-02	U	pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Lead-210	EPA 901.1 Modified	1.53E+00	1.30E+00	1.30E+00	2.13E+00	U	pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Lead-212	EPA 901.1 Modified	1.42E+00	2.22E-01	2.34E-01	2.66E-01	U	pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Lead-214	EPA 901.1 Modified	1.39E+00	1.73E-01	1.87E-01	3.19E-01		pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Promethium-145	EPA 901.1 Modified	-1.39E-01	2.12E-01	2.12E-01	2.62E-01	U	pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Radium-226	EPA 901.1 Modified	1.53E+00	2.17E-01	2.31E-01	2.91E-01		pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Antimony-125	EPA 901.1 Modified	-5.19E-02	1.59E-01	1.59E-01	2.32E-01	U	pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Thorium-234	EPA 901.1 Modified	3.01E+00	1.32E+00	1.32E+00	2.21E+00	U	pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Thallium-208	EPA 901.1 Modified	9.04E-01	1.79E-01	1.85E-01	2.47E-01		pCi/g
19-03041-04	DO	L1-12204B-FSGS-003-SS-A	02/04/19 08:04	3/12/2019	3/14/2019	19-03041	Uranium-235	EPA 901.1 Modified	1.20E-01	3.33E-01	3.33E-01	5.45E-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: **19-03041**
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
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Actinium-228	EPA 901.1 Modified	3.58E-01	1.70E-01	1.71E-01	3.14E-01		pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Silver-108m	EPA 901.1 Modified	-3.14E-02	4.84E-02	4.84E-02	4.20E-02	U	pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Americium-241	EPA 901.1 Modified	1.42E-02	9.00E-02	9.00E-02	1.19E-01	U	pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Barium-133	EPA 901.1 Modified	3.74E-02	3.83E-02	3.84E-02	6.98E-02	U	pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Bismuth-214	EPA 901.1 Modified	3.42E-01	9.84E-02	1.00E-01	1.64E-01		pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Cobalt-60	EPA 901.1 Modified	-1.46E-03	5.45E-02	5.45E-02	7.84E-02	U	pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Cesium-134	EPA 901.1 Modified	-6.61E-04	1.40E-02	1.40E-02	4.79E-02	U	pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Cesium-137	EPA 901.1 Modified	1.26E-01	4.85E-02	4.89E-02	8.87E-02		pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Europium-152	EPA 901.1 Modified	1.35E-01	1.47E-01	1.48E-01	1.59E-01	U	pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Europium-154	EPA 901.1 Modified	8.83E-03	1.30E-01	1.30E-01	8.06E-02	U	pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Europium-155	EPA 901.1 Modified	6.53E-02	6.46E-02	6.47E-02	1.03E-01	U	pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Holmium-166m	EPA 901.1 Modified	5.10E-02	5.65E-02	5.65E-02	7.00E-02	U	pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Iodine-129	EPA 901.1 Modified	4.02E-02	2.17E+00	2.17E+00	1.87E+00	U	pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Potassium-40	EPA 901.1 Modified	1.25E+01	1.75E+00	1.86E+00	6.96E-01		pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Manganese-54	EPA 901.1 Modified	-2.03E-02	4.74E-02	4.75E-02	6.66E-02	U	pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Molybdenum-93	EPA 901.1 Modified	-8.33E-03	3.44E-02	3.44E-02	4.62E-02	U	pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Niobium-94	EPA 901.1 Modified	1.27E-02	3.64E-02	3.65E-02	6.03E-02	U	pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Lead-210	EPA 901.1 Modified	8.47E-01	1.01E+00	1.01E+00	1.66E+00	U	pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Lead-212	EPA 901.1 Modified	4.09E-01	8.75E-02	8.99E-02	1.94E-01		pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Lead-214	EPA 901.1 Modified	4.16E-01	9.58E-02	9.81E-02	1.35E-01		pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Promethium-145	EPA 901.1 Modified	1.67E-01	3.51E-01	3.51E-01	5.47E-01	U	pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Radium-226	EPA 901.1 Modified	3.42E-01	9.84E-02	1.00E-01	1.64E-01		pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Antimony-125	EPA 901.1 Modified	4.12E-02	8.47E-02	8.48E-02	1.51E-01	U	pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Thorium-234	EPA 901.1 Modified	1.18E+00	8.45E-01	8.47E-01	1.20E+00	U	pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Thallium-208	EPA 901.1 Modified	1.72E-01	7.57E-02	7.62E-02	1.26E-01		pCi/g
19-03041-05	TRG	L1-12113A-FSGS-003-SS-A	01/17/19 07:10	3/12/2019	3/14/2019	19-03041	Uranium-235	EPA 901.1 Modified	2.09E-02	2.66E-01	2.66E-01	3.48E-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
Zion, IL 60099

Work Order Details:
SDG: 19-03041
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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
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Actinium-228	EPA 901.1 Modified	2.53E-01	2.42E-01	2.42E-01	4.58E-01	U	pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Silver-108m	EPA 901.1 Modified	1.70E-02	5.92E-02	5.92E-02	9.56E-02	U	pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Americium-241	EPA 901.1 Modified	-5.40E-02	9.87E-02	9.87E-02	1.38E-01	U	pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Barium-133	EPA 901.1 Modified	2.22E-02	3.04E-02	3.04E-02	1.30E-01	U	pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Bismuth-214	EPA 901.1 Modified	3.95E-01	1.56E-01	1.58E-01	2.57E-01		pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Cobalt-60	EPA 901.1 Modified	1.12E-01	1.14E-01	1.14E-01	1.75E-01	U	pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Cesium-134	EPA 901.1 Modified	5.08E-03	4.24E-02	4.24E-02	1.17E-01	U	pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Cesium-137	EPA 901.1 Modified	3.72E-01	1.12E-01	1.14E-01	1.46E-01		pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Europium-152	EPA 901.1 Modified	-7.57E-02	2.54E-01	2.54E-01	1.96E-01	U	pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Europium-154	EPA 901.1 Modified	6.26E-02	2.25E-01	2.25E-01	1.04E-01	U	pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Europium-155	EPA 901.1 Modified	2.57E-02	1.07E-01	1.07E-01	1.57E-01	U	pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Holmium-166m	EPA 901.1 Modified	5.32E-02	1.03E-01	1.03E-01	8.32E-02	U	pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Iodine-129	EPA 901.1 Modified	8.16E-02	2.52E-01	2.52E-01	3.74E-01	U	pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Potassium-40	EPA 901.1 Modified	1.63E+01	3.42E+00	3.52E+00	1.46E+00		pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Manganese-54	EPA 901.1 Modified	-3.87E-02	7.63E-02	7.64E-02	1.07E-01	U	pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Molybdenum-93	EPA 901.1 Modified	-1.54E-02	5.17E-02	5.17E-02	8.12E-02	U	pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Niobium-94	EPA 901.1 Modified	3.73E-02	5.64E-02	5.64E-02	1.00E-01	U	pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Lead-210	EPA 901.1 Modified	3.31E+00	1.61E+00	1.62E+00	2.58E+00	U	pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Lead-212	EPA 901.1 Modified	5.40E-01	1.81E-01	1.83E-01	2.71E-01		pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Lead-214	EPA 901.1 Modified	3.20E-01	1.45E-01	1.46E-01	2.18E-01		pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Promethium-145	EPA 901.1 Modified	1.14E-01	1.69E-01	1.69E-01	2.54E-01	U	pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Radium-226	EPA 901.1 Modified	3.95E-01	1.56E-01	1.58E-01	2.57E-01		pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Antimony-125	EPA 901.1 Modified	-9.66E-02	2.28E-01	2.28E-01	2.94E-01	U	pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Thorium-234	EPA 901.1 Modified	1.30E+00	1.48E+00	1.48E+00	2.48E+00	U	pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Thallium-208	EPA 901.1 Modified	4.74E-01	2.51E-01	2.52E-01	3.13E-01		pCi/g
19-03041-06	TRG	L1-10201D-FSGS-005-SS-A	01/08/19 12:34	3/12/2019	3/14/2019	19-03041	Uranium-235	EPA 901.1 Modified	-9.83E-04	2.91E-01	2.91E-01	4.27E-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:	19-03041
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
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Actinium-228	EPA 901.1 Modified	4.08E-01	2.56E-01	2.57E-01	4.92E-01	U	pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Silver-108m	EPA 901.1 Modified	1.74E-02	6.63E-02	6.63E-02	6.86E-02	U	pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Americium-241	EPA 901.1 Modified	1.27E-01	1.07E-01	1.08E-01	1.79E-01	U	pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Barium-133	EPA 901.1 Modified	2.10E-02	4.23E-02	4.23E-02	9.35E-02	U	pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Bismuth-214	EPA 901.1 Modified	5.05E-01	1.72E-01	1.74E-01	2.99E-01		pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Cobalt-60	EPA 901.1 Modified	8.47E-02	6.40E-02	6.41E-02	1.15E-01	U	pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Cesium-134	EPA 901.1 Modified	-2.05E-02	3.11E-02	3.11E-02	8.53E-02	U	pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Cesium-137	EPA 901.1 Modified	2.70E-01	1.02E-01	1.03E-01	1.38E-01		pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Europium-152	EPA 901.1 Modified	1.39E-01	1.86E-01	1.86E-01	2.66E-01	U	pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Europium-154	EPA 901.1 Modified	5.13E-02	1.58E-01	1.58E-01	1.36E-01	U	pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Europium-155	EPA 901.1 Modified	9.26E-02	1.31E-01	1.31E-01	1.83E-01	U	pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Holmium-166m	EPA 901.1 Modified	-9.36E-03	1.06E-01	1.06E-01	1.08E-01	U	pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Iodine-129	EPA 901.1 Modified	3.30E+00	1.38E+01	1.38E+01	3.17E+00	U	pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Potassium-40	EPA 901.1 Modified	6.42E+00	1.66E+00	1.70E+00	1.82E+00		pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Manganese-54	EPA 901.1 Modified	-3.64E-02	6.77E-02	6.78E-02	9.43E-02	U	pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Molybdenum-93	EPA 901.1 Modified	-3.46E-02	5.68E-02	5.68E-02	7.45E-02	U	pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Niobium-94	EPA 901.1 Modified	1.67E-02	6.04E-02	6.04E-02	7.84E-02	U	pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Lead-210	EPA 901.1 Modified	8.05E+00	2.93E+00	2.96E+00	4.01E+00		pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Lead-212	EPA 901.1 Modified	4.26E-01	1.95E-01	1.96E-01	3.02E-01		pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Lead-214	EPA 901.1 Modified	5.27E-01	1.62E-01	1.64E-01	2.87E-01		pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Promethium-145	EPA 901.1 Modified	-6.16E-02	5.56E-01	5.56E-01	8.33E-01	U	pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Radium-226	EPA 901.1 Modified	5.05E-01	1.72E-01	1.74E-01	2.99E-01		pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Antimony-125	EPA 901.1 Modified	-2.75E-02	1.40E-01	1.40E-01	2.34E-01	U	pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Thorium-234	EPA 901.1 Modified	4.06E-01	1.37E+00	1.37E+00	1.85E+00	U	pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Thallium-208	EPA 901.1 Modified	2.55E-01	1.17E-01	1.18E-01	2.39E-01		pCi/g
19-03041-07	TRG	L1-10201D-FSGS-006-SS-A	01/08/19 12:35	3/12/2019	3/14/2019	19-03041	Uranium-235	EPA 901.1 Modified	3.60E-02	4.05E-01	4.05E-01	5.37E-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: 19-03041
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
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Actinium-228	EPA 901.1 Modified	6.04E-01	2.03E-01	2.05E-01	4.22E-01		pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Silver-108m	EPA 901.1 Modified	1.22E-03	3.98E-02	3.98E-02	7.86E-02	U	pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Americium-241	EPA 901.1 Modified	-9.57E-02	8.61E-02	8.63E-02	1.18E-01	U	pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Barium-133	EPA 901.1 Modified	2.96E-03	2.79E-02	2.79E-02	1.35E-01	U	pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Bismuth-214	EPA 901.1 Modified	7.07E-01	1.83E-01	1.87E-01	2.82E-01		pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Cobalt-60	EPA 901.1 Modified	2.64E-02	7.74E-02	7.74E-02	1.19E-01	U	pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Cesium-134	EPA 901.1 Modified	-8.93E-02	9.64E-02	9.65E-02	1.03E-01	U	pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Cesium-137	EPA 901.1 Modified	7.79E-01	1.39E-01	1.44E-01	1.49E-01		pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Europium-152	EPA 901.1 Modified	2.82E-02	1.25E-01	1.25E-01	1.83E-01	U	pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Europium-154	EPA 901.1 Modified	-1.51E-01	2.09E-01	2.09E-01	9.15E-02	U	pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Europium-155	EPA 901.1 Modified	1.51E-01	9.12E-02	9.15E-02	1.45E-01		pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Holmium-166m	EPA 901.1 Modified	2.13E-02	8.81E-02	8.81E-02	7.41E-02	U	pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Iodine-129	EPA 901.1 Modified	-6.83E-02	2.10E-01	2.10E-01	3.01E-01	U	pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Potassium-40	EPA 901.1 Modified	1.51E+01	3.05E+00	3.15E+00	1.53E+00		pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Manganese-54	EPA 901.1 Modified	-1.18E-02	5.64E-02	5.65E-02	8.93E-02	U	pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Molybdenum-93	EPA 901.1 Modified	-1.01E-02	4.61E-02	4.61E-02	7.11E-02	U	pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Niobium-94	EPA 901.1 Modified	2.75E-02	5.18E-02	5.18E-02	7.86E-02	U	pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Lead-210	EPA 901.1 Modified	6.72E-01	8.77E-01	8.78E-01	1.32E+00	U	pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Lead-212	EPA 901.1 Modified	5.62E-01	1.60E-01	1.62E-01	2.34E-01		pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Lead-214	EPA 901.1 Modified	6.37E-01	1.54E-01	1.58E-01	2.61E-01		pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Promethium-145	EPA 901.1 Modified	-1.37E-01	1.48E-01	1.48E-01	2.05E-01	U	pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Radium-226	EPA 901.1 Modified	7.07E-01	1.83E-01	1.87E-01	2.82E-01		pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Antimony-125	EPA 901.1 Modified	1.29E-01	1.70E-01	1.70E-01	2.56E-01	U	pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Thorium-234	EPA 901.1 Modified	1.06E+00	7.52E-01	7.54E-01	1.16E+00	U	pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Thallium-208	EPA 901.1 Modified	4.53E-01	1.62E-01	1.63E-01	2.28E-01		pCi/g
19-03041-08	TRG	L1-12204C-FSGS-003-SS-A	02/04/19 07:47	3/12/2019	3/14/2019	19-03041	Uranium-235	EPA 901.1 Modified	1.92E-01	2.68E-01	2.68E-01	4.07E-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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SDG: 19-03041
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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
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Actinium-228	EPA 901.1 Modified	3.49E-01	1.55E-01	1.56E-01	2.53E-01		pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Silver-108m	EPA 901.1 Modified	-6.12E-02	4.49E-02	4.50E-02	5.02E-02	U	pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Americium-241	EPA 901.1 Modified	-2.10E-01	9.34E-02	9.40E-02	1.29E-01	U	pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Barium-133	EPA 901.1 Modified	-2.65E-02	9.28E-02	9.28E-02	1.00E-01	U	pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Bismuth-214	EPA 901.1 Modified	5.17E-01	1.29E-01	1.31E-01	2.38E-01		pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Cobalt-60	EPA 901.1 Modified	3.66E-02	4.13E-02	4.14E-02	6.02E-02	U	pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Cesium-134	EPA 901.1 Modified	-4.58E-03	2.00E-02	2.00E-02	6.10E-02	U	pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Cesium-137	EPA 901.1 Modified	7.86E-02	6.29E-02	6.31E-02	1.02E-01	U	pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Europium-152	EPA 901.1 Modified	9.36E-02	1.16E-01	1.17E-01	1.74E-01	U	pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Europium-154	EPA 901.1 Modified	-3.33E-02	1.19E-01	1.19E-01	8.84E-02	U	pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Europium-155	EPA 901.1 Modified	2.04E-01	1.34E-01	1.35E-01	1.73E-01		pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Holmium-166m	EPA 901.1 Modified	-1.92E-02	6.72E-02	6.72E-02	6.57E-02	U	pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Iodine-129	EPA 901.1 Modified	-1.49E-01	1.55E-01	1.55E-01	1.81E-01	U	pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Potassium-40	EPA 901.1 Modified	1.17E+01	1.57E+00	1.68E+00	1.05E+00		pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Manganese-54	EPA 901.1 Modified	-2.80E-03	4.25E-02	4.25E-02	6.43E-02	U	pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Molybdenum-93	EPA 901.1 Modified	1.04E-02	2.97E-02	2.97E-02	3.41E-02	U	pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Niobium-94	EPA 901.1 Modified	1.95E-02	3.25E-02	3.25E-02	5.07E-02	U	pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Lead-210	EPA 901.1 Modified	8.41E-01	9.59E-01	9.60E-01	1.60E+00	U	pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Lead-212	EPA 901.1 Modified	5.89E-01	1.37E-01	1.40E-01	1.94E-01		pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Lead-214	EPA 901.1 Modified	5.16E-01	1.28E-01	1.30E-01	2.10E-01		pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Promethium-145	EPA 901.1 Modified	-9.64E-02	1.37E-01	1.38E-01	1.65E-01	U	pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Radium-226	EPA 901.1 Modified	5.17E-01	1.29E-01	1.31E-01	2.38E-01		pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Antimony-125	EPA 901.1 Modified	-6.36E-02	1.01E-01	1.01E-01	1.39E-01	U	pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Thorium-234	EPA 901.1 Modified	1.63E+00	8.20E-01	8.24E-01	1.41E+00	U	pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Thallium-208	EPA 901.1 Modified	3.11E-01	9.07E-02	9.21E-02	1.07E-01		pCi/g
19-03041-09	TRG	L1-12204A-FSGS-004-SS-A	02/05/19 10:38	3/12/2019	3/14/2019	19-03041	Uranium-235	EPA 901.1 Modified	-4.61E-02	2.11E-01	2.11E-01	3.39E-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:	19-03041
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
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Actinium-228	EPA 901.1 Modified	6.81E-01	1.79E-01	1.83E-01	3.19E-01		pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Silver-108m	EPA 901.1 Modified	1.96E-03	1.95E-02	1.95E-02	4.74E-02	U	pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Americium-241	EPA 901.1 Modified	1.10E-01	1.09E-01	1.09E-01	1.50E-01	U	pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Barium-133	EPA 901.1 Modified	8.53E-02	4.64E-02	4.66E-02	1.15E-01	U	pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Bismuth-214	EPA 901.1 Modified	7.40E-01	1.20E-01	1.26E-01	1.24E-01		pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Cobalt-60	EPA 901.1 Modified	7.01E-02	5.25E-02	5.27E-02	8.19E-02	U	pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Cesium-134	EPA 901.1 Modified	-2.94E-03	2.04E-02	2.04E-02	4.92E-02	U	pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Cesium-137	EPA 901.1 Modified	2.34E-01	6.87E-02	6.97E-02	8.96E-02		pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Europium-152	EPA 901.1 Modified	-1.04E-02	1.42E-01	1.42E-01	1.73E-01	U	pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Europium-154	EPA 901.1 Modified	-2.02E-01	1.62E-01	1.62E-01	9.00E-02	U	pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Europium-155	EPA 901.1 Modified	1.61E-01	1.12E-01	1.12E-01	1.47E-01	U	pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Holmium-166m	EPA 901.1 Modified	2.67E-02	6.72E-02	6.73E-02	7.52E-02	U	pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Iodine-129	EPA 901.1 Modified	1.73E+00	7.36E+00	7.36E+00	1.94E+00	U	pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Potassium-40	EPA 901.1 Modified	1.73E+01	2.21E+00	2.38E+00	7.74E-01		pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Manganese-54	EPA 901.1 Modified	-1.46E-02	4.61E-02	4.61E-02	6.59E-02	U	pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Molybdenum-93	EPA 901.1 Modified	-2.32E-02	4.01E-02	4.01E-02	4.91E-02	U	pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Niobium-94	EPA 901.1 Modified	2.54E-02	3.82E-02	3.82E-02	5.92E-02	U	pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Lead-210	EPA 901.1 Modified	2.07E+00	1.61E+00	1.61E+00	2.59E+00	U	pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Lead-212	EPA 901.1 Modified	6.22E-01	1.12E-01	1.16E-01	2.02E-01		pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Lead-214	EPA 901.1 Modified	8.39E-01	1.20E-01	1.28E-01	2.03E-01		pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Promethium-145	EPA 901.1 Modified	2.55E-01	3.81E-01	3.81E-01	5.66E-01	U	pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Radium-226	EPA 901.1 Modified	7.40E-01	1.20E-01	1.26E-01	1.24E-01		pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Antimony-125	EPA 901.1 Modified	9.88E-02	8.64E-02	8.65E-02	1.61E-01	U	pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Thorium-234	EPA 901.1 Modified	3.30E-01	1.07E+00	1.07E+00	1.40E+00	U	pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Thallium-208	EPA 901.1 Modified	3.67E-01	1.01E-01	1.03E-01	1.28E-01		pCi/g
19-03041-10	TRG	L1-12204B-FSGS-015-SS-A	02/04/19 08:16	3/12/2019	3/14/2019	19-03041	Uranium-235	EPA 901.1 Modified	-1.69E-01	3.11E-01	3.11E-01	3.82E-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: 19-03041
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
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Actinium-228	EPA 901.1 Modified	3.00E-01	2.26E-01	2.26E-01	4.13E-01	U	pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Silver-108m	EPA 901.1 Modified	-1.01E-02	5.30E-02	5.30E-02	6.94E-02	U	pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Americium-241	EPA 901.1 Modified	-1.09E-01	8.22E-02	8.24E-02	1.09E-01	U	pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Barium-133	EPA 901.1 Modified	1.76E-02	2.45E-02	2.45E-02	1.16E-01	U	pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Bismuth-214	EPA 901.1 Modified	4.62E-01	1.36E-01	1.39E-01	2.12E-01		pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Cobalt-60	EPA 901.1 Modified	9.72E-02	7.78E-02	7.79E-02	1.46E-01	U	pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Cesium-134	EPA 901.1 Modified	1.16E-02	2.96E-02	2.96E-02	9.72E-02	U	pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Cesium-137	EPA 901.1 Modified	2.85E-01	8.99E-02	9.11E-02	1.23E-01		pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Europium-152	EPA 901.1 Modified	-1.46E-01	1.85E-01	1.85E-01	1.67E-01	U	pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Europium-154	EPA 901.1 Modified	9.03E-02	1.77E-01	1.77E-01	8.26E-02	U	pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Europium-155	EPA 901.1 Modified	4.18E-02	8.58E-02	8.59E-02	1.28E-01	U	pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Holmium-166m	EPA 901.1 Modified	7.58E-03	8.40E-02	8.40E-02	6.88E-02	U	pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Iodine-129	EPA 901.1 Modified	6.21E-02	1.85E-01	1.85E-01	2.73E-01	U	pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Potassium-40	EPA 901.1 Modified	1.77E+01	3.39E+00	3.51E+00	1.11E+00		pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Manganese-54	EPA 901.1 Modified	-1.24E-02	5.87E-02	5.87E-02	9.26E-02	U	pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Molybdenum-93	EPA 901.1 Modified	-5.10E-02	4.83E-02	4.84E-02	6.74E-02	U	pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Niobium-94	EPA 901.1 Modified	-1.03E-03	4.60E-02	4.60E-02	7.58E-02	U	pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Lead-210	EPA 901.1 Modified	9.32E-01	9.73E-01	9.74E-01	1.62E+00	U	pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Lead-212	EPA 901.1 Modified	3.64E-01	9.97E-02	1.01E-01	2.25E-01		pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Lead-214	EPA 901.1 Modified	5.45E-01	1.27E-01	1.30E-01	1.93E-01		pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Promethium-145	EPA 901.1 Modified	1.40E-01	1.32E-01	1.32E-01	2.01E-01	U	pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Radium-226	EPA 901.1 Modified	4.62E-01	1.36E-01	1.39E-01	2.12E-01		pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Antimony-125	EPA 901.1 Modified	-1.01E-01	1.70E-01	1.70E-01	2.18E-01	U	pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Thorium-234	EPA 901.1 Modified	5.36E-01	7.37E-01	7.37E-01	1.10E+00	U	pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Thallium-208	EPA 901.1 Modified	3.65E-01	1.88E-01	1.89E-01	2.26E-01		pCi/g
19-03041-11	TRG	L1-10201C-FQGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Uranium-235	EPA 901.1 Modified	1.74E-01	2.33E-01	2.33E-01	3.60E-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: 19-03041
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
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Actinium-228	EPA 901.1 Modified	6.36E-01	2.34E-01	2.36E-01	4.55E-01		pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Silver-108m	EPA 901.1 Modified	-4.17E-02	8.19E-02	8.19E-02	9.72E-02	U	pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Americium-241	EPA 901.1 Modified	3.76E-04	1.03E-01	1.03E-01	1.50E-01	U	pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Barium-133	EPA 901.1 Modified	1.44E-02	4.43E-02	4.43E-02	1.64E-01	U	pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Bismuth-214	EPA 901.1 Modified	6.60E-01	1.77E-01	1.80E-01	2.42E-01		pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Cobalt-60	EPA 901.1 Modified	1.01E-01	5.72E-02	5.74E-02	1.21E-01	U	pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Cesium-134	EPA 901.1 Modified	1.35E-02	4.45E-02	4.45E-02	1.29E-01	U	pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Cesium-137	EPA 901.1 Modified	3.63E-01	1.22E-01	1.23E-01	1.65E-01		pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Europium-152	EPA 901.1 Modified	1.36E-01	1.83E-01	1.84E-01	2.31E-01	U	pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Europium-154	EPA 901.1 Modified	1.06E-01	2.45E-01	2.45E-01	1.20E-01	U	pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Europium-155	EPA 901.1 Modified	-2.58E-02	1.28E-01	1.28E-01	1.85E-01	U	pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Holmium-166m	EPA 901.1 Modified	7.57E-02	6.57E-02	6.58E-02	1.11E-01	U	pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Iodine-129	EPA 901.1 Modified	1.54E-02	7.58E-02	7.58E-02	1.14E-01	U	pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Potassium-40	EPA 901.1 Modified	1.25E+01	2.26E+00	2.34E+00	1.95E+00		pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Manganese-54	EPA 901.1 Modified	6.70E-02	7.80E-02	7.81E-02	1.40E-01	U	pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Molybdenum-93	EPA 901.1 Modified	7.23E-03	7.26E-02	7.26E-02	9.17E-02	U	pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Niobium-94	EPA 901.1 Modified	5.57E-02	7.38E-02	7.39E-02	1.11E-01	U	pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Lead-210	EPA 901.1 Modified	-3.69E-01	8.83E-01	8.84E-01	1.26E+00	U	pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Lead-212	EPA 901.1 Modified	6.56E-01	1.54E-01	1.57E-01	2.15E-01		pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Lead-214	EPA 901.1 Modified	4.78E-01	1.32E-01	1.34E-01	2.24E-01		pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Promethium-145	EPA 901.1 Modified	-1.29E-01	9.95E-02	9.98E-02	1.34E-01	U	pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Radium-226	EPA 901.1 Modified	6.60E-01	1.77E-01	1.80E-01	2.42E-01		pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Antimony-125	EPA 901.1 Modified	-1.12E-01	2.34E-01	2.34E-01	3.00E-01	U	pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Thorium-234	EPA 901.1 Modified	4.84E-01	9.99E-01	1.00E+00	1.50E+00	U	pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Thallium-208	EPA 901.1 Modified	3.68E-01	1.67E-01	1.68E-01	2.16E-01		pCi/g
19-03041-12	TRG	L1-12113A-FSGS-006-SS-A	01/17/19 07:25	3/12/2019	3/14/2019	19-03041	Uranium-235	EPA 901.1 Modified	3.50E-02	3.24E-01	3.24E-01	4.82E-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: 19-03041
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
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Actinium-228	EPA 901.1 Modified	5.86E-01	1.62E-01	1.64E-01	4.93E-01		pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Silver-108m	EPA 901.1 Modified	1.67E-02	3.05E-02	3.05E-02	5.48E-02	U	pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Americium-241	EPA 901.1 Modified	-2.87E-01	1.14E-01	1.15E-01	1.55E-01	U	pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Barium-133	EPA 901.1 Modified	-2.46E-02	1.03E-01	1.03E-01	1.21E-01	U	pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Bismuth-214	EPA 901.1 Modified	6.32E-01	1.30E-01	1.34E-01	1.91E-01		pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Cobalt-60	EPA 901.1 Modified	3.34E-02	5.17E-02	5.17E-02	6.26E-02	U	pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Cesium-134	EPA 901.1 Modified	-7.43E-03	1.84E-02	1.84E-02	7.07E-02	U	pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Cesium-137	EPA 901.1 Modified	2.52E-02	5.72E-02	5.72E-02	9.08E-02	U	pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Europium-152	EPA 901.1 Modified	-3.04E-01	2.03E-01	2.04E-01	1.99E-01	U	pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Europium-154	EPA 901.1 Modified	2.93E-02	1.16E-01	1.16E-01	1.02E-01	U	pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Europium-155	EPA 901.1 Modified	7.71E-02	1.06E-01	1.06E-01	1.76E-01	U	pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Holmium-166m	EPA 901.1 Modified	1.97E-02	7.32E-02	7.32E-02	7.61E-02	U	pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Iodine-129	EPA 901.1 Modified	4.47E-03	1.74E-01	1.74E-01	2.24E-01	U	pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Potassium-40	EPA 901.1 Modified	1.69E+01	2.16E+00	2.33E+00	1.43E+00		pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Manganese-54	EPA 901.1 Modified	7.74E-03	4.64E-02	4.64E-02	7.35E-02	U	pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Molybdenum-93	EPA 901.1 Modified	1.03E-02	3.80E-02	3.80E-02	5.38E-02	U	pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Niobium-94	EPA 901.1 Modified	8.94E-03	3.90E-02	3.90E-02	6.33E-02	U	pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Lead-210	EPA 901.1 Modified	1.58E+00	1.35E+00	1.35E+00	2.23E+00	U	pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Lead-212	EPA 901.1 Modified	7.59E-01	1.58E-01	1.63E-01	2.13E-01		pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Lead-214	EPA 901.1 Modified	6.01E-01	1.48E-01	1.51E-01	2.71E-01		pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Promethium-145	EPA 901.1 Modified	-9.95E-02	1.64E-01	1.64E-01	2.01E-01	U	pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Radium-226	EPA 901.1 Modified	6.32E-01	1.30E-01	1.34E-01	1.91E-01		pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Antimony-125	EPA 901.1 Modified	2.66E-02	1.17E-01	1.17E-01	1.81E-01	U	pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Thorium-234	EPA 901.1 Modified	1.56E+00	1.02E+00	1.02E+00	1.69E+00	U	pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Thallium-208	EPA 901.1 Modified	5.89E-01	1.33E-01	1.37E-01	1.77E-01		pCi/g
19-03041-13	TRG	L1-12204A-FSGS-008-SS-A	02/05/19 10:42	3/12/2019	3/14/2019	19-03041	Uranium-235	EPA 901.1 Modified	1.35E-01	2.60E-01	2.60E-01	4.35E-01	U	pCi/g

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2701 Deborah Ave
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SDG: 19-03041
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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
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Actinium-228	EPA 901.1 Modified	3.97E-01	1.40E-01	1.42E-01	3.25E-01		pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Silver-108m	EPA 901.1 Modified	5.50E-03	2.54E-02	2.54E-02	4.39E-02	U	pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Americium-241	EPA 901.1 Modified	4.80E-02	7.74E-02	7.74E-02	1.25E-01	U	pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Barium-133	EPA 901.1 Modified	6.17E-03	3.83E-02	3.83E-02	7.78E-02	U	pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Bismuth-214	EPA 901.1 Modified	4.09E-01	1.18E-01	1.20E-01	1.95E-01		pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Cobalt-60	EPA 901.1 Modified	7.84E-02	4.42E-02	4.44E-02	7.07E-02		pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Cesium-134	EPA 901.1 Modified	-1.22E-01	6.20E-02	6.23E-02	5.44E-02	U	pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Cesium-137	EPA 901.1 Modified	1.82E-01	5.53E-02	5.61E-02	6.58E-02		pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Europium-152	EPA 901.1 Modified	7.73E-02	1.77E-01	1.77E-01	1.68E-01	U	pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Europium-154	EPA 901.1 Modified	-1.02E-01	1.37E-01	1.37E-01	8.92E-02	U	pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Europium-155	EPA 901.1 Modified	1.92E-02	9.24E-02	9.24E-02	1.23E-01	U	pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Holmium-166m	EPA 901.1 Modified	5.29E-02	6.07E-02	6.07E-02	7.12E-02	U	pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Iodine-129	EPA 901.1 Modified	1.14E+00	5.08E+00	5.08E+00	2.03E+00	U	pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Potassium-40	EPA 901.1 Modified	1.23E+01	1.89E+00	2.00E+00	1.42E+00		pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Manganese-54	EPA 901.1 Modified	1.77E-02	3.91E-02	3.91E-02	6.56E-02	U	pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Molybdenum-93	EPA 901.1 Modified	2.92E-02	3.45E-02	3.45E-02	5.18E-02	U	pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Niobium-94	EPA 901.1 Modified	-8.91E-03	3.20E-02	3.20E-02	5.19E-02	U	pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Lead-210	EPA 901.1 Modified	3.53E+00	1.82E+00	1.83E+00	2.73E+00		pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Lead-212	EPA 901.1 Modified	4.60E-01	9.83E-02	1.01E-01	1.91E-01		pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Lead-214	EPA 901.1 Modified	4.89E-01	1.03E-01	1.06E-01	3.82E-01		pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Promethium-145	EPA 901.1 Modified	2.84E-01	3.76E-01	3.76E-01	5.68E-01	U	pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Radium-226	EPA 901.1 Modified	4.09E-01	1.18E-01	1.20E-01	1.95E-01		pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Antimony-125	EPA 901.1 Modified	7.75E-02	7.72E-02	7.73E-02	1.48E-01	U	pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Thorium-234	EPA 901.1 Modified	6.10E-01	7.44E-01	7.45E-01	1.24E+00	U	pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Thallium-208	EPA 901.1 Modified	2.68E-01	1.15E-01	1.16E-01	1.78E-01		pCi/g
19-03041-14	TRG	L1-10201C-FSGS-012-SS-A	02/13/19 09:00	3/12/2019	3/14/2019	19-03041	Uranium-235	EPA 901.1 Modified	1.71E-01	2.74E-01	2.75E-01	3.81E-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: 19-03041
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
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Actinium-228	EPA 901.1 Modified	7.08E-01	2.21E-01	2.24E-01	3.68E-01		pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Silver-108m	EPA 901.1 Modified	2.58E-02	3.38E-02	3.38E-02	8.37E-02	U	pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Americium-241	EPA 901.1 Modified	1.60E-01	1.18E-01	1.18E-01	1.94E-01	U	pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Barium-133	EPA 901.1 Modified	4.51E-02	1.06E-01	1.06E-01	1.35E-01	U	pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Bismuth-214	EPA 901.1 Modified	5.14E-01	1.75E-01	1.77E-01	2.51E-01		pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Cobalt-60	EPA 901.1 Modified	2.83E-02	8.81E-02	8.81E-02	1.49E-01	U	pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Cesium-134	EPA 901.1 Modified	8.36E-03	3.18E-02	3.18E-02	1.14E-01	U	pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Cesium-137	EPA 901.1 Modified	7.65E-02	7.18E-02	7.19E-02	1.17E-01	U	pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Europium-152	EPA 901.1 Modified	-1.89E-01	2.17E-01	2.18E-01	1.88E-01	U	pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Europium-154	EPA 901.1 Modified	8.33E-02	2.42E-01	2.42E-01	9.79E-02	U	pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Europium-155	EPA 901.1 Modified	-1.59E-02	1.02E-01	1.02E-01	1.46E-01	U	pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Holmium-166m	EPA 901.1 Modified	-4.00E-02	1.03E-01	1.03E-01	8.01E-02	U	pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Iodine-129	EPA 901.1 Modified	4.18E-02	1.22E-01	1.22E-01	3.40E-01	U	pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Potassium-40	EPA 901.1 Modified	2.10E+01	4.08E+00	4.22E+00	1.69E+00		pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Manganese-54	EPA 901.1 Modified	-8.31E-02	7.70E-02	7.72E-02	1.06E-01	U	pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Molybdenum-93	EPA 901.1 Modified	-3.99E-02	5.70E-02	5.70E-02	8.41E-02	U	pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Niobium-94	EPA 901.1 Modified	4.92E-03	5.92E-02	5.92E-02	9.68E-02	U	pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Lead-210	EPA 901.1 Modified	1.18E+00	1.15E+00	1.15E+00	1.92E+00	U	pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Lead-212	EPA 901.1 Modified	5.06E-01	1.29E-01	1.31E-01	2.25E-01		pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Lead-214	EPA 901.1 Modified	5.40E-01	1.35E-01	1.38E-01	3.35E-01		pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Promethium-145	EPA 901.1 Modified	-4.68E-02	1.00E-01	1.00E-01	2.26E-01	U	pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Radium-226	EPA 901.1 Modified	5.14E-01	1.75E-01	1.77E-01	2.51E-01		pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Antimony-125	EPA 901.1 Modified	1.82E-02	1.89E-01	1.89E-01	2.67E-01	U	pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Thorium-234	EPA 901.1 Modified	1.15E+00	1.16E+00	1.17E+00	1.63E+00	U	pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Thallium-208	EPA 901.1 Modified	2.98E-01	2.42E-01	2.43E-01	2.70E-01		pCi/g
19-03041-15	TRG	L1-12204C-FQGS-001-SB-A	02/06/19 13:13	3/12/2019	3/14/2019	19-03041	Uranium-235	EPA 901.1 Modified	-3.35E-02	2.95E-01	2.95E-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:	19-03041
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
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Actinium-228	EPA 901.1 Modified	5.57E-01	4.01E-01	4.02E-01	7.13E-01	U	pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Silver-108m	EPA 901.1 Modified	1.34E-02	8.66E-02	8.66E-02	8.85E-02	U	pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Americium-241	EPA 901.1 Modified	3.13E-02	1.15E-01	1.15E-01	1.68E-01	U	pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Barium-133	EPA 901.1 Modified	-1.53E-02	3.07E-02	3.07E-02	1.86E-01	U	pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Bismuth-214	EPA 901.1 Modified	6.91E-01	1.64E-01	1.68E-01	1.15E-01		pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Cobalt-60	EPA 901.1 Modified	1.01E+00	1.52E-01	1.60E-01	2.34E-01		pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Cesium-134	EPA 901.1 Modified	1.61E-02	2.79E-02	2.79E-02	1.42E-01	U	pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Cesium-137	EPA 901.1 Modified	2.12E-01	1.22E-01	1.22E-01	1.90E-01		pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Europium-152	EPA 901.1 Modified	-1.84E-01	2.15E-01	2.15E-01	2.41E-01	U	pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Europium-154	EPA 901.1 Modified	-1.75E-01	2.54E-01	2.55E-01	1.25E-01	U	pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Europium-155	EPA 901.1 Modified	5.61E-02	1.37E-01	1.37E-01	2.03E-01	U	pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Holmium-166m	EPA 901.1 Modified	9.36E-02	1.48E-01	1.48E-01	9.32E-02	U	pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Iodine-129	EPA 901.1 Modified	-1.08E-02	8.40E-02	8.40E-02	1.22E-01	U	pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Potassium-40	EPA 901.1 Modified	1.59E+01	2.51E+00	2.64E+00	1.76E+00		pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Manganese-54	EPA 901.1 Modified	-6.53E-02	1.05E-01	1.05E-01	1.52E-01	U	pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Molybdenum-93	EPA 901.1 Modified	1.93E-02	8.10E-02	8.10E-02	1.11E-01	U	pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Niobium-94	EPA 901.1 Modified	1.16E-03	7.81E-02	7.81E-02	1.22E-01	U	pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Lead-210	EPA 901.1 Modified	1.47E+00	8.25E-01	8.29E-01	1.32E+00		pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Lead-212	EPA 901.1 Modified	6.19E-01	1.76E-01	1.79E-01	2.62E-01		pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Lead-214	EPA 901.1 Modified	6.36E-01	1.86E-01	1.89E-01	3.26E-01		pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Promethium-145	EPA 901.1 Modified	4.79E-02	9.88E-02	9.88E-02	1.50E-01	U	pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Radium-226	EPA 901.1 Modified	6.91E-01	1.64E-01	1.68E-01	1.15E-01		pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Antimony-125	EPA 901.1 Modified	1.53E-02	2.13E-01	2.13E-01	2.97E-01	U	pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Thorium-234	EPA 901.1 Modified	1.09E+00	1.10E+00	1.10E+00	1.67E+00	U	pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Thallium-208	EPA 901.1 Modified	4.69E-01	1.69E-01	1.71E-01	2.08E-01		pCi/g
19-03041-16	TRG	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/14/2019	19-03041	Uranium-235	EPA 901.1 Modified	3.75E-01	3.41E-01	3.42E-01	5.34E-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: 19-03041
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
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Actinium-228	EPA 901.1 Modified	3.62E-01	2.10E-01	2.10E-01	3.73E-01	U	pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Silver-108m	EPA 901.1 Modified	-3.78E-02	4.51E-02	4.51E-02	5.74E-02	U	pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Americium-241	EPA 901.1 Modified	-2.15E-01	1.09E-01	1.09E-01	1.52E-01	U	pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Barium-133	EPA 901.1 Modified	-7.46E-03	2.66E-02	2.66E-02	1.20E-01	U	pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Bismuth-214	EPA 901.1 Modified	4.40E-01	1.07E-01	1.09E-01	1.94E-01		pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Cobalt-60	EPA 901.1 Modified	-4.44E-02	5.84E-02	5.85E-02	7.44E-02	U	pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Cesium-134	EPA 901.1 Modified	4.33E-03	2.20E-02	2.20E-02	7.08E-02	U	pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Cesium-137	EPA 901.1 Modified	1.89E-01	7.07E-02	7.13E-02	1.01E-01		pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Europium-152	EPA 901.1 Modified	-2.69E-02	1.60E-01	1.60E-01	1.84E-01	U	pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Europium-154	EPA 901.1 Modified	2.12E-02	1.23E-01	1.23E-01	9.54E-02	U	pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Europium-155	EPA 901.1 Modified	1.26E-01	1.03E-01	1.03E-01	1.73E-01	U	pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Holmium-166m	EPA 901.1 Modified	1.97E-02	6.35E-02	6.35E-02	6.98E-02	U	pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Iodine-129	EPA 901.1 Modified	-2.05E-02	1.67E-01	1.67E-01	2.17E-01	U	pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Potassium-40	EPA 901.1 Modified	1.47E+01	1.95E+00	2.09E+00	1.39E+00		pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Manganese-54	EPA 901.1 Modified	-1.22E-02	4.66E-02	4.66E-02	6.83E-02	U	pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Molybdenum-93	EPA 901.1 Modified	-2.11E-02	3.65E-02	3.65E-02	4.20E-02	U	pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Niobium-94	EPA 901.1 Modified	3.75E-02	3.69E-02	3.70E-02	4.53E-02	U	pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Lead-210	EPA 901.1 Modified	1.52E+00	8.99E-01	9.02E-01	1.55E+00	U	pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Lead-212	EPA 901.1 Modified	6.13E-01	1.47E-01	1.51E-01	2.10E-01		pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Lead-214	EPA 901.1 Modified	5.57E-01	1.36E-01	1.39E-01	2.09E-01		pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Promethium-145	EPA 901.1 Modified	-9.76E-02	1.62E-01	1.62E-01	1.91E-01	U	pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Radium-226	EPA 901.1 Modified	4.40E-01	1.07E-01	1.09E-01	1.94E-01		pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Antimony-125	EPA 901.1 Modified	-2.92E-02	1.14E-01	1.14E-01	1.68E-01	U	pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Thorium-234	EPA 901.1 Modified	1.35E+00	1.62E+00	1.62E+00	2.72E+00	U	pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Thallium-208	EPA 901.1 Modified	5.41E-01	1.39E-01	1.42E-01	1.22E-01		pCi/g
19-03041-17	TRG	L1-12112A-FSGS-013-SS-A	01/17/19 11:00	3/12/2019	3/14/2019	19-03041	Uranium-235	EPA 901.1 Modified	5.13E-02	2.41E-01	2.41E-01	3.94E-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:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-03041
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
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Actinium-228	EPA 901.1 Modified	3.37E-01	1.39E-01	1.40E-01	2.79E-01	U	pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Silver-108m	EPA 901.1 Modified	9.15E-05	3.82E-02	3.82E-02	4.13E-02	U	pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Americium-241	EPA 901.1 Modified	-3.42E-03	8.22E-02	8.22E-02	1.06E-01	U	pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Barium-133	EPA 901.1 Modified	-1.35E-02	2.26E-02	2.26E-02	5.72E-02	U	pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Bismuth-214	EPA 901.1 Modified	4.45E-01	8.94E-02	9.22E-02	1.16E-01		pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Cobalt-60	EPA 901.1 Modified	-1.29E-02	4.66E-02	4.66E-02	5.50E-02	U	pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Cesium-134	EPA 901.1 Modified	-8.72E-05	1.64E-02	1.64E-02	3.56E-02	U	pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Cesium-137	EPA 901.1 Modified	9.41E-02	5.87E-02	5.89E-02	9.24E-02		pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Europium-152	EPA 901.1 Modified	-6.83E-02	1.56E-01	1.56E-01	1.37E-01	U	pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Europium-154	EPA 901.1 Modified	1.06E-01	9.80E-02	9.81E-02	7.26E-02	U	pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Europium-155	EPA 901.1 Modified	9.24E-02	8.01E-02	8.03E-02	1.10E-01	U	pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Holmium-166m	EPA 901.1 Modified	-4.01E-04	5.99E-02	5.99E-02	5.60E-02	U	pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Iodine-129	EPA 901.1 Modified	1.46E+00	6.21E+00	6.21E+00	1.60E+00	U	pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Potassium-40	EPA 901.1 Modified	1.12E+01	1.54E+00	1.65E+00	5.44E-01		pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Manganese-54	EPA 901.1 Modified	1.64E-02	3.41E-02	3.41E-02	5.78E-02	U	pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Molybdenum-93	EPA 901.1 Modified	1.65E-02	2.92E-02	2.92E-02	4.80E-02	U	pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Niobium-94	EPA 901.1 Modified	1.06E-02	3.50E-02	3.50E-02	5.41E-02	U	pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Lead-210	EPA 901.1 Modified	1.70E+00	9.52E-01	9.56E-01	1.61E+00	U	pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Lead-212	EPA 901.1 Modified	2.71E-01	6.69E-02	6.83E-02	1.23E-01		pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Lead-214	EPA 901.1 Modified	3.77E-01	9.54E-02	9.73E-02	1.61E-01		pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Promethium-145	EPA 901.1 Modified	-3.43E-03	2.92E-01	2.92E-01	4.41E-01	U	pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Radium-226	EPA 901.1 Modified	4.45E-01	8.94E-02	9.22E-02	1.16E-01		pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Antimony-125	EPA 901.1 Modified	1.41E-02	8.26E-02	8.26E-02	1.40E-01	U	pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Thorium-234	EPA 901.1 Modified	7.53E-01	7.54E-01	7.55E-01	1.05E+00	U	pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Thallium-208	EPA 901.1 Modified	2.22E-01	7.43E-02	7.52E-02	8.15E-02		pCi/g
19-03041-18	TRG	L1-12112A-FSGS-010-SS-A	01/17/19 10:45	3/12/2019	3/14/2019	19-03041	Uranium-235	EPA 901.1 Modified	3.88E-01	2.23E-01	2.24E-01	3.32E-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: 19-03041
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
		CONFIRMATION RUN												
19-03041-01	LCS	KNOWN	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Cobalt-60	EPA 901.1 Modified	1.31E+02	5.10E+00				pCi/g
19-03041-01	LCS	KNOWN	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Cesium-137	EPA 901.1 Modified	8.26E+01	3.39E+00				pCi/g
19-03041-01	LCS	SPIKE	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Cobalt-60	EPA 901.1 Modified	1.45E+02	9.35E+00	1.19E+01	1.19E+00		pCi/g
19-03041-01	LCS	SPIKE	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Cesium-137	EPA 901.1 Modified	9.40E+01	1.03E+01	1.14E+01	1.95E+00		pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Actinium-228	EPA 901.1 Modified	-1.07E-02	8.05E-02	8.05E-02	1.25E-01	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Silver-108m	EPA 901.1 Modified	1.95E-03	5.87E-03	5.87E-03	2.40E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Americium-241	EPA 901.1 Modified	-4.80E-03	3.56E-02	3.56E-02	5.34E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Barium-133	EPA 901.1 Modified	-1.45E-02	2.93E-02	2.93E-02	3.32E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Bismuth-214	EPA 901.1 Modified	4.70E-02	5.01E-02	5.02E-02	8.56E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Cobalt-60	EPA 901.1 Modified	-4.34E-03	1.82E-02	1.82E-02	2.71E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Cesium-134	EPA 901.1 Modified	1.97E-03	1.77E-02	1.77E-02	3.12E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Cesium-137	EPA 901.1 Modified	2.93E-03	2.07E-02	2.07E-02	3.41E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Europium-152	EPA 901.1 Modified	-3.33E-02	9.43E-02	9.43E-02	7.80E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Europium-154	EPA 901.1 Modified	1.99E-02	5.88E-02	5.88E-02	4.00E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Europium-155	EPA 901.1 Modified	1.07E-02	3.68E-02	3.68E-02	5.11E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Holmium-166m	EPA 901.1 Modified	-2.41E-02	4.29E-02	4.29E-02	3.70E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Iodine-129	EPA 901.1 Modified	-1.17E+00	4.94E+00	4.94E+00	1.00E+00	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Potassium-40	EPA 901.1 Modified	2.26E-01	2.09E-01	2.10E-01	4.55E-01	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Manganese-54	EPA 901.1 Modified	8.87E-03	1.71E-02	1.71E-02	3.12E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Molybdenum-93	EPA 901.1 Modified	1.63E-02	1.88E-02	1.88E-02	3.47E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Niobium-94	EPA 901.1 Modified	3.12E-04	9.51E-03	9.51E-03	3.04E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Lead-210	EPA 901.1 Modified	4.54E-01	5.76E-01	5.76E-01	9.94E-01	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Lead-212	EPA 901.1 Modified	1.97E-02	4.06E-02	4.06E-02	5.81E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Lead-214	EPA 901.1 Modified	8.07E-02	4.40E-02	4.42E-02	8.14E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Promethium-145	EPA 901.1 Modified	8.56E-02	1.90E-01	1.90E-01	2.98E-01	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Radium-226	EPA 901.1 Modified	4.70E-02	5.01E-02	5.02E-02	8.56E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Antimony-125	EPA 901.1 Modified	4.65E-02	4.24E-02	4.24E-02	8.48E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Thorium-234	EPA 901.1 Modified	2.68E-01	3.85E-01	3.85E-01	5.62E-01	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Thallium-208	EPA 901.1 Modified	5.17E-02	4.83E-02	4.84E-02	7.13E-02	U	pCi/g
19-03041-02	MBL	BLANK	03/12/19 00:00	3/12/2019	3/26/2019	19-03041	Uranium-235	EPA 901.1 Modified	1.23E-01	1.19E-01	1.19E-01	1.85E-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:	19-03041
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
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Actinium-228	EPA 901.1 Modified	7.60E-01	3.49E-01	3.51E-01	7.89E-01	U	pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Silver-108m	EPA 901.1 Modified	7.37E-03	7.03E-02	7.03E-02	8.19E-02	U	pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Americium-241	EPA 901.1 Modified	-7.74E-02	8.93E-02	8.94E-02	1.23E-01	U	pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Barium-133	EPA 901.1 Modified	-6.93E-02	1.20E-01	1.20E-01	1.32E-01	U	pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Bismuth-214	EPA 901.1 Modified	5.75E-01	1.32E-01	1.36E-01	1.48E-01		pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Cobalt-60	EPA 901.1 Modified	1.03E+00	1.59E-01	1.68E-01	2.31E-01		pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Cesium-134	EPA 901.1 Modified	1.72E-02	3.86E-02	3.86E-02	1.26E-01	U	pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Cesium-137	EPA 901.1 Modified	1.96E-01	1.30E-01	1.30E-01	2.10E-01	U	pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Europium-152	EPA 901.1 Modified	8.61E-02	1.13E-01	1.13E-01	2.13E-01	U	pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Europium-154	EPA 901.1 Modified	1.92E-02	2.28E-01	2.28E-01	1.08E-01	U	pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Europium-155	EPA 901.1 Modified	-6.08E-02	9.21E-02	9.22E-02	1.48E-01	U	pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Holmium-166m	EPA 901.1 Modified	-1.37E-01	1.05E-01	1.05E-01	7.99E-02	U	pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Iodine-129	EPA 901.1 Modified	-5.45E-02	2.13E-01	2.13E-01	3.06E-01	U	pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Potassium-40	EPA 901.1 Modified	2.05E+01	3.88E+00	4.02E+00	1.45E+00		pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Manganese-54	EPA 901.1 Modified	3.50E-02	7.74E-02	7.75E-02	1.28E-01	U	pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Molybdenum-93	EPA 901.1 Modified	1.07E-02	5.75E-02	5.75E-02	8.94E-02	U	pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Niobium-94	EPA 901.1 Modified	2.51E-02	6.56E-02	6.56E-02	9.35E-02	U	pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Lead-210	EPA 901.1 Modified	-5.06E-02	8.95E-01	8.95E-01	1.30E+00	U	pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Lead-212	EPA 901.1 Modified	5.21E-01	1.38E-01	1.41E-01	2.54E-01		pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Lead-214	EPA 901.1 Modified	6.11E-01	1.57E-01	1.60E-01	2.66E-01		pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Promethium-145	EPA 901.1 Modified	2.93E-02	1.42E-01	1.42E-01	2.10E-01	U	pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Radium-226	EPA 901.1 Modified	5.75E-01	1.32E-01	1.36E-01	1.48E-01		pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Antimony-125	EPA 901.1 Modified	1.39E-03	2.01E-01	2.01E-01	2.74E-01	U	pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Thorium-234	EPA 901.1 Modified	7.13E-01	8.24E-01	8.25E-01	1.23E+00	U	pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Thallium-208	EPA 901.1 Modified	4.44E-01	2.25E-01	2.26E-01	2.29E-01		pCi/g
19-03041-03	DUP	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Uranium-235	EPA 901.1 Modified	1.68E-01	2.75E-01	2.75E-01	4.18E-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: 19-03041
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
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Actinium-228	EPA 901.1 Modified	7.85E-01	2.97E-01	2.99E-01	5.69E-01	U	pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Silver-108m	EPA 901.1 Modified	-8.61E-03	6.73E-02	6.73E-02	7.88E-02	U	pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Americium-241	EPA 901.1 Modified	-3.58E-02	9.13E-02	9.13E-02	1.28E-01	U	pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Barium-133	EPA 901.1 Modified	-1.94E-02	1.14E-01	1.14E-01	1.35E-01	U	pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Bismuth-214	EPA 901.1 Modified	6.43E-01	2.75E-01	2.77E-01	4.72E-01		pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Cobalt-60	EPA 901.1 Modified	9.75E-01	1.58E-01	1.66E-01	1.53E-01		pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Cesium-134	EPA 901.1 Modified	-1.15E-01	1.06E-01	1.07E-01	1.26E-01	U	pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Cesium-137	EPA 901.1 Modified	1.64E-01	8.27E-02	8.31E-02	1.26E-01		pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Europium-152	EPA 901.1 Modified	-7.42E-02	1.46E-01	1.46E-01	1.95E-01	U	pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Europium-154	EPA 901.1 Modified	-4.15E-02	2.38E-01	2.38E-01	9.93E-02	U	pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Europium-155	EPA 901.1 Modified	-1.76E-02	1.02E-01	1.02E-01	1.47E-01	U	pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Holmium-166m	EPA 901.1 Modified	-2.67E-02	1.06E-01	1.06E-01	7.59E-02	U	pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Iodine-129	EPA 901.1 Modified	-1.47E-01	2.23E-01	2.23E-01	3.06E-01	U	pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Potassium-40	EPA 901.1 Modified	1.79E+01	3.56E+00	3.67E+00	1.99E+00		pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Manganese-54	EPA 901.1 Modified	1.82E-02	7.00E-02	7.00E-02	1.16E-01	U	pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Molybdenum-93	EPA 901.1 Modified	-1.13E-02	5.58E-02	5.58E-02	8.73E-02	U	pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Niobium-94	EPA 901.1 Modified	4.75E-02	6.71E-02	6.71E-02	9.12E-02	U	pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Lead-210	EPA 901.1 Modified	9.85E-01	9.07E-01	9.08E-01	1.38E+00	U	pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Lead-212	EPA 901.1 Modified	4.15E-01	1.13E-01	1.15E-01	3.06E-01		pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Lead-214	EPA 901.1 Modified	6.55E-01	1.74E-01	1.77E-01	3.09E-01		pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Promethium-145	EPA 901.1 Modified	-1.21E-02	1.43E-01	1.43E-01	2.08E-01	U	pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Radium-226	EPA 901.1 Modified	6.43E-01	2.75E-01	2.77E-01	4.72E-01		pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Antimony-125	EPA 901.1 Modified	-1.29E-01	2.00E-01	2.00E-01	2.54E-01	U	pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Thorium-234	EPA 901.1 Modified	2.44E-01	8.30E-01	8.30E-01	1.22E+00	U	pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Thallium-208	EPA 901.1 Modified	3.07E-01	2.59E-01	2.59E-01	2.29E-01		pCi/g
19-03041-16	DO	L1-12112A-FQGS-014-SS-A	01/17/19 11:05	3/12/2019	3/26/2019	19-03041	Uranium-235	EPA 901.1 Modified	-1.72E-01	2.88E-01	2.88E-01	4.06E-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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Attachment 1 – Chain-of-Custody Form

	Sample ID	Sample Log	Matrix	Sample Type	Sample Container Vol	Unit	Type	Qty	Sample Date	Sample Time	Analysis Type	Preservative	Remarks
4	L1-12204B-FSGS-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	2/4/2019	0804	5 ROC HTD	NA	719.10g
	L1-10209E-EJGS-341-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/13/2018	0940	Full Suite	NA	763.75g
	L1-10209E-EJGS-319-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/13/2018	0917	Full Suite	NA	891.89g
	L1-10207A-EJGS-208-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	11/18/2018	0827	Full Suite	NA	893.69g
	L1-10209E-EJGS-338-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/13/2018	0937	Full Suite	NA	954.78g
	L1-10209E-EJGS-330-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/13/2018	0928	Full Suite	NA	853.46g
5	L1-12113A-FSGS-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	1/17/2019	0710	5 ROC HTD	NA	824.96g
6	L1-10201D-FSGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	1/8/2019	1234	5 ROC HTD	NA	538.40g
7	L1-10201D-FSGS-006-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	1/8/2019	1235	5 ROC HTD	NA	460.10g
8	L1-12204C-FSGS-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	2/4/2019	0747	5 ROC HTD	NA	747.66g
9	L1-12204A-FSGS-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	2/5/2019	1038	5 ROC HTD	NA	823.20g
10	L1-12204B-FSGS-015-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	2/4/2019	0816	5 ROC HTD	NA	806.44g
11	L1-10201C-FQGS-012-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	2/13/2019	0900	5 ROC HTD	NA	756.85g
	L1-10207C-EJGS-225-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	11/12/2018	1003	Full Suite	NA	701.23g
	L1-10207A-EJGS-202-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	11/8/2018	0821	Full Suite	NA	722.89g
	L1-10207A-EJGS-201-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	11/8/2018	0820	Full Suite	NA	626.12g
	L1-10207D-EJGS-101-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	11/8/2018	0900	Full Suite	NA	735.25g

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12	L1-12113A-FSGS-006-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	1/17/2019	0725	5 ROC HTD	NA	810.37g
	L1-10209B-EJGS-210-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	11/13/2018	1325	Full Suite	NA	752.11g
	L1-10209E-EJGS-229-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/23/2018	1330	Full Suite	NA	826.80g
	L1-10209A-EJGS-212-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	11/14/2018	0809	Full Suite	NA	858.73g
	L1-10209A-EJGS-202-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	11/13/2018	1257	Full Suite	NA	600.27g
13	L1-12204A-FSGS-008-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	2/5/2019	1042	5 ROC HTD	NA	746.38g
14	L1-10201C-FSGS-012-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	2/13/2019	0900	5 ROC HTD	NA	817.65g
15	L1-12204C-FQGS-001-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	2/6/2019	1313	5 ROC HTD	NA	700.53g
	L1-10209E-EJGS-334-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/13/2018	0933	Full Suite	NA	991.39g
	L1-10209E-EJGS-336-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/13/2018	0935	Full Suite	NA	988.68g
	L1-10209E-EJGS-337-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/13/2018	0936	Full Suite	NA	969.73g
	L1-10209E-EJGS-323-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/13/2018	0921	Full Suite	NA	933.50g
	L1-10209E-EJGS-335-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/13/2018	0934	Full Suite	NA	1010.80g
16	L1-12112A-FQGS-014-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	1/17/2019	1105	5 ROC HTD	NA	793.26g
17	L1-12112A-FSGS-013-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	1/17/2019	1100	5 ROC HTD	NA	758.52g
	L1-10209E-EJGS-329-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/13/2018	0927	Full Suite	NA	887.12g
	L1-10207C-EJGS-223-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	11/12/2018	1001	Full Suite	NA	691.74g
	L1-10209E-EJGS-324-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/13/2018	0922	Full Suite	NA	822.61g
	L1-10209E-EJGS-326-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/13/2018	0924	Full Suite	NA	871.62g

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L1-10209E-EJGS-320-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/13/2018	0918	Full Suite	NA	883.77g
L1-10209E-EJGS-332-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/13/2018	0930	Full Suite	NA	900.75g
L1-10209E-EJGS-321-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/13/2018	0919	Full Suite	NA	571.22g
L1-10209E-EJGS-333-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/13/2018	0932	Full Suite	NA	623.86g
L1-10209E-EJGS-318-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/13/2018	0916	Full Suite	NA	635.09g
18 L1-12112A-FSGS-010-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	1/17/2019	1045	5 ROC HTD	NA	925.37g
L1-10207A-EJGS-207-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	11/8/2018	0826	Full Suite	NA	761.51g

Laboratory:	Date Submitted To Lab:	Ship Container No.:	Cooler Temperature:	Airbill Number:
EBERLINE LABS		NA	N/A	FedEx Express Saver 8115 9539 7221 8115 9539 7232

Relinquished by:	Date (mm/dd/yyyy):	Time:	Received by:	Date: (mm/dd/yyyy):	
[illegible]	3/7/19	1020	Richard F. Rickert	03/07/2019	1020
Relinquished by: Richard F. Rickert	Date (mm/dd/yyyy): 03/07/2019	Time: 1600	Received by: FedEx Express Saver	Date: (mm/dd/yyyy): 03/07/2019	1600
Relinquished by: Fedex	Date (mm/dd/yyyy):	Time:	Received by: [illegible] Spencer	Date: (mm/dd/yyyy): 03/12/2019	1355
Relinquished by:	Date (mm/dd/yyyy):	Time:	Received by:	Date: (mm/dd/yyyy):	

Comments

HTD PO# 67716 Full Suite PO# 67716 30 day turnaround

EBERLINE ANALYTICAL

EBERLINE ANALYTICAL CORPORATION
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October 21, 2019

Patricia Giza
Zion Solutions, LLC
101 Shiloh Blvd
Zion, IL 60099

CASE NARRATIVE
Work Order # 19-10018-OR

SAMPLE RECEIPT

This work order contains nine soil samples received 10/04/2019. Samples were analyzed for Total Strontium, Tritium, Nickel-63 and by Gamma Spectroscopy.

CLIENT ID	LAB ID	CLIENT ID	LAB ID
L1-12204-B-FSGS-010-SB-A	19-10018-04	L1-12202-C-FSGS-007-SS-A	19-10018-09
L1-12202-E-FSGS-007-SS-A	19-10018-05	L1-12202-D-FSGS-013-SS-A	19-10018-10
L1-12202-E-FSGS-012-SS-A	19-10018-06	L1-12110-A-FSGS-013-SS-A	19-10018-11
L1-12202-F-FSGS-005-SS-A	19-10018-07	L1-12110-A-FSGS-014-SS-A	19-10018-12
L1-12202-F-FSGS-010-SS-A	19-10018-08		

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 then 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 a round-bottomed distillation flask and attached to a single stage still. 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 an appropriately sized beaker. 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, Bismuth-214 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: 10/21/2019

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: 19-10018
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
19-10018-01	LCS	KNOWN	10/04/19 00:00	10/4/2019	10/9/2019	19-10018	Tritium	LANL ER-210 Modified	2.05E+02	7.39E+00				pCi/g
19-10018-01	LCS	SPIKE	10/04/19 00:00	10/4/2019	10/9/2019	19-10018	Tritium	LANL ER-210 Modified	2.00E+02	7.65E+00	1.36E+01	5.57E+00		pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/9/2019	19-10018	Tritium	LANL ER-210 Modified	0.00E+00	3.21E+00	3.21E+00	5.57E+00	U	pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/9/2019	19-10018	Tritium	LANL ER-210 Modified	-7.81E-01	3.29E+00	3.29E+00	5.77E+00	U	pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/9/2019	19-10018	Tritium	LANL ER-210 Modified	-7.82E-01	3.30E+00	3.30E+00	5.78E+00	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/9/2019	19-10018	Tritium	LANL ER-210 Modified	1.82E-01	3.11E+00	3.11E+00	5.39E+00	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/9/2019	19-10018	Tritium	LANL ER-210 Modified	-1.78E-01	3.03E+00	3.03E+00	5.27E+00	U	pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/9/2019	19-10018	Tritium	LANL ER-210 Modified	-1.45E+00	3.02E+00	3.02E+00	5.34E+00	U	pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/10/2019	19-10018	Tritium	LANL ER-210 Modified	-1.08E+00	3.03E+00	3.03E+00	5.33E+00	U	pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/10/2019	19-10018	Tritium	LANL ER-210 Modified	-5.39E-01	3.04E+00	3.04E+00	5.31E+00	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/10/2019	19-10018	Tritium	LANL ER-210 Modified	8.95E-01	3.08E+00	3.08E+00	5.29E+00	U	pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/10/2019	19-10018	Tritium	LANL ER-210 Modified	0.00E+00	3.23E+00	3.23E+00	5.61E+00	U	pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/10/2019	19-10018	Tritium	LANL ER-210 Modified	-2.19E+00	3.02E+00	3.02E+00	5.39E+00	U	pCi/g
19-10018-01	LCS	KNOWN	10/04/19 00:00	10/4/2019	10/10/2019	19-10018	Nickel-63	ASTM 3500-Ni Modified	1.45E+03	4.34E+01				pCi/g
19-10018-01	LCS	SPIKE	10/04/19 00:00	10/4/2019	10/10/2019	19-10018	Nickel-63	ASTM 3500-Ni Modified	1.50E+03	1.34E+01	8.94E+01	3.46E+00		pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/10/2019	19-10018	Nickel-63	ASTM 3500-Ni Modified	-5.45E-01	1.98E+00	1.98E+00	3.43E+00	U	pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/10/2019	19-10018	Nickel-63	ASTM 3500-Ni Modified	1.87E-01	2.05E+00	2.05E+00	3.53E+00	U	pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/10/2019	19-10018	Nickel-63	ASTM 3500-Ni Modified	-4.72E-01	2.06E+00	2.06E+00	3.57E+00	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/10/2019	19-10018	Nickel-63	ASTM 3500-Ni Modified	-7.44E-01	2.02E+00	2.02E+00	3.52E+00	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/10/2019	19-10018	Nickel-63	ASTM 3500-Ni Modified	-9.30E-01	2.01E+00	2.01E+00	3.51E+00	U	pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/10/2019	19-10018	Nickel-63	ASTM 3500-Ni Modified	-1.64E+00	1.95E+00	1.96E+00	3.45E+00	U	pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/10/2019	19-10018	Nickel-63	ASTM 3500-Ni Modified	-2.75E-01	2.00E+00	2.00E+00	3.46E+00	U	pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/10/2019	19-10018	Nickel-63	ASTM 3500-Ni Modified	-2.68E-01	1.95E+00	1.95E+00	3.37E+00	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/10/2019	19-10018	Nickel-63	ASTM 3500-Ni Modified	5.42E-01	2.00E+00	2.00E+00	3.42E+00	U	pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/10/2019	19-10018	Nickel-63	ASTM 3500-Ni Modified	-1.30E+00	2.01E+00	2.01E+00	3.52E+00	U	pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/10/2019	19-10018	Nickel-63	ASTM 3500-Ni Modified	-1.12E+00	2.01E+00	2.01E+00	3.51E+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: 19-10018
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
19-10018-01	LCS	KNOWN	10/04/19 00:00	10/4/2019	10/10/2019	19-10018	Strontium-90	ElChroM SRW01 Modified	5.10E+01	2.85E-01				pCi/g
19-10018-01	LCS	SPIKE	10/04/19 00:00	10/4/2019	10/10/2019	19-10018	Strontium-90	ElChroM SRW01 Modified	5.39E+01	2.88E+00	1.90E+01	9.99E-01		pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/10/2019	19-10018	Strontium-90	ElChroM SRW01 Modified	5.84E-01	3.96E-01	4.45E-01	7.85E-01	U	pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/10/2019	19-10018	Strontium-90	ElChroM SRW01 Modified	3.14E-01	3.60E-01	3.77E-01	7.36E-01	U	pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/10/2019	19-10018	Strontium-90	ElChroM SRW01 Modified	1.89E-01	3.39E-01	3.45E-01	7.04E-01	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/10/2019	19-10018	Strontium-90	ElChroM SRW01 Modified	1.99E-01	3.07E-01	3.15E-01	6.35E-01	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/10/2019	19-10018	Strontium-90	ElChroM SRW01 Modified	2.37E-01	2.87E-01	2.98E-01	5.86E-01	U	pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/10/2019	19-10018	Strontium-90	ElChroM SRW01 Modified	-9.67E-02	4.12E-01	4.13E-01	8.89E-01	U	pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/10/2019	19-10018	Strontium-90	ElChroM SRW01 Modified	3.32E-01	3.68E-01	3.86E-01	7.51E-01	U	pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/10/2019	19-10018	Strontium-90	ElChroM SRW01 Modified	2.49E-01	3.29E-01	3.40E-01	6.75E-01	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/10/2019	19-10018	Strontium-90	ElChroM SRW01 Modified	3.93E-01	4.00E-01	4.23E-01	8.13E-01	U	pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/10/2019	19-10018	Strontium-90	ElChroM SRW01 Modified	1.51E-01	2.76E-01	2.81E-01	5.75E-01	U	pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/10/2019	19-10018	Strontium-90	ElChroM SRW01 Modified	6.82E-02	2.93E-01	2.94E-01	6.21E-01	U	pCi/g
19-10018-01	LCS	KNOWN	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Cobalt-60	EPA 901.1 Modified	1.31E+02	5.10E+00				pCi/g
19-10018-01	LCS	KNOWN	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Cesium-137	EPA 901.1 Modified	8.26E+01	3.39E+00				pCi/g
19-10018-01	LCS	SPIKE	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Cobalt-60	EPA 901.1 Modified	1.53E+02	1.29E+01	1.51E+01	1.36E+00		pCi/g
19-10018-01	LCS	SPIKE	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Cesium-137	EPA 901.1 Modified	8.33E+01	7.60E+00	8.72E+00	1.32E+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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Final Report of Analysis

Report To:
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Work Order Details:
SDG: 19-10018
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
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Actinium-228	EPA 901.1 Modified	2.79E-02	1.05E-01	1.05E-01	1.94E-01	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Silver-108m	EPA 901.1 Modified	-1.14E-02	3.02E-02	3.02E-02	4.16E-02	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Americium-241	EPA 901.1 Modified	-3.13E-02	4.01E-02	4.01E-02	5.39E-02	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Barium-133	EPA 901.1 Modified	-1.67E-03	4.55E-02	4.55E-02	5.53E-02	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Bismuth-214	EPA 901.1 Modified	-3.88E-02	7.94E-02	7.95E-02	1.03E-01	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Cobalt-60	EPA 901.1 Modified	1.38E-02	3.52E-02	3.52E-02	6.42E-02	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Cesium-134	EPA 901.1 Modified	-2.01E-02	4.49E-02	4.49E-02	5.61E-02	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Cesium-137	EPA 901.1 Modified	-2.38E-02	4.60E-02	4.61E-02	5.37E-02	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Europium-152	EPA 901.1 Modified	-6.81E-02	1.12E-01	1.12E-01	9.03E-02	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Europium-154	EPA 901.1 Modified	-3.13E-02	9.07E-02	9.07E-02	4.69E-02	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Europium-155	EPA 901.1 Modified	-2.89E-02	4.45E-02	4.45E-02	5.98E-02	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Holmium-166m	EPA 901.1 Modified	6.57E-03	5.97E-02	5.97E-02	3.96E-02	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Iodine-129	EPA 901.1 Modified	-9.74E-03	3.27E-02	3.27E-02	4.73E-02	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Potassium-40	EPA 901.1 Modified	1.48E-02	3.43E-01	3.43E-01	5.85E-01	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Manganese-54	EPA 901.1 Modified	-9.65E-03	3.70E-02	3.70E-02	5.86E-02	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Molybdenum-93	EPA 901.1 Modified	-9.10E-03	2.63E-02	2.63E-02	3.93E-02	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Niobium-94	EPA 901.1 Modified	4.12E-03	2.34E-02	2.34E-02	3.92E-02	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Lead-210	EPA 901.1 Modified	5.85E-01	5.76E-01	5.77E-01	9.58E-01	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Lead-212	EPA 901.1 Modified	5.45E-02	4.11E-02	4.12E-02	7.25E-02	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Lead-214	EPA 901.1 Modified	4.17E-02	5.87E-02	5.88E-02	1.00E-01	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Promethium-145	EPA 901.1 Modified	-1.14E-02	3.94E-02	3.94E-02	5.58E-02	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Radium-226	EPA 901.1 Modified	-3.88E-02	7.94E-02	7.95E-02	1.03E-01	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Antimony-125	EPA 901.1 Modified	-5.25E-02	1.01E-01	1.01E-01	1.27E-01	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Thorium-234	EPA 901.1 Modified	3.99E-01	4.88E-01	4.89E-01	8.18E-01	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Thallium-208	EPA 901.1 Modified	3.00E-02	1.03E-01	1.03E-01	1.60E-01	U	pCi/g
19-10018-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10018	Uranium-235	EPA 901.1 Modified	2.25E-02	1.31E-01	1.31E-01	2.02E-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:	19-10018
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
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Actinium-228	EPA 901.1 Modified	6.24E-01	2.66E-01	2.68E-01	6.20E-01		pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Silver-108m	EPA 901.1 Modified	-3.61E-02	8.43E-02	8.43E-02	9.76E-02	U	pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Americium-241	EPA 901.1 Modified	-1.07E-01	1.18E-01	1.18E-01	1.62E-01	U	pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Barium-133	EPA 901.1 Modified	2.65E-02	3.83E-02	3.84E-02	1.95E-01	U	pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Bismuth-214	EPA 901.1 Modified	8.10E-01	1.81E-01	1.85E-01	1.01E-01		pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Cobalt-60	EPA 901.1 Modified	2.97E-02	1.06E-01	1.06E-01	1.08E-01	U	pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Cesium-134	EPA 901.1 Modified	4.30E-02	5.39E-02	5.39E-02	1.34E-01	U	pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Cesium-137	EPA 901.1 Modified	1.62E-02	8.61E-02	8.61E-02	1.22E-01	U	pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Europium-152	EPA 901.1 Modified	-1.04E-02	1.87E-01	1.87E-01	2.45E-01	U	pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Europium-154	EPA 901.1 Modified	-1.33E-02	2.76E-01	2.76E-01	1.32E-01	U	pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Europium-155	EPA 901.1 Modified	1.42E-01	1.10E-01	1.11E-01	2.14E-01	U	pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Holmium-166m	EPA 901.1 Modified	3.45E-02	1.42E-01	1.42E-01	9.54E-02	U	pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Iodine-129	EPA 901.1 Modified	-3.21E-02	7.78E-02	7.78E-02	1.12E-01	U	pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Potassium-40	EPA 901.1 Modified	1.93E+01	2.64E+00	2.82E+00	1.19E+00		pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Manganese-54	EPA 901.1 Modified	3.93E-02	1.19E-01	1.19E-01	1.99E-01	U	pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Molybdenum-93	EPA 901.1 Modified	-4.89E-02	8.00E-02	8.01E-02	8.01E-02	U	pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Niobium-94	EPA 901.1 Modified	5.43E-02	6.29E-02	6.29E-02	1.09E-01	U	pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Lead-210	EPA 901.1 Modified	1.02E+00	9.67E-01	9.68E-01	1.61E+00	U	pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Lead-212	EPA 901.1 Modified	7.00E-01	1.42E-01	1.47E-01	2.70E-01		pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Lead-214	EPA 901.1 Modified	9.36E-01	1.66E-01	1.73E-01	2.42E-01		pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Promethium-145	EPA 901.1 Modified	-9.40E-02	1.02E-01	1.02E-01	1.42E-01	U	pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Radium-226	EPA 901.1 Modified	8.10E-01	1.81E-01	1.85E-01	1.01E-01		pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Antimony-125	EPA 901.1 Modified	-3.86E-02	2.36E-01	2.36E-01	3.17E-01	U	pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Thorium-234	EPA 901.1 Modified	1.51E+00	1.39E+00	1.39E+00	2.25E+00	U	pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Thallium-208	EPA 901.1 Modified	7.28E-01	1.90E-01	1.94E-01	6.27E-02		pCi/g
19-10018-03	DUP	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Uranium-235	EPA 901.1 Modified	-1.63E-01	3.67E-01	3.68E-01	5.25E-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: 19-10018
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
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Actinium-228	EPA 901.1 Modified	7.06E-01	2.57E-01	2.60E-01	4.77E-01		pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Silver-108m	EPA 901.1 Modified	9.48E-03	3.31E-02	3.31E-02	8.56E-02	U	pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Americium-241	EPA 901.1 Modified	-5.03E-02	1.10E-01	1.10E-01	1.55E-01	U	pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Barium-133	EPA 901.1 Modified	7.50E-03	2.74E-02	2.74E-02	1.92E-01	U	pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Bismuth-214	EPA 901.1 Modified	8.12E-01	1.84E-01	1.89E-01	3.86E-01		pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Cobalt-60	EPA 901.1 Modified	-3.96E-03	1.04E-01	1.04E-01	1.52E-01	U	pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Cesium-134	EPA 901.1 Modified	5.04E-03	5.08E-02	5.08E-02	1.51E-01	U	pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Cesium-137	EPA 901.1 Modified	2.79E-02	9.44E-02	9.44E-02	1.35E-01	U	pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Europium-152	EPA 901.1 Modified	-2.46E-02	2.64E-01	2.64E-01	2.46E-01	U	pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Europium-154	EPA 901.1 Modified	-5.87E-02	2.56E-01	2.56E-01	1.28E-01	U	pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Europium-155	EPA 901.1 Modified	1.37E-01	1.04E-01	1.04E-01	2.15E-01	U	pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Holmium-166m	EPA 901.1 Modified	5.38E-02	8.91E-02	8.92E-02	9.02E-02	U	pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Iodine-129	EPA 901.1 Modified	8.04E-03	7.95E-02	7.95E-02	1.17E-01	U	pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Potassium-40	EPA 901.1 Modified	1.87E+01	2.68E+00	2.85E+00	1.74E+00		pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Manganese-54	EPA 901.1 Modified	-5.75E-02	1.25E-01	1.25E-01	1.85E-01	U	pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Molybdenum-93	EPA 901.1 Modified	2.05E-02	7.72E-02	7.72E-02	8.90E-02	U	pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Niobium-94	EPA 901.1 Modified	-3.42E-03	6.86E-02	6.86E-02	1.05E-01	U	pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Lead-210	EPA 901.1 Modified	6.46E-01	8.86E-01	8.86E-01	1.33E+00	U	pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Lead-212	EPA 901.1 Modified	7.92E-01	1.45E-01	1.50E-01	2.83E-01		pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Lead-214	EPA 901.1 Modified	8.37E-01	1.86E-01	1.91E-01	2.81E-01		pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Promethium-145	EPA 901.1 Modified	7.72E-03	1.01E-01	1.01E-01	1.49E-01	U	pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Radium-226	EPA 901.1 Modified	8.12E-01	1.84E-01	1.89E-01	3.86E-01		pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Antimony-125	EPA 901.1 Modified	-5.99E-03	2.30E-01	2.30E-01	3.17E-01	U	pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Thorium-234	EPA 901.1 Modified	2.31E+00	1.37E+00	1.37E+00	4.53E+00	U	pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Thallium-208	EPA 901.1 Modified	5.63E-01	1.80E-01	1.83E-01	6.27E-02		pCi/g
19-10018-04	DO	L1-12204-B-FSGS-010-SB-A	02/09/19 14:07	10/4/2019	10/7/2019	19-10018	Uranium-235	EPA 901.1 Modified	-3.24E-02	3.58E-01	3.58E-01	5.21E-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: 19-10018
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
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Actinium-228	EPA 901.1 Modified	2.01E-01	1.34E-01	1.35E-01	2.74E-01	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Silver-108m	EPA 901.1 Modified	-1.23E-02	3.22E-02	3.22E-02	3.38E-02	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Americium-241	EPA 901.1 Modified	1.17E-02	7.08E-02	7.08E-02	9.32E-02	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Barium-133	EPA 901.1 Modified	-1.49E-02	2.80E-02	2.81E-02	5.02E-02	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Bismuth-214	EPA 901.1 Modified	2.25E-01	6.99E-02	7.09E-02	1.05E-01		pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Cobalt-60	EPA 901.1 Modified	-2.08E-02	4.20E-02	4.20E-02	5.13E-02	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Cesium-134	EPA 901.1 Modified	1.62E-03	1.51E-02	1.51E-02	3.70E-02	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Cesium-137	EPA 901.1 Modified	3.18E-02	2.58E-02	2.59E-02	4.07E-02	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Europium-152	EPA 901.1 Modified	-6.12E-03	1.04E-01	1.04E-01	1.07E-01	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Europium-154	EPA 901.1 Modified	1.11E-02	8.99E-02	8.99E-02	5.73E-02	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Europium-155	EPA 901.1 Modified	6.74E-02	7.15E-02	7.16E-02	1.13E-01	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Holmium-166m	EPA 901.1 Modified	1.18E-03	4.94E-02	4.94E-02	4.45E-02	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Iodine-129	EPA 901.1 Modified	2.12E-01	2.45E+00	2.45E+00	2.41E+00	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Potassium-40	EPA 901.1 Modified	9.00E+00	1.28E+00	1.36E+00	6.54E-01		pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Manganese-54	EPA 901.1 Modified	-4.16E-03	1.83E-02	1.83E-02	4.19E-02	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Molybdenum-93	EPA 901.1 Modified	-1.99E-02	2.63E-02	2.63E-02	3.57E-02	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Niobium-94	EPA 901.1 Modified	-1.23E-02	3.34E-02	3.34E-02	4.29E-02	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Lead-210	EPA 901.1 Modified	1.41E+00	7.13E-01	7.17E-01	1.53E+00	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Lead-212	EPA 901.1 Modified	2.82E-01	8.86E-02	8.99E-02	1.28E-01	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Lead-214	EPA 901.1 Modified	2.07E-01	7.71E-02	7.78E-02	1.10E-01		pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Promethium-145	EPA 901.1 Modified	5.43E-02	4.27E-01	4.27E-01	6.45E-01	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Radium-226	EPA 901.1 Modified	2.25E-01	6.99E-02	7.09E-02	1.05E-01		pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Antimony-125	EPA 901.1 Modified	2.61E-02	4.39E-02	4.40E-02	1.08E-01	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Thorium-234	EPA 901.1 Modified	6.40E-01	6.06E-01	6.07E-01	8.60E-01	U	pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Thallium-208	EPA 901.1 Modified	1.97E-01	7.18E-02	7.25E-02	1.30E-01		pCi/g
19-10018-05	TRG	L1-12202-E-FSGS-007-SS-A	09/10/19 09:42	10/4/2019	10/7/2019	19-10018	Uranium-235	EPA 901.1 Modified	5.86E-02	1.89E-01	1.89E-01	2.54E-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:	19-10018
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
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Actinium-228	EPA 901.1 Modified	1.45E-01	1.51E-01	1.52E-01	2.78E-01	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Silver-108m	EPA 901.1 Modified	-4.14E-03	3.93E-02	3.93E-02	4.87E-02	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Americium-241	EPA 901.1 Modified	-8.47E-02	5.72E-02	5.74E-02	7.43E-02	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Barium-133	EPA 901.1 Modified	7.50E-03	2.23E-02	2.23E-02	7.44E-02	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Bismuth-214	EPA 901.1 Modified	2.04E-01	8.51E-02	8.57E-02	2.63E-01	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Cobalt-60	EPA 901.1 Modified	-1.39E-02	5.96E-02	5.96E-02	7.94E-02	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Cesium-134	EPA 901.1 Modified	-1.52E-03	2.07E-02	2.07E-02	6.52E-02	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Cesium-137	EPA 901.1 Modified	1.11E-02	3.67E-02	3.67E-02	6.25E-02	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Europium-152	EPA 901.1 Modified	0.00E+00	1.23E-01	1.23E-01	1.20E-01	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Europium-154	EPA 901.1 Modified	1.52E-01	1.53E-01	1.54E-01	6.26E-02	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Europium-155	EPA 901.1 Modified	3.34E-02	5.70E-02	5.70E-02	8.44E-02	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Holmium-166m	EPA 901.1 Modified	2.16E-02	6.57E-02	6.58E-02	4.67E-02	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Iodine-129	EPA 901.1 Modified	4.96E-01	2.53E-01	2.54E-01	4.92E-01		pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Potassium-40	EPA 901.1 Modified	1.21E+01	2.39E+00	2.47E+00	9.47E-01		pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Manganese-54	EPA 901.1 Modified	2.76E-02	3.97E-02	3.97E-02	7.08E-02	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Molybdenum-93	EPA 901.1 Modified	-3.26E-03	3.14E-02	3.14E-02	5.05E-02	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Niobium-94	EPA 901.1 Modified	-7.68E-03	3.37E-02	3.37E-02	5.35E-02	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Lead-210	EPA 901.1 Modified	4.67E-01	5.40E-01	5.40E-01	8.32E-01	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Lead-212	EPA 901.1 Modified	2.68E-01	6.86E-02	7.00E-02	1.51E-01		pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Lead-214	EPA 901.1 Modified	2.04E-01	9.31E-02	9.36E-02	1.41E-01		pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Promethium-145	EPA 901.1 Modified	1.29E-02	9.43E-02	9.43E-02	1.40E-01	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Radium-226	EPA 901.1 Modified	2.04E-01	8.51E-02	8.57E-02	2.63E-01	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Antimony-125	EPA 901.1 Modified	-2.69E-02	1.18E-01	1.18E-01	1.59E-01	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Thorium-234	EPA 901.1 Modified	5.34E-01	4.76E-01	4.76E-01	7.35E-01	U	pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Thallium-208	EPA 901.1 Modified	2.14E-01	9.76E-02	9.83E-02	1.40E-01		pCi/g
19-10018-06	TRG	L1-12202-E-FSGS-012-SS-A	09/10/19 09:52	10/4/2019	10/7/2019	19-10018	Uranium-235	EPA 901.1 Modified	6.98E-02	1.54E-01	1.54E-01	2.61E-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:	Work Order Details:	
Patricia Giza	SDG:	19-10018
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
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Actinium-228	EPA 901.1 Modified	3.18E-01	1.48E-01	1.49E-01	2.34E-01		pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Silver-108m	EPA 901.1 Modified	-2.83E-02	4.24E-02	4.24E-02	3.78E-02	U	pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Americium-241	EPA 901.1 Modified	-8.73E-03	8.60E-02	8.60E-02	1.12E-01	U	pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Barium-133	EPA 901.1 Modified	4.49E-02	3.22E-02	3.22E-02	6.32E-02	U	pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Bismuth-214	EPA 901.1 Modified	3.32E-01	8.96E-02	9.12E-02	1.31E-01		pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Cobalt-60	EPA 901.1 Modified	1.87E-02	4.42E-02	4.42E-02	5.65E-02	U	pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Cesium-134	EPA 901.1 Modified	3.55E-02	2.18E-02	2.19E-02	4.76E-02	U	pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Cesium-137	EPA 901.1 Modified	3.87E-02	2.93E-02	2.94E-02	8.27E-02	U	pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Europium-152	EPA 901.1 Modified	-1.55E-02	1.42E-01	1.42E-01	1.45E-01	U	pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Europium-154	EPA 901.1 Modified	-1.66E-02	1.05E-01	1.05E-01	7.31E-02	U	pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Europium-155	EPA 901.1 Modified	5.03E-02	6.28E-02	6.28E-02	1.03E-01	U	pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Holmium-166m	EPA 901.1 Modified	5.99E-03	5.90E-02	5.90E-02	5.78E-02	U	pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Iodine-129	EPA 901.1 Modified	-1.99E+00	8.76E+00	8.76E+00	3.10E+00	U	pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Potassium-40	EPA 901.1 Modified	8.21E+00	1.34E+00	1.41E+00	9.18E-01		pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Manganese-54	EPA 901.1 Modified	-1.88E-02	3.71E-02	3.71E-02	5.32E-02	U	pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Molybdenum-93	EPA 901.1 Modified	-2.64E-04	3.10E-02	3.10E-02	4.85E-02	U	pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Niobium-94	EPA 901.1 Modified	1.83E-02	2.92E-02	2.92E-02	5.03E-02	U	pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Lead-210	EPA 901.1 Modified	4.18E-01	1.20E+00	1.20E+00	1.88E+00	U	pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Lead-212	EPA 901.1 Modified	2.80E-01	7.08E-02	7.23E-02	1.60E-01		pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Lead-214	EPA 901.1 Modified	3.76E-01	9.34E-02	9.53E-02	1.42E-01		pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Promethium-145	EPA 901.1 Modified	6.17E-01	6.52E-01	6.53E-01	8.60E-01	U	pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Radium-226	EPA 901.1 Modified	3.32E-01	8.96E-02	9.12E-02	1.31E-01		pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Antimony-125	EPA 901.1 Modified	1.85E-02	3.80E-02	3.80E-02	1.30E-01	U	pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Thorium-234	EPA 901.1 Modified	1.09E+00	7.59E-01	7.61E-01	1.10E+00	U	pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Thallium-208	EPA 901.1 Modified	2.39E-01	7.33E-02	7.43E-02	1.27E-01		pCi/g
19-10018-07	TRG	L1-12202-F-FSGS-005-SS-A	09/10/19 13:08	10/4/2019	10/7/2019	19-10018	Uranium-235	EPA 901.1 Modified	-1.33E-01	2.39E-01	2.39E-01	2.95E-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: 19-10018
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
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Actinium-228	EPA 901.1 Modified	3.23E-01	1.67E-01	1.68E-01	3.39E-01	U	pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Silver-108m	EPA 901.1 Modified	4.03E-03	3.78E-02	3.78E-02	4.59E-02	U	pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Americium-241	EPA 901.1 Modified	-5.76E-02	5.16E-02	5.17E-02	6.93E-02	U	pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Barium-133	EPA 901.1 Modified	3.53E-03	1.64E-02	1.64E-02	7.21E-02	U	pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Bismuth-214	EPA 901.1 Modified	2.30E-01	7.90E-02	7.99E-02	1.58E-01		pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Cobalt-60	EPA 901.1 Modified	1.82E-02	5.21E-02	5.21E-02	7.78E-02	U	pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Cesium-134	EPA 901.1 Modified	-1.82E-02	4.76E-02	4.76E-02	6.24E-02	U	pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Cesium-137	EPA 901.1 Modified	3.70E-02	3.57E-02	3.57E-02	5.82E-02	U	pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Europium-152	EPA 901.1 Modified	4.60E-02	1.31E-01	1.31E-01	1.07E-01	U	pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Europium-154	EPA 901.1 Modified	-2.43E-02	1.40E-01	1.40E-01	5.49E-02	U	pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Europium-155	EPA 901.1 Modified	-1.30E-03	5.55E-02	5.55E-02	8.11E-02	U	pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Holmium-166m	EPA 901.1 Modified	-1.04E-02	6.21E-02	6.21E-02	4.50E-02	U	pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Iodine-129	EPA 901.1 Modified	7.45E-02	1.38E-01	1.38E-01	2.04E-01	U	pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Potassium-40	EPA 901.1 Modified	1.11E+01	2.22E+00	2.29E+00	1.03E+00		pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Manganese-54	EPA 901.1 Modified	-5.20E-03	3.62E-02	3.62E-02	5.79E-02	U	pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Molybdenum-93	EPA 901.1 Modified	-1.48E-02	3.05E-02	3.05E-02	4.64E-02	U	pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Niobium-94	EPA 901.1 Modified	-6.49E-03	3.25E-02	3.25E-02	5.23E-02	U	pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Lead-210	EPA 901.1 Modified	3.39E-01	5.02E-01	5.03E-01	7.67E-01	U	pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Lead-212	EPA 901.1 Modified	2.34E-01	7.71E-02	7.80E-02	1.16E-01		pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Lead-214	EPA 901.1 Modified	2.26E-01	7.21E-02	7.31E-02	1.32E-01		pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Promethium-145	EPA 901.1 Modified	-3.17E-02	8.91E-02	8.91E-02	1.28E-01	U	pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Radium-226	EPA 901.1 Modified	2.30E-01	7.90E-02	7.99E-02	1.58E-01		pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Antimony-125	EPA 901.1 Modified	5.76E-02	1.05E-01	1.05E-01	1.57E-01	U	pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Thorium-234	EPA 901.1 Modified	5.57E-01	4.49E-01	4.50E-01	6.99E-01	U	pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Thallium-208	EPA 901.1 Modified	1.86E-01	1.17E-01	1.18E-01	1.85E-01		pCi/g
19-10018-08	TRG	L1-12202-F-FSGS-010-SS-A	09/10/19 13:18	10/4/2019	10/7/2019	19-10018	Uranium-235	EPA 901.1 Modified	5.09E-02	1.54E-01	1.55E-01	2.33E-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: 19-10018
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
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Actinium-228	EPA 901.1 Modified	4.53E-01	2.73E-01	2.74E-01	6.00E-01	U	pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Silver-108m	EPA 901.1 Modified	-2.07E-02	6.28E-02	6.28E-02	6.72E-02	U	pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Americium-241	EPA 901.1 Modified	-6.25E-02	8.04E-02	8.04E-02	1.12E-01	U	pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Barium-133	EPA 901.1 Modified	9.19E-03	2.37E-02	2.37E-02	1.27E-01	U	pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Bismuth-214	EPA 901.1 Modified	4.22E-01	1.03E-01	1.05E-01	9.23E-02		pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Cobalt-60	EPA 901.1 Modified	1.74E-02	6.77E-02	6.77E-02	8.39E-02	U	pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Cesium-134	EPA 901.1 Modified	-3.09E-02	3.76E-02	3.77E-02	7.92E-02	U	pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Cesium-137	EPA 901.1 Modified	8.26E-02	7.42E-02	7.44E-02	1.20E-01	U	pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Europium-152	EPA 901.1 Modified	1.41E-02	1.07E-01	1.07E-01	1.75E-01	U	pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Europium-154	EPA 901.1 Modified	-3.65E-02	1.78E-01	1.78E-01	8.81E-02	U	pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Europium-155	EPA 901.1 Modified	4.01E-02	8.12E-02	8.12E-02	1.37E-01	U	pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Holmium-166m	EPA 901.1 Modified	-1.43E-02	1.12E-01	1.12E-01	6.61E-02	U	pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Iodine-129	EPA 901.1 Modified	-3.79E-02	6.01E-02	6.01E-02	8.46E-02	U	pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Potassium-40	EPA 901.1 Modified	1.11E+01	1.75E+00	1.84E+00	8.78E-01		pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Manganese-54	EPA 901.1 Modified	6.90E-03	5.78E-02	5.78E-02	9.50E-02	U	pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Molybdenum-93	EPA 901.1 Modified	2.97E-02	4.56E-02	4.56E-02	6.92E-02	U	pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Niobium-94	EPA 901.1 Modified	-1.83E-02	4.90E-02	4.90E-02	7.63E-02	U	pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Lead-210	EPA 901.1 Modified	4.02E-01	6.22E-01	6.22E-01	9.49E-01	U	pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Lead-212	EPA 901.1 Modified	3.47E-01	1.14E-01	1.16E-01	1.72E-01		pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Lead-214	EPA 901.1 Modified	3.14E-01	1.16E-01	1.17E-01	2.03E-01		pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Promethium-145	EPA 901.1 Modified	-2.80E-02	6.78E-02	6.78E-02	9.72E-02	U	pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Radium-226	EPA 901.1 Modified	4.22E-01	1.03E-01	1.05E-01	9.23E-02		pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Antimony-125	EPA 901.1 Modified	-6.07E-02	1.61E-01	1.61E-01	2.13E-01	U	pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Thorium-234	EPA 901.1 Modified	8.73E-01	7.18E-01	7.20E-01	1.12E+00	U	pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Thallium-208	EPA 901.1 Modified	4.59E-01	1.75E-01	1.77E-01	5.74E-02		pCi/g
19-10018-09	TRG	L1-12202-C-FSGS-007-SS-A	09/11/19 09:12	10/4/2019	10/7/2019	19-10018	Uranium-235	EPA 901.1 Modified	-4.39E-02	2.50E-01	2.50E-01	3.62E-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: 19-10018
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
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Actinium-228	EPA 901.1 Modified	2.40E-01	1.41E-01	1.42E-01	2.67E-01	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Silver-108m	EPA 901.1 Modified	7.85E-04	2.75E-02	2.75E-02	3.92E-02	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Americium-241	EPA 901.1 Modified	-6.14E-02	8.65E-02	8.66E-02	1.04E-01	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Barium-133	EPA 901.1 Modified	-2.37E-03	2.32E-02	2.32E-02	5.93E-02	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Bismuth-214	EPA 901.1 Modified	3.61E-01	7.99E-02	8.20E-02	1.75E-01		pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Cobalt-60	EPA 901.1 Modified	4.08E-02	4.29E-02	4.30E-02	6.35E-02	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Cesium-134	EPA 901.1 Modified	9.76E-03	2.23E-02	2.23E-02	4.48E-02	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Cesium-137	EPA 901.1 Modified	8.81E-03	3.32E-02	3.32E-02	5.19E-02	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Europium-152	EPA 901.1 Modified	-6.81E-02	1.56E-01	1.56E-01	1.43E-01	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Europium-154	EPA 901.1 Modified	-1.09E-02	1.12E-01	1.12E-01	7.16E-02	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Europium-155	EPA 901.1 Modified	6.45E-02	7.85E-02	7.86E-02	1.06E-01	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Holmium-166m	EPA 901.1 Modified	-1.78E-02	5.30E-02	5.30E-02	5.84E-02	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Iodine-129	EPA 901.1 Modified	-1.31E+00	6.07E+00	6.07E+00	2.89E+00	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Potassium-40	EPA 901.1 Modified	1.22E+01	1.71E+00	1.82E+00	9.22E-01		pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Manganese-54	EPA 901.1 Modified	5.31E-03	3.53E-02	3.53E-02	5.63E-02	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Molybdenum-93	EPA 901.1 Modified	-2.68E-02	3.58E-02	3.58E-02	4.46E-02	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Niobium-94	EPA 901.1 Modified	-2.43E-02	3.48E-02	3.49E-02	4.51E-02	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Lead-210	EPA 901.1 Modified	3.49E-01	1.22E+00	1.22E+00	1.89E+00	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Lead-212	EPA 901.1 Modified	3.07E-01	6.98E-02	7.15E-02	1.11E-01		pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Lead-214	EPA 901.1 Modified	3.28E-01	9.05E-02	9.21E-02	1.41E-01		pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Promethium-145	EPA 901.1 Modified	4.43E-01	5.63E-01	5.64E-01	8.04E-01	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Radium-226	EPA 901.1 Modified	3.61E-01	7.99E-02	8.20E-02	1.75E-01		pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Antimony-125	EPA 901.1 Modified	-4.19E-02	7.16E-02	7.16E-02	1.13E-01	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Thorium-234	EPA 901.1 Modified	4.45E-01	7.67E-01	7.68E-01	1.04E+00	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Thallium-208	EPA 901.1 Modified	9.38E-02	8.58E-02	8.59E-02	1.71E-01	U	pCi/g
19-10018-10	TRG	L1-12202-D-FSGS-013-SS-A	09/11/19 08:36	10/4/2019	10/7/2019	19-10018	Uranium-235	EPA 901.1 Modified	1.50E-01	2.24E-01	2.24E-01	3.14E-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: 19-10018
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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
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Actinium-228	EPA 901.1 Modified	2.68E-01	1.43E-01	1.44E-01	2.53E-01		pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Silver-108m	EPA 901.1 Modified	-1.76E-03	3.17E-02	3.17E-02	3.36E-02	U	pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Americium-241	EPA 901.1 Modified	3.94E-02	6.69E-02	6.70E-02	9.31E-02	U	pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Barium-133	EPA 901.1 Modified	-5.45E-02	4.73E-02	4.74E-02	4.91E-02	U	pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Bismuth-214	EPA 901.1 Modified	1.80E-01	7.15E-02	7.21E-02	1.16E-01		pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Cobalt-60	EPA 901.1 Modified	-8.30E-03	4.13E-02	4.13E-02	4.45E-02	U	pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Cesium-134	EPA 901.1 Modified	7.90E-03	1.44E-02	1.44E-02	3.63E-02	U	pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Cesium-137	EPA 901.1 Modified	3.55E-03	3.35E-02	3.35E-02	5.18E-02	U	pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Europium-152	EPA 901.1 Modified	8.45E-03	8.32E-02	8.32E-02	1.18E-01	U	pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Europium-154	EPA 901.1 Modified	2.87E-02	9.09E-02	9.09E-02	6.13E-02	U	pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Europium-155	EPA 901.1 Modified	4.04E-02	6.55E-02	6.55E-02	8.80E-02	U	pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Holmium-166m	EPA 901.1 Modified	-7.25E-03	5.22E-02	5.22E-02	4.58E-02	U	pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Iodine-129	EPA 901.1 Modified	-7.61E-01	3.99E+00	3.99E+00	2.53E+00	U	pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Potassium-40	EPA 901.1 Modified	1.06E+01	1.45E+00	1.55E+00	5.07E-01		pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Manganese-54	EPA 901.1 Modified	2.06E-04	2.90E-02	2.90E-02	4.56E-02	U	pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Molybdenum-93	EPA 901.1 Modified	-5.54E-03	2.55E-02	2.55E-02	3.09E-02	U	pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Niobium-94	EPA 901.1 Modified	4.24E-03	2.32E-02	2.32E-02	3.75E-02	U	pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Lead-210	EPA 901.1 Modified	8.56E-01	9.50E-01	9.51E-01	1.53E+00	U	pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Lead-212	EPA 901.1 Modified	2.24E-01	5.79E-02	5.90E-02	1.50E-01		pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Lead-214	EPA 901.1 Modified	2.44E-01	8.87E-02	8.96E-02	1.78E-01		pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Promethium-145	EPA 901.1 Modified	2.51E-01	4.67E-01	4.67E-01	6.86E-01	U	pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Radium-226	EPA 901.1 Modified	1.80E-01	7.15E-02	7.21E-02	1.16E-01		pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Antimony-125	EPA 901.1 Modified	1.59E-03	6.15E-02	6.15E-02	1.06E-01	U	pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Thorium-234	EPA 901.1 Modified	5.54E-01	6.56E-01	6.57E-01	9.15E-01	U	pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Thallium-208	EPA 901.1 Modified	1.69E-01	6.52E-02	6.58E-02	1.04E-01		pCi/g
19-10018-11	TRG	L1-12110-A-FSGS-013-SS-A	09/16/19 13:24	10/4/2019	10/7/2019	19-10018	Uranium-235	EPA 901.1 Modified	-8.90E-02	2.03E-01	2.04E-01	2.56E-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:	19-10018
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
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Actinium-228	EPA 901.1 Modified	3.86E-01	1.58E-01	1.59E-01	3.36E-01		pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Silver-108m	EPA 901.1 Modified	-1.09E-02	4.16E-02	4.16E-02	4.77E-02	U	pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Americium-241	EPA 901.1 Modified	-8.45E-02	5.60E-02	5.62E-02	7.32E-02	U	pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Barium-133	EPA 901.1 Modified	-2.57E-02	5.65E-02	5.65E-02	6.87E-02	U	pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Bismuth-214	EPA 901.1 Modified	2.46E-01	8.58E-02	8.67E-02	1.09E-01		pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Cobalt-60	EPA 901.1 Modified	1.01E-02	6.08E-02	6.08E-02	6.76E-02	U	pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Cesium-134	EPA 901.1 Modified	1.53E-02	2.12E-02	2.12E-02	6.42E-02	U	pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Cesium-137	EPA 901.1 Modified	-7.11E-03	3.81E-02	3.81E-02	6.03E-02	U	pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Europium-152	EPA 901.1 Modified	-3.87E-02	1.31E-01	1.31E-01	1.20E-01	U	pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Europium-154	EPA 901.1 Modified	-3.43E-02	1.44E-01	1.44E-01	6.21E-02	U	pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Europium-155	EPA 901.1 Modified	8.17E-02	5.16E-02	5.18E-02	1.10E-01	U	pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Holmium-166m	EPA 901.1 Modified	-2.83E-03	7.14E-02	7.14E-02	4.77E-02	U	pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Iodine-129	EPA 901.1 Modified	-5.43E-03	1.47E-01	1.47E-01	2.13E-01	U	pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Potassium-40	EPA 901.1 Modified	1.42E+01	2.68E+00	2.78E+00	7.47E-01		pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Manganese-54	EPA 901.1 Modified	6.16E-03	2.54E-02	2.55E-02	5.94E-02	U	pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Molybdenum-93	EPA 901.1 Modified	3.05E-02	3.20E-02	3.20E-02	4.06E-02	U	pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Niobium-94	EPA 901.1 Modified	1.08E-02	3.46E-02	3.46E-02	5.80E-02	U	pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Lead-210	EPA 901.1 Modified	6.13E-01	5.77E-01	5.78E-01	8.88E-01	U	pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Lead-212	EPA 901.1 Modified	2.45E-01	6.44E-02	6.56E-02	1.51E-01		pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Lead-214	EPA 901.1 Modified	2.96E-01	9.40E-02	9.53E-02	1.86E-01		pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Promethium-145	EPA 901.1 Modified	1.16E-02	9.79E-02	9.79E-02	1.45E-01	U	pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Radium-226	EPA 901.1 Modified	2.46E-01	8.58E-02	8.67E-02	1.09E-01		pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Antimony-125	EPA 901.1 Modified	-2.33E-02	1.10E-01	1.10E-01	1.49E-01	U	pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Thorium-234	EPA 901.1 Modified	6.98E-01	4.56E-01	4.58E-01	7.20E-01	U	pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Thallium-208	EPA 901.1 Modified	2.08E-01	1.12E-01	1.12E-01	1.71E-01		pCi/g
19-10018-12	TRG	L1-12110-A-FSGS-014-SS-A	09/16/19 13:26	10/4/2019	10/7/2019	19-10018	Uranium-235	EPA 901.1 Modified	8.85E-02	1.62E-01	1.62E-01	2.49E-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

ZIONSOLUTIONS LLC
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REC'D OCT 04 2019

ZS-WM-131
Revision 0
Information Use

19-10018

Attachment 1 – Chain-of-Custody Form

	Sample ID	Sample Log	Matrix	Sample Type	Sample Container Vol	Unit	Type	Qty	Sample Date	Sample Time	Analysis Type	Preservative	Remarks
4	L1-12204-B-FSG-010-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	2/9/19	1407	5 ROC HTD	NA	889.81 g
5	L1-12202-E-FSG-007-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/10/19	0942	5 ROC HTD	NA	1202.80 g
6	L1-12202-E-FSG-012-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/10/19	0952	5 ROC HTD	NA	1189.10 g
7	L1-12202-F-FSG-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/10/19	1308	5 ROC HTD	NA	1045.64 g
8	L1-12202-F-FSG-010-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/10/19	1318	5 ROC HTD	NA	1107.70 g
9	L1-12202-C-FSG-007-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/11/19	0912	5 ROC HTD	NA	1054.03 g
10	L1-12202-D-FSG-013-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/11/19	0836	5 ROC HTD	NA	913.68 g
11	L1-12110-A-FSG-013-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/16/19	1324	5 ROC HTD	NA	958.11 g
12	L1-12110-A-FSG-014-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/16/19	1326	5 ROC HTD	NA	1084.06 g
	L1-12202-C-FSG-013-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/16/19	0830	5 ROC HTD	NA	1082.40 g
	L1-12202-D-FSG-015-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/16/19	1300	5 ROC HTD	NA	922.89 g
	L1-12109-A-FSG-008-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/17/19	0914	5 ROC HTD	NA	1030.30 g
	L1-12109-A-FSG-013-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/17/19	0924	5 ROC HTD	NA	968.97 g
	L1-12202-F-FJGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/17/19	0952	5 ROC HTD	NA	1017.40 g
	L1-10220-I-FIGS-011-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/17/19	0838	5 ROC HTD	NA	749.70 g
	L1-12108-A-FSG-015-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/18/19	1328	5 ROC HTD	NA	948.00 g
	L1-12108-A-FSG-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/18/19	1308	5 ROC HTD	NA	935.70 g

Rec BS 0743 10-4-19

ZION SOLUTIONS LLC
An EnergySolutions Company

19-10018

REC'D OCT 04 2019

ZS-WM-131
Revision 0
Information Use

Laboratory:	Date Submitted To Lab:		Ship Container No.:	Cooler Temperature:	Airbill Number:
EBERLINE LABS			NA	N/A	FedEx First Overnight 8132 0229 0210

Relinquished by: Jack Lucia	Date (mm/dd/yyyy): 10/1/19	Time: 1430	Received by: Richard F. Rickert	Date: (mm/dd/yyyy): 10/1/2019	1430
Relinquished by: Richard F. Rickert	Date (mm/dd/yyyy): 10/02/2019	Time: 1600	Received by: FedEx First Overnight	Date: (mm/dd/yyyy): 10/02/2019	1600
Relinquished by: Fedex	Date (mm/dd/yyyy):	Time:	Received by: Ronald Spencer	Date: (mm/dd/yyyy): 10/4/2019	0743
Relinquished by:	Date (mm/dd/yyyy):	Time:	Received by:	Date: (mm/dd/yyyy):	

Comments
PO # 67718 HTD's 7 day Turn Around