



ZION STATION RESTORATION PROJECT FINAL STATUS SURVEY RELEASE RECORD

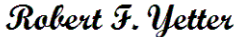
GATE HOUSE AND SOUTHWEST YARD

SURVEY UNIT 12202C

REVISION 1



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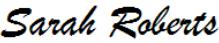
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LIST OF ACRONYMS AND ABBREVIATIONS

ALARA	As Low As Reasonably Achievable
AMCG	Average Member of the Critical Group
BcDCGL	Base Case Soil Derived Concentration Guideline Level
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
ISOCS	In Situ Object Counting System
LBGR	Lower Bound of the Gray Region
LTP	License Termination Plan
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	Minimum Detectable Concentration
MDCR	Minimum Detectable Count Rate
NAD	North American Datum
NaI	Sodium Iodide
OpDCGL	Operational Derived Concentration Guideline Level
OpSOF	Operational Sum of Fractions
QAPP	Quality Assurance Project Plan
QC	Quality Control
RE	Radiological Engineer
ROC	Radionuclides of Concern

SOF	Sum of Fractions
TEDE	Total Effective Dose Equivalent
TSD	Technical Support Documents
UBGR	Upper Bound of the Gray Region
VSP	Visual Sample Plan
ZNPS	Zion Nuclear Power Station
ZSRP	Zion Station Restoration Project

1. EXECUTIVE SUMMARY

This Final Status Survey (FSS) Release Record for Survey Unit 12202C, the “Gate House and Southwest Yard,” has been generated for the Zion Station Restoration Project (ZSRP) in accordance with *ZionSolutions* 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 (L1-12202C-F) was developed in accordance with *ZionSolutions* 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 12202C indicated that the Sum of Fractions (SOF) for each sample, when compared to the Operational Derived Concentration Guideline Levels (OpDCGL), was less than 1.0. The maximum Operational SOF (OpSOF) was 0.091. The mean OpSOF for the systematic samples was 0.039. The mean Base Case SOF (BcSOF), when the analytical results were compared to the Base Case DCGLs (BcDCGLs), was 0.010, which results in a dose assigned to the survey unit of 0.248 mrem/year Total Effective Dose Equivalent (TEDE). Therefore, the null hypothesis is rejected and survey unit 12202C is acceptable for unrestricted release.

2. SURVEY UNIT DESCRIPTION

Survey unit 12202C, “Gate House and Southwest Yard,” is a Class 1 open land survey unit and is 1,894 m² in size. It is bounded on the west by survey unit 10207E, the south by survey unit 12202E, the east by survey units 12202D and 12110, and the north by survey unit 12202B.

The topography of the survey unit is mainly flat with some small dips and depressions. The soil is mostly sand.

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

3. CLASSIFICATION BASIS

Survey unit 12202C was classified in accordance with *ZionSolutions* procedure ZS-LT-300-001-002, “*Survey Unit Classification*” (Reference 5).

The area encompassing this survey unit is made up of the majority of survey unit 10106 and portions of survey units 10104, 10105, 10108, 10206, 10207 and 10208 as identified in Figure 3 of the “Zion Station Historical Site Assessment” (HSA) (Reference 6). The HSA initially classified survey units 10104, 10106 and 10108 as Class 2; and survey units 10105, 10206, 10207 and 10208 as Class 3. Subsequently, this area was designated as survey unit 12202, a Class 2 open land survey unit, and described as the “Gate House and Southwest Yard” in Table 2-30 of the LTP as represented in Figure 2-7 of the LTP, and replicated below as Figure 1.

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

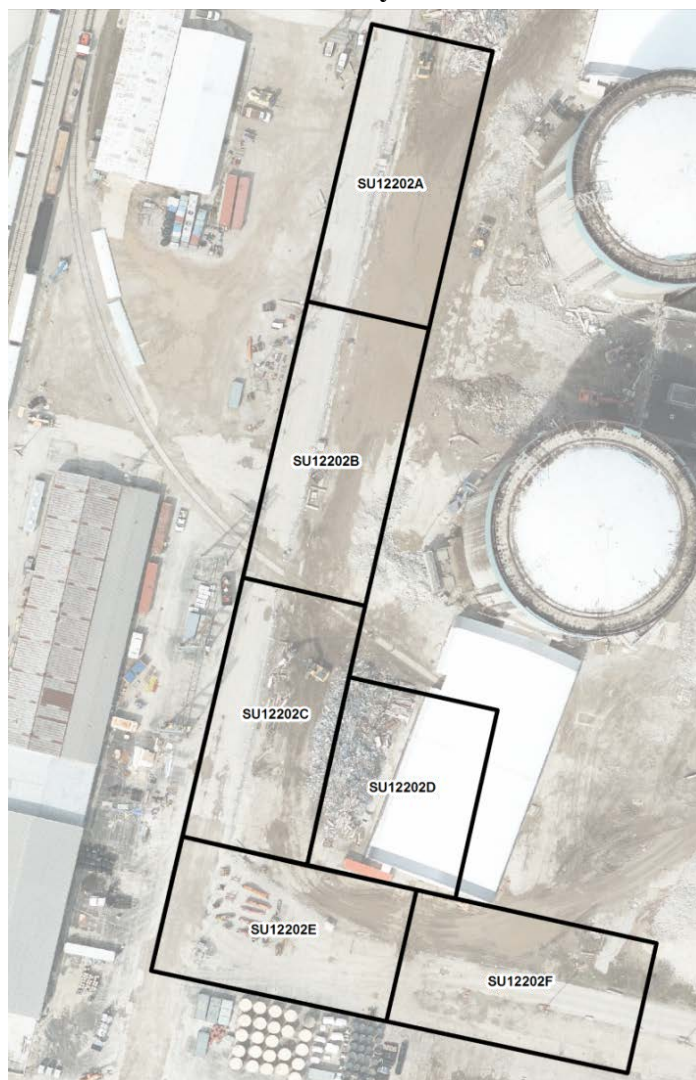


The HSA states that this area contained the Dry Active Waste Storage Building, Illinois Department of Nuclear Safety (IDNS) Building, Meeting Trailers, Security Office and Gate House. Also, the area between the Fuel Handling Building and U2 Containment was a storage area for radwaste containers awaiting shipment. The HSA also notes that there were several instances of contaminated materials being found in the area. The most significant occurrence was in 1979 when a contaminated trailer was found parked outside the Fuel Building trackway door with contamination levels up to 300k disintegrations per minute and a hot spot of 120 mR/h.

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 12202 was

reclassified as a Class 1, and divided into six (6) survey units: 12202A, 12202B, 12202C, 12202D, 12202E and 12202F to comply with the survey unit size recommendations from MARSSIM Section 4.6. Figure 2 shows the boundaries of the resulting Class 1 survey units. The change in classification was a conservative response and ensured that the survey unit was surveyed with the appropriate rigor.

Figure 2 - The Six Class 1 Open Land Survey Units Created from the Original Class 2 Survey Unit 12202



A Radiological Engineer (RE) and a Characterization/License Termination (C/LT) Supervisor performed a visual inspection and walk-down of the survey unit on September 4, 2019, prior to performing FSS. The purpose of the walk-down was to assess the physical condition of the survey unit, evaluate access points and travel paths and identify potentially hazardous conditions. A final classification assessment was performed in accordance with procedure ZS-LT-300-001-002,

“Survey Unit Classification” as part of the survey design for FSS. The assessment confirmed that survey unit 12202C was correctly classified as Class 1.

4. DATA QUALITY OBJECTIVES (DQO)

Final Status Survey 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 12202C 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).

ZionSolutions 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).

ZionSolutions 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 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. ZionSolutions 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 BcDCGLs in this Release Record).

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

singular ROC present in the mixture are compared against their respective DCGL to derive a dose fraction.

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

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

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

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

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

Each radionuclide-specific BcDCGL is equivalent to the level of residual radioactivity (above background levels) that could, when considered independently, result in a TEDE of 25 mrem/year to an Average Member of the Critical Group (AMCG). To ensure that the summation of dose from each source term is 25 mrem/year or less after all FSS is completed, the BcDCGLs are reduced based on an expected, or *a priori*, fraction of the 25 mrem/year dose limit from each source term. The reduced DCGLs, or “Operational” DCGLs, can be related to the BcDCGLs as an expected fraction of dose based on an *a priori* assessment of what the expected dose should be based on the results of site characterization, process knowledge and the extent of planned remediation. The OpDCGL is then used as the DCGL for the FSS design of the survey unit (calculation of surrogate DCGLs, investigations levels, etc.). Details of the OpDCGLs derived for each dose component and the basis for the applied *a priori* dose fractions are provided

in ZionSolutions TSD 17-004, “Operational Derived Concentration Guideline Levels for Final Status Survey” (Reference 10).

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

Table 4 - Operational DCGLs for Surface Soils (OpDCGL_{SS})

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

Table 5 - Operational DCGLs for Subsurface Soils (OpDCGL_{SB})

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

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

Instrument DQOs included a verification of the ability of the survey instrument to detect the radiation(s) of interest at the required scan Minimum Detectable Concentration (MDC), which for Class 1 open land survey units, is the *a priori* Elevated Measurement Comparison DCGL (DCGL_{EMC}). Survey instrument response checks were required prior to issuance and after the instrument had been used. Control and accountability of survey instruments was required to ensure the quality and prevent the loss of data.

As part of the DQOs applied to laboratory processes, analysis results were reported as actual calculated results. The actual recorded value was used as the recorded FSS result for

measurement and/or sample values that are less than MDC. Negative values were recorded as “zero.” For radionuclides less than MDC, the value representing the highest abundance was selected. Results were not reported as “less than MDC.” Sample report summaries included unique sample identification, analytical method, radionuclide, result, uncertainty, laboratory data qualifiers, units, and the observed MDC.

In accordance with the LTP, for laboratory analysis, MDCs less than 10% of the Operational DCGL were preferable while MDCs up to 50% of the Operational DCGL 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 12202C. 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 ZionSolutions TSD 14-019, “*Radionuclides of Concern for Soil and Basement Fill Model Source Terms*,” and are presented in Table 6. The maximum ratios were 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 12202C, 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

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

Where: $DCGL_{Sur}$ = Surrogate radionuclide DCGL
 $DCGL_{2,3...n}$ = DCGL for radionuclides to be represented by the surrogate
 R_n = Ratio of concentration (or nuclide mixture fraction) of radionuclide “n” to surrogate radionuclide

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

Equation 2

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

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

Equation 3

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

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

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

Equation 4

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

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

Equation 5

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

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

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

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

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

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

The computer program Visual Sample Plan (VSP) was used to generate the sample map, in accordance with ZS-LT-300-001-001. The map used was provided by the Survey

Mapping/Computer Assisted Design Specialist, with coordinates based on the Illinois State Plane NAD 1983 standard topographical grid coordinate system. The number of samples generated by VSP for a systematic triangular grid was 17. The Prospective Power Curve generated by VSP showed adequate power for the survey design.

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

- To calculate the area bounded by the systematic samples: $A = \frac{A_{SU}}{N} = \frac{1894}{17} = 111.4 \text{ m}^2$
- From the LTP, Table 5-16, the Area Factors for the next larger area (300 m²) 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 = $1.46 * 14.15 = 20.66 \text{ pCi/g}$
 - The DCGL_{EMC} for Cs-134 = $1.30 * 6.77 = 8.80 \text{ pCi/g}$
 - The DCGL_{EMC} for Co-60 = $1.16 * 3.51 = 4.07 \text{ pCi/g}$

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 ZionSolutions 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 (L1-12202C-FQGS-010-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 L1-12202C-FSGS-004-SB and L1-12202C-FSGS-013-SB were selected for this survey unit.

The locations of the seventeen (17) systematic samples and two (2) subsurface samples are listed in Table 8. A map of the systematic sample locations is included in Attachment 1.

Table 8 - Systematic Sample Measurement Locations

MEASUREMENT ID	NORTHING (meters)	EASTING (meters)
L1-12202C-FSGS-001-SS	641678.58	343536.26
L1-12202C-FSGS-002-SS	641678.58	343547.60
L1-12202C-FSGS-003-SS	641678.58	343558.94
L1-12202C-FSGS-004-SS	641688.41	343541.93
L1-12202C-FSGS-005-SS	641688.41	343553.27
L1-12202C-FSGS-006-SS	641688.41	343564.61
L1-12202C-FSGS-007-SS	641698.23	343547.60
L1-12202C-FSGS-008-SS	641698.23	343558.94
L1-12202C-FSGS-009-SS	641698.23	343570.29
L1-12202C-FSGS-010-SS	641708.05	343553.27
L1-12202C-FSGS-011-SS	641708.05	343564.61
L1-12202C-FSGS-012-SS	641717.88	343547.60
L1-12202C-FSGS-013-SS	641717.88	343558.94
L1-12202C-FSGS-014-SS	641717.88	343570.29
L1-12202C-FSGS-015-SS	641727.70	343553.27
L1-12202C-FSGS-016-SS	641727.70	343564.61
L1-12202C-FSGS-017-SS	641727.70	343575.96
L1-12202C-FSGS-004-SB	641688.41	343541.93
L1-12202C-FSGS-013-SB	641717.88	343558.94

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. No samples exceeded on OpSOF of 0.1 during the FSS of survey unit 12202C.

Two (2) soil samples, L1-12202C-FSGS-007-SS, which had the highest OpSOF of the samples, and L1-12202C-FSGS-013-SB, which had a result for Cs-137 > MDC, were selected to meet the requirement that 10% of the samples collected for the FSS of survey unit 12202C

be analyzed for HTD ROC. Each sample was sent off-site (Eberline Analytical) for analysis of the HTD ROC as specified in LTP, Section 5.1. Eberline analytical reports are provided in Attachment 8.

Table 9 provides a synopsis of the survey design for survey unit 12202C.

Table 9 - Synopsis of Survey Design

FEATURE	DESIGN CRITERIA	BASIS
Survey Unit Area	1,894 m ²	GPS measurements of area
Number of Surface Soil Samples	17 (Systematic)	• $\sigma = 0.30$ • UBGR = SOF of 1 • LBGR = SOF of 0.5 • Type I error = 0.05 • Type II error = 0.05 • $\Delta/\sigma = 1.67$ (MARSSIM Table 5.5)
Grid Spacing	11.3 m	(LTP, Section 5.6.4.5.2)
DCGLs	• Co-60 – 1.091 pCi/g • Cs-134 – 1.733 pCi/g • Cs-137 – 3.630 pCi/g • Ni-63 – 914.458 pCi/g • Sr-90 – 3.095 pCi/g	Operational DCGLs for Surface Soils, (LTP, Table 5-7)
HTD ROC Analysis	A minimum of two (2) soil samples selected for HTD ROC analysis	(LTP, Section 5.1)
Measurement Investigation Level	Operational DCGL	(LTP, Table 5-25)
Scan Survey Area Coverage	100%	(LTP, Table 5-24)
QC	One (1) systematic 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 4 and 13	(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 L1-12202C-F, which was developed in accordance with ZionSolutions procedure ZS-LT-300-001-001, “*Final Status Survey Package Development*.” The FSS unit was inspected and controlled in accordance with ZionSolutions procedure ZS-LT-300-001-003, “*Isolation and Control for Final Status Survey*” (Reference 13).

For survey unit 12202C, 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 indicated the potential presence of residual radioactivity at a concentration of 75% of the subsurface Operational DCGL, 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 12202C.

FSS field activities were conducted under FSS sample plan L1-12202C-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 September 10, 2019, and concluding on September 16, 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 2-inch) 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 (see Section 9 for further discussion). 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 a check source to 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	216166/PR372106	11/29/2019
Ludlum 2350-1/Ludlum 44-10	216173/ES0118	12/6/2019
Ludlum 2350-1/Ludlum 44-10	304711/PR321902	1/18/2020
Ludlum 2350-1/Ludlum 44-10	304726/PR363452	8/28/2020

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.

Two (2) samples (L1-12202C-FSGS-007-SS, and L1-12202C-FSGS-013-SB) were selected for HTD radionuclide analysis. One (1) surface soil sample (L1-12202C-FQGS-010-SS) was selected randomly for QC sample analysis.

7. SURVEY RESULTS

One hundred percent (100%) of the surface of the survey unit was scanned for elevated radiation levels. Sixty-three (63) 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	2878	3139	None	None
Row 2	2991	3139	None	None
Row 3	3000	3139	None	None
Row 4	2895	3139	None	None
Row 5	2876	3139	None	None
Row 6	2884	3139	None	None
Row 7	2737	3139	None	None
Row 8	2749	3139	None	None
Row 9	2734	3139	None	None
Row 10	2771	3139	None	None
Row 11	2753	3139	None	None
Row 12	2726	3139	None	None
Row 13	3040	3222	None	None
Row 14	3032	3222	None	None
Row 15	2919	3222	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 16	3042	3222	None	None
Row 17	3130	3222	None	None
Row 18	3218	3222	None	None
Row 19	3169	3222	None	None
Row 20	3046	3222	None	None
Row 21	3111	3222	None	None
Row 22	3136	3222	None	None
Row 23	3150	3222	None	None
Row 24	3139	3293	None	None
Row 25	2876	3080	None	None
Row 26	2790	3080	None	None
Row 27	2898	3080	None	None
Row 28	2821	3080	None	None
Row 29	3037	3080	None	None
Row 30	2898	3080	None	None
Row 31	2969	3080	None	None
Row 32	3003	3080	None	None
Row 33	3052	3080	None	None
Row 34	2903	3080	None	None
Row 35	2946	3080	None	None
Row 36	2978	3080	None	None
Row 37	3317	3559	None	None
Row 38	3427	3559	None	None
Row 39	3083	3559	None	None
Row 40	3351	3559	None	None
Row 41	3288	3559	None	None
Row 42	3418	3559	None	None
Row 43	3282	3559	None	None
Row 44	3169	3559	None	None
Row 45	3364	3559	None	None
Row 46	3374	3559	None	None
Row 47	3377	3559	None	None
Row 48	3369	3559	None	None
Row 49	3130	3559	None	None
Row 50	2840	3337	None	None
Row 51	2870	3337	None	None
Row 52	3050	3337	None	None
Row 53	3160	3337	None	None
Row 54	2940	3337	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 55	2870	3337	None	None
Row 56	3150	3337	None	None
Row 57	3240	3337	None	None
Row 58	2830	3337	None	None
Row 59	2860	3337	None	None
Row 60	2940	3337	None	None
Row 61	2940	3337	None	None
Row 62	2850	3337	None	None
Row 63	2870	3337	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 the 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. The gamma spectroscopy results revealed one (1) sample with activity level 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 ZionSolutions 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)
L1-12202C-FSGS-001-SS	2.42E-02	1.81E-02	1.24E-02	4.37E+00	2.48E-05
L1-12202C-FSGS-002-SS	1.88E-03	0.00E+00	1.19E-02	3.39E-01	2.38E-05
L1-12202C-FSGS-003-SS	3.76E-02	0.00E+00	1.05E-02	6.78E+00	2.10E-05
L1-12202C-FSGS-004-SS	1.93E-02	2.88E-02	2.75E-02	3.48E+00	5.50E-05
L1-12202C-FSGS-005-SS	2.20E-02	1.61E-02	0.00E+00	3.97E+00	0.00E+00
L1-12202C-FSGS-006-SS	4.79E-02	0.00E+00	0.00E+00	8.64E+00	0.00E+00
L1-12202C-FSGS-007-SS	4.62E-02	4.13E-02	5.65E-02	8.34E+00	1.13E-04
L1-12202C-FSGS-008-SS	0.00E+00	2.85E-02	0.00E+00	0.00E+00	0.00E+00
L1-12202C-FSGS-009-SS	1.60E-04	2.32E-03	3.53E-03	2.89E-02	7.06E-06
L1-12202C-FSGS-010-SS	3.48E-02	1.19E-02	1.01E-02	6.28E+00	2.02E-05
L1-12202C-FSGS-011-SS	2.70E-02	1.23E-02	6.46E-03	4.87E+00	1.29E-05
L1-12202C-FSGS-012-SS	4.27E-02	9.82E-03	1.41E-02	7.71E+00	2.82E-05
L1-12202C-FSGS-013-SS	6.82E-03	1.10E-02	1.38E-02	1.23E+00	2.76E-05
L1-12202C-FSGS-014-SS	4.36E-02	0.00E+00	0.00E+00	7.87E+00	0.00E+00
L1-12202C-FSGS-015-SS	2.81E-02	2.31E-02	0.00E+00	5.07E+00	0.00E+00
L1-12202C-FSGS-016-SS	2.16E-02	2.64E-02	7.97E-03	3.90E+00	1.59E-05
L1-12202C-FSGS-017-SS	1.56E-02	8.44E-03	1.97E-02	2.82E+00	3.94E-05

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

Table 13 - Summary of Gamma Spectroscopy Results for 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)
L1-12202C-FSGS-004-SB	7.37E-03	2.76E-02	6.87E-03	1.33E+00	1.37E-05
L1-12202C-FSGS-013-SB	1.70E-02	3.00E-03	4.91E-02	3.07E+00	9.82E-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 two (2) samples selected for HTD ROC analysis. Samples L1-12202C-FSGS-007-SS-A and L1-12202C-FSGS-013-SB-A were selected. Only HTD radionuclides included as ROC (Ni-63 and Sr-90 for soils) were included in the analysis. All analyses met the required MDC. No activity was positively detected in either of the samples 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 # L1-12202C-FSGS-007-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	1.74E-02	6.77E-02	8.39E-02	No
Cs-134	-3.09E-02	3.76E-02	7.92E-02	No
Cs-137	8.26E-02	7.42E-02	1.20E-01	No
Ni-63	-2.68E-01	1.95E+00	3.37E+00	No
Sr-90	2.49E-01	3.29E-01	6.75E-01	No

Sample # L1-12202C-FSGS-013-SB-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	1.57E-02	5.28E-02	9.04E-02	No
Cs-134	-9.66E-02	6.97E-02	7.83E-02	No
Cs-137	3.86E-02	4.55E-02	7.98E-02	No
Ni-63	1.30E+00	1.96E+00	3.32E+00	No
Sr-90 ⁽¹⁾	4.02E-02	3.73E-02	7.51E-02	No

(1) Sr-90 recounted February 19, 2020, to achieve adequate MDC

The implementation of survey specific QC measures included the collection of one (1) systematic sample (L1-12202C-FQGS-010-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 concentrations for Cs-137, Co-60 and Cs-134 were less than MDC in the sample. The concentration for Ni-63 and Sr-90 are 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)
L1-12202C-FQGS-010-SS	3.09E-02	0.00E+00	1.41E-02	5.58E+00	2.82E-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

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

Where: C_n = concentration of radionuclide n

$DCGL_n$ = DCGL of radionuclide n .

The results of the unity rule calculations for the ROC in the systematic sample population when compared against the OpDCGLs for surface soils for survey unit 12202C are provided in Table 16. The results of the unity rule calculations for the ROC for the subsurface samples are provided in Table 17, and the results for the QC samples are presented in Table 18.

Table 16 - Sum of Fractions for Systematic Surface Soil Samples compared to the OpDCGLs

MEASUREMENT ID	Fraction of the OpDCGLs for Surface Soils					OpSOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L1-12202C-FSGS-001-SS	2.22E-02	1.04E-02	3.42E-03	4.78E-03	8.01E-06	0.041
L1-12202C-FSGS-002-SS	1.72E-03	0.00E+00	3.28E-03	3.71E-04	7.69E-06	0.005
L1-12202C-FSGS-003-SS	3.45E-02	0.00E+00	2.89E-03	7.42E-03	6.79E-06	0.045
L1-12202C-FSGS-004-SS	1.77E-02	1.66E-02	7.58E-03	3.81E-03	1.78E-05	0.046
L1-12202C-FSGS-005-SS	2.02E-02	9.29E-03	0.00E+00	4.34E-03	0.00E+00	0.034
L1-12202C-FSGS-006-SS	4.39E-02	0.00E+00	0.00E+00	9.45E-03	0.00E+00	0.053
L1-12202C-FSGS-007-SS	4.23E-02	2.38E-02	1.56E-02	9.12E-03	3.65E-05	0.091
L1-12202C-FSGS-008-SS	0.00E+00	1.64E-02	0.00E+00	0.00E+00	0.00E+00	0.016
L1-12202C-FSGS-009-SS	1.47E-04	1.34E-03	9.72E-04	3.16E-05	2.28E-06	0.002
L1-12202C-FSGS-010-SS	3.19E-02	6.87E-03	2.78E-03	6.87E-03	6.53E-06	0.048
L1-12202C-FSGS-011-SS	2.47E-02	7.10E-03	1.78E-03	5.33E-03	4.17E-06	0.039
L1-12202C-FSGS-012-SS	3.91E-02	5.67E-03	3.88E-03	8.43E-03	9.11E-06	0.057
L1-12202C-FSGS-013-SS	6.25E-03	6.35E-03	3.80E-03	1.35E-03	8.92E-06	0.018
L1-12202C-FSGS-014-SS	4.00E-02	0.00E+00	0.00E+00	8.60E-03	0.00E+00	0.049
L1-12202C-FSGS-015-SS	2.58E-02	1.33E-02	0.00E+00	5.54E-03	0.00E+00	0.045
L1-12202C-FSGS-016-SS	1.98E-02	1.52E-02	2.20E-03	4.26E-03	5.15E-06	0.041
L1-12202C-FSGS-017-SS	1.43E-02	4.87E-03	5.43E-03	3.08E-03	1.27E-05	0.028

Systematic Measurements

Number of Systematic Measurements =	17
# of Systematic Measurements with OpSOF ≥ 1 =	0
# of Systematic Measurements with OpSOF > 0.1 (HTD Assessment) =	0
Max Individual Systematic Measurement OpSOF =	0.091
Mean Systematic Measurement OpSOF =	0.039

Table 17 - Sum of Fractions for Subsurface Soil Samples compared to the OpDCGLs

MEASUREMENT ID	Fraction of the OpDCGLs for Subsurface Soils					OpSOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L1-12202C-FSGS-004-SB	8.37E-03	2.43E-02	3.46E-03	6.81E-03	3.23E-05	0.043
L1-12202C-FSGS-013-SB	1.93E-02	2.64E-03	2.47E-02	1.57E-02	2.31E-04	0.063

Table 18 - Sum of Fractions for QC Soil Samples compared to the OpDCGLs

MEASUREMENT ID	Fraction of the OpDCGLs for Surface Soils					OpSOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L1-12202C-FQGS-010-SS	2.83E-02	0.00E+00	3.88E-03	6.10E-03	9.11E-06	0.038

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	2.47E-02	2.42E-02	4.79E-02	0.00E+00	0.016	4.26	5.79E-03	1.45E-01
Cs-134	1.40E-02	1.19E-02	4.13E-02	0.00E+00	0.012	6.77	2.07E-03	5.17E-02
Cs-137	1.14E-02	1.01E-02	5.65E-02	0.00E+00	0.014	14.18	8.07E-04	2.02E-02
Ni-63	4.45E+00	4.37E+00	8.64E+00	0.00E+00	2.906	3572.1	1.25E-03	3.12E-02
Sr-90	2.29E-05	2.02E-05	1.13E-04	0.00E+00	0.000	12.09	1.89E-06	4.73E-05

The mean BcSOF for survey unit 12202C is 0.010, which equates to a dose of 0.248 mrem/year TEDE.

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

8. QUALITY CONTROL

The on-site laboratory processed one (1) split sample, L1-12202C-FQGS-010-SS, using gamma spectroscopy analysis. The data was evaluated using acceptance criteria specified in ZionSolutions procedure ZS-LT-01, “*Quality Assurance Project Plan (for Characterization and FSS)*.” For the sample, the standard 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 between standard and comparison results. Refer to Attachment 5 for data and quality control analysis results.

9. INVESTIGATIONS AND RESULTS

No investigations were performed in survey unit 12202C.

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 (DQA)

The DQO sample design and data were reviewed in accordance with ZionSolutions 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 Operational DCGLs. 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 12202C has met the DQOs of the FSS plan. The ALARA criteria for soils as specified in Chapter 4 of the LTP were achieved. The EMC for soils was not needed for this survey unit.

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

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

The mean BcSOF, when the analytical results were compared to the BcDCGLs, was 0.010, which results in a dose contribution from soil in survey unit 12202C of 0.248 mrem/year, 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 12202C is acceptable for unrestricted release.

15. REFERENCES

1. *ZionSolutions* procedure ZS-LT-300-001-005, “Final Status Survey Data Reporting”
2. Zion Station Restoration Project License Termination Plan
3. *ZionSolutions* procedure ZS-LT-300-001-001, “Final Status Survey Package Development”
4. NUREG-1575, “Multi-Agency Radiation Survey and Site Investigation Manual”
5. *ZionSolutions* procedure ZS-LT-300-001-002, “Survey Unit Classification”
6. “Zion Station Historical Site Assessment”
7. *ZionSolutions* TSD 11-001, “Technical Support Document for Potential Radionuclides of Concern During the Decommissioning of the Zion Station”
8. *ZionSolutions* TSD 14-019, “Radionuclides of Concern for Soil and Basement Fill Model Source Terms”
9. *ZionSolutions* TSD 14-011, “Soil Area Factors”
10. *ZionSolutions* TSD 17-004, “Operational Derived Concentration Guideline Levels for Final Status Survey”
11. *ZionSolutions* TSD 11-004, “Ludlum Model 44-10 Detector Sensitivity”
12. *ZionSolutions* procedure ZS-LT-01, “Quality Assurance Project Plan (for Characterization and FSS)”
13. *ZionSolutions* procedure ZS-LT-300-001-003, “Isolation and Control for Final Status Survey”
14. *ZionSolutions* procedure ZS-RP-108-004-011, “Operation of the Ludlum Model 2350-1 Data Logger”
15. *ZionSolutions* TSD 13-004, “Examination of Cs-137 Global Fallout In Soils At Zion Station”
16. *ZionSolutions* procedure ZS-LT-300-001-004, “Final Status Survey Data Assessment”

16. ATTACHMENTS

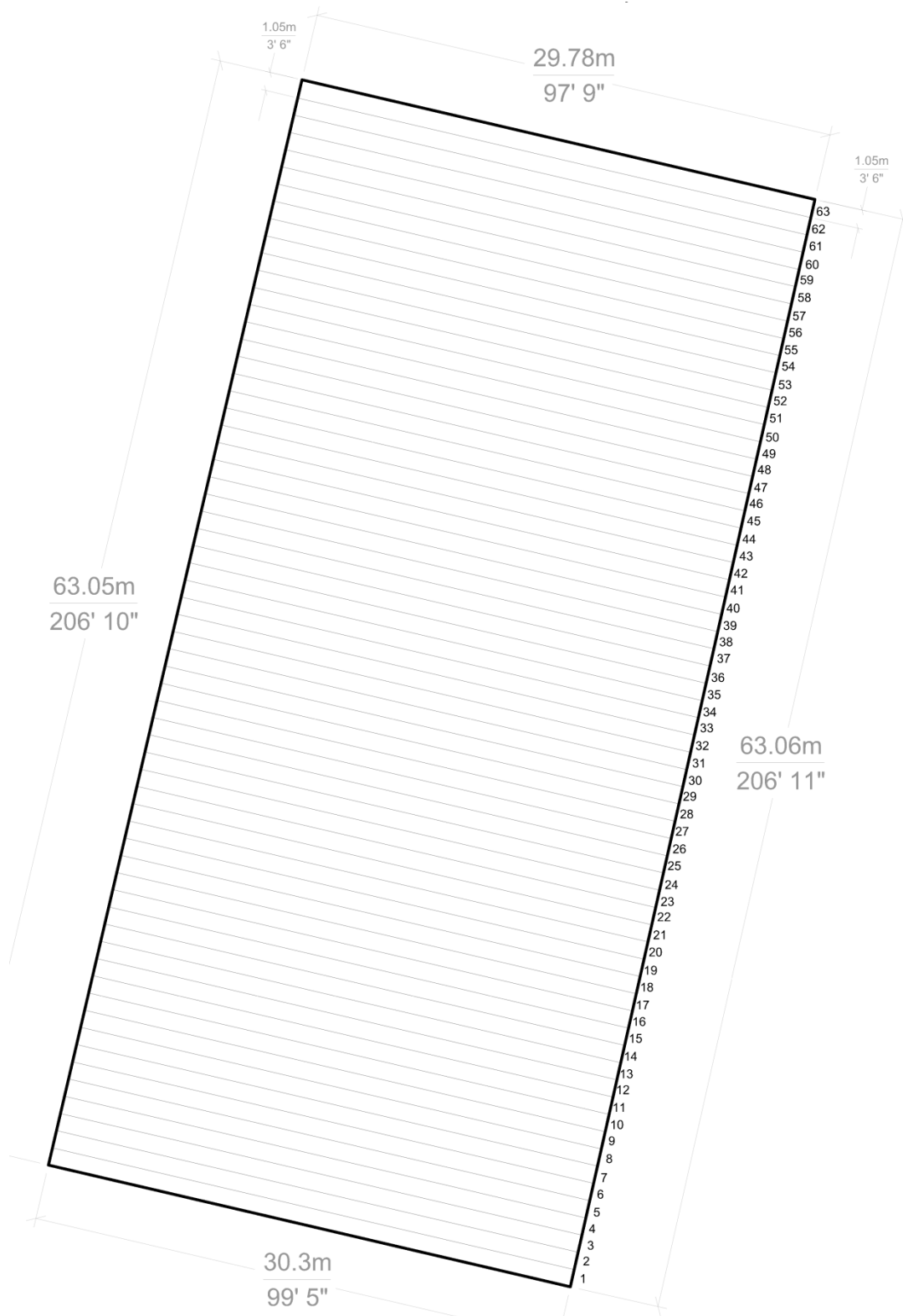
1. Attachment 1 - Figure and Map
2. Attachment 2 - Scan Data
3. Attachment 3 - Consultation Triggers for Residential and Commercial/Industrial Soil Contamination
4. Attachment 4 - Sign Test
5. Attachment 5 - QC Sample Assessment
6. Attachment 6 - Graphical Presentations
7. Attachment 7 - Sample Analytical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

ATTACHMENT 1
FIGURE AND MAP

Survey Unit 12202C Final Status Survey Boundaries and Systematic Sample Points



Survey Unit 12202C Final Status Survey Scan Rows



ATTACHMENT 2

SCAN DATA

FSS RELEASE RECORD – REV. 1
GATE HOUSE AND SOUTHWEST YARD
SURVEY UNIT 12202C



Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	PR372106	216166	12202C	GS013	9/10/2019 10:14	3040	2471	3222	No
44-10	PR372106	216166	12202C	GS013	9/10/2019 10:16	2943	2471	3222	No
44-10	PR372106	216166	12202C	GS013	9/10/2019 10:18	2812	2471	3222	No
44-10	PR372106	216166	12202C	GS014	9/10/2019 10:20	2942	2471	3222	No
44-10	PR372106	216166	12202C	GS014	9/10/2019 10:23	2904	2471	3222	No
44-10	PR372106	216166	12202C	GS014	9/10/2019 10:25	3032	2471	3222	No
44-10	PR372106	216166	12202C	GS015	9/10/2019 10:27	2919	2471	3222	No
44-10	PR372106	216166	12202C	GS015	9/10/2019 10:29	2915	2471	3222	No
44-10	PR372106	216166	12202C	GS015	9/10/2019 10:31	2801	2471	3222	No
44-10	PR372106	216166	12202C	GS016	9/10/2019 11:58	2899	2471	3222	No
44-10	PR372106	216166	12202C	GS016	9/10/2019 12:00	3041	2471	3222	No
44-10	PR372106	216166	12202C	GS016	9/10/2019 12:02	3042	2471	3222	No
44-10	PR372106	216166	12202C	GS017	9/10/2019 12:04	2903	2471	3222	No
44-10	PR372106	216166	12202C	GS017	9/10/2019 12:07	3130	2471	3222	No
44-10	PR372106	216166	12202C	GS017	9/10/2019 12:09	3011	2471	3222	No
44-10	PR372106	216166	12202C	GS018	9/10/2019 12:11	3218	2471	3222	No
44-10	PR372106	216166	12202C	GS018	9/10/2019 12:13	2888	2471	3222	No
44-10	PR372106	216166	12202C	GS018	9/10/2019 12:15	2854	2471	3222	No
44-10	PR372106	216166	12202C	GS019	9/10/2019 12:17	3074	2471	3222	No
44-10	PR372106	216166	12202C	GS019	9/10/2019 12:19	2882	2471	3222	No
44-10	PR372106	216166	12202C	GS019	9/10/2019 12:21	3169	2471	3222	No
44-10	PR372106	216166	12202C	GS020	9/10/2019 12:23	3046	2471	3222	No
44-10	PR372106	216166	12202C	GS020	9/10/2019 12:25	2713	2471	3222	No
44-10	PR372106	216166	12202C	GS020	9/10/2019 12:27	2953	2471	3222	No
44-10	PR372106	216166	12202C	GS021	9/10/2019 12:30	2821	2471	3222	No
44-10	PR372106	216166	12202C	GS021	9/10/2019 12:32	2862	2471	3222	No
44-10	PR372106	216166	12202C	GS021	9/10/2019 12:34	3111	2471	3222	No
44-10	PR372106	216166	12202C	GS022	9/10/2019 12:37	3136	2471	3222	No
44-10	PR372106	216166	12202C	GS022	9/10/2019 12:39	2709	2471	3222	No
44-10	PR372106	216166	12202C	GS022	9/10/2019 12:41	2965	2471	3222	No
44-10	PR372106	216166	12202C	GS023	9/10/2019 12:43	3150	2471	3222	No
44-10	PR372106	216166	12202C	GS023	9/10/2019 12:45	2863	2471	3222	No
44-10	PR372106	216166	12202C	GS023	9/10/2019 12:48	3143	2471	3222	No
44-10	ES0118	216173	12202C	GS050	9/10/2019 10:17	2840	2571	3337	No
44-10	ES0118	216173	12202C	GS050	9/10/2019 10:20	2830	2571	3337	No

FSS RELEASE RECORD – REV. 1
GATE HOUSE AND SOUTHWEST YARD
SURVEY UNIT 12202C



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	ES0118	216173	12202C	GS050	9/10/2019 10:23	2640	2571	3337	No
44-10	ES0118	216173	12202C	GS051	9/10/2019 10:26	2850	2571	3337	No
44-10	ES0118	216173	12202C	GS051	9/10/2019 10:28	2780	2571	3337	No
44-10	ES0118	216173	12202C	GS051	9/10/2019 10:31	2870	2571	3337	No
44-10	ES0118	216173	12202C	GS052	9/10/2019 11:56	3050	2571	3337	No
44-10	ES0118	216173	12202C	GS052	9/10/2019 11:58	2740	2571	3337	No
44-10	ES0118	216173	12202C	GS052	9/10/2019 12:01	2920	2571	3337	No
44-10	ES0118	216173	12202C	GS053	9/10/2019 12:04	2880	2571	3337	No
44-10	ES0118	216173	12202C	GS053	9/10/2019 12:06	2940	2571	3337	No
44-10	ES0118	216173	12202C	GS053	9/10/2019 12:10	3160	2571	3337	No
44-10	ES0118	216173	12202C	GS054	9/10/2019 12:12	2910	2571	3337	No
44-10	ES0118	216173	12202C	GS054	9/10/2019 12:15	2920	2571	3337	No
44-10	ES0118	216173	12202C	GS054	9/10/2019 12:18	2940	2571	3337	No
44-10	ES0118	216173	12202C	GS055	9/10/2019 12:20	2870	2571	3337	No
44-10	ES0118	216173	12202C	GS055	9/10/2019 12:23	2840	2571	3337	No
44-10	ES0118	216173	12202C	GS055	9/10/2019 12:26	2800	2571	3337	No
44-10	ES0118	216173	12202C	GS056	9/10/2019 12:29	3150	2571	3337	No
44-10	ES0118	216173	12202C	GS056	9/10/2019 12:32	2880	2571	3337	No
44-10	ES0118	216173	12202C	GS056	9/10/2019 12:34	2770	2571	3337	No
44-10	ES0118	216173	12202C	GS057	9/10/2019 12:37	2820	2571	3337	No
44-10	ES0118	216173	12202C	GS057	9/10/2019 12:40	2940	2571	3337	No
44-10	ES0118	216173	12202C	GS057	9/10/2019 12:42	3240	2571	3337	No
44-10	ES0118	216173	12202C	GS058	9/10/2019 12:45	2830	2571	3337	No
44-10	ES0118	216173	12202C	GS058	9/10/2019 12:48	2800	2571	3337	No
44-10	ES0118	216173	12202C	GS058	9/10/2019 12:50	2820	2571	3337	No
44-10	ES0118	216173	12202C	GS059	9/10/2019 12:53	2730	2571	3337	No
44-10	ES0118	216173	12202C	GS059	9/10/2019 12:55	2800	2571	3337	No
44-10	ES0118	216173	12202C	GS059	9/10/2019 12:58	2860	2571	3337	No
44-10	ES0118	216173	12202C	GS060	9/10/2019 13:01	2820	2571	3337	No
44-10	ES0118	216173	12202C	GS060	9/10/2019 13:03	2570	2571	3337	No
44-10	ES0118	216173	12202C	GS060	9/10/2019 13:06	2940	2571	3337	No
44-10	ES0118	216173	12202C	GS061	9/10/2019 13:09	2930	2571	3337	No
44-10	ES0118	216173	12202C	GS061	9/10/2019 13:11	2940	2571	3337	No
44-10	ES0118	216173	12202C	GS061	9/10/2019 13:14	2850	2571	3337	No
44-10	ES0118	216173	12202C	GS062	9/10/2019 13:17	2850	2571	3337	No
44-10	ES0118	216173	12202C	GS062	9/10/2019 13:19	2850	2571	3337	No

FSS RELEASE RECORD – REV. 1
GATE HOUSE AND SOUTHWEST YARD
SURVEY UNIT 12202C



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	ES0118	216173	12202C	GS062	9/10/2019 13:22	2700	2571	3337	No
44-10	ES0118	216173	12202C	GS063	9/10/2019 13:24	2870	2571	3337	No
44-10	ES0118	216173	12202C	GS063	9/10/2019 13:27	2770	2571	3337	No
44-10	ES0118	216173	12202C	GS063	9/10/2019 13:30	2790	2571	3337	No
44-10	PR321902	304711	12202C	GS001	9/10/2019 10:27	2787	2399	3139	No
44-10	PR321902	304711	12202C	GS001	9/10/2019 10:29	2645	2399	3139	No
44-10	PR321902	304711	12202C	GS001	9/10/2019 10:32	2878	2399	3139	No
44-10	PR321902	304711	12202C	GS002	9/10/2019 10:34	2991	2399	3139	No
44-10	PR321902	304711	12202C	GS002	9/10/2019 10:36	2572	2399	3139	No
44-10	PR321902	304711	12202C	GS002	9/10/2019 10:38	2589	2399	3139	No
44-10	PR321902	304711	12202C	GS003	9/10/2019 12:22	3000	2399	3139	No
44-10	PR321902	304711	12202C	GS003	9/10/2019 12:24	2876	2399	3139	No
44-10	PR321902	304711	12202C	GS003	9/10/2019 12:27	2487	2399	3139	No
44-10	PR321902	304711	12202C	GS004	9/10/2019 12:30	2562	2399	3139	No
44-10	PR321902	304711	12202C	GS004	9/10/2019 12:32	2594	2399	3139	No
44-10	PR321902	304711	12202C	GS004	9/10/2019 12:34	2895	2399	3139	No
44-10	PR321902	304711	12202C	GS005	9/10/2019 12:37	2876	2399	3139	No
44-10	PR321902	304711	12202C	GS005	9/10/2019 12:40	2589	2399	3139	No
44-10	PR321902	304711	12202C	GS005	9/10/2019 12:42	2513	2399	3139	No
44-10	PR321902	304711	12202C	GS006	9/10/2019 12:45	2633	2399	3139	No
44-10	PR321902	304711	12202C	GS006	9/10/2019 12:47	2759	2399	3139	No
44-10	PR321902	304711	12202C	GS006	9/10/2019 12:50	2884	2399	3139	No
44-10	PR321902	304711	12202C	GS007	9/10/2019 12:54	2737	2399	3139	No
44-10	PR321902	304711	12202C	GS007	9/10/2019 12:56	2593	2399	3139	No
44-10	PR321902	304711	12202C	GS007	9/10/2019 12:59	2435	2399	3139	No
44-10	PR321902	304711	12202C	GS008	9/10/2019 13:02	2601	2399	3139	No
44-10	PR321902	304711	12202C	GS008	9/10/2019 13:05	2603	2399	3139	No
44-10	PR321902	304711	12202C	GS008	9/10/2019 13:07	2749	2399	3139	No
44-10	PR321902	304711	12202C	GS009	9/10/2019 13:12	2734	2399	3139	No
44-10	PR321902	304711	12202C	GS009	9/10/2019 13:14	2616	2399	3139	No
44-10	PR321902	304711	12202C	GS009	9/10/2019 13:18	2533	2399	3139	No
44-10	PR321902	304711	12202C	GS010	9/10/2019 13:20	2544	2399	3139	No
44-10	PR321902	304711	12202C	GS010	9/10/2019 13:23	2578	2399	3139	No
44-10	PR321902	304711	12202C	GS010	9/10/2019 13:25	2771	2399	3139	No
44-10	PR321902	304711	12202C	GS011	9/10/2019 13:30	2753	2399	3139	No
44-10	PR321902	304711	12202C	GS011	9/10/2019 13:33	2556	2399	3139	No

FSS RELEASE RECORD – REV. 1
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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	PR321902	304711	12202C	GS011	9/10/2019 13:35	2588	2399	3139	No
44-10	PR321902	304711	12202C	GS012	9/10/2019 13:38	2605	2399	3139	No
44-10	PR321902	304711	12202C	GS012	9/10/2019 13:43	2644	2399	3139	No
44-10	PR321902	304711	12202C	GS012	9/10/2019 13:47	2726	2399	3139	No
44-10	PR363452	304726	12202C	GS025	9/10/2019 10:24	2876	2348	3080	No
44-10	PR363452	304726	12202C	GS025	9/10/2019 10:26	2540	2348	3080	No
44-10	PR363452	304726	12202C	GS025	9/10/2019 10:28	2778	2348	3080	No
44-10	PR363452	304726	12202C	GS026	9/10/2019 12:17	2790	2348	3080	No
44-10	PR363452	304726	12202C	GS026	9/10/2019 12:19	2696	2348	3080	No
44-10	PR363452	304726	12202C	GS026	9/10/2019 12:21	2638	2348	3080	No
44-10	PR363452	304726	12202C	GS027	9/10/2019 12:24	2806	2348	3080	No
44-10	PR363452	304726	12202C	GS027	9/10/2019 12:26	2881	2348	3080	No
44-10	PR363452	304726	12202C	GS027	9/10/2019 12:28	2898	2348	3080	No
44-10	PR363452	304726	12202C	GS028	9/10/2019 12:31	2765	2348	3080	No
44-10	PR363452	304726	12202C	GS028	9/10/2019 12:33	2707	2348	3080	No
44-10	PR363452	304726	12202C	GS028	9/10/2019 12:36	2821	2348	3080	No
44-10	PR363452	304726	12202C	GS029	9/10/2019 12:38	2794	2348	3080	No
44-10	PR363452	304726	12202C	GS029	9/10/2019 12:40	3037	2348	3080	No
44-10	PR363452	304726	12202C	GS029	9/10/2019 12:43	2892	2348	3080	No
44-10	PR363452	304726	12202C	GS030	9/10/2019 12:45	2898	2348	3080	No
44-10	PR363452	304726	12202C	GS030	9/10/2019 12:48	2872	2348	3080	No
44-10	PR363452	304726	12202C	GS030	9/10/2019 12:50	2841	2348	3080	No
44-10	PR363452	304726	12202C	GS031	9/10/2019 12:53	2909	2348	3080	No
44-10	PR363452	304726	12202C	GS031	9/10/2019 12:55	2753	2348	3080	No
44-10	PR363452	304726	12202C	GS031	9/10/2019 12:57	2969	2348	3080	No
44-10	PR363452	304726	12202C	GS032	9/10/2019 13:07	2932	2348	3080	No
44-10	PR363452	304726	12202C	GS032	9/10/2019 13:10	3003	2348	3080	No
44-10	PR363452	304726	12202C	GS032	9/10/2019 13:12	2680	2348	3080	No
44-10	PR363452	304726	12202C	GS033	9/10/2019 13:15	2784	2348	3080	No
44-10	PR363452	304726	12202C	GS033	9/10/2019 13:17	2955	2348	3080	No
44-10	PR363452	304726	12202C	GS033	9/10/2019 13:20	3052	2348	3080	No
44-10	PR363452	304726	12202C	GS034	9/10/2019 13:23	2876	2348	3080	No
44-10	PR363452	304726	12202C	GS034	9/10/2019 13:25	2903	2348	3080	No
44-10	PR363452	304726	12202C	GS034	9/10/2019 13:29	2685	2348	3080	No
44-10	PR363452	304726	12202C	GS035	9/10/2019 13:31	2794	2348	3080	No
44-10	PR363452	304726	12202C	GS035	9/10/2019 13:34	2946	2348	3080	No

FSS RELEASE RECORD – REV. 1
GATE HOUSE AND SOUTHWEST YARD
SURVEY UNIT 12202C



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	12202C	GS035	9/10/2019 13:36	2946	2348	3080	No
44-10	PR363452	304726	12202C	GS036	9/10/2019 13:46	2735	2348	3080	No
44-10	PR363452	304726	12202C	GS036	9/10/2019 13:48	2978	2348	3080	No
44-10	PR363452	304726	12202C	GS036	9/10/2019 13:51	2885	2348	3080	No
44-10	PR372106	216166	12202C	GS024	9/11/2019 7:30	3139	2533	3293	No
44-10	PR372106	216166	12202C	GS024	9/11/2019 7:32	2817	2533	3293	No
44-10	PR372106	216166	12202C	GS024	9/11/2019 7:34	2963	2533	3293	No
44-10	ES0118	216173	12202C	GS037	9/11/2019 9:00	3053	2765	3559	No
44-10	ES0118	216173	12202C	GS037	9/11/2019 9:02	3317	2765	3559	No
44-10	ES0118	216173	12202C	GS037	9/11/2019 9:05	3131	2765	3559	No
44-10	ES0118	216173	12202C	GS038	9/11/2019 9:08	3135	2765	3559	No
44-10	ES0118	216173	12202C	GS038	9/11/2019 9:10	3427	2765	3559	No
44-10	ES0118	216173	12202C	GS038	9/11/2019 9:13	3024	2765	3559	No
44-10	ES0118	216173	12202C	GS039	9/11/2019 9:16	3083	2765	3559	No
44-10	ES0118	216173	12202C	GS039	9/11/2019 9:19	3053	2765	3559	No
44-10	ES0118	216173	12202C	GS039	9/11/2019 9:21	3062	2765	3559	No
44-10	ES0118	216173	12202C	GS040	9/11/2019 9:24	3351	2765	3559	No
44-10	ES0118	216173	12202C	GS040	9/11/2019 9:26	3075	2765	3559	No
44-10	ES0118	216173	12202C	GS040	9/11/2019 9:29	3288	2765	3559	No
44-10	ES0118	216173	12202C	GS041	9/11/2019 9:32	3288	2765	3559	No
44-10	ES0118	216173	12202C	GS041	9/11/2019 9:35	3277	2765	3559	No
44-10	ES0118	216173	12202C	GS041	9/11/2019 9:38	3058	2765	3559	No
44-10	ES0118	216173	12202C	GS042	9/11/2019 9:40	3088	2765	3559	No
44-10	ES0118	216173	12202C	GS042	9/11/2019 9:43	3157	2765	3559	No
44-10	ES0118	216173	12202C	GS042	9/11/2019 9:46	3418	2765	3559	No
44-10	ES0118	216173	12202C	GS043	9/11/2019 9:49	3282	2765	3559	No
44-10	ES0118	216173	12202C	GS043	9/11/2019 9:52	3023	2765	3559	No
44-10	ES0118	216173	12202C	GS043	9/11/2019 9:54	3115	2765	3559	No
44-10	ES0118	216173	12202C	GS044	9/11/2019 9:57	2941	2765	3559	No
44-10	ES0118	216173	12202C	GS044	9/11/2019 10:00	3111	2765	3559	No
44-10	ES0118	216173	12202C	GS044	9/11/2019 10:02	3169	2765	3559	No
44-10	ES0118	216173	12202C	GS045	9/11/2019 10:05	3150	2765	3559	No
44-10	ES0118	216173	12202C	GS045	9/11/2019 10:08	3364	2765	3559	No
44-10	ES0118	216173	12202C	GS045	9/11/2019 10:10	3104	2765	3559	No
44-10	ES0118	216173	12202C	GS046	9/11/2019 10:13	3265	2765	3559	No
44-10	ES0118	216173	12202C	GS046	9/11/2019 10:15	3117	2765	3559	No

FSS RELEASE RECORD – REV. 1
 GATE HOUSE AND SOUTHWEST YARD
 SURVEY UNIT 12202C



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	ES0118	216173	12202C	GS046	9/11/2019 10:18	3374	2765	3559	No
44-10	ES0118	216173	12202C	GS047	9/11/2019 10:21	3377	2765	3559	No
44-10	ES0118	216173	12202C	GS047	9/11/2019 10:23	2933	2765	3559	No
44-10	ES0118	216173	12202C	GS047	9/11/2019 10:26	3000	2765	3559	No
44-10	ES0118	216173	12202C	GS048	9/11/2019 10:28	3075	2765	3559	No
44-10	ES0118	216173	12202C	GS048	9/11/2019 10:31	3049	2765	3559	No
44-10	ES0118	216173	12202C	GS048	9/11/2019 10:34	3369	2765	3559	No
44-10	ES0118	216173	12202C	GS049	9/11/2019 10:36	3130	2765	3559	No
44-10	ES0118	216173	12202C	GS049	9/11/2019 10:39	2988	2765	3559	No
44-10	ES0118	216173	12202C	GS049	9/11/2019 10:41	3090	2765	3559	No

ATTACHMENT 3

CONSULTATION TRIGGERS FOR RESIDENTIAL AND COMMERCIAL/INDUSTRIAL SOIL CONTAMINATION

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

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

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

ATTACHMENT 4

SIGN TEST

Attachment 12
Sign Statistical Test

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

Survey Area: No. 12000 **Description:** Security Restricted Area Grounds
Survey Unit: No. 12202C **Description:** Gate House and Southwest Yard
Classification: 1 **Type I (α) Error:** 0.05 **Number of Samples:** 17

#	Fraction of the Release Criterion						Weighted Sum (W _s)	1-W _s	Sign
	Radionuclides of Concern					Activity or SOF (as applicable)			
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90				
1	2.22E-02	1.04E-02	3.42E-03	4.78E-03	8.01E-06	SOF	0.041	0.959	+
2	1.72E-03	0.00E+00	3.28E-03	3.71E-04	7.69E-06	SOF	0.005	0.995	+
3	3.45E-02	0.00E+00	2.89E-03	7.42E-03	6.79E-06	SOF	0.045	0.955	+
4	1.77E-02	1.66E-02	7.58E-03	3.81E-03	1.78E-05	SOF	0.046	0.954	+
5	2.02E-02	9.29E-03	0.00E+00	4.34E-03	0.00E+00	SOF	0.034	0.966	+
6	4.39E-02	0.00E+00	0.00E+00	9.45E-03	0.00E+00	SOF	0.053	0.947	+
7	4.23E-02	2.38E-02	1.56E-02	9.12E-03	3.65E-05	SOF	0.091	0.909	+
8	0.00E+00	1.64E-02	0.00E+00	0.00E+00	0.00E+00	SOF	0.016	0.984	+
9	1.47E-04	1.34E-03	9.72E-04	3.16E-05	2.28E-06	SOF	0.002	0.998	+
10	3.19E-02	6.87E-03	2.78E-03	6.87E-03	6.53E-06	SOF	0.048	0.952	+
11	2.47E-02	7.10E-03	1.78E-03	5.33E-03	4.17E-06	SOF	0.039	0.961	+
12	3.91E-02	5.67E-03	3.88E-03	8.43E-03	9.11E-06	SOF	0.057	0.943	+
13	6.25E-03	6.35E-03	3.80E-03	1.35E-03	8.92E-06	SOF	0.018	0.982	+
14	4.00E-02	0.00E+00	0.00E+00	8.60E-03	0.00E+00	SOF	0.049	0.951	+
15	2.58E-02	1.33E-02	0.00E+00	5.54E-03	0.00E+00	SOF	0.045	0.955	+
16	1.98E-02	1.52E-02	2.20E-03	4.26E-03	5.15E-06	SOF	0.041	0.959	+
17	1.43E-02	4.87E-03	5.43E-03	3.08E-03	1.27E-05	SOF	0.028	0.972	+

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

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

Prepared By (RE): J. Broham 1 [Signature] 4/17/19
(Print Name) (Signature) (Date)

Peer Reviewed By (RE): R.J. Mandic 1 [Signature] 12-17-19
(Print Name) (Signature) (Date)

ATTACHMENT 5
QC SAMPLE ASSESSMENT

FSS RELEASE RECORD – REV. 1
GATE HOUSE AND SOUTHWEST YARD
SURVEY UNIT 12202C



Duplicate Sample Assessment Form																						
Survey Area #: 12000		Survey Unit #: 12202C		Survey Unit Name: Gate House and Southwest Yard																		
Sample Plan#: L1-12202C-F																						
Sample Description: Comparison of split samples collected from systematic surface soil sample #10. The samples were analyzed using gamma spectroscopy by on-site HPGe system. The standard/comparison samples were L1-12202C-FSGS-010SS/L1-12202C-FQGS-010SS.																						
STANDARD					COMPARISON																	
Radionuclide	Activity Value	Standard Error	Resolution	Agreement Range	Activity Value	Standard Error	Comparison Ratio	Acceptable (Y/N)														
K-40	9.67E+00	6.51E-01	14.85	0.6-1.66	9.79E+00	6.90E-01	0.99	Y														
Comments/Corrective Actions: The standard sample and QC sample did not both have positive results 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. <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: left; padding: 5px;"><u>Resolution</u></th> <th style="text-align: left; padding: 5px;"><u>Acceptable Ratio</u></th> </tr> </thead> <tbody> <tr><td style="padding: 5px;"><4</td><td style="padding: 5px;">not comparable</td></tr> <tr><td style="padding: 5px;">4-7</td><td style="padding: 5px;">0.5-2.0</td></tr> <tr><td style="padding: 5px;">8-15</td><td style="padding: 5px;">0.6-1.66</td></tr> <tr><td style="padding: 5px;">16-50</td><td style="padding: 5px;">0.75-1.33</td></tr> <tr><td style="padding: 5px;">51-200</td><td style="padding: 5px;">0.80-1.25</td></tr> <tr><td style="padding: 5px;">>200</td><td style="padding: 5px;">0.85-1.18</td></tr> </tbody> </table>				<u>Resolution</u>	<u>Acceptable Ratio</u>	<4	not comparable	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
<u>Resolution</u>	<u>Acceptable Ratio</u>																					
<4	not comparable																					
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: <i>J. Graham</i>		Date: <i>12/17/19</i>		Reviewed by: <i>R.J. Mandia</i>		Date: <i>12-17-19</i>																

ATTACHMENT 6
GRAPHICAL PRESENTATIONS

Posting Plot

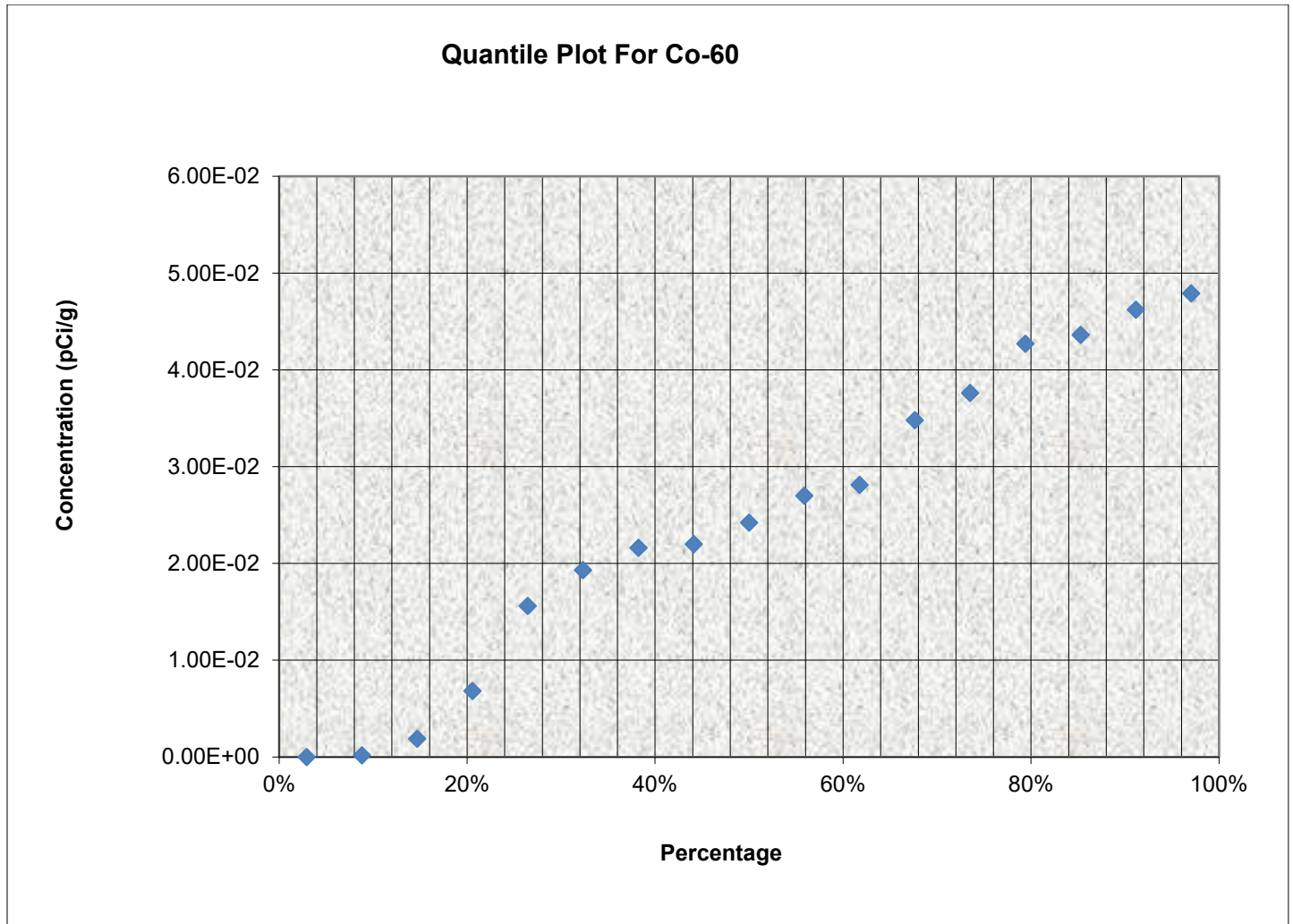


QUANTILE PLOT FOR Co-60

Survey Unit: 12202C

Survey Unit Name: Gate House and Southwest Yard

Mean: 2.47E-02 pCi/g

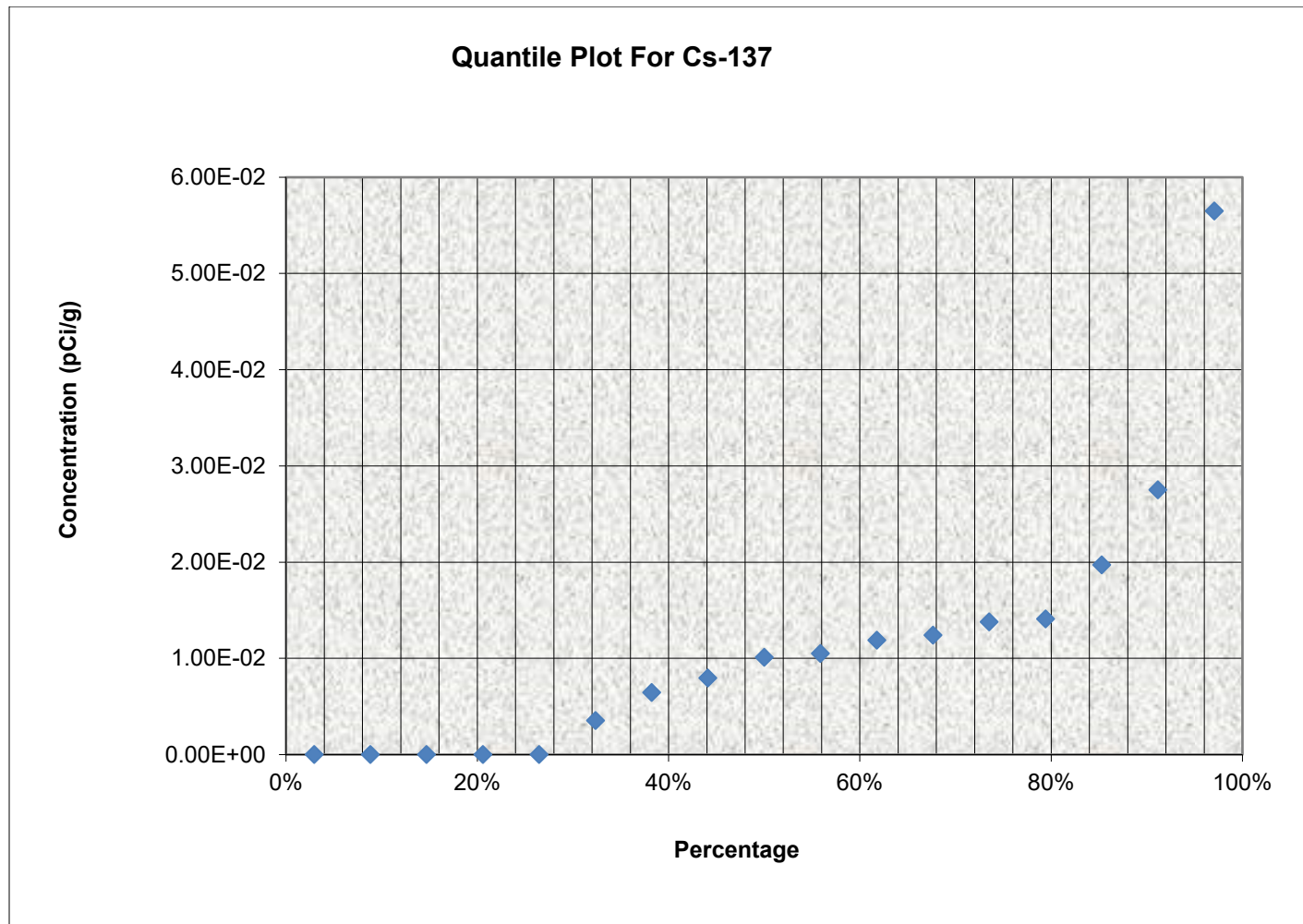


QUANTILE PLOT FOR Cs-137

Survey Unit: 12202C

Survey Unit Name: Gate House and Southwest Yard

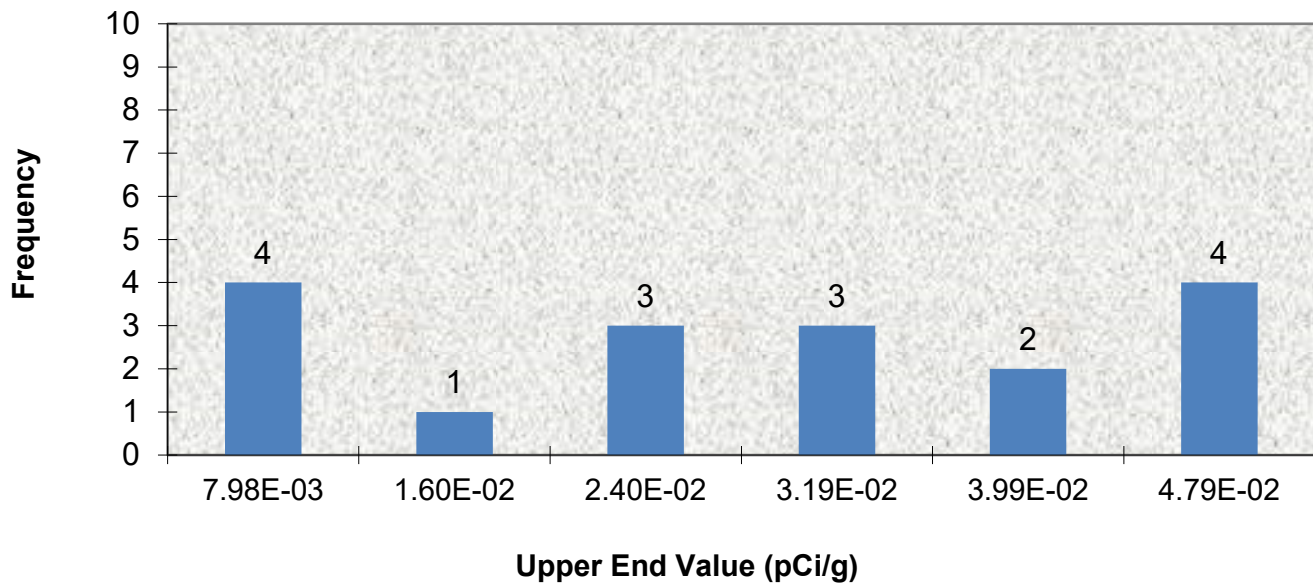
Mean: 1.14E-02 pCi/g



HISTOGRAM FOR Co-60

Survey Unit: 12202C
Survey Unit Name: Gate House and Southwest Yard
Mean: 2.47E-02 pCi/g
Median: 2.42E-02 pCi/g
ST DEV: 0.016
Skew: -0.167

Frequency Plot For Co-60



Upper Value	Observation Frequency	Observation %
7.98E-03	4	24%
1.60E-02	1	6%
2.40E-02	3	18%
3.19E-02	3	18%
3.99E-02	2	12%
4.79E-02	4	24%
TOTAL	17	100%

HISTOGRAM FOR Cs-137

Survey Unit: 12202C

Survey Unit Name: Gate House and Southwest Yard

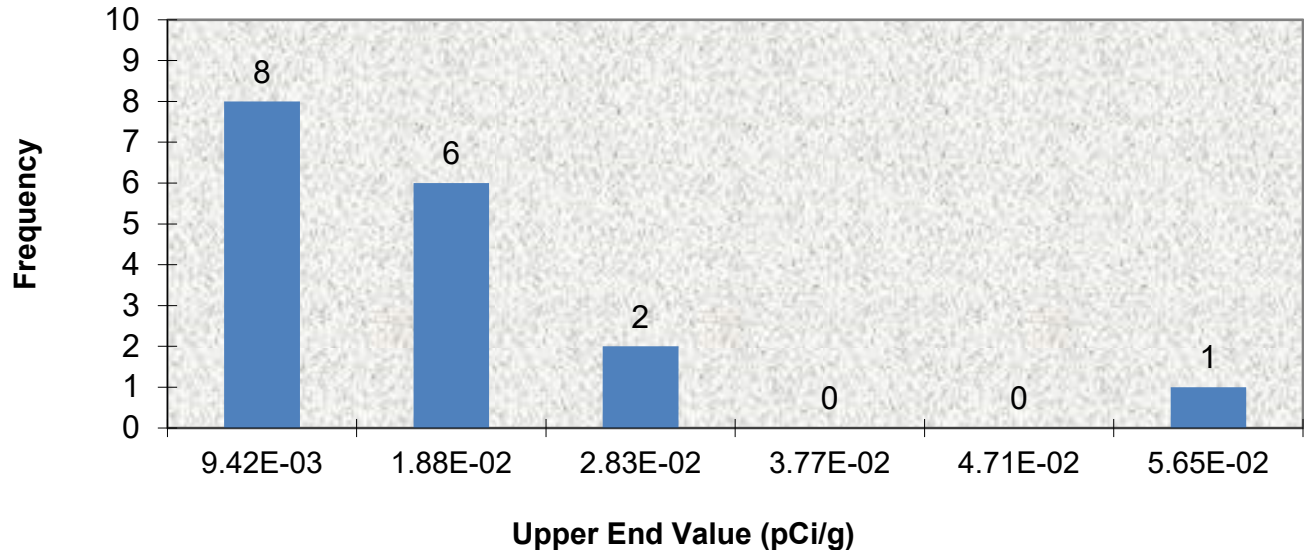
Mean: 1.14E-02 pCi/g

Median: 1.01E-02 pCi/g

ST DEV: 0.014

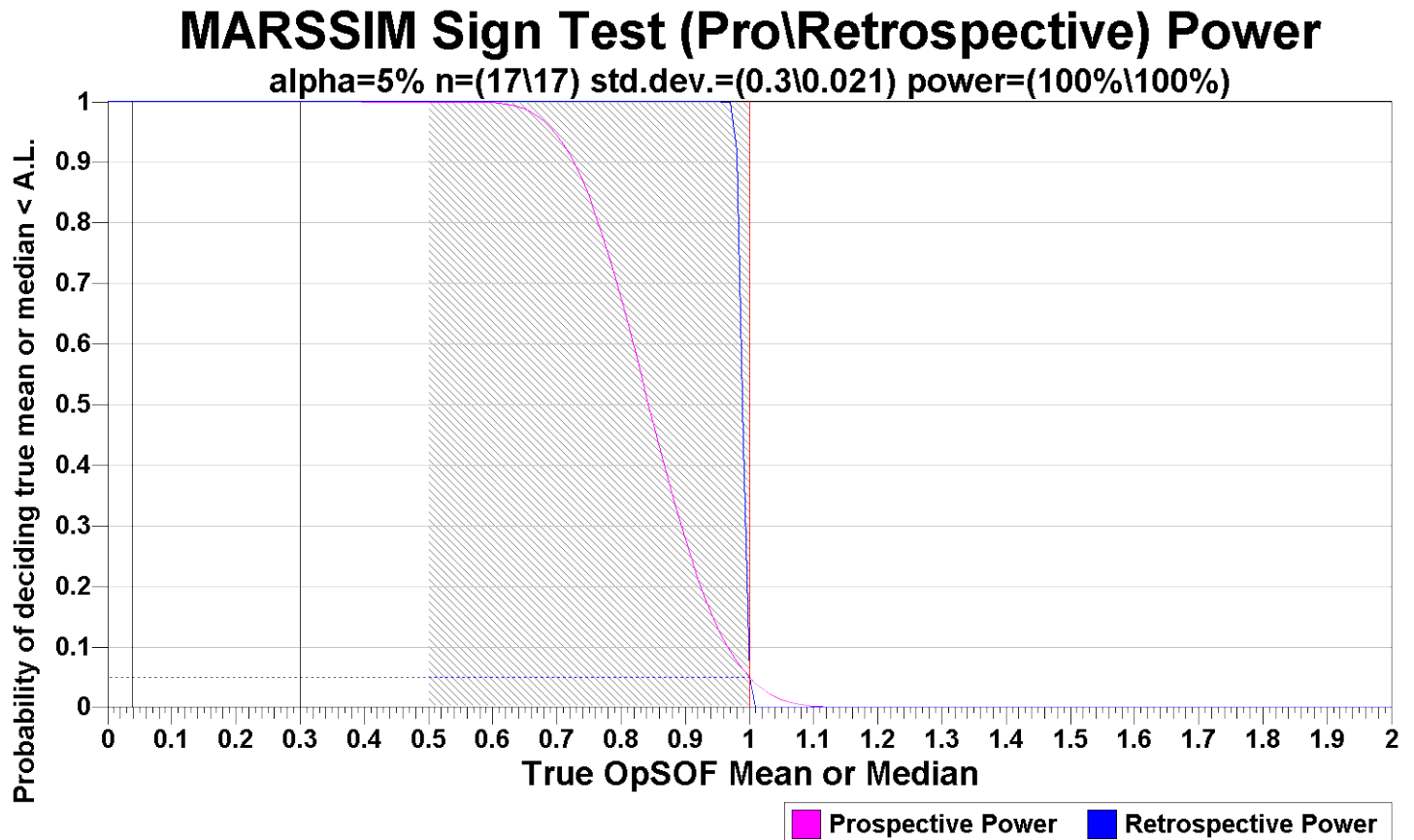
Skew: 2.284

Frequency Plot For Cs-137



Upper Value	Observation Frequency	Observation %
9.42E-03	8	47%
1.88E-02	6	35%
2.83E-02	2	12%
3.77E-02	0	0%
4.71E-02	0	0%
5.65E-02	1	6%
TOTAL	17	100%

Prospective and Retrospective Power Curves for Survey Unit 12202C



ATTACHMENT 7
SAMPLE ANALYTICAL REPORTS

Analysis Report for 12-Sep-19-10009
L1-12202C-FSGS-001SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 12-Sep-19-10009
Sample Description : L1-12202C-FSGS-001SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.904E+03 grams
Facility : Default

Sample Taken On : 9/11/2019 9:00:00AM
Acquisition Started : 9/12/2019 9:11:01AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : 324
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 900.3 seconds

Dead Time : 0.04 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 120 - 4096
Peak Area Range (in channels) : 120 - 4096
Identification Energy Tolerance : 1.000 keV

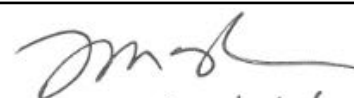
Energy Calibration Used Done On : 9/29/2018
Efficiency Calibration Used Done On : 9/12/2019
Efficiency Calibration Description :

Sample Number : 79471
Fill Height : 1904.47 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 9/12/2019 9:26:03AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 4096


Data Validated
1600 9-[53]19

Analysis Report for 12-Sep-19-10009
L1-12202C-FSGS-001SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.66	473 -	481	477.51	1.74E+02	20.31	1.07E+02	1.31
2	295.26	587 -	595	590.58	3.98E+01	12.83	5.52E+01	1.18
3	338.26	672 -	681	676.49	5.27E+01	12.00	4.03E+01	1.26
4	351.76	698 -	708	703.46	9.63E+01	14.67	4.97E+01	0.73
5	583.13	1160 -	1170	1165.87	5.64E+01	10.29	2.06E+01	1.79
6	609.25	1212 -	1222	1218.08	5.29E+01	10.73	2.61E+01	0.88
7	910.90	1816 -	1826	1821.26	2.75E+01	8.03	1.45E+01	1.58
8	969.00	1933 -	1942	1937.47	2.90E+01	7.93	1.50E+01	1.60
9	1460.78	2914 -	2929	2921.61	3.69E+02	19.38	2.12E+00	1.88

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.82 *	10.66	6.59E+00	4.49E-01
Tl-208	1.00	583.19 *	85.00	6.99E-02	1.34E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	2.36E-01	3.36E-02
		300.09	3.30		
Bi-214	1.00	609.32 *	45.49	1.26E-01	2.66E-02
		768.36	4.89		
		806.18	1.26		

[56]

Analysis Report for 12-Sep-19-10009

L1-12202C-FSGS-001SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	0.99	241.99	7.25		
		295.22 *	18.42	1.44E-01	4.79E-02
		351.93 *	35.60	2.04E-01	3.51E-02
		785.96	1.06		
Ac-228	0.99	129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32 *	11.27	3.43E-01	8.30E-02
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	1.49E-01	4.42E-02
		964.77	4.99		
		968.97 *	15.80	2.68E-01	7.42E-02
		1588.20	3.22		

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 12-Sep-19-10009

L1-12202C-FSGS-001SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	1.000	6.59E+00	4.49E-01	
	Tl-208	1.000	6.99E-02	1.34E-02	
X	Bi-211	0.927			
	Pb-212	1.000	2.36E-01	3.36E-02	
	Bi-214	1.000	1.26E-01	2.66E-02	
	Pb-214	0.997	1.83E-01	2.83E-02	
	Ac-228	0.995	2.09E-01	3.45E-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 12-Sep-19-10009
L1-12202C-FSGS-001SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 9/12/2019 9:26:03AM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
All peaks were identified.					
M = First peak in a multiplet region					
m = Other peak in a multiplet region					
F = Fitted singlet					
Errors quoted at 1.000sigma					

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	5.55E-02	4.66E-02	4.66E-02
	BE-7	477.60	10.44	2.00E-01	3.88E-01	3.88E-01
+	K-40	1460.82	* 10.66	6.59E+00	2.07E-01	2.07E-01
	Mn-54	834.85	99.98	-3.52E-03	3.63E-02	3.63E-02
	Co-60	1173.23	99.85	1.63E-02	4.14E-02	4.79E-02
		1332.49	99.98	2.42E-02		4.14E-02
	Nb-94	702.65	99.81	-5.05E-03	3.31E-02	3.41E-02
		871.09	99.89	1.34E-02		3.31E-02
	Ag-108m	79.13	6.60	7.80E-01	3.39E-02	1.19E+00
		433.94	90.50	-8.45E-03		3.39E-02
		614.28	89.80	-1.10E-02		4.58E-02
		722.94	90.80	8.18E-04		4.27E-02
	Sb-125	176.31	6.84	-1.72E-01	9.54E-02	4.89E-01
		380.45	1.52	2.07E-01		1.84E+00
		427.87	29.60	1.57E-02		9.54E-02
		463.36	10.49	2.20E-01		3.59E-01
		600.60	17.65	-5.41E-02		1.93E-01
		606.71	4.98	-1.98E-01		1.07E+00
		635.95	11.22	-1.57E-01		3.18E-01

Analysis Report for 12-Sep-19-10009

L1-12202C-FSGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	6.59E-01	9.54E-02	2.09E+00
Ba-133	79.61	2.65	1.36E+00	6.51E-02	2.80E+00
	81.00	32.90	-1.86E-01		1.82E-01
	276.40	7.16	3.18E-01		4.61E-01
	302.85	18.34	8.28E-02		1.80E-01
	356.01	62.05	-2.90E-02		6.51E-02
	383.85	8.94	-3.94E-02		2.94E-01
Cs-134	475.36	1.48	2.32E+00	5.17E-02	2.87E+00
	563.25	8.34	1.54E-01		4.10E-01
	569.33	15.37	1.19E-01		2.19E-01
	604.72	97.62	-2.89E-03		5.17E-02
	795.86	85.46	1.81E-02		5.17E-02
	801.95	8.69	-8.90E-02		4.20E-01
	1038.61	0.99	2.61E+00		4.42E+00
	1167.97	1.79	1.22E-01		2.67E+00
	1365.19	3.02	5.71E-02		1.08E+00
Cs-137	661.66	85.10	1.24E-02	4.66E-02	4.66E-02
Eu-152	121.78	28.67	-5.88E-03	1.12E-01	1.14E-01
	244.70	7.61	-3.43E-01		4.47E-01
	295.94	0.45	3.33E+00		8.11E+00
	344.28	26.60	-4.49E-04		1.12E-01
	367.79	0.86	-2.15E+00		3.03E+00
	411.12	2.24	1.03E-01		1.50E+00
	443.96	2.83	-3.15E-01		1.06E+00
	488.68	0.42	2.95E+00		7.99E+00
	563.99	0.49	5.00E+00		7.20E+00
	586.26	0.46	-3.64E+00		1.15E+01
	678.62	0.47	-3.97E-03		7.28E+00
	688.67	0.86	-2.68E+00		3.53E+00
	719.35	0.28	1.78E+00		1.38E+01
	778.90	12.96	1.18E-01		2.81E-01
	810.45	0.32	-9.11E-01		1.18E+01
	867.37	4.26	-7.13E-01		7.03E-01
	919.33	0.43	-1.03E+00		9.02E+00
	964.08	14.65	3.15E-02		3.75E-01
	1085.87	10.24	3.70E-02		3.55E-01
	1089.74	1.73	-2.05E+00		1.95E+00
	1112.07	13.69	-1.27E-01		3.43E-01
	1212.95	1.43	-7.20E-01		3.48E+00
	1249.94	0.19	-2.89E+00		2.64E+01
	1299.14	1.63	4.82E-01		2.38E+00
	1408.01	21.07	1.25E-01		1.99E-01
	1457.64	0.50	-8.09E+00		3.61E+01
	1528.10	0.28	1.43E+00		9.49E+00
Eu-154	123.07	40.40	4.00E-02	8.38E-02	8.38E-02
	247.93	6.89	-3.09E-02		4.43E-01
	591.76	4.95	7.51E-02		7.29E-01
	692.42	1.78	1.03E+00		1.99E+00
	723.30	20.06	1.10E-01		2.05E-01
	756.80	4.52	-9.64E-02		7.40E-01
	873.18	12.08	-1.12E-01		2.49E-01

Analysis Report for 12-Sep-19-10009

L1-12202C-FSGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	4.61E-02	8.38E-02	4.25E-01
	1004.76	18.01	-2.03E-02		2.30E-01
	1274.43	34.80	-3.30E-02		1.34E-01
	1596.48	1.80	-3.53E-01		1.86E+00
Eu-155	45.30	1.31	-1.69E+00	1.70E-01	1.06E+01
	60.01	1.22	-4.57E+00		1.23E+01
	86.55	30.70	2.62E-02		1.70E-01
	105.31	21.10	3.95E-02		1.82E-01
Ra-226	186.21	3.64	6.34E-01	9.78E-01	9.78E-01
Pa-231	27.36	10.30	7.25E-01	1.11E+00	1.11E+00
	283.69	1.70	3.26E-01		1.66E+00
	300.07	2.47	-2.07E-01		1.27E+00
	302.65	2.20	6.90E-01		1.50E+00
	330.06	1.40	2.28E-01		2.34E+00
U-235	143.76	10.96	2.10E-01	6.16E-02	3.08E-01
	163.33	5.08	-5.53E-02		6.71E-01
	185.71	57.20	3.27E-02		6.16E-02
	202.11	1.08	-5.94E-01		2.90E+00
Am-241	205.31	5.01	-2.52E-01	4.39E-01	6.56E-01
	59.54	35.90	5.35E-02		4.39E-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

Analysis Report for 12-Sep-19-10010
L1-12202C-FSGS-002SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 12-Sep-19-10010
Sample Description : L1-12202C-FSGS-002SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.719E+03 grams
Facility : Default

Sample Taken On : 9/11/2019 9:02:00AM
Acquisition Started : 9/12/2019 8:38:29AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : 352
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 900.3 seconds

Dead Time : 0.03 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 120 - 8192
Peak Area Range (in channels) : 120 - 8192
Identification Energy Tolerance : 1.000 keV

Energy Calibration Used Done On : 9/29/2018
Efficiency Calibration Used Done On : 9/12/2019
Efficiency Calibration Description :

Sample Number : 79470
Fill Height : 1719.22 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 9/12/2019 8:53:32AM

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

DMJ
Data Validated
1600 9/12/19

Analysis Report for 12-Sep-19-10010
L1-12202C-FSGS-002SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	185.95	738 -	750	744.54	3.37E+01	11.76	3.93E+01	0.91
2	238.74	949 -	964	955.41	8.45E+01	18.19	7.95E+01	0.82
3	295.16	1175 -	1187	1180.87	4.15E+01	11.26	3.25E+01	0.82
4	351.86	1397 -	1413	1407.44	8.67E+01	12.97	2.63E+01	1.06
5	583.40	2326 -	2339	2332.93	3.69E+01	8.08	1.01E+01	1.02
6	609.32	2429 -	2443	2436.54	4.92E+01	10.22	1.88E+01	0.57
7	911.57	3640 -	3651	3645.33	2.11E+01	6.12	5.88E+00	0.40
8	1460.73	5831 -	5856	5843.29	3.79E+02	20.09	6.07E+00	1.39

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82 *	10.66	7.70E+00	5.28E-01
Tl-208	0.99	583.19 *	85.00	5.16E-02	1.17E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	1.30E-01	2.99E-02
		300.09	3.30		
Bi-214	1.00	609.32 *	45.49	1.32E-01	2.86E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		

Analysis Report for 12-Sep-19-10010

L1-12202C-FSGS-002SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	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	1.69E-01	4.79E-02
		351.93 *	35.60	2.07E-01	3.51E-02
		785.96	1.06		
Ra-226	0.98	186.21 *	3.64	5.55E-01	1.99E-01
Ac-228	0.99	129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32	11.27		
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	1.30E-01	3.81E-02
		964.77	4.99		
		968.97	15.80		
		1588.20	3.22		
U-235	0.99	143.76	10.96		
		163.33	5.08		
		185.71 *	57.20	3.53E-02	1.27E-02
		202.11	1.08		
		205.31	5.01		

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

Analysis Report for 12-Sep-19-10010
L1-12202C-FSGS-002SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.999	7.70E+00	5.28E-01	
	Tl-208	0.993	5.16E-02	1.17E-02	
X	Bi-211	0.905			
	Pb-212	0.998	1.30E-01	2.99E-02	
	Bi-214	1.000	1.32E-01	2.86E-02	
	Pb-214	0.999	1.94E-01	2.83E-02	
?	Ra-226	0.989	5.55E-01	1.99E-01	
	Ac-228	0.993	1.30E-01	3.81E-02	
?	U-235	0.993	3.53E-02	1.27E-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 12-Sep-19-10010
L1-12202C-FSGS-002SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 9/12/2019 8:53:32AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
All peaks were identified.					
M = First peak in a multiplet region					
m = Other peak in a multiplet region					
F = Fitted singlet					
Errors quoted at 1.000sigma					

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	3.48E-02	4.84E-02	4.84E-02
	BE-7	477.60	10.44	-8.90E-02	3.85E-01	3.85E-01
+	K-40	1460.82	* 10.66	7.70E+00	4.00E-01	4.00E-01
	Mn-54	834.85	99.98	-1.44E-03	4.87E-02	4.87E-02
	Co-60	1173.23	99.85	-4.02E-03	4.22E-02	6.21E-02
		1332.49	99.98	1.88E-03		4.22E-02
	Nb-94	702.65	99.81	-1.36E-03	3.83E-02	4.41E-02
		871.09	99.89	1.05E-02		3.83E-02
	Ag-108m	79.13	6.60	1.55E-01	3.46E-02	1.45E+00
		433.94	90.50	-1.70E-02		3.46E-02
		614.28	89.80	-1.41E-02		6.52E-02
		722.94	90.80	1.97E-02		5.27E-02
	Sb-125	176.31	6.84	-1.87E-01	1.05E-01	4.61E-01
		380.45	1.52	3.09E-01		2.13E+00
		427.87	29.60	-3.85E-02		1.05E-01
		463.36	10.49	1.51E-01		3.24E-01
		600.60	17.65	8.07E-02		2.23E-01
		606.71	4.98	1.40E+00		1.22E+00
		635.95	11.22	4.73E-02		3.55E-01

Analysis Report for 12-Sep-19-10010

L1-12202C-FSGS-002SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	5.14E-01	1.05E-01	2.27E+00
Ba-133	79.61	2.65	-1.11E-01	7.05E-02	3.44E+00
	81.00	32.90	-4.21E-01		2.31E-01
	276.40	7.16	-8.03E-02		4.72E-01
	302.85	18.34	1.16E-02		1.71E-01
	356.01	62.05	-6.05E-02		7.05E-02
	383.85	8.94	3.54E-02		3.71E-01
Cs-134	475.36	1.48	1.67E+00	5.52E-02	2.77E+00
	563.25	8.34	-5.36E-01		4.24E-01
	569.33	15.37	-1.66E-02		2.50E-01
	604.72	97.62	-1.65E-02		5.61E-02
	795.86	85.46	-4.84E-03		5.52E-02
	801.95	8.69	7.82E-02		5.19E-01
	1038.61	0.99	-1.82E+00		4.94E+00
	1167.97	1.79	1.22E+00		3.49E+00
	1365.19	3.02	5.52E-02		1.38E+00
Cs-137	661.66	85.10	1.19E-02	4.80E-02	4.80E-02
Eu-152	121.78	28.67	2.78E-02	1.20E-01	1.33E-01
	244.70	7.61	-4.03E-03		4.75E-01
	295.94	0.45	4.69E+00		9.32E+00
	344.28	26.60	4.13E-02		1.20E-01
	367.79	0.86	4.08E-01		4.07E+00
	411.12	2.24	-1.41E-02		1.65E+00
	443.96	2.83	-4.05E-01		1.19E+00
	488.68	0.42	-4.19E+00		7.67E+00
	563.99	0.49	1.46E+00		7.59E+00
	586.26	0.46	1.15E+01		1.14E+01
	678.62	0.47	2.32E-01		7.98E+00
	688.67	0.86	6.94E-01		4.29E+00
	719.35	0.28	-1.79E+01		1.46E+01
	778.90	12.96	1.27E-01		3.46E-01
	810.45	0.32	7.54E+00		1.41E+01
	867.37	4.26	-3.91E-02		9.51E-01
	919.33	0.43	-3.25E+00		8.68E+00
	964.08	14.65	5.74E-01		4.18E-01
	1085.87	10.24	-1.18E-01		6.02E-01
	1089.74	1.73	1.68E+00		3.46E+00
	1112.07	13.69	2.60E-01		4.33E-01
	1212.95	1.43	-1.87E+00		4.49E+00
	1249.94	0.19	-1.54E+00		2.81E+01
	1299.14	1.63	2.39E+00		3.35E+00
	1408.01	21.07	-1.29E-01		1.81E-01
	1457.64	0.50	1.70E+02		4.23E+01
	1528.10	0.28	5.56E+00		1.24E+01
Eu-154	123.07	40.40	4.57E-02	9.34E-02	9.34E-02
	247.93	6.89	-2.02E-01		4.84E-01
	591.76	4.95	7.35E-02		8.05E-01
	692.42	1.78	-2.06E-01		2.21E+00
	723.30	20.06	1.02E-01		2.44E-01
	756.80	4.52	2.65E-01		9.34E-01
	873.18	12.08	1.34E-01		3.24E-01

Analysis Report for 12-Sep-19-10010

L1-12202C-FSGS-002SS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29	10.48	1.33E-01	9.34E-02	3.91E-01
		1004.76	18.01	-2.03E-01		2.70E-01
		1274.43	34.80	-1.65E-01		1.67E-01
		1596.48	1.80	6.62E-01		2.42E+00
	Eu-155	45.30	1.31	-2.90E+00	1.99E-01	1.86E+01
		60.01	1.22	-2.52E+00		2.11E+01
		86.55	30.70	-4.67E-02		2.19E-01
		105.31	21.10	-1.24E-01		1.99E-01
+	Ra-226	186.21	*	5.55E-01	6.19E-01	6.19E-01
	Pa-231	27.36	10.30	2.58E+00	1.45E+00	2.37E+00
		283.69	1.70	-5.36E-01		2.12E+00
		300.07	2.47	-5.19E-01		1.47E+00
		302.65	2.20	4.62E-02		1.45E+00
		330.06	1.40	-9.77E-01		2.43E+00
+	U-235	143.76	10.96	-2.13E-01	3.94E-02	3.30E-01
		163.33	5.08	1.15E-01		6.89E-01
		185.71	*	3.53E-02		3.94E-02
		202.11	1.08	2.71E-01		3.34E+00
		205.31	5.01	-5.19E-01		6.74E-01
	Am-241	59.54	35.90	1.19E-01	7.43E-01	7.43E-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

Analysis Report for 12-Sep-19-10011
L1-12202C-FSGS-003SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 12-Sep-19-10011
Sample Description : L1-12202C-FSGS-003SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.905E+03 grams
Facility : Default

Sample Taken On : 9/11/2019 9:04:00AM
Acquisition Started : 9/12/2019 9:11:10AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : P40818B
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 901.3 seconds

Dead Time : 0.15 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 120 - 8192
Peak Area Range (in channels) : 120 - 8192
Identification Energy Tolerance : 1.000 keV

Energy Calibration Used Done On : 1/29/2019
Efficiency Calibration Used Done On : 9/12/2019
Efficiency Calibration Description :

Sample Number : 79472
Fill Height : 1905.43 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 9/12/2019 9:26:14AM

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

DM
Data Validated
1600 9[69]79

Analysis Report for 12-Sep-19-10011
L1-12202C-FSGS-003SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.63	951 -	962	954.60	8.03E+01	17.31	8.17E+01	0.64
2	295.06	1174 -	1186	1180.14	5.53E+01	11.08	2.57E+01	0.94
3	351.80	1398 -	1414	1406.94	7.65E+01	12.51	2.55E+01	0.65
4	582.92	2324 -	2337	2330.87	4.32E+01	9.01	1.38E+01	0.72
5	609.18	2430 -	2440	2435.89	4.72E+01	8.56	1.08E+01	0.43
6	846.51	3380 -	3390	3385.00	1.75E+01	4.85	2.45E+00	0.36
7	1460.30	5830 -	5852	5841.03	3.65E+02	19.10	0.00E+00	1.75

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
K-40	0.95	1460.82 *	10.66	8.62E+00	5.86E-01
Tl-208	0.98	583.19 *	85.00	6.90E-02	1.50E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.39E-01	3.20E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.45E-01	2.77E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		

Analysis Report for 12-Sep-19-10011

L1-12202C-FSGS-003SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	0.99	241.99	7.25		
		295.22 *	18.42	2.55E-01	5.49E-02
		351.93 *	35.60	2.06E-01	3.76E-02
		785.96	1.06		

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
X	K-40	0.957	8.62E+00	5.86E-01
	Tl-208	0.988	6.90E-02	1.50E-02
	Bi-211	0.918		
	Pb-212	1.000	1.39E-01	3.20E-02
	Bi-214	0.999	1.45E-01	2.77E-02
	Pb-214	0.997	2.22E-01	3.10E-02

Analysis Report for 12-Sep-19-10011

L1-12202C-FSGS-003SS

- ? = 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 12-Sep-19-10011
L1-12202C-FSGS-003SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 9/12/2019 9:26:14AM
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	846.51	1.95000E-02	27.65		

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	6.52E-02	5.70E-02	5.70E-02
	BE-7	477.60	10.44	-1.25E-01	4.00E-01	4.00E-01
+	K-40	1460.82	* 10.66	8.62E+00	6.79E-02	6.79E-02
	Mn-54	834.85	99.98	2.73E-02	4.74E-02	4.74E-02
	Co-60	1173.23	99.85	4.16E-03	5.19E-02	6.77E-02
		1332.49	99.98	3.76E-02		5.19E-02
	Nb-94	702.65	99.81	-6.56E-03	3.41E-02	3.41E-02
		871.09	99.89	-3.90E-02		4.03E-02
	Ag-108m	79.13	6.60	1.98E-01	4.44E-02	1.88E+00
		433.94	90.50	4.99E-03		4.44E-02
		614.28	89.80	-6.41E-02		5.82E-02
		722.94	90.80	9.16E-03		5.74E-02
	Sb-125	176.31	6.84	1.54E-01	1.25E-01	5.72E-01
		380.45	1.52	-1.19E+00		2.23E+00
		427.87	29.60	-1.11E-01		1.25E-01
		463.36	10.49	2.22E-02		3.55E-01
		600.60	17.65	-9.25E-02		2.03E-01
		606.71	4.98	1.15E+00		1.28E+00

Analysis Report for 12-Sep-19-10011
L1-12202C-FSGS-003SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	635.95	11.22	-6.99E-02	1.25E-01	3.69E-01
	671.44	1.79	-5.71E-01		2.64E+00
Ba-133	79.61	2.65	-1.90E+00	6.85E-02	4.44E+00
	81.00	32.90	-2.40E-01		3.17E-01
	276.40	7.16	-1.56E-01		4.92E-01
	302.85	18.34	6.18E-03		2.18E-01
	356.01	62.05	-1.44E-02		6.85E-02
	383.85	8.94	1.09E-01		3.75E-01
	475.36	1.48	-1.71E+00		2.87E+00
Cs-134	563.25	8.34	-1.52E-01	5.36E-02	4.13E-01
	569.33	15.37	1.59E-01		2.46E-01
	604.72	97.62	-3.11E-02		6.10E-02
	795.86	85.46	-9.62E-04		5.36E-02
	801.95	8.69	8.76E-02		5.30E-01
	1038.61	0.99	6.01E-01		4.80E+00
	1167.97	1.79	1.63E+00		3.91E+00
	1365.19	3.02	8.73E-01		1.49E+00
	661.66	85.10	1.05E-02		5.07E-02
	121.78	28.67	8.85E-02		1.73E-01
Cs-137	661.66	85.10	1.05E-02	5.07E-02	5.07E-02
	121.78	28.67	8.85E-02		1.73E-01
Eu-152	244.70	7.61	-1.06E-01	1.48E-01	5.51E-01
	295.94	0.45	9.29E-01		1.02E+01
	344.28	26.60	7.99E-02		1.48E-01
	367.79	0.86	-1.79E+00		3.99E+00
	411.12	2.24	-1.41E+00		1.61E+00
	443.96	2.83	7.78E-01		1.28E+00
	488.68	0.42	-5.41E-01		9.20E+00
	563.99	0.49	1.49E+00		7.14E+00
	586.26	0.46	-4.01E+00		1.32E+01
	678.62	0.47	-7.98E+00		8.26E+00
	688.67	0.86	1.97E+00		6.08E+00
	719.35	0.28	8.88E+00		1.68E+01
	778.90	12.96	2.96E-02		3.93E-01
	810.45	0.32	-1.23E+01		1.49E+01
	867.37	4.26	-1.74E-01		1.12E+00
	919.33	0.43	2.43E+00		1.11E+01
	964.08	14.65	-6.61E-02		4.65E-01
	1085.87	10.24	1.40E-01		5.77E-01
	1089.74	1.73	-2.68E-01		3.47E+00
	1112.07	13.69	-1.11E-01		4.31E-01
	1212.95	1.43	-1.73E+00		5.32E+00
	1249.94	0.19	-2.86E+01		3.31E+01
	1299.14	1.63	1.21E-01		3.46E+00
	1408.01	21.07	1.28E-01		2.18E-01
	1457.64	0.50	1.85E+02		4.76E+01
	1528.10	0.28	1.85E+00		8.93E+00
	123.07	40.40	3.55E-02		1.23E-01
Eu-154	247.93	6.89	-1.82E-01	1.23E-01	5.39E-01
	591.76	4.95	-4.53E-01		7.96E-01
	692.42	1.78	-3.29E-01		2.50E+00
	723.30	20.06	1.41E-01		2.63E-01
	756.80	4.52	1.07E+00		1.04E+00

Analysis Report for 12-Sep-19-10011
L1-12202C-FSGS-003SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	873.18	12.08	1.44E-01	1.23E-01	3.66E-01
	996.29	10.48	-1.79E-01		5.41E-01
	1004.76	18.01	1.58E-01		3.02E-01
	1274.43	34.80	-1.18E-01		1.76E-01
	1596.48	1.80	1.05E+00		2.33E+00
Eu-155	45.30	1.31	-3.63E+00	2.70E-01	2.99E+01
	60.01	1.22	3.30E+00		3.26E+01
	86.55	30.70	-3.61E-02		2.70E-01
	105.31	21.10	7.74E-02		2.84E-01
Ra-226	186.21	3.64	4.75E-01	1.12E+00	1.12E+00
Pa-231	27.36	10.30	4.56E+00	1.51E+00	3.78E+00
	283.69	1.70	-5.88E-01		2.25E+00
	300.07	2.47	1.19E-01		1.51E+00
	302.65	2.20	2.12E-01		1.82E+00
	330.06	1.40	2.69E-01		2.82E+00
U-235	143.76	10.96	2.03E-02	7.26E-02	4.07E-01
	163.33	5.08	-3.27E-01		7.95E-01
	185.71	57.20	2.99E-02		7.26E-02
	202.11	1.08	-4.63E-02		3.41E+00
Am-241	205.31	5.01	-4.12E-01	1.14E+00	7.44E-01
	59.54	35.90	3.98E-03		1.14E+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

Analysis Report for 12-Sep-19-10012
L1-12202C-FSGS-004SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 12-Sep-19-10012
Sample Description : L1-12202C-FSGS-004SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.703E+03 grams
Facility : Default

Sample Taken On : 9/11/2019 9:06:00AM
Acquisition Started : 9/12/2019 9:44:09AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : 324
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 900.3 seconds

Dead Time : 0.04 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 120 - 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 : 9/12/2019
Efficiency Calibration Description :

Sample Number : 79475
Fill Height : 1702.89 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 9/12/2019 9:59:12AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 4096


Data Validated
1600 9/17/19

Analysis Report for 12-Sep-19-10012
L1-12202C-FSGS-004SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.68	473 -	482	477.55	1.29E+02	19.86	1.16E+02	1.18
2	338.43	671 -	681	676.83	3.84E+01	12.60	5.06E+01	0.80
3	351.93	698 -	708	703.80	1.06E+02	14.03	3.85E+01	1.32
4	583.16	1161 -	1171	1165.92	6.02E+01	10.48	2.08E+01	1.67
5	609.50	1212 -	1224	1218.58	6.46E+01	11.63	2.64E+01	1.19
6	911.04	1817 -	1827	1821.54	4.82E+01	9.40	1.68E+01	1.12
7	1460.78	2914 -	2929	2921.61	4.10E+02	20.86	8.24E+00	1.86

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.82 *	10.66	7.49E+00	5.01E-01
Tl-208	1.00	583.19 *	85.00	7.59E-02	1.40E-02
Bi-211	0.88	351.07 *	13.02	6.20E-01	9.64E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.78E-01	3.09E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.57E-01	2.97E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		

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Analysis Report for 12-Sep-19-10012

L1-12202C-FSGS-004SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	1120.29	14.92		
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	0.51	241.99	7.25		
		295.22	18.42		
		351.93 *	35.60	2.27E-01	3.52E-02
		785.96	1.06		
Ac-228	0.99	129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32 *	11.27	2.54E-01	8.58E-02
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	2.68E-01	5.35E-02
		964.77	4.99		
		968.97	15.80		
		1588.20	3.22		

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 12-Sep-19-10012

L1-12202C-FSGS-004SS

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	1.000	7.49E+00	5.01E-01	
Tl-208	1.000	7.59E-02	1.40E-02	
? Bi-211	0.889	6.20E-01	9.64E-02	
Pb-212	1.000	1.78E-01	3.09E-02	
Bi-214	0.998	1.57E-01	2.97E-02	
? Pb-214	0.513	2.27E-01	3.52E-02	
Ac-228	0.998	2.64E-01	4.54E-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 12-Sep-19-10012
L1-12202C-FSGS-004SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 9/12/2019 9:59:12AM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
All peaks were identified.					
M = First peak in a multiplet region					
m = Other peak in a multiplet region					
F = Fitted singlet					
Errors quoted at 1.000sigma					

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	4.64E-02	4.74E-02	4.74E-02
	BE-7	477.60	10.44	7.99E-02	3.74E-01	3.74E-01
+	K-40	1460.82	* 10.66	7.49E+00	3.65E-01	3.65E-01
	Mn-54	834.85	99.98	-6.49E-03	3.22E-02	3.22E-02
	Co-60	1173.23	99.85	1.74E-02	4.44E-02	5.33E-02
		1332.49	99.98	1.93E-02		4.44E-02
	Nb-94	702.65	99.81	1.33E-02	3.43E-02	3.43E-02
		871.09	99.89	-1.01E-03		3.60E-02
	Ag-108m	79.13	6.60	4.19E-01	3.12E-02	1.08E+00
		433.94	90.50	-7.72E-03		3.12E-02
		614.28	89.80	4.63E-03		4.91E-02
		722.94	90.80	7.16E-03		4.02E-02
	Sb-125	176.31	6.84	1.29E-01	9.70E-02	4.96E-01
		380.45	1.52	5.57E-01		2.13E+00
		427.87	29.60	-2.78E-03		9.70E-02
		463.36	10.49	1.87E-01		3.38E-01
		600.60	17.65	-1.03E-01		1.94E-01
		606.71	4.98	-3.09E-01		1.12E+00
		635.95	11.22	2.89E-02		2.90E-01

Analysis Report for 12-Sep-19-10012

L1-12202C-FSGS-004SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.25E-01	9.70E-02	1.97E+00
Ba-133	79.61	2.65	2.33E-01	6.61E-02	2.50E+00
	81.00	32.90	-2.65E-01		1.68E-01
	276.40	7.16	-6.95E-02		4.16E-01
	302.85	18.34	5.07E-02		1.76E-01
	356.01	62.05	-5.40E-02		6.61E-02
	383.85	8.94	3.85E-02		3.50E-01
Cs-134	475.36	1.48	2.11E+00	4.74E-02	2.71E+00
	563.25	8.34	-1.75E-01		3.44E-01
	569.33	15.37	-4.42E-04		2.15E-01
	604.72	97.62	-1.47E-02		4.94E-02
	795.86	85.46	2.88E-02		4.74E-02
	801.95	8.69	-7.47E-02		4.15E-01
	1038.61	0.99	-3.54E+00		4.30E+00
	1167.97	1.79	-2.98E-01		2.77E+00
	1365.19	3.02	-6.74E-01		1.16E+00
Cs-137	661.66	85.10	2.75E-02	4.89E-02	4.89E-02
Eu-152	121.78	28.67	4.05E-02	1.16E-01	1.16E-01
	244.70	7.61	-1.61E-01		4.58E-01
	295.94	0.45	6.92E+00		8.82E+00
	344.28	26.60	-2.99E-02		1.20E-01
	367.79	0.86	-1.48E-01		3.67E+00
	411.12	2.24	4.73E-01		1.41E+00
	443.96	2.83	-3.84E-01		1.00E+00
	488.68	0.42	2.66E+00		7.19E+00
	563.99	0.49	-2.23E+00		5.94E+00
	586.26	0.46	-2.69E+00		1.18E+01
	678.62	0.47	3.00E+00		7.31E+00
	688.67	0.86	-3.90E+00		3.38E+00
	719.35	0.28	-5.04E+00		1.20E+01
	778.90	12.96	-1.18E-01		2.63E-01
	810.45	0.32	-6.20E-01		1.17E+01
	867.37	4.26	-9.38E-03		8.89E-01
	919.33	0.43	-6.35E+00		8.20E+00
	964.08	14.65	-1.88E-01		3.21E-01
	1085.87	10.24	-9.87E-02		4.69E-01
	1089.74	1.73	-3.17E-01		3.12E+00
	1112.07	13.69	5.93E-02		3.35E-01
	1212.95	1.43	-2.59E+00		3.76E+00
	1249.94	0.19	-1.48E+01		2.15E+01
	1299.14	1.63	1.05E-01		2.50E+00
	1408.01	21.07	4.73E-02		1.93E-01
	1457.64	0.50	-4.26E+00		3.92E+01
	1528.10	0.28	1.21E+00		8.92E+00
Eu-154	123.07	40.40	5.58E-02	8.51E-02	8.51E-02
	247.93	6.89	3.53E-02		4.54E-01
	591.76	4.95	7.68E-01		8.34E-01
	692.42	1.78	-1.45E-01		1.97E+00
	723.30	20.06	6.47E-02		1.82E-01
	756.80	4.52	2.00E-01		8.06E-01
	873.18	12.08	6.15E-02		3.20E-01

Analysis Report for 12-Sep-19-10012
L1-12202C-FSGS-004SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-1.45E-01	8.51E-02	3.28E-01
	1004.76	18.01	-1.64E-01		2.15E-01
	1274.43	34.80	-6.78E-02		1.27E-01
	1596.48	1.80	3.15E-01		1.80E+00
Eu-155	45.30	1.31	-1.76E-01	1.69E-01	1.02E+01
	60.01	1.22	-2.48E+00		1.23E+01
	86.55	30.70	-3.34E-02		1.69E-01
	105.31	21.10	6.15E-02		1.88E-01
Ra-226	186.21	3.64	-9.11E-03	9.71E-01	9.71E-01
Pa-231	27.36	10.30	1.06E+00	1.19E+00	1.19E+00
	283.69	1.70	4.68E-01		1.77E+00
	300.07	2.47	-1.94E+00		1.27E+00
	302.65	2.20	4.23E-01		1.46E+00
	330.06	1.40	5.62E-01		2.45E+00
U-235	143.76	10.96	2.48E-02	6.32E-02	2.59E-01
	163.33	5.08	-2.02E-02		6.60E-01
	185.71	57.20	2.93E-02		6.32E-02
	202.11	1.08	-2.04E+00		2.95E+00
Am-241	205.31	5.01	9.77E-02	4.38E-01	6.71E-01
	59.54	35.90	-1.03E-01		4.38E-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

Analysis Report for 12-Sep-19-10013
L1-12202C-FSGS-005SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 12-Sep-19-10013
Sample Description : L1-12202C-FSGS-005SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.823E+03 grams
Facility : Default

Sample Taken On : 9/11/2019 9:08:00AM
Acquisition Started : 9/12/2019 9:11:28AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : 352
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 900.3 seconds

Dead Time : 0.03 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 120 - 8192
Peak Area Range (in channels) : 120 - 8192
Identification Energy Tolerance : 1.000 keV

Energy Calibration Used Done On : 9/29/2018
Efficiency Calibration Used Done On : 9/12/2019
Efficiency Calibration Description :

Sample Number : 79474
Fill Height : 1822.81 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 9/12/2019 9:26:33AM

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

DMH
Data Validated
1600 9[83] 79

Analysis Report for 12-Sep-19-10013
L1-12202C-FSGS-005SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.79	950 -	960	955.62	8.67E+01	13.27	3.73E+01	1.09
2	295.19	1175 -	1186	1180.97	3.55E+01	10.69	3.15E+01	0.84
3	351.91	1401 -	1413	1407.62	7.35E+01	11.52	2.25E+01	0.53
4	375.33	1497 -	1506	1501.23	1.16E+01	5.16	6.44E+00	0.39
5	583.13	2327 -	2338	2331.84	3.07E+01	6.99	7.29E+00	0.34
6	609.15	2429 -	2442	2435.86	2.92E+01	8.53	1.58E+01	0.86
7	1460.81	5833 -	5854	5843.63	2.30E+02	15.76	5.17E+00	1.74

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.82 *	10.66	4.61E+00	3.74E-01
Tl-208	0.99	583.19 *	85.00	4.25E-02	1.00E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	1.32E-01	2.29E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	7.77E-02	2.32E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		

Analysis Report for 12-Sep-19-10013

L1-12202C-FSGS-005SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	1.00	241.99	7.25		
		295.22 *	18.42	1.44E-01	4.48E-02
		351.93 *	35.60	1.74E-01	3.06E-02
		785.96	1.06		

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
X	K-40	1.000	4.61E+00	3.74E-01
	Tl-208	0.999	4.25E-02	1.00E-02
	Bi-211	0.894		
	Pb-212	0.996	1.32E-01	2.29E-02
	Bi-214	0.998	7.77E-02	2.32E-02
	Pb-214	1.000	1.64E-01	2.53E-02

Analysis Report for 12-Sep-19-10013

L1-12202C-FSGS-005SS

- ? = 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 12-Sep-19-10013
L1-12202C-FSGS-005SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 9/12/2019 9:26:33AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
4	375.33	1.28395E-02	44.65		

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	4.63E-02	4.98E-02	4.98E-02
	BE-7	477.60	10.44	-3.58E-01	3.13E-01	3.13E-01
+	K-40	1460.82	* 10.66	4.61E+00	3.52E-01	3.52E-01
	Mn-54	834.85	99.98	2.54E-02	3.77E-02	3.77E-02
	Co-60	1173.23	99.85	9.13E-03	3.76E-02	5.77E-02
		1332.49	99.98	2.20E-02		3.76E-02
	Nb-94	702.65	99.81	1.04E-02	3.88E-02	3.88E-02
		871.09	99.89	2.08E-02		4.51E-02
	Ag-108m	79.13	6.60	-2.77E-01	3.30E-02	1.35E+00
		433.94	90.50	-2.00E-02		3.30E-02
		614.28	89.80	-6.28E-03		5.71E-02
		722.94	90.80	1.23E-02		5.06E-02
	Sb-125	176.31	6.84	-1.13E-01	1.07E-01	4.35E-01
		380.45	1.52	5.37E-02		1.86E+00
		427.87	29.60	2.04E-03		1.07E-01
		463.36	10.49	7.40E-02		3.28E-01
		600.60	17.65	6.29E-02		2.26E-01
		606.71	4.98	1.25E+00		1.07E+00

Analysis Report for 12-Sep-19-10013

L1-12202C-FSGS-005SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	635.95	11.22	-5.27E-02	1.07E-01	3.19E-01
	671.44	1.79	-1.24E+00		2.36E+00
Ba-133	79.61	2.65	1.71E-01	6.66E-02	3.30E+00
	81.00	32.90	-1.74E-01		2.38E-01
	276.40	7.16	-6.29E-02		3.87E-01
	302.85	18.34	2.62E-02		1.83E-01
	356.01	62.05	-4.49E-02		6.66E-02
	383.85	8.94	8.38E-02		3.51E-01
	475.36	1.48	5.15E-01		2.26E+00
Cs-134	563.25	8.34	-1.10E-01	4.83E-02	4.20E-01
	569.33	15.37	-5.12E-02		2.48E-01
	604.72	97.62	-2.99E-03		5.09E-02
	795.86	85.46	1.61E-02		4.83E-02
	801.95	8.69	-9.50E-02		4.39E-01
	1038.61	0.99	9.93E-01		4.64E+00
	1167.97	1.79	1.99E+00		3.41E+00
	1365.19	3.02	-7.04E-01		1.36E+00
	661.66	85.10	-1.40E-02		4.87E-02
	121.78	28.67	7.96E-04		1.26E-01
Cs-137	661.66	85.10	-1.40E-02	4.87E-02	4.87E-02
	121.78	28.67	7.96E-04		1.26E-01
Eu-152	244.70	7.61	-2.90E-01	1.18E-01	4.32E-01
	295.94	0.45	2.41E-01		9.14E+00
	344.28	26.60	2.89E-02		1.18E-01
	367.79	0.86	-6.15E-01		3.50E+00
	411.12	2.24	-1.43E-01		1.41E+00
	443.96	2.83	-4.83E-01		9.83E-01
	488.68	0.42	-4.89E+00		7.05E+00
	563.99	0.49	-4.72E-01		7.23E+00
	586.26	0.46	9.35E+00		9.70E+00
	678.62	0.47	-2.41E+00		7.39E+00
	688.67	0.86	-8.77E-01		4.31E+00
	719.35	0.28	2.03E+00		1.53E+01
	778.90	12.96	4.89E-02		3.42E-01
	810.45	0.32	-1.26E+01		1.34E+01
	867.37	4.26	4.91E-01		1.09E+00
	919.33	0.43	-8.57E+00		1.06E+01
	964.08	14.65	3.45E-01		3.86E-01
	1085.87	10.24	-2.95E-01		3.68E-01
	1089.74	1.73	2.85E+00		2.88E+00
	1112.07	13.69	-1.83E-01		3.91E-01
	1212.95	1.43	-7.26E-01		3.35E+00
	1249.94	0.19	-2.54E+00		2.73E+01
	1299.14	1.63	-6.51E-01		2.67E+00
	1408.01	21.07	-6.20E-02		1.71E-01
	1457.64	0.50	8.72E+01		3.28E+01
	1528.10	0.28	3.14E+00		9.78E+00
	123.07	40.40	5.59E-02		9.19E-02
Eu-154	247.93	6.89	7.76E-04		4.25E-01
	591.76	4.95	5.30E-02		6.45E-01
	692.42	1.78	6.61E-01		2.19E+00
	723.30	20.06	1.36E-01		2.31E-01
	756.80	4.52	-1.26E-01		6.98E-01

Analysis Report for 12-Sep-19-10013
L1-12202C-FSGS-005SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	873.18	12.08	1.73E-01	9.19E-02	3.68E-01
	996.29	10.48	1.63E-01		4.11E-01
	1004.76	18.01	1.73E-01		2.54E-01
	1274.43	34.80	1.26E-02		1.23E-01
	1596.48	1.80	3.81E-01		1.42E+00
Eu-155	45.30	1.31	-2.42E+00	1.83E-01	1.72E+01
	60.01	1.22	-1.73E+00		2.00E+01
	86.55	30.70	-1.02E-01		2.03E-01
	105.31	21.10	-2.76E-02		1.83E-01
Ra-226	186.21	3.64	1.12E+00	9.38E-01	9.38E-01
Pa-231	27.36	10.30	1.51E+00	1.45E+00	2.04E+00
	283.69	1.70	1.32E+00		1.68E+00
	300.07	2.47	-1.53E-01		1.45E+00
	302.65	2.20	5.81E-02		1.52E+00
	330.06	1.40	-6.91E-01		2.19E+00
U-235	143.76	10.96	1.46E-01	5.85E-02	3.21E-01
	163.33	5.08	3.82E-02		5.95E-01
	185.71	57.20	2.65E-02		5.85E-02
	202.11	1.08	-1.02E-01		2.85E+00
Am-241	205.31	5.01	-2.89E-01	6.86E-01	5.93E-01
	59.54	35.90	-3.39E-01		6.86E-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

Analysis Report for 12-Sep-19-10014
L1-12202C-FSGS-006SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 12-Sep-19-10014
Sample Description : L1-12202C-FSGS-006SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.749E+03 grams
Facility : Default

Sample Taken On : 9/11/2019 9:10:00AM
Acquisition Started : 9/12/2019 9:44:15AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : P40818B
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 901.3 seconds

Dead Time : 0.15 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 120 - 8192
Peak Area Range (in channels) : 120 - 8192
Identification Energy Tolerance : 1.000 keV

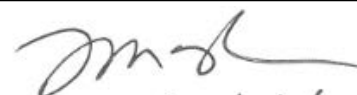
Energy Calibration Used Done On : 1/29/2019
Efficiency Calibration Used Done On : 9/12/2019
Efficiency Calibration Description :

Sample Number : 79476
Fill Height : 1749.26 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 9/12/2019 9:59:19AM

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


Data Validated
1600 9/19/19

Analysis Report for 12-Sep-19-10014
L1-12202C-FSGS-006SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.54	946 -	960	954.27	1.16E+02	18.43	7.69E+01	0.64
2	351.82	1401 -	1414	1407.01	7.92E+01	11.06	1.58E+01	1.17
3	582.91	2325 -	2337	2330.87	4.73E+01	8.87	1.17E+01	0.88
4	1460.34	5829 -	5852	5841.20	3.98E+02	20.25	3.00E+00	1.29

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.96	1460.82 *	10.66	9.58E+00	6.40E-01
Tl-208	0.98	583.19 *	85.00	7.67E-02	1.51E-02
Bi-211	0.91	351.07 *	13.02	5.91E-01	9.53E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	2.03E-01	3.62E-02
		300.09	3.30		
Pb-214	0.99	241.99	7.25		
		295.22	18.42		
		351.93 *	35.60	2.16E-01	3.48E-02
		785.96	1.06		

Analysis Report for 12-Sep-19-10014

L1-12202C-FSGS-006SS

* = 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	0.964	9.58E+00	6.40E-01	
Tl-208	0.988	7.67E-02	1.51E-02	
? Bi-211	0.914	5.91E-01	9.53E-02	
Pb-212	0.999	2.03E-01	3.62E-02	
? Pb-214	0.999	2.16E-01	3.48E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 12-Sep-19-10014
L1-12202C-FSGS-006SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 9/12/2019 9:59:19AM
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	5.62E-02	5.64E-02	5.64E-02
	BE-7	477.60	10.44	2.92E-03	4.05E-01	4.05E-01
+	K-40	1460.82	* 10.66	9.58E+00	3.52E-01	3.52E-01
	Mn-54	834.85	99.98	2.09E-02	5.28E-02	5.28E-02
	Co-60	1173.23	99.85	1.40E-02	5.82E-02	7.49E-02
		1332.49	99.98	4.79E-02		5.82E-02
	Nb-94	702.65	99.81	1.62E-02	4.96E-02	4.96E-02
		871.09	99.89	2.51E-02		5.72E-02
	Ag-108m	79.13	6.60	1.45E+00	4.87E-02	1.95E+00
		433.94	90.50	-2.19E-02		4.87E-02
		614.28	89.80	-8.97E-02		5.52E-02
		722.94	90.80	4.44E-02		6.22E-02
	Sb-125	176.31	6.84	-4.39E-02	1.28E-01	5.81E-01
		380.45	1.52	7.24E-01		2.92E+00
		427.87	29.60	-2.03E-02		1.28E-01
		463.36	10.49	1.29E-01		4.32E-01
		600.60	17.65	-5.33E-02		2.43E-01
		606.71	4.98	1.46E+00		1.20E+00
		635.95	11.22	1.12E-01		3.92E-01

Analysis Report for 12-Sep-19-10014

L1-12202C-FSGS-006SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	3.18E-01	1.28E-01	2.58E+00
Ba-133	79.61	2.65	3.71E-01	6.66E-02	4.52E+00
	81.00	32.90	-4.36E-01		2.97E-01
	276.40	7.16	-2.41E-01		5.41E-01
	302.85	18.34	4.48E-02		2.05E-01
	356.01	62.05	-3.10E-02		6.66E-02
	383.85	8.94	7.48E-02		4.91E-01
Cs-134	475.36	1.48	-6.00E-01	5.44E-02	2.91E+00
	563.25	8.34	-3.73E-01		4.57E-01
	569.33	15.37	-6.00E-03		2.65E-01
	604.72	97.62	-2.93E-02		5.62E-02
	795.86	85.46	-1.23E-02		5.44E-02
	801.95	8.69	-3.09E-02		5.19E-01
	1038.61	0.99	-1.83E-01		5.81E+00
	1167.97	1.79	2.32E+00		4.21E+00
	1365.19	3.02	5.49E-01		1.58E+00
Cs-137	661.66	85.10	-5.09E-02	5.07E-02	5.07E-02
Eu-152	121.78	28.67	-2.33E-02	1.50E-01	1.56E-01
	244.70	7.61	-1.90E-01		5.35E-01
	295.94	0.45	4.78E+00		1.05E+01
	344.28	26.60	2.16E-02		1.50E-01
	367.79	0.86	1.78E+00		4.59E+00
	411.12	2.24	-3.49E-01		1.41E+00
	443.96	2.83	-2.96E-01		1.36E+00
	488.68	0.42	1.07E+00		8.48E+00
	563.99	0.49	-3.67E+00		7.76E+00
	586.26	0.46	-5.14E+00		1.33E+01
	678.62	0.47	-5.40E+00		9.00E+00
	688.67	0.86	1.70E+00		4.83E+00
	719.35	0.28	-2.05E+00		1.83E+01
	778.90	12.96	1.11E-01		3.34E-01
	810.45	0.32	-7.90E+00		1.18E+01
	867.37	4.26	-1.91E-01		1.32E+00
	919.33	0.43	2.17E+00		1.22E+01
	964.08	14.65	3.81E-01		4.72E-01
	1085.87	10.24	2.42E-01		5.96E-01
	1089.74	1.73	-2.63E+00		3.26E+00
	1112.07	13.69	-2.28E-01		4.46E-01
	1212.95	1.43	-4.17E-01		5.75E+00
	1249.94	0.19	1.55E+01		3.64E+01
	1299.14	1.63	3.67E+00		4.35E+00
	1408.01	21.07	-9.53E-02		2.14E-01
	1457.64	0.50	2.09E+02		5.10E+01
	1528.10	0.28	-1.11E+01		9.10E+00
Eu-154	123.07	40.40	-2.12E-02	1.09E-01	1.09E-01
	247.93	6.89	2.47E-01		5.71E-01
	591.76	4.95	-1.46E-01		8.33E-01
	692.42	1.78	-5.88E-01		2.30E+00
	723.30	20.06	5.74E-02		2.73E-01
	756.80	4.52	2.47E-01		1.03E+00
	873.18	12.08	1.79E-01		4.55E-01

Analysis Report for 12-Sep-19-10014

L1-12202C-FSGS-006SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.36E-01	1.09E-01	4.79E-01
	1004.76	18.01	-1.74E-01		2.69E-01
	1274.43	34.80	1.05E-02		1.59E-01
	1596.48	1.80	7.64E-01		2.08E+00
Eu-155	45.30	1.31	-2.06E+01	2.67E-01	2.91E+01
	60.01	1.22	4.97E+00		3.18E+01
	86.55	30.70	4.49E-02		2.78E-01
	105.31	21.10	-2.97E-02		2.67E-01
Ra-226	186.21	3.64	8.43E-01	1.10E+00	1.10E+00
Pa-231	27.36	10.30	3.32E+00	1.57E+00	3.53E+00
	283.69	1.70	1.75E+00		2.46E+00
	300.07	2.47	-1.26E+00		1.57E+00
	302.65	2.20	4.29E-03		1.71E+00
	330.06	1.40	-1.54E+00		3.09E+00
U-235	143.76	10.96	1.48E-02	6.96E-02	4.00E-01
	163.33	5.08	-4.34E-01		7.30E-01
	185.71	57.20	2.58E-02		6.96E-02
	202.11	1.08	-1.54E+00		3.26E+00
Am-241	205.31	5.01	-3.60E-01	1.13E+00	7.64E-01
	59.54	35.90	-2.70E-01		1.13E+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

Analysis Report for 12-Sep-19-10015
L1-12202C-FSGS-007SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 12-Sep-19-10015
Sample Description : L1-12202C-FSGS-007SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.655E+03 grams
Facility : Default

Sample Taken On : 9/11/2019 9:12:00AM
Acquisition Started : 9/12/2019 9:44:23AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : P11314
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 900.4 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

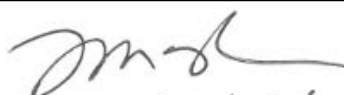
Energy Calibration Used Done On : 1/24/2019
Efficiency Calibration Used Done On : 9/12/2019
Efficiency Calibration Description :

Sample Number : 79477
Fill Height : 1654.56 gram
Certificate Name : Eu155-Na22
Certificate Date : 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 9/12/2019 9:59:37AM

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


Data Validated
1600 9/12/19

Analysis Report for 12-Sep-19-10015
L1-12202C-FSGS-007SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.75	949 -	960	954.56	1.26E+02	16.80	6.20E+01	1.19
2	338.24	1349 -	1356	1352.02	2.14E+01	7.64	1.76E+01	0.50
3	351.81	1400 -	1412	1406.24	6.20E+01	12.30	3.40E+01	1.05
4	1460.23	5827 -	5851	5838.87	3.86E+02	20.57	9.19E+00	2.07

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.94	1460.82 *	10.66	8.47E+00	5.82E-01
Bi-211	0.91	351.07 *	13.02	4.20E-01	9.00E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	1.97E-01	3.08E-02
		300.09	3.30		
Pb-214	0.99	241.99	7.25		
		295.22	18.42		
		351.93 *	35.60	1.54E-01	3.29E-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		

Analysis Report for 12-Sep-19-10015
L1-12202C-FSGS-007SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Ac-228	1.00	338.32 *	11.27	1.63E-01	5.96E-02
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20	25.80		
		964.77	4.99		
		968.97	15.80		
		1588.20	3.22		

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.946	8.47E+00	5.82E-01	
? Bi-211	0.917	4.20E-01	9.00E-02	
Pb-212	0.998	1.97E-01	3.08E-02	
? Pb-214	0.999	1.54E-01	3.29E-02	
Ac-228	1.000	1.63E-01	5.96E-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 12-Sep-19-10015
L1-12202C-FSGS-007SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 9/12/2019 9:59:37AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
All peaks were identified.					
M = First peak in a multiplet region					
m = Other peak in a multiplet region					
F = Fitted singlet					
Errors quoted at 1.000sigma					

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	6.75E-02	5.29E-02	5.29E-02
	BE-7	477.60	10.44	-3.40E-02	3.87E-01	3.87E-01
+	K-40	1460.82	* 10.66	8.47E+00	5.19E-01	5.19E-01
	Mn-54	834.85	99.98	4.01E-03	4.15E-02	4.15E-02
	Co-60	1173.23	99.85	4.62E-02	5.54E-02	6.20E-02
		1332.49	99.98	5.86E-03		5.54E-02
	Nb-94	702.65	99.81	3.28E-02	4.29E-02	4.29E-02
		871.09	99.89	1.69E-02		4.58E-02
	Ag-108m	79.13	6.60	7.17E-01	3.67E-02	1.16E+00
		433.94	90.50	-2.80E-02		3.67E-02
		614.28	89.80	-7.74E-02		5.53E-02
		722.94	90.80	2.24E-02		5.13E-02
	Sb-125	176.31	6.84	-5.95E-02	1.23E-01	4.80E-01
		380.45	1.52	-1.05E+00		2.16E+00
		427.87	29.60	3.48E-03		1.23E-01
		463.36	10.49	1.34E-01		3.69E-01
		600.60	17.65	2.51E-02		2.09E-01
		606.71	4.98	1.23E+00		1.21E+00
		635.95	11.22	1.98E-01		3.31E-01

Analysis Report for 12-Sep-19-10015

L1-12202C-FSGS-007SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	6.65E-02	1.23E-01	2.08E+00
Ba-133	79.61	2.65	1.39E+00	6.05E-02	2.81E+00
	81.00	32.90	-2.44E-01		1.86E-01
	276.40	7.16	2.36E-01		5.21E-01
	302.85	18.34	6.65E-02		1.86E-01
	356.01	62.05	-2.18E-02		6.05E-02
	383.85	8.94	-1.24E-01		4.01E-01
Cs-134	475.36	1.48	-2.59E-01	5.45E-02	2.70E+00
	563.25	8.34	-1.96E-01		5.16E-01
	569.33	15.37	-3.03E-02		2.42E-01
	604.72	97.62	-1.86E-02		5.45E-02
	795.86	85.46	4.13E-02		5.53E-02
	801.95	8.69	-2.05E-01		4.99E-01
	1038.61	0.99	1.18E+00		5.21E+00
	1167.97	1.79	-2.29E+00		3.06E+00
	1365.19	3.02	-2.27E+00		1.27E+00
Cs-137	661.66	85.10	5.65E-02	6.88E-02	6.88E-02
Eu-152	121.78	28.67	1.41E-02	1.23E-01	1.23E-01
	244.70	7.61	1.61E-02		4.44E-01
	295.94	0.45	8.17E+00		9.41E+00
	344.28	26.60	-7.53E-02		1.25E-01
	367.79	0.86	1.39E+00		4.17E+00
	411.12	2.24	1.12E+00		1.56E+00
	443.96	2.83	-1.43E+00		1.22E+00
	488.68	0.42	2.02E+00		7.84E+00
	563.99	0.49	-1.35E+01		8.12E+00
	586.26	0.46	5.42E+00		1.15E+01
	678.62	0.47	9.81E-01		8.34E+00
	688.67	0.86	-4.86E-01		4.16E+00
	719.35	0.28	-1.97E+01		1.29E+01
	778.90	12.96	-2.36E-01		3.22E-01
	810.45	0.32	4.97E+00		1.38E+01
	867.37	4.26	-5.40E-01		1.07E+00
	919.33	0.43	3.00E+00		1.17E+01
	964.08	14.65	3.00E-01		4.23E-01
	1085.87	10.24	1.57E-01		5.52E-01
	1089.74	1.73	1.68E+00		3.37E+00
	1112.07	13.69	-1.31E-01		3.94E-01
	1212.95	1.43	-1.15E+00		5.25E+00
	1249.94	0.19	4.10E+00		3.42E+01
	1299.14	1.63	-7.34E-01		3.07E+00
	1408.01	21.07	-1.89E-01		1.78E-01
	1457.64	0.50	1.80E+02		4.59E+01
	1528.10	0.28	-1.46E+00		1.17E+01
Eu-154	123.07	40.40	3.39E-02	8.57E-02	8.57E-02
	247.93	6.89	6.17E-02		4.62E-01
	591.76	4.95	1.53E-01		8.33E-01
	692.42	1.78	-2.01E+00		1.85E+00
	723.30	20.06	6.36E-02		2.32E-01
	756.80	4.52	-1.27E+00		7.89E-01
	873.18	12.08	-3.12E-01		3.86E-01

Analysis Report for 12-Sep-19-10015

L1-12202C-FSGS-007SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	3.88E-02	8.57E-02	5.46E-01
	1004.76	18.01	-1.34E-01		2.80E-01
	1274.43	34.80	1.44E-01		1.78E-01
	1596.48	1.80	-1.22E+00		1.90E+00
Eu-155	45.30	1.31	6.91E+00	1.73E-01	1.16E+01
	60.01	1.22	3.57E+00		1.33E+01
	86.55	30.70	-4.43E-02		1.73E-01
	105.31	21.10	-1.26E-01		1.91E-01
Ra-226	186.21	3.64	8.05E-01	9.93E-01	9.93E-01
Pa-231	27.36	10.30	1.60E+00	1.37E+00	1.37E+00
	283.69	1.70	1.32E-01		1.88E+00
	300.07	2.47	-2.21E+00		1.46E+00
	302.65	2.20	8.43E-01		1.57E+00
	330.06	1.40	-2.03E-01		2.57E+00
U-235	143.76	10.96	-5.64E-02	6.16E-02	3.00E-01
	163.33	5.08	2.50E-02		6.30E-01
	185.71	57.20	6.38E-03		6.16E-02
	202.11	1.08	-2.02E-01		3.19E+00
Am-241	205.31	5.01	-3.81E-01	4.52E-01	6.70E-01
	59.54	35.90	-1.14E-01		4.52E-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

Analysis Report for 12-Sep-19-10016
L1-12202C-FSGS-008SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 12-Sep-19-10016
Sample Description : L1-12202C-FSGS-008SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.636E+03 grams
Facility : Default

Sample Taken On : 9/11/2019 9:14:00AM
Acquisition Started : 9/12/2019 9:44:32AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : 352
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 900.3 seconds

Dead Time : 0.03 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 120 - 8192
Peak Area Range (in channels) : 120 - 8192
Identification Energy Tolerance : 1.000 keV

Energy Calibration Used Done On : 9/29/2018
Efficiency Calibration Used Done On : 9/12/2019
Efficiency Calibration Description :

Sample Number : 79478
Fill Height : 1636.39 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 9/12/2019 9:59:35AM

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

DMJ
Data Validated
1600 91021 79

Analysis Report for 12-Sep-19-10016
L1-12202C-FSGS-008SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.21	307 -	315	310.14	2.48E+01	11.18	4.33E+01	0.93
2	185.99	739 -	748	744.67	2.70E+01	11.75	4.90E+01	0.57
3	238.62	946 -	962	954.94	1.07E+02	18.12	6.95E+01	0.61
4	295.22	1176 -	1187	1181.08	4.54E+01	10.49	2.56E+01	1.00
5	351.83	1402 -	1412	1407.30	5.98E+01	10.73	2.32E+01	1.02
6	583.20	2324 -	2338	2332.12	5.12E+01	9.97	1.68E+01	1.64
7	609.43	2431 -	2444	2436.99	4.05E+01	8.17	9.50E+00	0.36
8	1460.82	5833 -	5855	5843.64	3.72E+02	21.80	2.62E+01	2.11

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.82 *	10.66	7.65E+00	5.58E-01
Tl-208	1.00	583.19 *	85.00	7.23E-02	1.47E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.66E-01	3.11E-02
		300.09	3.30		
Pb212-XR	0.99	74.82	10.28		
		77.11 *	17.10	2.28E-01	1.06E-01
		87.35	3.97		
		89.78	1.46		

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Analysis Report for 12-Sep-19-10016

L1-12202C-FSGS-008SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	609.32	*	45.49	1.10E-01	2.31E-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	1.86E-01	4.57E-02
		295.22	*	18.42		
		351.93	*	35.60		
Pb214-XR	0.99	785.96		1.06	4.03E-01	1.87E-01
		74.82		5.80		
		77.11	*	9.70		
		87.35		2.24		
		89.78		0.82		
Ra-226	0.99	186.21	*	3.64	4.48E-01	1.98E-01
U-235	0.99	143.76		10.96	2.85E-02	1.26E-02
		163.33		5.08		
		185.71	*	57.20		
		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

Analysis Report for 12-Sep-19-10016

L1-12202C-FSGS-008SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	1.000	7.65E+00	5.58E-01	
	Tl-208	1.000	7.23E-02	1.47E-02	
X	Bi-211	0.912			
	Pb-212	1.000	1.66E-01	3.11E-02	
?	Pb212-XR	0.999	2.28E-01	1.06E-01	
	Bi-214	0.999	1.10E-01	2.31E-02	
	Pb-214	0.999	1.55E-01	2.40E-02	
?	Pb214-XR	0.999	4.03E-01	1.87E-01	
?	Ra-226	0.992	4.48E-01	1.98E-01	
?	U-235	0.991	2.85E-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 12-Sep-19-10016
L1-12202C-FSGS-008SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 9/12/2019 9:59:35AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
All peaks were identified.					
M = First peak in a multiplet region					
m = Other peak in a multiplet region					
F = Fitted singlet					
Errors quoted at 1.000sigma					

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	4.90E-02	5.24E-02	5.24E-02
	BE-7	477.60	10.44	1.27E-01	3.68E-01	3.68E-01
+	K-40	1460.82	* 10.66	7.65E+00	7.68E-01	7.68E-01
	Mn-54	834.85	99.98	8.11E-03	4.80E-02	4.80E-02
	Co-60	1173.23	99.85	-2.46E-02	4.52E-02	6.82E-02
		1332.49	99.98	-2.48E-02		4.52E-02
	Nb-94	702.65	99.81	-3.76E-02	4.29E-02	4.29E-02
		871.09	99.89	3.24E-02		4.80E-02
	Ag-108m	79.13	6.60	1.01E+00	4.62E-02	1.33E+00
		433.94	90.50	1.69E-02		4.62E-02
		614.28	89.80	-2.40E-03		5.94E-02
		722.94	90.80	1.61E-02		5.54E-02
	Sb-125	176.31	6.84	1.96E-01	1.20E-01	4.89E-01
		380.45	1.52	-3.72E-01		2.17E+00
		427.87	29.60	-4.68E-02		1.20E-01
		463.36	10.49	1.29E-01		3.81E-01
		600.60	17.65	1.53E-01		2.50E-01
		606.71	4.98	6.21E-01		1.14E+00
		635.95	11.22	-3.20E-01		3.49E-01

Analysis Report for 12-Sep-19-10016

L1-12202C-FSGS-008SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-8.30E-01	1.20E-01	2.17E+00
Ba-133	79.61	2.65	1.38E-01	7.17E-02	3.11E+00
	81.00	32.90	-1.02E-01		2.01E-01
	276.40	7.16	2.49E-01		5.19E-01
	302.85	18.34	-3.50E-02		1.71E-01
	356.01	62.05	-4.99E-02		7.17E-02
	383.85	8.94	-4.57E-02		3.78E-01
Cs-134	475.36	1.48	1.50E-01	5.58E-02	2.51E+00
	563.25	8.34	-2.21E-01		4.10E-01
	569.33	15.37	-1.34E-02		2.21E-01
	604.72	97.62	3.02E-03		5.66E-02
	795.86	85.46	2.85E-02		5.58E-02
	801.95	8.69	-5.47E-01		4.22E-01
	1038.61	0.99	3.50E+00		5.87E+00
	1167.97	1.79	2.52E-02		3.76E+00
	1365.19	3.02	6.56E-01		1.53E+00
Cs-137	661.66	85.10	-1.79E-02	5.25E-02	5.25E-02
Eu-152	121.78	28.67	-6.28E-02	1.22E-01	1.31E-01
	244.70	7.61	3.07E-01		5.14E-01
	295.94	0.45	1.16E+01		9.42E+00
	344.28	26.60	-4.75E-03		1.22E-01
	367.79	0.86	-7.93E-01		3.80E+00
	411.12	2.24	-1.75E+00		1.65E+00
	443.96	2.83	-2.99E-01		1.13E+00
	488.68	0.42	3.18E-01		7.62E+00
	563.99	0.49	3.15E+00		7.27E+00
	586.26	0.46	-8.08E+00		1.27E+01
	678.62	0.47	-2.31E-01		7.80E+00
	688.67	0.86	3.89E-02		4.80E+00
	719.35	0.28	-4.41E+00		1.52E+01
	778.90	12.96	-3.12E-01		2.89E-01
	810.45	0.32	-2.03E-01		1.33E+01
	867.37	4.26	-4.69E-01		1.09E+00
	919.33	0.43	-1.25E+01		1.15E+01
	964.08	14.65	2.22E-01		3.99E-01
	1085.87	10.24	-1.77E-01		5.48E-01
	1089.74	1.73	2.24E+00		3.76E+00
	1112.07	13.69	-3.24E-01		4.22E-01
	1212.95	1.43	3.03E+00		4.54E+00
	1249.94	0.19	-4.15E+01		3.33E+01
	1299.14	1.63	-2.17E+00		3.67E+00
	1408.01	21.07	-1.24E-01		1.67E-01
	1457.64	0.50	1.69E+02		4.37E+01
	1528.10	0.28	3.77E-01		1.32E+01
Eu-154	123.07	40.40	-6.29E-02	9.28E-02	9.28E-02
	247.93	6.89	-1.45E-01		4.50E-01
	591.76	4.95	-2.60E-01		7.74E-01
	692.42	1.78	-1.28E+00		2.48E+00
	723.30	20.06	3.20E-01		2.60E-01
	756.80	4.52	3.93E-01		9.16E-01
	873.18	12.08	-1.05E-02		4.13E-01

Analysis Report for 12-Sep-19-10016

L1-12202C-FSGS-008SS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29	10.48	2.62E-01	9.28E-02	5.07E-01
		1004.76	18.01	-1.94E-01		2.51E-01
		1274.43	34.80	2.26E-02		1.74E-01
		1596.48	1.80	-3.57E+00		1.46E+00
	Eu-155	45.30	1.31	-2.23E+00	2.12E-01	1.92E+01
		60.01	1.22	-4.36E+00		2.14E+01
		86.55	30.70	1.25E-01		2.22E-01
		105.31	21.10	-3.98E-02		2.12E-01
+	Ra-226	186.21	* 3.64	4.48E-01	6.40E-01	6.40E-01
	Pa-231	27.36	10.30	1.51E+00	1.40E+00	2.13E+00
		283.69	1.70	-2.02E-01		2.00E+00
		300.07	2.47	9.32E-02		1.40E+00
		302.65	2.20	-4.27E-01		1.42E+00
		330.06	1.40	8.09E-01		2.60E+00
+	U-235	143.76	10.96	-7.15E-02	4.07E-02	3.30E-01
		163.33	5.08	-2.98E-01		7.19E-01
		185.71	* 57.20	2.85E-02		4.07E-02
		202.11	1.08	7.47E-01		3.41E+00
		205.31	5.01	-2.80E-01		7.12E-01
	Am-241	59.54	35.90	6.75E-02	7.75E-01	7.75E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Analysis Report for 12-Sep-19-10017
L1-12202C-FSGS-009SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 12-Sep-19-10017
Sample Description : L1-12202C-FSGS-009SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.617E+03 grams
Facility : Default

Sample Taken On : 9/11/2019 9:16:00AM
Acquisition Started : 9/12/2019 10:04:32AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : 324
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 900.3 seconds

Dead Time : 0.04 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 120 - 4096
Peak Area Range (in channels) : 120 - 4096
Identification Energy Tolerance : 1.000 keV

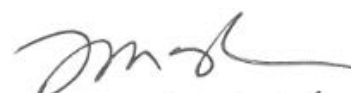
Energy Calibration Used Done On : 9/29/2018
Efficiency Calibration Used Done On : 9/12/2019
Efficiency Calibration Description :

Sample Number : 79479
Fill Height : 1617.05 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 9/12/2019 10:19:35AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 4096


Data Validated
1600 9109179

Analysis Report for 12-Sep-19-10017
L1-12202C-FSGS-009SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.67	473 -	481	477.51	1.53E+02	18.69	9.14E+01	1.13
2	352.03	699 -	708	704.00	1.03E+02	13.76	3.85E+01	0.91
3	583.06	1160 -	1170	1165.73	6.23E+01	11.37	2.77E+01	1.59
4	609.29	1213 -	1223	1218.15	6.23E+01	10.67	2.17E+01	1.49
5	911.15	1816 -	1828	1821.74	5.70E+01	9.56	1.30E+01	1.59
6	1224.03	2445 -	2452	2447.72	9.45E+00	5.54	9.55E+00	0.94
7	1460.78	2914 -	2928	2921.62	4.60E+02	21.70	3.75E+00	2.10

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.82 *	10.66	8.52E+00	5.46E-01
Tl-208	0.99	583.19 *	85.00	7.94E-02	1.52E-02
Bi-211	0.86	351.07 *	13.02	6.08E-01	9.51E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	2.12E-01	3.11E-02
		300.09	3.30		
Bi-214	1.00	609.32 *	45.49	1.53E-01	2.77E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		

Analysis Report for 12-Sep-19-10017

L1-12202C-FSGS-009SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	1120.29	14.92	2.22E-01	3.47E-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		
		241.99	7.25		
		295.22	18.42		
Pb-214	0.99	351.93 *	35.60		
		785.96	1.06		
		129.07	2.42		
Ac-228	1.00	209.25	3.89	3.20E-01	5.54E-02
		270.24	3.46		
		328.00	2.95		
		338.32	11.27		
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80		
		964.77	4.99		
		968.97	15.80		
		1588.20	3.22		

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 12-Sep-19-10017

L1-12202C-FSGS-009SS

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	1.000	8.52E+00	5.46E-01	
Tl-208	0.998	7.94E-02	1.52E-02	
? Bi-211	0.864	6.08E-01	9.51E-02	
Pb-212	1.000	2.12E-01	3.11E-02	
Bi-214	1.000	1.53E-01	2.77E-02	
? Pb-214	0.999	2.22E-01	3.47E-02	
Ac-228	1.000	3.20E-01	5.54E-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 12-Sep-19-10017
L1-12202C-FSGS-009SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 9/12/2019 10:19:35AM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
6	1224.03	1.04971E-02	58.59		

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	6.64E-02	5.06E-02	5.06E-02
	BE-7	477.60	10.44	-3.97E-02	3.26E-01	3.26E-01
+	K-40	1460.82	* 10.66	8.52E+00	2.60E-01	2.60E-01
	Mn-54	834.85	99.98	4.80E-03	4.11E-02	4.11E-02
	Co-60	1173.23	99.85	1.60E-04	4.39E-02	5.11E-02
		1332.49	99.98	-1.58E-02		4.39E-02
	Nb-94	702.65	99.81	5.27E-03	3.84E-02	4.07E-02
		871.09	99.89	-2.34E-03		3.84E-02
	Ag-108m	79.13	6.60	2.62E-01	3.34E-02	1.18E+00
		433.94	90.50	-5.30E-03		3.34E-02
		614.28	89.80	6.02E-04		5.22E-02
		722.94	90.80	-1.18E-02		4.12E-02
	Sb-125	176.31	6.84	-1.26E-01	1.00E-01	4.62E-01
		380.45	1.52	-7.30E-01		2.08E+00
		427.87	29.60	2.80E-02		1.00E-01
		463.36	10.49	1.29E-01		3.41E-01
		600.60	17.65	7.75E-02		2.22E-01
		606.71	4.98	1.12E-02		1.16E+00

Analysis Report for 12-Sep-19-10017

L1-12202C-FSGS-009SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	635.95	11.22	-1.72E-01	1.00E-01	3.36E-01
	671.44	1.79	4.33E-01		2.07E+00
Ba-133	79.61	2.65	1.00E+00	7.33E-02	2.84E+00
	81.00	32.90	-8.42E-02		1.96E-01
	276.40	7.16	-3.00E-01		4.24E-01
	302.85	18.34	2.81E-02		1.73E-01
	356.01	62.05	-3.08E-02		7.33E-02
	383.85	8.94	-1.74E-02		3.56E-01
Cs-134	475.36	1.48	7.78E-01	4.52E-02	2.36E+00
	563.25	8.34	-1.66E-01		3.97E-01
	569.33	15.37	-1.49E-02		2.25E-01
	604.72	97.62	2.32E-03		5.20E-02
	795.86	85.46	-1.65E-02		4.52E-02
	801.95	8.69	-2.91E-02		4.40E-01
	1038.61	0.99	2.70E+00		4.71E+00
	1167.97	1.79	-1.21E+00		2.80E+00
	1365.19	3.02	-7.09E-01		1.34E+00
	661.66	85.10	3.53E-03	3.97E-02	3.97E-02
Cs-137					
Eu-152	121.78	28.67	2.33E-02	1.11E-01	1.16E-01
	244.70	7.61	-4.84E-02		4.37E-01
	295.94	0.45	1.14E+01		9.22E+00
	344.28	26.60	-1.43E-01		1.11E-01
	367.79	0.86	9.04E-01		3.55E+00
	411.12	2.24	3.05E-02		1.50E+00
	443.96	2.83	-6.69E-02		1.06E+00
	488.68	0.42	3.00E+00		8.82E+00
	563.99	0.49	-7.82E-01		6.83E+00
	586.26	0.46	-2.61E+00		1.26E+01
	678.62	0.47	-1.90E+00		7.92E+00
	688.67	0.86	6.87E-01		4.28E+00
	719.35	0.28	7.48E+00		1.43E+01
	778.90	12.96	-1.60E-01		2.85E-01
	810.45	0.32	-7.37E+00		1.16E+01
	867.37	4.26	-2.68E-01		8.51E-01
	919.33	0.43	-4.59E+00		9.47E+00
	964.08	14.65	-2.56E-03		3.48E-01
	1085.87	10.24	-4.16E-02		5.13E-01
	1089.74	1.73	7.02E-01		3.04E+00
	1112.07	13.69	-1.56E-01		3.65E-01
	1212.95	1.43	-1.89E+00		4.23E+00
	1249.94	0.19	-3.82E+00		2.93E+01
	1299.14	1.63	5.87E-01		2.95E+00
	1408.01	21.07	2.05E-02		2.27E-01
	1457.64	0.50	-5.58E+00		4.18E+01
	1528.10	0.28	-1.63E+00		9.03E+00
Eu-154	123.07	40.40	1.55E-02	8.20E-02	8.20E-02
	247.93	6.89	-3.39E-02		4.22E-01
	591.76	4.95	-2.05E-01		7.42E-01
	692.42	1.78	-6.62E-01		1.90E+00
	723.30	20.06	-5.65E-02		1.84E-01
	756.80	4.52	-1.33E-01		8.15E-01

Analysis Report for 12-Sep-19-10017

L1-12202C-FSGS-009SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	873.18	12.08	1.58E-01	8.20E-02	3.40E-01
	996.29	10.48	1.58E-01		4.20E-01
	1004.76	18.01	1.89E-02		1.99E-01
	1274.43	34.80	1.45E-02		1.55E-01
	1596.48	1.80	-1.20E+00		1.72E+00
Eu-155	45.30	1.31	-2.59E+00	1.65E-01	1.07E+01
	60.01	1.22	-4.69E+00		1.20E+01
	86.55	30.70	3.75E-02		1.79E-01
	105.31	21.10	-5.14E-02		1.65E-01
Ra-226	186.21	3.64	2.95E-01	9.72E-01	9.72E-01
Pa-231	27.36	10.30	1.10E+00	1.22E+00	1.25E+00
	283.69	1.70	-3.62E-01		1.85E+00
	300.07	2.47	-2.78E+00		1.22E+00
	302.65	2.20	2.34E-01		1.44E+00
	330.06	1.40	-5.35E-01		2.45E+00
U-235	143.76	10.96	-4.28E-02	6.12E-02	2.88E-01
	163.33	5.08	-1.20E-01		6.87E-01
	185.71	57.20	1.70E-02		6.12E-02
	202.11	1.08	-3.67E-01		2.98E+00
Am-241	205.31	5.01	-5.59E-01	4.25E-01	6.45E-01
	59.54	35.90	-1.49E-02		4.25E-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

Analysis Report for 12-Sep-19-10018
L1-12202C-FSGS-010SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 12-Sep-19-10018
Sample Description : L1-12202C-FSGS-010SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.607E+03 grams
Facility : Default

Sample Taken On : 9/11/2019 9:18:00AM
Acquisition Started : 9/12/2019 10:04:40AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : P40818B
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 901.4 seconds

Dead Time : 0.15 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 120 - 8192
Peak Area Range (in channels) : 120 - 8192
Identification Energy Tolerance : 1.000 keV

Energy Calibration Used Done On : 1/29/2019
Efficiency Calibration Used Done On : 9/12/2019
Efficiency Calibration Description :

Sample Number : 79480
Fill Height : 1607.40 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 9/12/2019 10:19:43AM

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

DM
Data Validated
1600 9116179

Analysis Report for 12-Sep-19-10018
L1-12202C-FSGS-010SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.69	948 -	960	954.87	1.13E+02	15.57	4.89E+01	1.07
2	295.27	1175 -	1188	1180.98	4.20E+01	10.01	2.10E+01	0.38
3	351.93	1401 -	1414	1407.46	6.16E+01	11.47	2.54E+01	0.68
4	582.95	2324 -	2337	2331.03	4.12E+01	6.81	1.83E+00	0.82
5	609.17	2430 -	2443	2435.86	4.26E+01	8.78	1.24E+01	1.17
6	910.59	3636 -	3648	3641.34	2.77E+01	7.07	8.30E+00	1.05
7	1460.37	5830 -	5854	5841.33	3.94E+02	20.22	3.42E+00	1.57

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.96	1460.82 *	10.66	9.67E+00	6.51E-01
Tl-208	0.99	583.19 *	85.00	6.79E-02	1.20E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	2.00E-01	3.20E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.35E-01	2.90E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		

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Analysis Report for 12-Sep-19-10018

L1-12202C-FSGS-010SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	1.00	241.99	7.25		
		295.22 *	18.42	1.98E-01	4.98E-02
		351.93 *	35.60	1.71E-01	3.46E-02
		785.96	1.06		
Ac-228	0.98	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	2.04E-01	5.28E-02
		964.77	4.99		
		968.97	15.80		
		1588.20	3.22		

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 12-Sep-19-10018

L1-12202C-FSGS-010SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.968	9.67E+00	6.51E-01	
	Tl-208	0.991	6.79E-02	1.20E-02	
X	Bi-211	0.888			
	Pb-212	0.999	2.00E-01	3.20E-02	
	Bi-214	0.999	1.35E-01	2.90E-02	
	Pb-214	1.000	1.80E-01	2.84E-02	
	Ac-228	0.982	2.04E-01	5.28E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 12-Sep-19-10018
L1-12202C-FSGS-010SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 9/12/2019 10:19:43AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
All peaks were identified.					
M = First peak in a multiplet region					
m = Other peak in a multiplet region					
F = Fitted singlet					
Errors quoted at 1.000sigma					

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	7.51E-02	5.94E-02	5.94E-02
	BE-7	477.60	10.44	6.74E-02	3.99E-01	3.99E-01
+	K-40	1460.82	* 10.66	9.67E+00	3.96E-01	3.96E-01
	Mn-54	834.85	99.98	-4.09E-02	4.98E-02	4.98E-02
	Co-60	1173.23	99.85	3.48E-02	6.08E-02	7.47E-02
		1332.49	99.98	-9.78E-03		6.08E-02
	Nb-94	702.65	99.81	7.10E-03	4.85E-02	5.17E-02
		871.09	99.89	-7.06E-02		4.85E-02
	Ag-108m	79.13	6.60	6.70E-02	4.25E-02	1.82E+00
		433.94	90.50	-1.56E-02		4.25E-02
		614.28	89.80	-2.45E-02		6.22E-02
		722.94	90.80	4.14E-03		5.80E-02
	Sb-125	176.31	6.84	2.97E-01	1.36E-01	5.73E-01
		380.45	1.52	-2.00E+00		2.10E+00
		427.87	29.60	8.73E-02		1.36E-01
		463.36	10.49	1.59E-01		3.92E-01
		600.60	17.65	1.69E-01		2.98E-01
		606.71	4.98	1.01E+00		1.33E+00
		635.95	11.22	-3.98E-02		4.20E-01

Analysis Report for 12-Sep-19-10018

L1-12202C-FSGS-010SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	3.77E-01	1.36E-01	2.48E+00
Ba-133	79.61	2.65	-2.73E+00	7.12E-02	4.17E+00
	81.00	32.90	-8.12E-02		2.90E-01
	276.40	7.16	-8.26E-02		5.45E-01
	302.85	18.34	4.59E-02		2.24E-01
	356.01	62.05	-7.25E-03		7.12E-02
	383.85	8.94	5.48E-02		3.99E-01
Cs-134	475.36	1.48	4.95E-01	5.63E-02	2.77E+00
	563.25	8.34	2.93E-01		4.57E-01
	569.33	15.37	5.25E-02		2.66E-01
	604.72	97.62	-1.69E-02		6.46E-02
	795.86	85.46	1.19E-02		5.63E-02
	801.95	8.69	-3.08E-01		5.75E-01
	1038.61	0.99	1.32E+00		5.32E+00
	1167.97	1.79	3.42E+00		4.43E+00
	1365.19	3.02	6.32E-01		1.82E+00
Cs-137	661.66	85.10	1.01E-02	5.39E-02	5.39E-02
Eu-152	121.78	28.67	-8.57E-02	1.37E-01	1.50E-01
	244.70	7.61	3.06E-01		5.80E-01
	295.94	0.45	-1.10E+00		9.56E+00
	344.28	26.60	7.67E-02		1.37E-01
	367.79	0.86	-1.77E+00		4.23E+00
	411.12	2.24	8.25E-01		1.94E+00
	443.96	2.83	-1.36E+00		1.30E+00
	488.68	0.42	8.76E-02		8.22E+00
	563.99	0.49	-9.77E-01		7.50E+00
	586.26	0.46	-5.72E-01		1.23E+01
	678.62	0.47	5.86E-01		8.85E+00
	688.67	0.86	-1.60E+00		4.73E+00
	719.35	0.28	-8.52E+00		1.69E+01
	778.90	12.96	-2.61E-01		3.60E-01
	810.45	0.32	6.68E+00		1.87E+01
	867.37	4.26	5.74E-01		1.25E+00
	919.33	0.43	-8.96E+00		1.18E+01
	964.08	14.65	3.16E-01		4.77E-01
	1085.87	10.24	1.85E-01		5.79E-01
	1089.74	1.73	1.09E+00		3.32E+00
	1112.07	13.69	-2.36E-01		4.33E-01
	1212.95	1.43	2.93E+00		5.81E+00
	1249.94	0.19	-5.23E+01		3.72E+01
	1299.14	1.63	6.51E-01		4.24E+00
	1408.01	21.07	-9.98E-02		2.18E-01
	1457.64	0.50	2.11E+02		5.18E+01
	1528.10	0.28	4.81E+00		1.31E+01
Eu-154	123.07	40.40	5.86E-02	1.11E-01	1.11E-01
	247.93	6.89	-7.28E-02		5.85E-01
	591.76	4.95	9.77E-02		9.29E-01
	692.42	1.78	3.25E-01		2.74E+00
	723.30	20.06	-1.64E-01		2.53E-01
	756.80	4.52	-2.70E-02		1.17E+00
	873.18	12.08	-2.04E-03		4.31E-01

Analysis Report for 12-Sep-19-10018

L1-12202C-FSGS-010SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	3.34E-01	1.11E-01	6.17E-01
	1004.76	18.01	-7.87E-02		3.43E-01
	1274.43	34.80	-5.62E-02		1.99E-01
	1596.48	1.80	-7.62E-01		1.51E+00
Eu-155	45.30	1.31	1.61E+01	2.67E-01	3.33E+01
	60.01	1.22	-9.55E-01		2.99E+01
	86.55	30.70	5.09E-02		2.67E-01
	105.31	21.10	-6.37E-03		2.83E-01
Ra-226	186.21	3.64	1.44E+00	1.18E+00	1.18E+00
Pa-231	27.36	10.30	2.56E+00	1.62E+00	3.36E+00
	283.69	1.70	-1.05E+00		2.12E+00
	300.07	2.47	8.36E-01		1.62E+00
	302.65	2.20	1.01E+00		1.87E+00
	330.06	1.40	4.64E-01		2.74E+00
U-235	143.76	10.96	-1.07E-01	7.45E-02	3.79E-01
	163.33	5.08	2.98E-02		7.59E-01
	185.71	57.20	7.31E-02		7.45E-02
	202.11	1.08	8.77E-01		3.59E+00
	205.31	5.01	-8.41E-02		7.98E-01
Am-241	59.54	35.90	-2.30E-02	1.06E+00	1.06E+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

Analysis Report for 12-Sep-19-10019
L1-12202C-FQGS-010SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 12-Sep-19-10019
Sample Description : L1-12202C-FQGS-010SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.546E+03 grams
Facility : Default

Sample Taken On : 9/11/2019 9:18:00AM
Acquisition Started : 9/12/2019 10:29:00AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : P40818B
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 901.4 seconds

Dead Time : 0.15 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 120 - 8192
Peak Area Range (in channels) : 120 - 8192
Identification Energy Tolerance : 1.000 keV

Energy Calibration Used Done On : 1/29/2019
Efficiency Calibration Used Done On : 9/12/2019
Efficiency Calibration Description :

Sample Number : 79483
Fill Height : 1545.68 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 9/12/2019 10:44:03AM

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

DM
Data Validated
1600 9/12/19

Analysis Report for 12-Sep-19-10019
L1-12202C-FQGS-010SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.61	947 -	961	954.53	1.08E+02	17.99	7.49E+01	1.15
2	351.86	1402 -	1413	1407.18	4.95E+01	10.42	2.35E+01	0.40
3	583.18	2327 -	2337	2331.92	3.95E+01	8.46	1.35E+01	0.44
4	609.07	2430 -	2441	2435.44	4.73E+01	9.06	1.37E+01	1.07
5	756.65	3021 -	3030	3025.62	1.40E+01	3.74	0.00E+00	0.70
6	1460.22	5830 -	5853	5840.72	3.94E+02	21.90	2.12E+01	1.72

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.94	1460.82 *	10.66	9.79E+00	6.90E-01
Tl-208	1.00	583.19 *	85.00	6.58E-02	1.46E-02
Bi-211	0.90	351.07 *	13.02	3.78E-01	8.52E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.93E-01	3.57E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.52E-01	3.04E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		

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Analysis Report for 12-Sep-19-10019

L1-12202C-FQGS-010SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	1.00	241.99	7.25		
		295.22	18.42		
		351.93 *	35.60	1.38E-01	3.11E-02
		785.96	1.06		

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.944	9.79E+00	6.90E-01	
Tl-208	1.000	6.58E-02	1.46E-02	
? Bi-211	0.904	3.78E-01	8.52E-02	
Pb-212	1.000	1.93E-01	3.57E-02	
Bi-214	0.996	1.52E-01	3.04E-02	
? Pb-214	1.000	1.38E-01	3.11E-02	

Analysis Report for 12-Sep-19-10019

L1-12202C-FQGS-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 1.000sigma

Analysis Report for 12-Sep-19-10019
L1-12202C-FQGS-010SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 9/12/2019 10:44:03AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
5	756.65	1.55556E-02	26.73	Tol.	Eu-154

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	5.01E-02	6.03E-02	6.03E-02
	BE-7	477.60	10.44	2.63E-01	4.32E-01	4.32E-01
+	K-40	1460.82	* 10.66	9.79E+00	8.52E-01	8.52E-01
	Mn-54	834.85	99.98	5.88E-03	5.58E-02	5.58E-02
	Co-60	1173.23	99.85	3.09E-02	5.60E-02	7.46E-02
		1332.49	99.98	3.63E-04		5.60E-02
	Nb-94	702.65	99.81	1.64E-02	5.10E-02	5.10E-02
		871.09	99.89	3.81E-02		5.66E-02
	Ag-108m	79.13	6.60	8.60E-01	4.60E-02	1.85E+00
		433.94	90.50	1.88E-02		4.60E-02
		614.28	89.80	-6.34E-02		5.42E-02
		722.94	90.80	2.64E-02		6.06E-02
	Sb-125	176.31	6.84	8.07E-02	1.39E-01	5.56E-01
		380.45	1.52	2.51E-01		2.62E+00
		427.87	29.60	1.64E-02		1.39E-01
		463.36	10.49	-1.34E-01		3.65E-01
		600.60	17.65	1.29E-01		2.56E-01
		606.71	4.98	1.05E+00		1.37E+00

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Analysis Report for 12-Sep-19-10019

L1-12202C-FQGS-010SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	635.95	11.22	-1.32E-02	1.39E-01	3.78E-01
	671.44	1.79	-1.82E+00		2.30E+00
Ba-133	79.61	2.65	1.90E+00	7.74E-02	4.49E+00
	81.00	32.90	-1.46E-02		3.31E-01
	276.40	7.16	-1.20E-01		5.23E-01
	302.85	18.34	9.40E-02		2.22E-01
	356.01	62.05	-1.35E-02		7.74E-02
	383.85	8.94	-1.17E-01		4.28E-01
Cs-134	475.36	1.48	1.09E-01	5.60E-02	2.92E+00
	563.25	8.34	1.16E-01		4.53E-01
	569.33	15.37	9.84E-03		2.60E-01
	604.72	97.62	-4.92E-02		6.77E-02
	795.86	85.46	-1.28E-03		5.60E-02
	801.95	8.69	-2.92E-01		5.03E-01
	1038.61	0.99	4.75E+00		7.03E+00
	1167.97	1.79	-1.55E+00		3.74E+00
	1365.19	3.02	2.09E-02		1.68E+00
	661.66	85.10	1.41E-02	5.81E-02	5.81E-02
Cs-137					
Eu-152	121.78	28.67	-4.74E-02	1.61E-01	1.63E-01
	244.70	7.61	-4.89E-02		5.83E-01
	295.94	0.45	6.20E+00		1.02E+01
	344.28	26.60	5.08E-02		1.61E-01
	367.79	0.86	-2.22E-01		4.88E+00
	411.12	2.24	1.04E+00		1.89E+00
	443.96	2.83	-1.90E-01		1.45E+00
	488.68	0.42	2.56E+00		1.00E+01
	563.99	0.49	1.98E+00		7.96E+00
	586.26	0.46	9.81E+00		1.40E+01
	678.62	0.47	7.15E+00		1.12E+01
	688.67	0.86	-1.71E+00		5.30E+00
	719.35	0.28	1.30E-01		1.63E+01
	778.90	12.96	-1.65E-01		3.64E-01
	810.45	0.32	1.75E+00		1.58E+01
	867.37	4.26	2.45E-01		1.41E+00
	919.33	0.43	3.57E+00		1.21E+01
	964.08	14.65	1.16E-02		5.00E-01
	1085.87	10.24	-2.65E-01		6.05E-01
	1089.74	1.73	2.23E-01		3.70E+00
	1112.07	13.69	-5.72E-01		4.59E-01
	1212.95	1.43	-1.30E+00		5.47E+00
	1249.94	0.19	2.88E+01		3.24E+01
	1299.14	1.63	-6.39E-01		4.22E+00
	1408.01	21.07	-3.72E-01		2.21E-01
	1457.64	0.50	2.18E+02		5.37E+01
	1528.10	0.28	5.84E+00		1.42E+01
Eu-154	123.07	40.40	-1.32E-01	1.10E-01	1.10E-01
	247.93	6.89	-1.23E-01		5.77E-01
	591.76	4.95	2.53E-01		8.79E-01
	692.42	1.78	-5.15E-01		2.41E+00
	723.30	20.06	1.04E-01		2.78E-01
	756.80	4.52	-5.55E-02		1.12E+00

Analysis Report for 12-Sep-19-10019

L1-12202C-FQGS-010SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	873.18	12.08	1.69E-01	1.10E-01	4.28E-01
	996.29	10.48	-1.76E-01		5.41E-01
	1004.76	18.01	1.14E-01		3.16E-01
	1274.43	34.80	-2.97E-02		1.98E-01
	1596.48	1.80	1.26E+00		2.60E+00
Eu-155	45.30	1.31	-4.21E+00	2.68E-01	2.96E+01
	60.01	1.22	2.82E+01		3.36E+01
	86.55	30.70	6.03E-02		2.79E-01
	105.31	21.10	9.77E-02		2.68E-01
Ra-226	186.21	3.64	1.09E+00	1.15E+00	1.15E+00
Pa-231	27.36	10.30	1.51E+00	1.59E+00	3.02E+00
	283.69	1.70	-7.59E-01		2.11E+00
	300.07	2.47	-1.09E+00		1.59E+00
	302.65	2.20	-3.88E-01		1.81E+00
	330.06	1.40	-9.40E-01		2.71E+00
U-235	143.76	10.96	-4.43E-03	7.24E-02	4.19E-01
	163.33	5.08	1.49E-01		7.90E-01
	185.71	57.20	4.85E-02		7.24E-02
	202.11	1.08	-2.27E-01		3.63E+00
Am-241	205.31	5.01	1.99E-01	1.16E+00	7.94E-01
	59.54	35.90	5.04E-01		1.16E+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

Analysis Report for 12-Sep-19-10020
L1-12202C-FSGS-011SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 12-Sep-19-10020
Sample Description : L1-12202C-FSGS-011SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.550E+03 grams
Facility : Default

Sample Taken On : 9/11/2019 9:20:00AM
Acquisition Started : 9/12/2019 10:04:46AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : P11314
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 900.3 seconds

Dead Time : 0.04 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 120 - 8192
Peak Area Range (in channels) : 120 - 8192
Identification Energy Tolerance : 1.000 keV

Energy Calibration Used Done On : 1/24/2019
Efficiency Calibration Used Done On : 9/12/2019
Efficiency Calibration Description :

Sample Number : 79481
Fill Height : 1550.36 gram
Certificate Name : Eu155-Na22
Certificate Date : 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 9/12/2019 10:19:55AM

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


Data Validated
1600 91301 79

Analysis Report for 12-Sep-19-10020
L1-12202C-FSGS-011SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.80	949 -	961	954.77	1.34E+02	16.69	5.34E+01	0.92
2	295.45	1175 -	1188	1181.07	6.39E+01	10.53	1.71E+01	1.21
3	352.05	1400 -	1416	1407.22	5.96E+01	13.22	3.64E+01	0.59
4	609.19	2428 -	2442	2434.81	6.30E+01	10.01	1.30E+01	1.50
5	1460.13	5826 -	5851	5838.45	4.32E+02	21.69	9.36E+00	1.90

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.92	1460.82 *	10.66	9.65E+00	6.41E-01
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	2.12E-01	3.15E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.82E-01	3.09E-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		

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Analysis Report for 12-Sep-19-10020
L1-12202C-FSGS-011SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	0.99	241.99	7.25		
		295.22 *	18.42	2.73E-01	4.99E-02
		351.93 *	35.60	1.50E-01	3.53E-02
		785.96	1.06		

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
X	K-40	0.926	9.65E+00	6.41E-01
	Bi-211	0.857		
	Pb-212	0.996	2.12E-01	3.15E-02
	Bi-214	0.999	1.82E-01	3.09E-02
	Pb-214	0.996	1.91E-01	2.88E-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 12-Sep-19-10020
L1-12202C-FSGS-011SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 9/12/2019 10:19:55AM
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	5.90E-02	5.55E-02	5.55E-02
	BE-7	477.60	10.44	1.97E-01	3.82E-01	3.82E-01
+	K-40	1460.82	* 10.66	9.65E+00	5.36E-01	5.36E-01
	Mn-54	834.85	99.98	3.67E-03	4.96E-02	4.96E-02
	Co-60	1173.23	99.85	2.58E-02	5.16E-02	6.48E-02
		1332.49	99.98	2.70E-02		5.16E-02
	Nb-94	702.65	99.81	-3.15E-02	4.35E-02	4.35E-02
		871.09	99.89	9.21E-03		4.58E-02
	Ag-108m	79.13	6.60	2.79E-01	3.85E-02	1.16E+00
		433.94	90.50	1.97E-03		3.85E-02
		614.28	89.80	-2.61E-02		5.80E-02
		722.94	90.80	-3.25E-03		5.34E-02
	Sb-125	176.31	6.84	3.95E-02	1.22E-01	4.43E-01
		380.45	1.52	1.26E+00		2.36E+00
		427.87	29.60	3.09E-02		1.22E-01
		463.36	10.49	-1.82E-01		3.85E-01
		600.60	17.65	-5.67E-02		2.53E-01
		606.71	4.98	1.55E+00		1.36E+00
		635.95	11.22	4.08E-02		3.41E-01

Analysis Report for 12-Sep-19-10020

L1-12202C-FSGS-011SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	1.24E+00	1.22E-01	2.39E+00
Ba-133	79.61	2.65	5.34E-01	6.29E-02	2.80E+00
	81.00	32.90	-1.91E-01		1.83E-01
	276.40	7.16	-4.01E-02		4.53E-01
	302.85	18.34	4.22E-02		1.94E-01
	356.01	62.05	1.26E-02		6.29E-02
	383.85	8.94	-1.50E-02		3.96E-01
Cs-134	475.36	1.48	3.48E-02	5.13E-02	2.55E+00
	563.25	8.34	-3.12E-01		4.67E-01
	569.33	15.37	-1.84E-02		2.27E-01
	604.72	97.62	7.58E-03		6.21E-02
	795.86	85.46	1.23E-02		5.13E-02
	801.95	8.69	1.76E-01		5.15E-01
	1038.61	0.99	1.43E+00		5.47E+00
	1167.97	1.79	7.07E-02		3.27E+00
	1365.19	3.02	5.71E-01		1.61E+00
Cs-137	661.66	85.10	6.46E-03	4.90E-02	4.90E-02
Eu-152	121.78	28.67	-2.51E-02	1.05E-01	1.05E-01
	244.70	7.61	3.12E-01		5.19E-01
	295.94	0.45	1.83E+00		9.34E+00
	344.28	26.60	-8.27E-04		1.26E-01
	367.79	0.86	-2.53E+00		3.52E+00
	411.12	2.24	2.30E-01		1.52E+00
	443.96	2.83	8.39E-02		1.32E+00
	488.68	0.42	-1.33E+01		7.08E+00
	563.99	0.49	-7.07E+00		7.40E+00
	586.26	0.46	1.09E+01		1.20E+01
	678.62	0.47	1.19E+00		9.37E+00
	688.67	0.86	-2.55E-01		4.70E+00
	719.35	0.28	-1.01E+01		1.49E+01
	778.90	12.96	1.23E-01		3.79E-01
	810.45	0.32	-3.97E+00		1.43E+01
	867.37	4.26	-2.35E-01		1.03E+00
	919.33	0.43	1.13E+01		1.33E+01
	964.08	14.65	2.83E-01		4.94E-01
	1085.87	10.24	-5.37E-03		5.53E-01
	1089.74	1.73	9.32E-01		3.38E+00
	1112.07	13.69	3.03E-01		5.00E-01
	1212.95	1.43	-3.11E+00		4.86E+00
	1249.94	0.19	-1.26E+01		2.97E+01
	1299.14	1.63	-7.39E-02		3.92E+00
	1408.01	21.07	-2.04E-01		2.22E-01
	1457.64	0.50	2.11E+02		4.93E+01
	1528.10	0.28	3.50E+00		1.09E+01
Eu-154	123.07	40.40	-3.69E-02	7.55E-02	7.55E-02
	247.93	6.89	1.02E-01		4.91E-01
	591.76	4.95	9.27E-02		9.40E-01
	692.42	1.78	5.45E-01		2.56E+00
	723.30	20.06	1.27E-02		2.42E-01
	756.80	4.52	5.72E-01		9.52E-01
	873.18	12.08	3.36E-01		3.98E-01

Analysis Report for 12-Sep-19-10020
L1-12202C-FSGS-011SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.98E-01	7.55E-02	5.48E-01
	1004.76	18.01	-2.01E-02		2.80E-01
	1274.43	34.80	-1.55E-02		1.60E-01
	1596.48	1.80	-8.17E-01		2.34E+00
Eu-155	45.30	1.31	-1.66E+00	1.75E-01	1.08E+01
	60.01	1.22	-1.16E+00		1.22E+01
	86.55	30.70	-3.08E-02		1.81E-01
	105.31	21.10	-6.27E-02		1.75E-01
Ra-226	186.21	3.64	3.57E-01	9.31E-01	9.31E-01
Pa-231	27.36	10.30	9.07E-01	1.32E+00	1.32E+00
	283.69	1.70	-8.07E-01		1.89E+00
	300.07	2.47	8.48E-01		1.47E+00
	302.65	2.20	9.92E-01		1.66E+00
	330.06	1.40	7.11E-01		2.57E+00
U-235	143.76	10.96	-2.86E-02	5.87E-02	3.05E-01
	163.33	5.08	6.98E-02		6.20E-01
	185.71	57.20	1.12E-02		5.87E-02
	202.11	1.08	1.59E+00		2.98E+00
Am-241	205.31	5.01	-5.52E-01	4.21E-01	5.62E-01
	59.54	35.90	-2.85E-02		4.21E-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

Analysis Report for 12-Sep-19-10021
L1-12202C-FSGS-012SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 12-Sep-19-10021
Sample Description : L1-12202C-FSGS-012SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.539E+03 grams
Facility : Default

Sample Taken On : 9/11/2019 9:22:00AM
Acquisition Started : 9/12/2019 10:04:54AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : 352
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 900.3 seconds

Dead Time : 0.03 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 120 - 8192
Peak Area Range (in channels) : 120 - 8192
Identification Energy Tolerance : 1.000 keV

Energy Calibration Used Done On : 9/29/2018
Efficiency Calibration Used Done On : 9/12/2019
Efficiency Calibration Description :

Sample Number : 79482
Fill Height : 1539.19 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 9/12/2019 10:19:59AM

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

DMJ
Data Validated
1600 9136179

Analysis Report for 12-Sep-19-10021
L1-12202C-FSGS-012SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.63	946 -	962	954.97	1.01E+02	17.84	6.81E+01	1.01
2	295.11	1176 -	1188	1180.65	2.44E+01	10.28	3.06E+01	0.50
3	351.94	1403 -	1413	1407.77	7.50E+01	10.96	1.90E+01	0.81
4	583.20	2327 -	2338	2332.12	3.64E+01	7.77	9.59E+00	0.59
5	609.38	2429 -	2444	2436.78	5.70E+01	9.65	1.20E+01	1.34
6	910.96	3637 -	3649	3642.88	2.64E+01	7.61	1.16E+01	0.32
7	1460.68	5830 -	5855	5843.10	3.82E+02	20.23	6.50E+00	1.53

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82 *	10.66	7.97E+00	5.46E-01
Tl-208	1.00	583.19 *	85.00	5.20E-02	1.15E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.58E-01	3.07E-02
		300.09	3.30		
Bi-214	1.00	609.32 *	45.49	1.57E-01	2.81E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		

Analysis Report for 12-Sep-19-10021

L1-12202C-FSGS-012SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	0.99	241.99	7.25		
		295.22 *	18.42	1.01E-01	4.35E-02
		351.93 *	35.60	1.82E-01	3.04E-02
		785.96	1.06		
Ac-228	0.99	129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32	11.27		
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	1.67E-01	4.86E-02
		964.77	4.99		
		968.97	15.80		
		1588.20	3.22		

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 12-Sep-19-10021

L1-12202C-FSGS-012SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.997	7.97E+00	5.46E-01	
	Tl-208	1.000	5.20E-02	1.15E-02	
X	Bi-211	0.885			
	Pb-212	1.000	1.58E-01	3.07E-02	
	Bi-214	1.000	1.57E-01	2.81E-02	
	Pb-214	0.999	1.56E-01	2.49E-02	
	Ac-228	0.997	1.67E-01	4.86E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 12-Sep-19-10021
L1-12202C-FSGS-012SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 9/12/2019 10:19:59AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
All peaks were identified.					
M = First peak in a multiplet region					
m = Other peak in a multiplet region					
F = Fitted singlet					
Errors quoted at 1.000sigma					

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	7.22E-02	5.28E-02	5.28E-02
	BE-7	477.60	10.44	-1.03E-01	3.27E-01	3.27E-01
+	K-40	1460.82	* 10.66	7.97E+00	4.33E-01	4.33E-01
	Mn-54	834.85	99.98	1.81E-02	4.49E-02	4.49E-02
	Co-60	1173.23	99.85	4.27E-02	5.07E-02	6.66E-02
		1332.49	99.98	-6.02E-02		5.07E-02
	Nb-94	702.65	99.81	-7.70E-03	4.62E-02	4.62E-02
		871.09	99.89	1.54E-03		4.67E-02
	Ag-108m	79.13	6.60	7.60E-02	4.13E-02	1.43E+00
		433.94	90.50	1.89E-02		4.13E-02
		614.28	89.80	1.77E-02		6.70E-02
		722.94	90.80	1.92E-03		4.81E-02
	Sb-125	176.31	6.84	3.40E-01	1.07E-01	4.78E-01
		380.45	1.52	1.31E+00		2.39E+00
		427.87	29.60	-1.26E-01		1.07E-01
		463.36	10.49	1.47E-01		3.95E-01
		600.60	17.65	1.34E-03		2.38E-01
		606.71	4.98	1.28E+00		1.25E+00
		635.95	11.22	-8.03E-02		3.72E-01

Analysis Report for 12-Sep-19-10021
L1-12202C-FSGS-012SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.60E+00	1.07E-01	2.10E+00
Ba-133	79.61	2.65	-1.57E+00	8.07E-02	3.38E+00
	81.00	32.90	-2.87E-01		2.31E-01
	276.40	7.16	2.21E-01		4.91E-01
	302.85	18.34	2.30E-02		1.98E-01
	356.01	62.05	-3.76E-02		8.07E-02
	383.85	8.94	7.15E-02		4.05E-01
Cs-134	475.36	1.48	-4.98E-01	5.38E-02	2.49E+00
	563.25	8.34	1.43E-01		4.45E-01
	569.33	15.37	-6.23E-02		2.34E-01
	604.72	97.62	-9.88E-03		5.91E-02
	795.86	85.46	9.82E-03		5.38E-02
	801.95	8.69	-4.55E-01		4.71E-01
	1038.61	0.99	-2.66E+00		5.15E+00
	1167.97	1.79	-1.96E-01		3.55E+00
	1365.19	3.02	3.32E-01		1.27E+00
Cs-137	661.66	85.10	1.41E-02	4.59E-02	4.59E-02
Eu-152	121.78	28.67	-1.15E-01	1.28E-01	1.28E-01
	244.70	7.61	1.91E-01		5.04E-01
	295.94	0.45	5.30E+00		9.30E+00
	344.28	26.60	-1.22E-01		1.33E-01
	367.79	0.86	9.04E-01		3.98E+00
	411.12	2.24	4.04E-01		1.84E+00
	443.96	2.83	3.58E-01		1.31E+00
	488.68	0.42	7.59E+00		9.89E+00
	563.99	0.49	5.44E-01		7.36E+00
	586.26	0.46	7.36E+00		1.22E+01
	678.62	0.47	-1.68E+00		8.77E+00
	688.67	0.86	4.38E-01		4.93E+00
	719.35	0.28	-1.60E+01		1.41E+01
	778.90	12.96	2.05E-01		3.40E-01
	810.45	0.32	7.07E+00		1.41E+01
	867.37	4.26	-8.89E-01		1.17E+00
	919.33	0.43	-3.94E+00		1.31E+01
	964.08	14.65	6.83E-01		4.76E-01
	1085.87	10.24	-3.21E-01		4.87E-01
	1089.74	1.73	-8.85E-01		3.17E+00
	1112.07	13.69	-3.04E-01		4.39E-01
	1212.95	1.43	-1.96E+00		4.96E+00
	1249.94	0.19	-7.42E+00		3.30E+01
	1299.14	1.63	-2.47E+00		3.67E+00
	1408.01	21.07	6.65E-02		2.08E-01
	1457.64	0.50	1.70E+02		4.34E+01
	1528.10	0.28	3.27E+00		1.02E+01
Eu-154	123.07	40.40	-1.49E-02	9.35E-02	9.35E-02
	247.93	6.89	1.19E-01		4.89E-01
	591.76	4.95	5.67E-01		9.36E-01
	692.42	1.78	1.73E+00		2.68E+00
	723.30	20.06	1.73E-01		2.21E-01
	756.80	4.52	-3.28E-01		9.56E-01
	873.18	12.08	2.58E-01		3.93E-01

Analysis Report for 12-Sep-19-10021

L1-12202C-FSGS-012SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-4.89E-03	9.35E-02	4.94E-01
	1004.76	18.01	1.47E-01		2.97E-01
	1274.43	34.80	1.51E-01		1.79E-01
	1596.48	1.80	-2.47E+00		2.39E+00
Eu-155	45.30	1.31	-4.17E+00	2.08E-01	1.92E+01
	60.01	1.22	-1.55E+01		2.04E+01
	86.55	30.70	-1.79E-02		2.21E-01
	105.31	21.10	-3.82E-02		2.08E-01
Ra-226	186.21	3.64	1.15E+00	1.06E+00	1.06E+00
Pa-231	27.36	10.30	2.66E+00	1.53E+00	2.43E+00
	283.69	1.70	-2.79E+00		1.86E+00
	300.07	2.47	2.43E-01		1.53E+00
	302.65	2.20	-2.72E-02		1.65E+00
	330.06	1.40	7.64E-02		2.37E+00
U-235	143.76	10.96	1.88E-01	6.65E-02	3.47E-01
	163.33	5.08	-5.55E-01		6.27E-01
	185.71	57.20	6.07E-02		6.65E-02
	202.11	1.08	4.73E-01		3.25E+00
Am-241	205.31	5.01	-1.69E-01	7.34E-01	7.11E-01
	59.54	35.90	-7.05E-02		7.34E-01

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

Analysis Report for 12-Sep-19-10022
L1-12202C-FSGS-013SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 12-Sep-19-10022
Sample Description : L1-12202C-FSGS-013SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.794E+03 grams
Facility : Default

Sample Taken On : 9/11/2019 9:24:00AM
Acquisition Started : 9/12/2019 10:29:07AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : 324
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 900.3 seconds

Dead Time : 0.04 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 120 - 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 : 9/12/2019
Efficiency Calibration Description :

Sample Number : 79484
Fill Height : 1793.70 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 9/12/2019 10:44:11AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 4096

DMJ
Data Validated
1600 91431 79

Analysis Report for 12-Sep-19-10022
L1-12202C-FSGS-013SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.70	473 -	482	477.58	1.10E+02	20.15	1.23E+02	0.98
2	295.22	585 -	595	590.50	6.10E+01	15.09	7.00E+01	1.20
3	351.83	698 -	708	703.61	8.33E+01	12.97	3.58E+01	0.76
4	583.12	1162 -	1171	1165.85	4.11E+01	10.42	2.89E+01	1.59
5	609.23	1213 -	1223	1218.05	7.44E+01	11.63	2.56E+01	1.22
6	1460.75	2915 -	2929	2921.56	4.59E+02	21.81	6.44E+00	1.85

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	8.29E+00	5.34E-01
Tl-208	0.99	583.19 *	85.00	5.14E-02	1.34E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	1.51E-01	3.02E-02
		300.09	3.30		
Bi-214	1.00	609.32 *	45.49	1.79E-01	2.99E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		

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Analysis Report for 12-Sep-19-10022

L1-12202C-FSGS-013SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	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		
		241.99	7.25		
		295.22 *	18.42	2.23E-01	5.79E-02
Pb-214	0.99	351.93 *	35.60	1.78E-01	3.11E-02
		785.96	1.06		

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
X	K-40	0.999	8.29E+00	5.34E-01
	Tl-208	0.999	5.14E-02	1.34E-02
	Bi-211	0.911		
	Pb-212	0.999	1.51E-01	3.02E-02
	Bi-214	1.000	1.79E-01	2.99E-02
	Pb-214	0.999	1.88E-01	2.74E-02

Analysis Report for 12-Sep-19-10022

L1-12202C-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 12-Sep-19-10022
L1-12202C-FSGS-013SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 9/12/2019 10:44:11AM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
All peaks were identified.					
M = First peak in a multiplet region					
m = Other peak in a multiplet region					
F = Fitted singlet					
Errors quoted at 1.000sigma					

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	5.92E-02	4.88E-02	4.88E-02
	BE-7	477.60	10.44	1.93E-01	3.56E-01	3.56E-01
+	K-40	1460.82	* 10.66	8.29E+00	3.05E-01	3.05E-01
	Mn-54	834.85	99.98	2.01E-02	4.14E-02	4.14E-02
	Co-60	1173.23	99.85	6.82E-03	4.19E-02	5.53E-02
		1332.49	99.98	-1.75E-03		4.19E-02
	Nb-94	702.65	99.81	-9.57E-03	3.34E-02	3.34E-02
		871.09	99.89	-6.25E-03		3.95E-02
	Ag-108m	79.13	6.60	6.53E-01	3.42E-02	1.16E+00
		433.94	90.50	8.19E-03		3.42E-02
		614.28	89.80	-1.08E-02		4.66E-02
		722.94	90.80	-1.11E-02		4.26E-02
	Sb-125	176.31	6.84	-1.38E-01	1.09E-01	4.75E-01
		380.45	1.52	-7.66E-01		2.00E+00
		427.87	29.60	1.47E-02		1.09E-01
		463.36	10.49	1.02E-01		3.35E-01
		600.60	17.65	3.42E-02		2.17E-01
		606.71	4.98	-3.75E-01		1.22E+00
		635.95	11.22	1.68E-01		2.96E-01

Analysis Report for 12-Sep-19-10022

L1-12202C-FSGS-013SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	2.24E-01	1.09E-01	1.90E+00
Ba-133	79.61	2.65	2.05E-01	6.53E-02	2.69E+00
	81.00	32.90	-1.54E-01		1.83E-01
	276.40	7.16	-9.16E-03		4.19E-01
	302.85	18.34	-5.07E-02		1.69E-01
	356.01	62.05	-2.23E-02		6.53E-02
	383.85	8.94	1.69E-01		3.55E-01
Cs-134	475.36	1.48	1.57E-01	4.81E-02	2.34E+00
	563.25	8.34	-5.42E-02		3.90E-01
	569.33	15.37	-2.67E-02		2.18E-01
	604.72	97.62	-1.61E-02		5.78E-02
	795.86	85.46	1.10E-02		4.81E-02
	801.95	8.69	2.52E-01		4.38E-01
	1038.61	0.99	-4.67E-01		3.79E+00
	1167.97	1.79	3.04E+00		3.31E+00
	1365.19	3.02	-5.13E-01		1.31E+00
Cs-137	661.66	85.10	1.38E-02	4.55E-02	4.55E-02
Eu-152	121.78	28.67	2.01E-03	1.15E-01	1.15E-01
	244.70	7.61	4.87E-02		4.60E-01
	295.94	0.45	-1.29E+00		8.96E+00
	344.28	26.60	-4.47E-02		1.21E-01
	367.79	0.86	-2.32E+00		3.34E+00
	411.12	2.24	1.05E+00		1.61E+00
	443.96	2.83	-1.55E-01		1.03E+00
	488.68	0.42	-2.63E+00		8.05E+00
	563.99	0.49	2.37E+00		6.87E+00
	586.26	0.46	-2.16E+00		1.10E+01
	678.62	0.47	-2.43E+00		6.17E+00
	688.67	0.86	-4.73E-01		4.13E+00
	719.35	0.28	-1.10E+00		1.21E+01
	778.90	12.96	-1.50E-01		2.75E-01
	810.45	0.32	2.86E+00		1.12E+01
	867.37	4.26	2.85E-01		1.03E+00
	919.33	0.43	-4.58E+00		7.74E+00
	964.08	14.65	1.13E-01		3.79E-01
	1085.87	10.24	2.68E-01		4.83E-01
	1089.74	1.73	-1.47E+00		2.79E+00
	1112.07	13.69	1.47E-02		3.81E-01
	1212.95	1.43	1.21E+00		4.30E+00
	1249.94	0.19	-1.92E+01		2.93E+01
	1299.14	1.63	5.93E-01		3.27E+00
	1408.01	21.07	4.94E-02		1.96E-01
	1457.64	0.50	-5.93E+00		4.10E+01
	1528.10	0.28	5.30E-01		1.10E+01
Eu-154	123.07	40.40	-2.35E-03	8.20E-02	8.20E-02
	247.93	6.89	9.51E-02		4.44E-01
	591.76	4.95	1.27E-01		7.11E-01
	692.42	1.78	4.77E-01		2.09E+00
	723.30	20.06	3.71E-02		2.04E-01
	756.80	4.52	1.41E-01		8.23E-01
	873.18	12.08	4.82E-02		3.17E-01

Analysis Report for 12-Sep-19-10022

L1-12202C-FSGS-013SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-2.13E-01	8.20E-02	4.24E-01
	1004.76	18.01	-9.01E-02		2.29E-01
	1274.43	34.80	-4.32E-02		1.44E-01
	1596.48	1.80	-1.78E+00		1.56E+00
Eu-155	45.30	1.31	-4.00E+00	1.67E-01	1.02E+01
	60.01	1.22	2.65E+00		1.18E+01
	86.55	30.70	-4.83E-03		1.67E-01
	105.31	21.10	3.83E-02		1.78E-01
Ra-226	186.21	3.64	6.06E-01	1.02E+00	1.02E+00
Pa-231	27.36	10.30	7.26E-01	1.11E+00	1.11E+00
	283.69	1.70	-1.94E-01		1.84E+00
	300.07	2.47	3.47E-01		1.27E+00
	302.65	2.20	-4.23E-01		1.41E+00
	330.06	1.40	1.13E+00		2.44E+00
U-235	143.76	10.96	-7.60E-02	6.44E-02	2.74E-01
	163.33	5.08	2.67E-01		6.97E-01
	185.71	57.20	2.97E-02		6.44E-02
	202.11	1.08	-1.23E+00		2.76E+00
	205.31	5.01	3.56E-02		6.44E-01
Am-241	59.54	35.90	1.74E-02	4.01E-01	4.01E-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

Analysis Report for 12-Sep-19-10023
L1-12202C-FSGS-014SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 12-Sep-19-10023
Sample Description : L1-12202C-FSGS-014SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.663E+03 grams
Facility : Default

Sample Taken On : 9/11/2019 9:26:00AM
Acquisition Started : 9/12/2019 10:29:14AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : P11314
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 900.4 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 : 9/12/2019
Efficiency Calibration Description :

Sample Number : 79485
Fill Height : 1663.21 gram
Certificate Name : Eu155-Na22
Certificate Date : 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 9/12/2019 10:44:26AM

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


Data Validated
1600 9150179

Analysis Report for 12-Sep-19-10023
L1-12202C-FSGS-014SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.44	306 -	313	310.28	3.62E+01	11.98	5.28E+01	0.58
2	238.70	949 -	960	954.39	1.27E+02	15.57	4.61E+01	1.21
3	295.16	1173 -	1188	1179.93	7.22E+01	11.98	2.38E+01	1.07
4	351.95	1399 -	1415	1406.80	8.39E+01	12.50	2.21E+01	0.83
5	583.03	2322 -	2335	2330.23	4.05E+01	9.41	1.75E+01	0.44
6	609.11	2428 -	2440	2434.47	6.38E+01	10.32	1.63E+01	1.18
7	1460.18	5827 -	5851	5838.67	3.98E+02	20.53	5.86E+00	1.69

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.93	1460.82 *	10.66	8.73E+00	5.88E-01
Tl-208	0.99	583.19 *	85.00	5.98E-02	1.44E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	1.99E-01	2.92E-02
		300.09	3.30		
Pb212-XR	0.99	74.82	10.28		
		77.11 *	17.10	2.51E-01	8.70E-02
		87.35	3.97		
		89.78	1.46		
Bi-214	0.99	609.32 *	45.49	1.81E-01	3.13E-02 ^[151]

Analysis Report for 12-Sep-19-10023

L1-12202C-FSGS-014SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	1.00	241.99	7.25		
		295.22 *	18.42	3.04E-01	5.60E-02
		351.93 *	35.60	2.08E-01	3.52E-02
Pb214-XR	0.99	785.96	1.06		
		74.82	5.80		
		77.11 *	9.70	4.43E-01	1.55E-01
		87.35	2.24		
		89.78	0.82		

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.937	8.73E+00	5.88E-01	
Tl-208	0.996	5.98E-02	1.44E-02	[152]

Analysis Report for 12-Sep-19-10023

L1-12202C-FSGS-014SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
X	Bi-211	0.884			
	Pb-212	0.999	1.99E-01	2.92E-02	
?	Pb212-XR	0.991	2.51E-01	8.70E-02	
	Bi-214	0.997	1.81E-01	3.13E-02	
	Pb-214	1.000	2.35E-01	2.98E-02	
?	Pb214-XR	0.991	4.43E-01	1.55E-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 12-Sep-19-10023
L1-12202C-FSGS-014SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 9/12/2019 10:44:26AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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	6.92E-02	5.77E-02	5.77E-02
	BE-7	477.60	10.44	1.47E-01	4.01E-01	4.01E-01
+	K-40	1460.82	* 10.66	8.73E+00	4.21E-01	4.21E-01
	Mn-54	834.85	99.98	4.21E-02	4.74E-02	4.74E-02
	Co-60	1173.23	99.85	-8.92E-02	5.31E-02	6.28E-02
		1332.49	99.98	4.36E-02		5.31E-02
	Nb-94	702.65	99.81	-2.09E-02	3.76E-02	3.76E-02
		871.09	99.89	-1.08E-02		4.73E-02
	Ag-108m	79.13	6.60	-8.74E-01	3.35E-02	1.10E+00
		433.94	90.50	-3.89E-02		3.35E-02
		614.28	89.80	-5.14E-02		6.02E-02
		722.94	90.80	4.09E-02		5.31E-02
	Sb-125	176.31	6.84	-1.26E-01	1.03E-01	4.05E-01
		380.45	1.52	-3.95E-01		2.18E+00
		427.87	29.60	-4.03E-02		1.03E-01
		463.36	10.49	1.19E-01		3.35E-01
		600.60	17.65	-7.74E-02		2.05E-01
		606.71	4.98	1.55E+00		1.33E+00
		635.95	11.22	-2.30E-01		3.19E-01

Analysis Report for 12-Sep-19-10023

L1-12202C-FSGS-014SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-8.66E-01	1.03E-01	2.32E+00
Ba-133	79.61	2.65	-1.83E+00	6.37E-02	2.71E+00
	81.00	32.90	-2.51E-01		1.81E-01
	276.40	7.16	-1.49E-01		4.42E-01
	302.85	18.34	-1.32E-02		1.70E-01
	356.01	62.05	1.71E-02		6.37E-02
	383.85	8.94	1.35E-01		3.83E-01
Cs-134	475.36	1.48	1.64E+00	5.21E-02	2.67E+00
	563.25	8.34	-2.46E-01		5.05E-01
	569.33	15.37	-1.28E-01		2.20E-01
	604.72	97.62	-5.48E-02		6.04E-02
	795.86	85.46	-1.12E-02		5.21E-02
	801.95	8.69	4.00E-01		5.82E-01
	1038.61	0.99	3.39E-01		5.38E+00
	1167.97	1.79	8.98E-01		3.76E+00
	1365.19	3.02	1.33E+00		1.71E+00
Cs-137	661.66	85.10	-1.30E-02	5.09E-02	5.09E-02
Eu-152	121.78	28.67	3.97E-02	1.13E-01	1.13E-01
	244.70	7.61	3.07E-02		4.71E-01
	295.94	0.45	1.47E+00		9.57E+00
	344.28	26.60	-4.10E-02		1.20E-01
	367.79	0.86	-4.91E-01		3.22E+00
	411.12	2.24	8.48E-01		1.53E+00
	443.96	2.83	-2.91E-02		1.31E+00
	488.68	0.42	3.26E+00		7.71E+00
	563.99	0.49	-6.90E+00		7.91E+00
	586.26	0.46	-1.19E+01		1.25E+01
	678.62	0.47	-3.28E+00		8.47E+00
	688.67	0.86	2.86E+00		5.25E+00
	719.35	0.28	-1.34E+01		1.37E+01
	778.90	12.96	-2.51E-01		3.58E-01
	810.45	0.32	-4.54E+00		1.40E+01
	867.37	4.26	-9.88E-01		1.03E+00
	919.33	0.43	4.89E+00		1.11E+01
	964.08	14.65	1.80E-01		4.55E-01
	1085.87	10.24	1.09E-01		5.90E-01
	1089.74	1.73	-1.55E+00		3.36E+00
	1112.07	13.69	-7.83E-02		4.12E-01
	1212.95	1.43	-1.87E+00		5.48E+00
	1249.94	0.19	-4.15E+00		3.37E+01
	1299.14	1.63	6.88E-01		3.14E+00
	1408.01	21.07	1.46E-01		2.63E-01
	1457.64	0.50	1.84E+02		4.62E+01
	1528.10	0.28	-1.72E+00		6.59E+00
Eu-154	123.07	40.40	-7.33E-03	7.81E-02	7.81E-02
	247.93	6.89	1.48E-01		4.53E-01
	591.76	4.95	2.19E-02		7.80E-01
	692.42	1.78	-1.43E+00		2.38E+00
	723.30	20.06	1.71E-01		2.41E-01
	756.80	4.52	4.79E-01		9.80E-01
	873.18	12.08	1.53E-01		3.79E-01

Analysis Report for 12-Sep-19-10023

L1-12202C-FSGS-014SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	3.24E-01	7.81E-02	5.72E-01
	1004.76	18.01	1.25E-02		3.23E-01
	1274.43	34.80	1.35E-02		1.90E-01
	1596.48	1.80	-3.87E-03		2.41E+00
Eu-155	45.30	1.31	2.00E+00	1.76E-01	1.24E+01
	60.01	1.22	8.36E+00		1.33E+01
	86.55	30.70	1.16E-01		1.76E-01
	105.31	21.10	1.15E-01		1.97E-01
Ra-226	186.21	3.64	1.01E+00	9.83E-01	9.83E-01
Pa-231	27.36	10.30	9.11E-01	1.28E+00	1.28E+00
	283.69	1.70	-1.75E-01		1.98E+00
	300.07	2.47	-6.38E-01		1.31E+00
	302.65	2.20	-3.83E-01		1.39E+00
	330.06	1.40	1.31E+00		2.53E+00
U-235	143.76	10.96	-1.18E-01	6.24E-02	3.06E-01
	163.33	5.08	-5.29E-01		5.95E-01
	185.71	57.20	6.15E-02		6.24E-02
	202.11	1.08	7.63E-02		2.79E+00
Am-241	205.31	5.01	-3.98E-02	4.43E-01	5.63E-01
	59.54	35.90	5.62E-02		4.43E-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

Analysis Report for 12-Sep-19-10024
L1-12202C-FSGS-015SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 12-Sep-19-10024
Sample Description : L1-12202C-FSGS-015SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.647E+03 grams
Facility : Default

Sample Taken On : 9/11/2019 9:28:00AM
Acquisition Started : 9/12/2019 10:29:22AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : 352
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 900.3 seconds

Dead Time : 0.03 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 120 - 8192
Peak Area Range (in channels) : 120 - 8192
Identification Energy Tolerance : 1.000 keV

Energy Calibration Used Done On : 9/29/2018
Efficiency Calibration Used Done On : 9/12/2019
Efficiency Calibration Description :

Sample Number : 79486
Fill Height : 1647.48 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 9/12/2019 10:44:29AM

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

DMJ
Data Validated
1600 91571 79

Analysis Report for 12-Sep-19-10024
L1-12202C-FSGS-015SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.76	947 -	961	955.50	1.02E+02	17.78	7.44E+01	1.01
2	295.25	1176 -	1186	1181.21	2.86E+01	9.58	2.54E+01	0.81
3	351.92	1401 -	1415	1407.67	7.54E+01	10.77	1.36E+01	1.16
4	583.12	2327 -	2337	2331.78	3.98E+01	8.30	1.22E+01	1.62
5	609.23	2430 -	2443	2436.19	4.03E+01	9.86	2.07E+01	0.40
6	911.64	3639 -	3652	3645.59	3.29E+01	7.44	8.13E+00	0.72
7	1460.81	5832 -	5855	5843.59	4.16E+02	21.44	1.14E+01	2.05

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.82 *	10.66	8.53E+00	5.75E-01
Tl-208	0.99	583.19 *	85.00	5.61E-02	1.22E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	1.57E-01	3.03E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.09E-01	2.75E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		

Analysis Report for 12-Sep-19-10024

L1-12202C-FSGS-015SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	1.00	241.99	7.25		
		295.22 *	18.42	1.18E-01	4.04E-02
		351.93 *	35.60	1.81E-01	2.96E-02
		785.96	1.06		
Ac-228	0.99	129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32	11.27		
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	2.04E-01	4.70E-02
		964.77	4.99		
		968.97	15.80		
		1588.20	3.22		

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 12-Sep-19-10024

L1-12202C-FSGS-015SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	1.000	8.53E+00	5.75E-01	
	Tl-208	0.999	5.61E-02	1.22E-02	
X	Bi-211	0.891			
	Pb-212	0.998	1.57E-01	3.03E-02	
	Bi-214	0.999	1.09E-01	2.75E-02	
	Pb-214	1.000	1.59E-01	2.39E-02	
	Ac-228	0.991	2.04E-01	4.70E-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 12-Sep-19-10024
L1-12202C-FSGS-015SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 9/12/2019 10:44:29AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
All peaks were identified.					
M = First peak in a multiplet region					
m = Other peak in a multiplet region					
F = Fitted singlet					
Errors quoted at 1.000sigma					

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	2.58E-02	4.91E-02	4.91E-02
	BE-7	477.60	10.44	2.26E-01	3.64E-01	3.64E-01
+	K-40	1460.82	* 10.66	8.53E+00	5.22E-01	5.22E-01
	Mn-54	834.85	99.98	-8.49E-03	4.35E-02	4.35E-02
	Co-60	1173.23	99.85	-7.47E-02	5.50E-02	5.50E-02
		1332.49	99.98	2.81E-02		5.78E-02
	Nb-94	702.65	99.81	-2.87E-02	3.95E-02	3.95E-02
		871.09	99.89	-2.40E-02		4.10E-02
	Ag-108m	79.13	6.60	1.60E-01	4.49E-02	1.42E+00
		433.94	90.50	2.04E-02		4.49E-02
		614.28	89.80	-1.30E-02		6.50E-02
		722.94	90.80	9.61E-03		4.68E-02
	Sb-125	176.31	6.84	2.74E-01	1.24E-01	4.85E-01
		380.45	1.52	1.86E-01		2.35E+00
		427.87	29.60	-7.00E-02		1.24E-01
		463.36	10.49	5.30E-02		3.30E-01
		600.60	17.65	3.52E-02		2.24E-01
		606.71	4.98	1.26E+00		1.19E+00
		635.95	11.22	-1.47E-01		3.39E-01

Analysis Report for 12-Sep-19-10024

L1-12202C-FSGS-015SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	1.71E+00	1.24E-01	2.44E+00
Ba-133	79.61	2.65	1.59E+00	7.13E-02	3.47E+00
	81.00	32.90	-3.04E-01		2.34E-01
	276.40	7.16	-6.73E-03		4.61E-01
	302.85	18.34	-1.99E-02		1.81E-01
	356.01	62.05	-2.35E-02		7.13E-02
	383.85	8.94	5.65E-03		4.28E-01
Cs-134	475.36	1.48	5.49E-01	5.65E-02	2.46E+00
	563.25	8.34	-1.02E-01		4.16E-01
	569.33	15.37	7.61E-03		2.33E-01
	604.72	97.62	-9.64E-03		5.65E-02
	795.86	85.46	2.31E-02		6.02E-02
	801.95	8.69	-3.49E-01		5.02E-01
	1038.61	0.99	1.39E+00		5.37E+00
	1167.97	1.79	2.55E-01		3.53E+00
	1365.19	3.02	-3.37E-01		1.35E+00
Cs-137	661.66	85.10	-2.92E-02	4.52E-02	4.52E-02
Eu-152	121.78	28.67	6.43E-02	1.32E-01	1.37E-01
	244.70	7.61	1.96E-01		5.17E-01
	295.94	0.45	1.77E+00		9.04E+00
	344.28	26.60	2.81E-02		1.32E-01
	367.79	0.86	-6.43E-01		3.83E+00
	411.12	2.24	9.79E-01		1.66E+00
	443.96	2.83	-6.85E-01		1.06E+00
	488.68	0.42	3.72E+00		9.50E+00
	563.99	0.49	2.74E+00		7.16E+00
	586.26	0.46	6.61E+00		1.13E+01
	678.62	0.47	-4.56E+00		8.75E+00
	688.67	0.86	7.48E-02		5.16E+00
	719.35	0.28	5.17E+00		1.50E+01
	778.90	12.96	-9.26E-02		3.35E-01
	810.45	0.32	1.02E+00		1.26E+01
	867.37	4.26	4.17E-01		1.06E+00
	919.33	0.43	9.71E-01		1.05E+01
	964.08	14.65	6.83E-01		4.72E-01
	1085.87	10.24	2.34E-01		5.26E-01
	1089.74	1.73	-8.33E-01		3.12E+00
	1112.07	13.69	-1.85E-01		3.99E-01
	1212.95	1.43	6.15E-01		4.38E+00
	1249.94	0.19	-1.29E+01		2.84E+01
	1299.14	1.63	1.08E+00		3.20E+00
	1408.01	21.07	3.03E-02		2.40E-01
	1457.64	0.50	1.84E+02		4.47E+01
	1528.10	0.28	8.03E+00		1.45E+01
Eu-154	123.07	40.40	3.09E-02	9.61E-02	9.61E-02
	247.93	6.89	-1.63E-01		4.86E-01
	591.76	4.95	4.97E-01		7.83E-01
	692.42	1.78	-2.87E+00		2.36E+00
	723.30	20.06	6.31E-02		2.20E-01
	756.80	4.52	-5.19E-01		8.58E-01
	873.18	12.08	2.24E-01		3.75E-01

Analysis Report for 12-Sep-19-10024

L1-12202C-FSGS-015SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	2.40E-01	9.61E-02	5.00E-01
	1004.76	18.01	8.39E-02		2.89E-01
	1274.43	34.80	-1.46E-01		1.64E-01
	1596.48	1.80	-2.02E+00		1.26E+00
Eu-155	45.30	1.31	-9.38E+00	2.08E-01	2.04E+01
	60.01	1.22	-1.42E+00		2.22E+01
	86.55	30.70	-1.03E-02		2.25E-01
	105.31	21.10	4.95E-02		2.08E-01
Ra-226	186.21	3.64	8.94E-01	1.04E+00	1.04E+00
Pa-231	27.36	10.30	1.44E+00	1.48E+00	2.16E+00
	283.69	1.70	-9.32E-01		1.98E+00
	300.07	2.47	1.51E-01		1.48E+00
	302.65	2.20	-1.67E-01		1.49E+00
	330.06	1.40	-4.06E-02		2.58E+00
U-235	143.76	10.96	8.06E-02	6.65E-02	3.46E-01
	163.33	5.08	-3.34E-01		6.90E-01
	185.71	57.20	7.96E-02		6.65E-02
	202.11	1.08	5.28E-01		3.38E+00
Am-241	205.31	5.01	3.63E-01	7.40E-01	7.46E-01
	59.54	35.90	-5.65E-01		7.40E-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

Analysis Report for 12-Sep-19-10025
L1-12202C-FSGS-016SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 12-Sep-19-10025
Sample Description : L1-12202C-FSGS-016SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.751E+03 grams
Facility : Default

Sample Taken On : 9/11/2019 9:30:00AM
Acquisition Started : 9/12/2019 11:34:39AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : 324
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 900.3 seconds

Dead Time : 0.04 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 120 - 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 : 9/12/2019
Efficiency Calibration Description :

Sample Number : 79487
Fill Height : 1750.53 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 9/12/2019 11:49:42AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 4096

DM
Data Validated
1600 1964 279

Analysis Report for 12-Sep-19-10025
L1-12202C-FSGS-016SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.59	475 -	481	477.36	1.11E+02	16.47	7.85E+01	1.07
2	351.98	699 -	708	703.91	8.29E+01	14.48	5.61E+01	0.82
3	609.21	1212 -	1223	1218.00	6.55E+01	10.69	1.95E+01	1.57
4	1460.83	2914 -	2929	2921.72	4.57E+02	21.66	4.00E+00	1.73

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.82 *	10.66	8.30E+00	5.34E-01
Bi-211	0.87	351.07 *	13.02	4.85E-01	9.33E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.53E-01	2.58E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.58E-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		

Analysis Report for 12-Sep-19-10025

L1-12202C-FSGS-016SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	1.00	241.99	7.25		
		295.22	18.42		
		351.93 *	35.60	1.77E-01	3.41E-02
		785.96	1.06		

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	1.000	8.30E+00	5.34E-01
?	Bi-211	0.875	4.85E-01	9.33E-02
	Pb-212	1.000	1.53E-01	2.58E-02
	Bi-214	0.999	1.58E-01	2.75E-02
?	Pb-214	1.000	1.77E-01	3.41E-02

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 12-Sep-19-10025
L1-12202C-FSGS-016SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 9/12/2019 11:49:42AM
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	6.26E-02	5.16E-02	5.16E-02
	BE-7	477.60	10.44	8.49E-02	3.31E-01	3.31E-01
+	K-40	1460.82	* 10.66	8.30E+00	2.66E-01	2.66E-01
	Mn-54	834.85	99.98	-8.04E-03	4.16E-02	4.16E-02
	Co-60	1173.23	99.85	2.16E-02	4.21E-02	5.80E-02
		1332.49	99.98	9.96E-03		4.21E-02
	Nb-94	702.65	99.81	2.27E-02	3.65E-02	4.23E-02
		871.09	99.89	1.04E-03		3.65E-02
	Ag-108m	79.13	6.60	5.15E-01	3.29E-02	1.12E+00
		433.94	90.50	4.12E-03		3.29E-02
		614.28	89.80	-1.21E-02		4.80E-02
		722.94	90.80	-2.85E-03		3.75E-02
	Sb-125	176.31	6.84	3.22E-02	9.99E-02	4.70E-01
		380.45	1.52	7.96E-02		2.02E+00
		427.87	29.60	5.44E-03		9.99E-02
		463.36	10.49	1.30E-01		3.25E-01
		600.60	17.65	8.36E-02		1.88E-01
		606.71	4.98	1.03E-02		1.11E+00
		635.95	11.22	1.96E-02		3.34E-01

Analysis Report for 12-Sep-19-10025

L1-12202C-FSGS-016SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-4.62E-01	9.99E-02	2.04E+00
Ba-133	79.61	2.65	9.26E-01	7.00E-02	2.66E+00
	81.00	32.90	-2.78E-01		1.73E-01
	276.40	7.16	4.33E-02		4.22E-01
	302.85	18.34	1.42E-01		1.83E-01
	356.01	62.05	-1.33E-02		7.00E-02
	383.85	8.94	-6.03E-02		3.36E-01
Cs-134	475.36	1.48	-6.77E-02	4.52E-02	2.30E+00
	563.25	8.34	-2.09E-01		3.65E-01
	569.33	15.37	-3.75E-02		2.30E-01
	604.72	97.62	1.20E-03		4.91E-02
	795.86	85.46	2.64E-02		4.52E-02
	801.95	8.69	-2.29E-01		3.75E-01
	1038.61	0.99	-4.17E+00		4.20E+00
	1167.97	1.79	1.69E+00		3.33E+00
	1365.19	3.02	7.57E-01		1.52E+00
Cs-137	661.66	85.10	7.97E-03	4.08E-02	4.08E-02
Eu-152	121.78	28.67	5.45E-02	1.16E-01	1.16E-01
	244.70	7.61	3.42E-01		4.94E-01
	295.94	0.45	3.70E+00		8.23E+00
	344.28	26.60	-4.83E-02		1.27E-01
	367.79	0.86	2.26E+00		4.07E+00
	411.12	2.24	3.59E-01		1.42E+00
	443.96	2.83	6.08E-02		1.09E+00
	488.68	0.42	-6.48E+00		7.07E+00
	563.99	0.49	-2.99E+00		6.47E+00
	586.26	0.46	9.58E+00		1.08E+01
	678.62	0.47	3.46E+00		8.74E+00
	688.67	0.86	-4.94E-01		3.97E+00
	719.35	0.28	3.50E+00		1.22E+01
	778.90	12.96	1.04E-01		3.14E-01
	810.45	0.32	5.63E+00		1.20E+01
	867.37	4.26	-2.79E-01		8.69E-01
	919.33	0.43	-5.82E+00		9.76E+00
	964.08	14.65	1.70E-01		4.13E-01
	1085.87	10.24	5.24E-02		5.28E-01
	1089.74	1.73	-5.82E-01		3.26E+00
	1112.07	13.69	-1.54E-01		4.09E-01
	1212.95	1.43	-1.36E+00		3.83E+00
	1249.94	0.19	-2.46E+01		2.47E+01
	1299.14	1.63	-2.57E-01		3.34E+00
	1408.01	21.07	-2.86E-02		1.61E-01
	1457.64	0.50	-9.23E+00		4.09E+01
	1528.10	0.28	-7.10E-01		7.95E+00
Eu-154	123.07	40.40	1.36E-02	8.10E-02	8.10E-02
	247.93	6.89	-1.38E-01		4.61E-01
	591.76	4.95	2.62E-01		7.06E-01
	692.42	1.78	-6.44E-01		1.83E+00
	723.30	20.06	-3.23E-02		1.67E-01
	756.80	4.52	-4.19E-02		7.77E-01
	873.18	12.08	-1.03E-01		2.97E-01

Analysis Report for 12-Sep-19-10025

L1-12202C-FSGS-016SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-1.46E-01	8.10E-02	4.26E-01
	1004.76	18.01	6.32E-02		2.77E-01
	1274.43	34.80	1.35E-02		1.45E-01
	1596.48	1.80	8.81E-01		2.08E+00
Eu-155	45.30	1.31	2.65E+00	1.84E-01	1.15E+01
	60.01	1.22	3.67E+00		1.31E+01
	86.55	30.70	2.84E-02		1.84E-01
	105.31	21.10	3.21E-02		1.85E-01
Ra-226	186.21	3.64	4.27E-02	8.87E-01	8.87E-01
Pa-231	27.36	10.30	8.72E-01	1.17E+00	1.17E+00
	283.69	1.70	-3.96E-01		1.74E+00
	300.07	2.47	-8.55E-01		1.31E+00
	302.65	2.20	1.18E+00		1.53E+00
	330.06	1.40	-4.13E-01		2.29E+00
U-235	143.76	10.96	-1.02E-01	5.73E-02	2.42E-01
	163.33	5.08	-7.27E-02		6.86E-01
	185.71	57.20	1.64E-02		5.73E-02
	202.11	1.08	-7.81E-01		2.82E+00
Am-241	205.31	5.01	-2.74E-01	4.63E-01	6.19E-01
	59.54	35.90	1.01E-01		4.63E-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

Analysis Report for 12-Sep-19-10026
L1-12202C-FSGS-017SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 12-Sep-19-10026
Sample Description : L1-12202C-FSGS-017SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.710E+03 grams
Facility : Default

Sample Taken On : 9/11/2019 9:32:00AM
Acquisition Started : 9/12/2019 11:34:45AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : P40818B
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 901.4 seconds

Dead Time : 0.15 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 120 - 8192
Peak Area Range (in channels) : 120 - 8192
Identification Energy Tolerance : 1.000 keV

Energy Calibration Used Done On : 1/29/2019
Efficiency Calibration Used Done On : 9/12/2019
Efficiency Calibration Description :

Sample Number : 79488
Fill Height : 1709.61 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 9/12/2019 11:49:49AM

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

DMJ
Data Validated
1600 91701.79

Analysis Report for 12-Sep-19-10026
L1-12202C-FSGS-017SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.61	947 -	960	954.54	1.01E+02	17.72	7.72E+01	0.97
2	295.25	1176 -	1187	1180.92	4.26E+01	11.58	3.64E+01	0.42
3	338.19	1349 -	1356	1352.53	2.02E+01	7.63	1.88E+01	0.45
4	351.94	1402 -	1412	1407.50	6.11E+01	10.99	2.49E+01	0.56
5	582.93	2326 -	2338	2330.95	4.70E+01	8.73	1.10E+01	0.67
6	609.10	2428 -	2442	2435.58	4.58E+01	9.18	1.32E+01	1.21
7	1460.37	5828 -	5852	5841.32	3.56E+02	19.23	3.28E+00	1.88

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.96	1460.82 *	10.66	8.61E+00	5.97E-01
Tl-208	0.99	583.19 *	85.00	7.65E-02	1.50E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.77E-01	3.42E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.44E-01	3.01E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		

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Analysis Report for 12-Sep-19-10026

L1-12202C-FSGS-017SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	1.00	241.99	7.25		
		295.22 *	18.42	1.99E-01	5.65E-02
		351.93 *	35.60	1.68E-01	3.30E-02
		785.96	1.06		
Ac-228	1.00	129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32 *	11.27	1.70E-01	6.57E-02
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20	25.80		
		964.77	4.99		
		968.97	15.80		
		1588.20	3.22		

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 12-Sep-19-10026

L1-12202C-FSGS-017SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.968	8.61E+00	5.97E-01	
	Tl-208	0.990	7.65E-02	1.50E-02	
X	Bi-211	0.886			
	Pb-212	1.000	1.77E-01	3.42E-02	
	Bi-214	0.997	1.44E-01	3.01E-02	
	Pb-214	1.000	1.76E-01	2.85E-02	
	Ac-228	1.000	1.70E-01	6.57E-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 12-Sep-19-10026
L1-12202C-FSGS-017SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 9/12/2019 11:49:49AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
All peaks were identified.					
M = First peak in a multiplet region					
m = Other peak in a multiplet region					
F = Fitted singlet					
Errors quoted at 1.000sigma					

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	3.48E-02	5.48E-02	5.48E-02
	BE-7	477.60	10.44	1.19E-01	4.47E-01	4.47E-01
+	K-40	1460.82	* 10.66	8.61E+00	3.78E-01	3.78E-01
	Mn-54	834.85	99.98	-2.41E-02	4.75E-02	4.75E-02
	Co-60	1173.23	99.85	-7.48E-02	5.86E-02	7.36E-02
		1332.49	99.98	1.56E-02		5.86E-02
	Nb-94	702.65	99.81	-3.91E-02	4.45E-02	4.45E-02
		871.09	99.89	2.68E-02		4.96E-02
	Ag-108m	79.13	6.60	3.94E-01	4.34E-02	1.95E+00
		433.94	90.50	-5.47E-03		4.34E-02
		614.28	89.80	-2.46E-02		6.04E-02
		722.94	90.80	3.96E-02		5.86E-02
	Sb-125	176.31	6.84	-4.76E-02	1.27E-01	5.42E-01
		380.45	1.52	-3.75E-01		2.36E+00
		427.87	29.60	-9.69E-02		1.27E-01
		463.36	10.49	2.56E-01		4.27E-01
		600.60	17.65	1.36E-02		2.44E-01
		606.71	4.98	1.48E+00		1.33E+00
		635.95	11.22	-9.68E-02		3.93E-01

Analysis Report for 12-Sep-19-10026

L1-12202C-FSGS-017SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-7.29E-01	1.27E-01	2.33E+00
Ba-133	79.61	2.65	2.12E-01	7.84E-02	4.72E+00
	81.00	32.90	-2.42E-01		3.40E-01
	276.40	7.16	1.29E-01		5.76E-01
	302.85	18.34	6.48E-02		2.12E-01
	356.01	62.05	-2.20E-02		7.84E-02
	383.85	8.94	-3.69E-02		4.47E-01
Cs-134	475.36	1.48	-9.87E-01	4.86E-02	2.89E+00
	563.25	8.34	-1.72E-01		4.80E-01
	569.33	15.37	1.20E-01		2.84E-01
	604.72	97.62	8.44E-03		6.51E-02
	795.86	85.46	-2.00E-03		4.86E-02
	801.95	8.69	-8.89E-02		4.36E-01
	1038.61	0.99	-7.89E-01		5.55E+00
	1167.97	1.79	-3.38E-01		3.75E+00
	1365.19	3.02	-1.65E+00		1.47E+00
Cs-137	661.66	85.10	1.97E-02	6.02E-02	6.02E-02
Eu-152	121.78	28.67	-4.54E-02	1.29E-01	1.52E-01
	244.70	7.61	2.83E-01		5.68E-01
	295.94	0.45	-1.26E+00		1.08E+01
	344.28	26.60	-6.88E-02		1.29E-01
	367.79	0.86	3.13E+00		4.50E+00
	411.12	2.24	-9.09E-01		1.56E+00
	443.96	2.83	-2.54E-01		1.56E+00
	488.68	0.42	2.94E+00		9.25E+00
	563.99	0.49	1.45E+00		8.39E+00
	586.26	0.46	-8.44E-01		1.39E+01
	678.62	0.47	1.46E+00		9.34E+00
	688.67	0.86	2.35E-02		4.85E+00
	719.35	0.28	1.05E+01		1.79E+01
	778.90	12.96	-9.57E-02		3.36E-01
	810.45	0.32	2.42E+00		1.45E+01
	867.37	4.26	-6.74E-01		1.01E+00
	919.33	0.43	-1.85E+00		1.24E+01
	964.08	14.65	1.12E-01		4.70E-01
	1085.87	10.24	6.42E-01		7.05E-01
	1089.74	1.73	-2.84E-01		4.00E+00
	1112.07	13.69	-1.82E-01		4.19E-01
	1212.95	1.43	9.46E-01		5.78E+00
	1249.94	0.19	3.18E+00		4.01E+01
	1299.14	1.63	-2.55E-02		3.54E+00
	1408.01	21.07	-1.13E-01		2.63E-01
	1457.64	0.50	1.84E+02		4.83E+01
	1528.10	0.28	-3.79E+00		9.15E+00
Eu-154	123.07	40.40	-2.62E-02	1.10E-01	1.10E-01
	247.93	6.89	-2.92E-01		5.20E-01
	591.76	4.95	-4.08E-01		7.73E-01
	692.42	1.78	1.51E+00		2.66E+00
	723.30	20.06	2.61E-01		2.71E-01
	756.80	4.52	8.31E-01		1.11E+00
	873.18	12.08	2.22E-01		4.11E-01

Analysis Report for 12-Sep-19-10026

L1-12202C-FSGS-017SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	3.32E-01	1.10E-01	4.81E-01
	1004.76	18.01	-2.08E-01		2.38E-01
	1274.43	34.80	5.87E-02		1.77E-01
	1596.48	1.80	-4.42E-01		2.25E+00
Eu-155	45.30	1.31	1.20E+01	2.76E-01	3.15E+01
	60.01	1.22	-1.61E+00		3.16E+01
	86.55	30.70	-1.08E-01		2.78E-01
	105.31	21.10	-1.19E-01		2.76E-01
Ra-226	186.21	3.64	7.68E-01	1.16E+00	1.16E+00
Pa-231	27.36	10.30	2.51E+00	1.58E+00	3.51E+00
	283.69	1.70	9.28E-01		2.27E+00
	300.07	2.47	2.46E-02		1.58E+00
	302.65	2.20	3.88E-01		1.77E+00
	330.06	1.40	-1.63E-01		2.81E+00
U-235	143.76	10.96	2.85E-03	7.35E-02	4.02E-01
	163.33	5.08	-3.50E-01		7.53E-01
	185.71	57.20	5.89E-03		7.35E-02
	202.11	1.08	1.46E+00		3.72E+00
Am-241	205.31	5.01	-6.16E-01	1.09E+00	7.69E-01
	59.54	35.90	-7.74E-01		1.09E+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

Analysis Report for 18-Sep-19-10032
L1-12202C-FSGS-004SB

GAMMA SPECTRUM ANALYSIS

Sample Identification : 18-Sep-19-10032
Sample Description : L1-12202C-FSGS-004SB
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.662E+03 grams
Facility : Default

Sample Taken On : 9/16/2019 9:25:00AM
Acquisition Started : 9/18/2019 10:53:38AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : 324
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 900.3 seconds

Dead Time : 0.04 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 120 - 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 : 9/18/2019
Efficiency Calibration Description :

Sample Number : 79627
Fill Height : 1662.28 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 9/18/2019 11:08:41AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 4096

DMH
Data Validated
0930 9/17/19

Analysis Report for 18-Sep-19-10032
L1-12202C-FSGS-004SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.20	151 -	158	155.00	7.99E+01	16.79	9.81E+01	0.83
2	238.69	474 -	480	477.56	1.25E+02	17.07	8.75E+01	1.20
3	338.26	673 -	679	676.49	3.66E+01	9.87	3.24E+01	0.97
4	352.03	699 -	708	704.01	9.87E+01	14.64	5.13E+01	0.85
5	583.35	1161 -	1171	1166.31	6.45E+01	10.64	2.05E+01	1.53
6	609.39	1213 -	1224	1218.35	8.00E+01	10.95	1.60E+01	1.28
7	911.14	1818 -	1825	1821.73	2.90E+01	6.72	8.00E+00	1.30
8	1460.83	2915 -	2928	2921.72	3.61E+02	19.23	3.35E+00	1.58

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.82 *	10.66	6.63E+00	4.56E-01
Tl-208	0.99	583.19 *	85.00	8.17E-02	1.44E-02
Bi-211	0.86	351.07 *	13.02	5.82E-01	9.83E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.72E-01	2.74E-02
		300.09	3.30		
Pb212-XR	0.99	74.82	10.28		
		77.11 *	17.10	5.17E-01	1.21E-01
		87.35	3.97		

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Analysis Report for 18-Sep-19-10032

L1-12202C-FSGS-004SB

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb212-XR	0.99	89.78	1.46		
Bi-214	1.00	609.32 *	45.49	1.95E-01	2.91E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	0.51	241.99	7.25		
		295.22	18.42		
		351.93 *	35.60	2.13E-01	3.59E-02
		785.96	1.06		
Pb214-XR	0.99	74.82	5.80		
		77.11 *	9.70	9.12E-01	2.17E-01
		87.35	2.24		
		89.78	0.82		
Ac-228	1.00	129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32 *	11.27	2.43E-01	6.84E-02
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	1.62E-01	3.82E-02
		964.77	4.99		
		968.97	15.80		
		1588.20	3.22		

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

Analysis Report for 18-Sep-19-10032
L1-12202C-FSGS-004SB

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	1.000	6.63E+00	4.56E-01	
Tl-208	0.996	8.17E-02	1.44E-02	
? Bi-211	0.862	5.82E-01	9.83E-02	
Pb-212	1.000	1.72E-01	2.74E-02	
? Pb212-XR	0.999	5.17E-01	1.21E-01	
Bi-214	1.000	1.95E-01	2.91E-02	
? Pb-214	0.512	2.13E-01	3.59E-02	
? Pb214-XR	0.999	9.12E-01	2.17E-01	
Ac-228	1.000	1.81E-01	3.33E-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 18-Sep-19-10032
L1-12202C-FSGS-004SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 9/18/2019 11:08:41AM
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	8.61E-02	5.51E-02	5.51E-02
	BE-7	477.60	10.44	7.42E-02	3.12E-01	3.12E-01
+	K-40	1460.82	* 10.66	6.63E+00	2.40E-01	2.40E-01
	Mn-54	834.85	99.98	-9.24E-03	3.92E-02	3.92E-02
	Co-60	1173.23	99.85	-4.83E-02	3.82E-02	4.86E-02
		1332.49	99.98	7.37E-03		3.82E-02
	Nb-94	702.65	99.81	-8.80E-03	3.03E-02	3.03E-02
		871.09	99.89	8.42E-03		3.62E-02
	Ag-108m	79.13	6.60	-4.63E-01	3.18E-02	9.89E-01
		433.94	90.50	-5.72E-03		3.18E-02
		614.28	89.80	-3.51E-03		4.85E-02
		722.94	90.80	-1.23E-02		3.92E-02
	Sb-125	176.31	6.84	3.56E-02	1.01E-01	4.92E-01
		380.45	1.52	-8.61E-01		2.01E+00
		427.87	29.60	1.34E-02		1.01E-01
		463.36	10.49	1.05E-01		3.22E-01
		600.60	17.65	2.45E-03		1.95E-01
		606.71	4.98	-2.00E-01		1.17E+00
		635.95	11.22	1.33E-01		3.45E-01

Analysis Report for 18-Sep-19-10032

L1-12202C-FSGS-004SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	1.57E-01	1.01E-01	1.98E+00
Ba-133	79.61	2.65	-1.33E+00	7.57E-02	2.43E+00
	81.00	32.90	-2.47E-01		1.51E-01
	276.40	7.16	-7.76E-02		4.39E-01
	302.85	18.34	-8.72E-02		1.69E-01
	356.01	62.05	-1.23E-02		7.57E-02
	383.85	8.94	5.73E-02		3.51E-01
Cs-134	475.36	1.48	1.86E-01	4.99E-02	2.21E+00
	563.25	8.34	1.82E-01		3.95E-01
	569.33	15.37	-3.61E-02		1.92E-01
	604.72	97.62	-1.11E-02		4.99E-02
	795.86	85.46	2.76E-02		5.07E-02
	801.95	8.69	-1.58E-01		4.10E-01
	1038.61	0.99	1.76E+00		4.69E+00
	1167.97	1.79	2.05E+00		2.98E+00
	1365.19	3.02	2.38E-01		1.16E+00
Cs-137	661.66	85.10	6.87E-03	4.72E-02	4.72E-02
Eu-152	121.78	28.67	2.11E-02	1.14E-01	1.14E-01
	244.70	7.61	-6.30E-02		4.60E-01
	295.94	0.45	5.65E+00		8.78E+00
	344.28	26.60	-8.31E-02		1.20E-01
	367.79	0.86	1.46E+00		3.95E+00
	411.12	2.24	-3.67E-01		1.31E+00
	443.96	2.83	6.78E-03		1.07E+00
	488.68	0.42	1.24E+00		8.00E+00
	563.99	0.49	1.22E+00		6.44E+00
	586.26	0.46	-5.24E+00		1.14E+01
	678.62	0.47	-3.79E+00		6.77E+00
	688.67	0.86	-4.51E-02		4.13E+00
	719.35	0.28	2.91E+00		1.25E+01
	778.90	12.96	-8.63E-02		2.79E-01
	810.45	0.32	1.15E+00		1.01E+01
	867.37	4.26	-3.78E-01		8.62E-01
	919.33	0.43	-3.07E+00		8.76E+00
	964.08	14.65	1.08E-01		3.79E-01
	1085.87	10.24	1.98E-01		4.51E-01
	1089.74	1.73	-2.63E+00		2.11E+00
	1112.07	13.69	-1.49E-01		2.90E-01
	1212.95	1.43	9.29E-01		4.24E+00
	1249.94	0.19	-4.50E-01		2.75E+01
	1299.14	1.63	-1.91E+00		2.31E+00
	1408.01	21.07	9.74E-02		2.05E-01
	1457.64	0.50	-4.67E+00		3.69E+01
	1528.10	0.28	-2.11E+00		1.12E+01
Eu-154	123.07	40.40	-1.67E-02	7.95E-02	7.95E-02
	247.93	6.89	-2.12E-01		4.25E-01
	591.76	4.95	6.78E-02		6.87E-01
	692.42	1.78	-5.10E-01		1.85E+00
	723.30	20.06	-3.90E-02		1.83E-01
	756.80	4.52	-7.06E-02		8.10E-01
	873.18	12.08	6.89E-02		2.88E-01

Analysis Report for 18-Sep-19-10032

L1-12202C-FSGS-004SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-8.54E-03	7.95E-02	3.77E-01
	1004.76	18.01	-1.34E-01		2.12E-01
	1274.43	34.80	6.33E-02		1.45E-01
	1596.48	1.80	1.52E-01		2.10E+00
Eu-155	45.30	1.31	8.14E-01	1.74E-01	1.08E+01
	60.01	1.22	-6.43E+00		1.19E+01
	86.55	30.70	6.12E-02		1.74E-01
	105.31	21.10	7.38E-02		1.92E-01
Ra-226	186.21	3.64	8.61E-01	1.05E+00	1.05E+00
Pa-231	27.36	10.30	3.74E-01	1.11E+00	1.11E+00
	283.69	1.70	1.07E+00		1.86E+00
	300.07	2.47	-7.99E-01		1.39E+00
	302.65	2.20	-7.26E-01		1.41E+00
	330.06	1.40	-1.44E-03		2.31E+00
U-235	143.76	10.96	6.18E-02	6.61E-02	2.83E-01
	163.33	5.08	-2.14E-02		6.88E-01
	185.71	57.20	5.07E-02		6.61E-02
	202.11	1.08	-3.13E-01		2.98E+00
Am-241	205.31	5.01	-7.01E-01	4.34E-01	6.23E-01
	59.54	35.90	-9.33E-02		4.34E-01

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

Analysis Report for 18-Sep-19-10027
L1-12202C-FSGS-013SB

GAMMA SPECTRUM ANALYSIS

Sample Identification : 18-Sep-19-10027
Sample Description : L1-12202C-FSGS-013SB
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.673E+03 grams
Facility : Default

Sample Taken On : 9/16/2019 8:40:00AM
Acquisition Started : 9/18/2019 10:14:33AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : 352
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 900.3 seconds

Dead Time : 0.03 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 120 - 8192
Peak Area Range (in channels) : 120 - 8192
Identification Energy Tolerance : 1.000 keV

Energy Calibration Used Done On : 9/29/2018
Efficiency Calibration Used Done On : 9/18/2019
Efficiency Calibration Description :

Sample Number : 79622
Fill Height : 1673.15 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 9/18/2019 10:29:36AM

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

DMH
Data Validated
0930 9/18/19

Analysis Report for 18-Sep-19-10027
L1-12202C-FSGS-013SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.06	305 -	314	309.57	2.43E+01	13.14	6.57E+01	0.50
2	238.64	947 -	961	955.03	1.64E+02	19.05	6.89E+01	1.10
3	295.37	1175 -	1188	1181.72	5.17E+01	12.50	3.73E+01	0.71
4	351.97	1400 -	1415	1407.86	9.93E+01	13.27	2.57E+01	0.84
5	510.80	2038 -	2048	2042.70	2.16E+01	9.10	2.54E+01	1.25
6	583.32	2325 -	2340	2332.60	4.90E+01	9.23	1.20E+01	0.83
7	609.20	2427 -	2446	2436.05	1.02E+02	12.74	1.74E+01	0.42
8	661.51	2640 -	2651	2645.21	3.22E+01	6.83	5.76E+00	1.24
9	1460.77	5830 -	5855	5843.44	3.04E+02	18.59	9.72E+00	1.98

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.99	511.00 *	100.00	2.43E-02	1.04E-02
K-40	1.00	1460.82 *	10.66	6.22E+00	4.66E-01
Cs-137	0.99	661.66 *	85.10	4.91E-02	1.08E-02
Tl-208	0.99	583.19 *	85.00	6.88E-02	1.36E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	2.53E-01	3.58E-02
		300.09	3.30		
Pb212-XR	1.00	74.82	10.28		

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Analysis Report for 18-Sep-19-10027

L1-12202C-FSGS-013SB

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb212-XR	1.00	77.11 *		17.10	2.25E-01	1.24E-01
		87.35		3.97		
		89.78		1.46		
Bi-214	0.99	609.32 *		45.49	2.74E-01	3.81E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22 *		18.42	2.12E-01	5.40E-02
		351.93 *		35.60	2.38E-01	3.71E-02
		785.96		1.06		
Pb214-XR	1.00	74.82		5.80		
		77.11 *		9.70	3.97E-01	2.19E-01
		87.35		2.24		
		89.78		0.82		

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 18-Sep-19-10027

L1-12202C-FSGS-013SB

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.994	2.43E-02	1.04E-02	
	K-40	1.000	6.22E+00	4.66E-01	
	Cs-137	0.996	4.91E-02	1.08E-02	
	Tl-208	0.997	6.88E-02	1.36E-02	
X	Bi-211	0.880			
	Pb-212	1.000	2.53E-01	3.58E-02	
?	Pb212-XR	1.000	2.25E-01	1.24E-01	
	Bi-214	0.999	2.74E-01	3.81E-02	
	Pb-214	0.999	2.30E-01	3.06E-02	
?	Pb214-XR	1.000	3.97E-01	2.19E-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 18-Sep-19-10027
L1-12202C-FSGS-013SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 9/18/2019 10:29:36AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
All peaks were identified.					
M = First peak in a multiplet region					
m = Other peak in a multiplet region					
F = Fitted singlet					
Errors quoted at 1.000sigma					

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	* 100.00	2.43E-02	3.31E-02	3.31E-02
	BE-7	477.60	10.44	-2.29E-01	3.18E-01	3.18E-01
+	K-40	1460.82	* 10.66	6.22E+00	5.05E-01	5.05E-01
	Mn-54	834.85	99.98	-9.58E-03	4.35E-02	4.35E-02
	Co-60	1173.23	99.85	1.70E-02	5.58E-02	6.92E-02
		1332.49	99.98	-3.45E-02		5.58E-02
	Nb-94	702.65	99.81	7.27E-03	4.59E-02	5.01E-02
		871.09	99.89	-6.57E-03		4.59E-02
	Ag-108m	79.13	6.60	-3.50E-02	3.89E-02	1.45E+00
		433.94	90.50	-5.53E-03		3.89E-02
		614.28	89.80	-3.95E-03		7.77E-02
		722.94	90.80	4.75E-02		5.41E-02
	Sb-125	176.31	6.84	-5.03E-02	1.27E-01	5.22E-01
		380.45	1.52	4.02E-01		2.38E+00
		427.87	29.60	-5.89E-02		1.27E-01
		463.36	10.49	-5.31E-03		4.13E-01
		600.60	17.65	2.50E-02		2.07E-01
		606.71	4.98	2.33E+00		1.43E+00
		635.95	11.22	2.74E-02		3.52E-01

Analysis Report for 18-Sep-19-10027

L1-12202C-FSGS-013SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.23E+00	1.27E-01	2.35E+00
Ba-133	79.61	2.65	-9.82E-01	8.21E-02	3.53E+00
	81.00	32.90	-2.58E-01		2.37E-01
	276.40	7.16	3.87E-04		4.63E-01
	302.85	18.34	-1.19E-01		1.73E-01
	356.01	62.05	-1.57E-02		8.21E-02
	383.85	8.94	-2.98E-01		3.99E-01
Cs-134	475.36	1.48	-6.65E-01	5.49E-02	2.33E+00
	563.25	8.34	-2.00E-01		4.50E-01
	569.33	15.37	1.91E-01		2.46E-01
	604.72	97.62	-2.05E-02		6.53E-02
	795.86	85.46	3.00E-03		5.49E-02
	801.95	8.69	-5.15E-02		5.15E-01
	1038.61	0.99	-2.15E+00		4.81E+00
	1167.97	1.79	-1.75E+00		3.67E+00
	1365.19	3.02	-3.44E-02		1.29E+00
+	Cs-137	*	85.10	4.91E-02	2.40E-02
	Eu-152		28.67	3.18E-02	1.30E-01
	244.70	7.61	4.49E-01		5.62E-01
	295.94	0.45	1.00E+01		1.00E+01
	344.28	26.60	-7.76E-02		1.30E-01
	367.79	0.86	7.08E-01		4.02E+00
	411.12	2.24	1.71E-01		1.67E+00
	443.96	2.83	-3.27E-01		1.27E+00
	488.68	0.42	-3.75E+00		8.98E+00
	563.99	0.49	-3.15E+00		7.73E+00
	586.26	0.46	1.54E+01		1.21E+01
	678.62	0.47	-9.97E-01		8.02E+00
	688.67	0.86	2.58E+00		4.78E+00
	719.35	0.28	8.22E+00		1.39E+01
	778.90	12.96	-6.16E-01		3.04E-01
	810.45	0.32	-3.34E+00		1.30E+01
	867.37	4.26	-5.40E-01		1.04E+00
	919.33	0.43	-1.40E+01		1.09E+01
	964.08	14.65	4.94E-01		4.24E-01
	1085.87	10.24	-1.02E-01		5.24E-01
	1089.74	1.73	-2.95E+00		3.06E+00
	1112.07	13.69	9.09E-02		4.45E-01
	1212.95	1.43	1.78E+00		4.52E+00
	1249.94	0.19	1.49E+01		3.23E+01
	1299.14	1.63	5.58E-01		3.25E+00
	1408.01	21.07	1.33E-02		1.82E-01
	1457.64	0.50	1.40E+02		3.86E+01
	1528.10	0.28	-6.00E-01		1.25E+01
Eu-154	123.07	40.40	9.09E-02	1.06E-01	1.06E-01
	247.93	6.89	-1.03E-01		5.26E-01
	591.76	4.95	-1.71E-01		7.51E-01
	692.42	1.78	-2.04E-02		2.35E+00
	723.30	20.06	7.70E-02		2.40E-01
	756.80	4.52	-4.77E-01		1.02E+00
	873.18	12.08	1.97E-01		3.96E-01

Analysis Report for 18-Sep-19-10027

L1-12202C-FSGS-013SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-2.42E-01	1.06E-01	4.18E-01
	1004.76	18.01	5.94E-02		2.20E-01
	1274.43	34.80	-6.74E-02		1.66E-01
	1596.48	1.80	-1.72E+00		1.90E+00
Eu-155	45.30	1.31	-9.01E+00	2.08E-01	2.04E+01
	60.01	1.22	-1.23E+01		2.13E+01
	86.55	30.70	-2.65E-02		2.43E-01
	105.31	21.10	-6.82E-03		2.08E-01
Ra-226	186.21	3.64	6.53E-01	1.14E+00	1.14E+00
Pa-231	27.36	10.30	9.12E-01	1.45E+00	2.25E+00
	283.69	1.70	-2.03E+00		1.88E+00
	300.07	2.47	4.60E-01		1.50E+00
	302.65	2.20	-1.05E+00		1.45E+00
	330.06	1.40	-1.63E+00		2.57E+00
U-235	143.76	10.96	-1.25E-01	7.23E-02	3.45E-01
	163.33	5.08	2.82E-01		6.98E-01
	185.71	57.20	1.99E-02		7.23E-02
	202.11	1.08	2.69E+00		3.41E+00
	205.31	5.01	-2.11E-01		6.86E-01
Am-241	59.54	35.90	-6.00E-01	7.51E-01	7.51E-01

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

ATTACHMENT 8
EBERLINE ANALYTICAL REPORTS



EBERLINE

ANALYTICAL

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

EBS-OR-46224

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.

<u>CLIENT ID</u>	<u>LAB ID</u>	<u>CLIENT ID</u>	<u>LAB ID</u>
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.

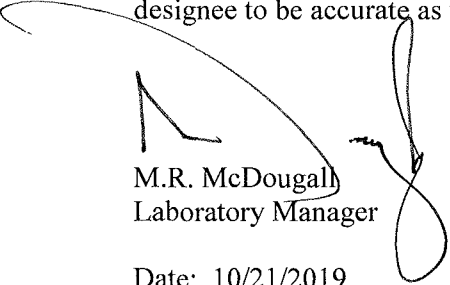
ANALYTICAL RESULTS CONTINUED

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:					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
19-10018-01	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

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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
19-10018-01	LCS	KNOWN	10/04/19 00:00	10/4/2019	10/10/2019	19-10018	Strontium-90	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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

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			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
19-10018-02	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

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			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 CORPORATION

601 SCARBORO ROAD OAK RIDGE, TN 37830 865/481-0683 FAX 865/483-4621

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
19-10018-04	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



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			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
19-10018-05	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	8.88E-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



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[200]

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			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
19-10018-06	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 CORPORATION

601 SCARBORO ROAD OAK RIDGE, TN 37830 865/481-0683 FAX 865/483-4621

[201]

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

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			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
19-10018-08	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



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			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
19-10018-09	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



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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
19-10018-10	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	8.66E-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

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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	
19-10018-11	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	

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			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
19-10018-12	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



EBERLINE ANALYTICAL CORPORATION

601 SCARBORO ROAD OAK RIDGE, TN 37830 865/481-0683 FAX 865/483-4621

[207]

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				Sample Date	Sample Time	Analysis Type	Preservative	Remarks
					Vol	Unit	Type	Qty					
4	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
5	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
6	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
7	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
8	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
9	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
10	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
11	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
12	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-FSGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/17/19	0952	5 ROC HTD	NA	1017.40 g
	L1-10220-I-FSGS-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 88 0743 10-4-19

Laboratory:	Date Submitted To Lab:		Ship Container No.:	Cooler Temperature:	Airbill Number:	
EBERLINE LABS			<u>NA</u>	<u>N/A</u>	FedEx First Overnight 8132-0224-0210	
Relinquished by:	Date (mm/dd/yyyy):	Time:	Received by:	Date: (mm/dd/yyyy):		
Jack Mueis	10/1/19	1430	Richard F. Rickett	10/01/2019		1430
Relinquished by:	Date (mm/dd/yyyy):	Time:	Received by:	Date: (mm/dd/yyyy):		
Richard F. Rickett	10/02/2019	1600	FedEx First Overnight	10/02/2019		1600
Relinquished by:	Date (mm/dd/yyyy):	Time:	Received by:	Date: (mm/dd/yyyy):		
Fedex			Kandice Spencer	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						



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ANALYTICAL

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EBS-OR-46226

October 21, 2019

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

CASE NARRATIVE
Work Order # 19-10019-OR

SAMPLE RECEIPT

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

<u>CLIENT ID</u>	<u>LAB ID</u>	<u>CLIENT ID</u>	<u>LAB ID</u>
L1-12202-C-FSGS-013-SB-A	19-10019-04	L1-12202-F-FJGS-005-SS-A	19-10019-08
L1-12202-D-FSGS-015-SB-A	19-10019-05	L1-10220-I-FIGS-011-SS-A	19-10019-09
L1-12109-A-FSGS-008-SS-A	19-10019-06	L1-12108-A-FSGS-015-SS-A	19-10019-10
L1-12109-A-FSGS-013-SS-A	19-10019-07	L1-12108-A-FSGS-005-SS-A	19-10019-11

ANALYTICAL METHODS

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

Laboratory qualifiers are as follows:

U - Result is less than the MDA.

ANALYTICAL RESULTS

Combined Standard Uncertainty is reported at 1-sigma value.

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

ANALYTICAL RESULTS CONTINUED

TOTAL STRONTIUM

Samples were prepared by acid digestion as appropriate for the matrix. Digested samples were acidified and selectively extracted and precipitated. Precipitates were 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 an acceptable relative percent difference and normalized difference. Results for the Total Strontium laboratory control sample demonstrated an acceptable percent recovery.

TRITIUM

A representative aliquot of each sample was equilibrated with tritium free water. Equilibrates were transferred into 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 a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Tritium laboratory control sample demonstrated an acceptable percent recovery.

NICKEL-63

A representative aliquot of each sample was prepared by leaching in acids. Aliquots were placed into 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.

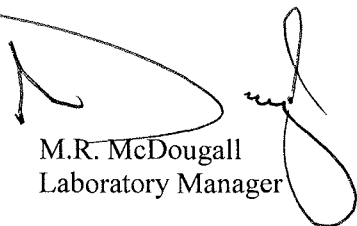
ANALYTICAL RESULTS CONTINUED

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 replicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the 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:					Work Order Details:						
			Patricia Giza					SDG:		19-10019				
			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
19-10019-01	LCS	KNOWN	10/04/19 00:00	10/4/2019	10/9/2019	19-10019	Tritium	LANL ER-210 Modified	2.05E+02	7.39E+00				pCi/g
19-10019-01	LCS	SPIKE	10/04/19 00:00	10/4/2019	10/9/2019	19-10019	Tritium	LANL ER-210 Modified	2.03E+02	7.67E+00	1.37E+01	5.52E+00		pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/9/2019	19-10019	Tritium	LANL ER-210 Modified	-3.80E-01	3.21E+00	3.21E+00	5.59E+00	U	pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/9/2019	19-10019	Tritium	LANL ER-210 Modified	-7.50E-01	3.15E+00	3.15E+00	5.51E+00	U	pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/9/2019	19-10019	Tritium	LANL ER-210 Modified	7.46E-01	3.19E+00	3.19E+00	5.49E+00	U	pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/9/2019	19-10019	Tritium	LANL ER-210 Modified	7.46E-01	3.19E+00	3.19E+00	5.49E+00	U	pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/9/2019	19-10019	Tritium	LANL ER-210 Modified	-1.82E-01	3.08E+00	3.08E+00	5.36E+00	U	pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/9/2019	19-10019	Tritium	LANL ER-210 Modified	-1.76E-01	2.97E+00	2.97E+00	5.17E+00	U	pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/9/2019	19-10019	Tritium	LANL ER-210 Modified	9.29E-01	3.18E+00	3.18E+00	5.46E+00	U	pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/10/2019	19-10019	Tritium	LANL ER-210 Modified	1.99E+00	3.14E+00	3.15E+00	5.33E+00	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/10/2019	19-10019	Tritium	LANL ER-210 Modified	-1.29E+00	3.07E+00	3.07E+00	5.41E+00	U	pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/10/2019	19-10019	Tritium	LANL ER-210 Modified	-3.70E-01	3.12E+00	3.12E+00	5.44E+00	U	pCi/g
19-10019-01	LCS	KNOWN	10/04/19 00:00	10/4/2019	10/10/2019	19-10019	Nickel-63	ASTM 3500-Ni Modified	1.44E+03	4.32E+01				pCi/g
19-10019-01	LCS	SPIKE	10/04/19 00:00	10/4/2019	10/10/2019	19-10019	Nickel-63	ASTM 3500-Ni Modified	1.35E+03	1.26E+01	8.03E+01	3.24E+00		pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/10/2019	19-10019	Nickel-63	ASTM 3500-Ni Modified	0.00E+00	1.85E+00	1.85E+00	3.19E+00	U	pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/10/2019	19-10019	Nickel-63	ASTM 3500-Ni Modified	5.53E-01	1.94E+00	1.94E+00	3.31E+00	U	pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/10/2019	19-10019	Nickel-63	ASTM 3500-Ni Modified	1.30E+00	1.96E+00	1.97E+00	3.32E+00	U	pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/10/2019	19-10019	Nickel-63	ASTM 3500-Ni Modified	9.00E-02	1.87E+00	1.87E+00	3.23E+00	U	pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/10/2019	19-10019	Nickel-63	ASTM 3500-Ni Modified	1.46E+00	1.94E+00	1.94E+00	3.27E+00	U	pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/10/2019	19-10019	Nickel-63	ASTM 3500-Ni Modified	1.41E+00	1.87E+00	1.87E+00	3.16E+00	U	pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/10/2019	19-10019	Nickel-63	ASTM 3500-Ni Modified	2.51E+00	1.94E+00	1.95E+00	3.22E+00	U	pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/10/2019	19-10019	Nickel-63	ASTM 3500-Ni Modified	-9.08E-02	1.89E+00	1.89E+00	3.26E+00	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/10/2019	19-10019	Nickel-63	ASTM 3500-Ni Modified	5.29E-01	1.85E+00	1.85E+00	3.17E+00	U	pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/10/2019	19-10019	Nickel-63	ASTM 3500-Ni Modified	-4.11E-01	2.13E+00	2.13E+00	3.69E+00	U	pCi/g

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601 SCARBORO ROAD OAK RIDGE, TN 37830 865/481-0683 FAX 865/483-4621

Eberline Analytical Final Report of Analysis			Report To:					Work Order Details:						
			Patricia Giza					SDG:	19-10019					
			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
19-10019-01	LCS	KNOWN	10/04/19 00:00	10/4/2019	10/10/2019	19-10019	Strontium-90	EiChroM SRW01 Modified	5.06E+01	2.83E-01				pCi/g
19-10019-01	LCS	SPIKE	10/04/19 00:00	10/4/2019	10/10/2019	19-10019	Strontium-90	EiChroM SRW01 Modified	4.79E+01	2.57E+00	1.69E+01	8.94E-01		pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/10/2019	19-10019	Strontium-90	EiChroM SRW01 Modified	3.69E-01	2.95E-01	3.21E-01	5.87E-01	U	pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/10/2019	19-10019	Strontium-90	EiChroM SRW01 Modified	1.02E-01	3.57E-01	3.59E-01	7.52E-01	U	pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/10/2019	19-10019	Strontium-90	EiChroM SRW01 Modified	1.21E-01	3.43E-01	3.46E-01	7.20E-01	U	pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/10/2019	19-10019	Strontium-90	EiChroM SRW01 Modified	1.82E-01	3.26E-01	3.32E-01	6.77E-01	U	pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/10/2019	19-10019	Strontium-90	EiChroM SRW01 Modified	1.65E-01	2.82E-01	2.88E-01	5.86E-01	U	pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/10/2019	19-10019	Strontium-90	EiChroM SRW01 Modified	6.07E-02	2.94E-01	2.95E-01	6.23E-01	U	pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/10/2019	19-10019	Strontium-90	EiChroM SRW01 Modified	-1.77E-01	3.21E-01	3.26E-01	7.07E-01	U	pCi/g
19-10019-09	TRG	L1-10220-I-FJGS-011-SS-A	09/17/19 08:38	10/4/2019	10/10/2019	19-10019	Strontium-90	EiChroM SRW01 Modified	-1.86E-02	3.15E-01	3.15E-01	6.78E-01	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/10/2019	19-10019	Strontium-90	EiChroM SRW01 Modified	5.83E-02	3.72E-01	3.73E-01	7.89E-01	U	pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/10/2019	19-10019	Strontium-90	EiChroM SRW01 Modified	7.81E-03	2.71E-01	2.71E-01	5.79E-01	U	pCi/g
19-10019-01	LCS	KNOWN	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Cobalt-60	EPA 901.1 Modified	1.31E+02	5.10E+00				pCi/g
19-10019-01	LCS	KNOWN	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Cesium-137	EPA 901.1 Modified	8.26E+01	3.39E+00				pCi/g
19-10019-01	LCS	SPIKE	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Cobalt-60	EPA 901.1 Modified	1.54E+02	1.30E+01	1.52E+01	1.52E+00		pCi/g
19-10019-01	LCS	SPIKE	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Cesium-137	EPA 901.1 Modified	8.34E+01	7.61E+00	8.73E+00	1.32E+00		pCi/g

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			Patricia Giza					SDG:	19-10019					
			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
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Actinium-228	EPA 901.1 Modified	1.81E-02	6.84E-02	6.84E-02	1.18E-01	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Silver-108m	EPA 901.1 Modified	3.84E-03	2.04E-02	2.04E-02	2.29E-02	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Americium-241	EPA 901.1 Modified	2.24E-02	3.53E-02	3.53E-02	5.30E-02	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Barium-133	EPA 901.1 Modified	-2.06E-02	3.24E-02	3.24E-02	3.28E-02	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Bismuth-214	EPA 901.1 Modified	5.25E-02	4.32E-02	4.33E-02	8.12E-02	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Cobalt-60	EPA 901.1 Modified	-4.43E-04	1.57E-02	1.57E-02	3.67E-02	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Cesium-134	EPA 901.1 Modified	-3.67E-03	1.58E-02	1.58E-02	2.65E-02	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Cesium-137	EPA 901.1 Modified	5.54E-03	1.55E-02	1.55E-02	3.09E-02	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Europium-152	EPA 901.1 Modified	-4.50E-02	8.73E-02	8.73E-02	8.06E-02	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Europium-154	EPA 901.1 Modified	3.56E-02	4.94E-02	4.95E-02	4.13E-02	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Europium-155	EPA 901.1 Modified	3.37E-02	3.72E-02	3.72E-02	5.44E-02	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Holmium-166m	EPA 901.1 Modified	-8.65E-03	3.63E-02	3.64E-02	3.38E-02	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Iodine-129	EPA 901.1 Modified	9.17E-02	2.11E+00	2.11E+00	2.22E+00	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Potassium-40	EPA 901.1 Modified	1.84E-01	2.16E-01	2.16E-01	4.55E-01	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Manganese-54	EPA 901.1 Modified	1.13E-02	1.78E-02	1.78E-02	3.37E-02	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Molybdenum-93	EPA 901.1 Modified	3.69E-03	1.64E-02	1.64E-02	2.71E-02	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Niobium-94	EPA 901.1 Modified	8.17E-03	1.81E-02	1.81E-02	2.91E-02	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Lead-210	EPA 901.1 Modified	1.17E+00	7.90E-01	7.92E-01	1.28E+00	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Lead-212	EPA 901.1 Modified	5.71E-02	4.35E-02	4.36E-02	6.97E-02	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Lead-214	EPA 901.1 Modified	4.39E-02	4.01E-02	4.01E-02	8.40E-02	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Promethium-145	EPA 901.1 Modified	4.80E-02	4.25E-01	4.25E-01	6.14E-01	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Radium-226	EPA 901.1 Modified	5.25E-02	4.32E-02	4.33E-02	8.12E-02	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Antimony-125	EPA 901.1 Modified	0.00E+00	4.09E-02	4.09E-02	7.29E-02	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Thorium-234	EPA 901.1 Modified	2.75E-01	3.77E-01	3.77E-01	5.54E-01	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Thallium-208	EPA 901.1 Modified	7.62E-02	4.65E-02	4.67E-02	7.96E-02	U	pCi/g
19-10019-02	MBL	BLANK	10/04/19 00:00	10/4/2019	10/7/2019	19-10019	Uranium-235	EPA 901.1 Modified	-1.44E-03	1.36E-01	1.36E-01	1.82E-01	U	pCi/g

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			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
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Actinium-228	EPA 901.1 Modified	5.24E-01	1.72E-01	1.74E-01	2.88E-01		pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Silver-108m	EPA 901.1 Modified	-3.74E-03	4.63E-02	4.63E-02	5.94E-02	U	pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Americium-241	EPA 901.1 Modified	-7.57E-02	5.95E-02	5.96E-02	8.02E-02	U	pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Barium-133	EPA 901.1 Modified	-1.52E-02	1.55E-02	1.55E-02	8.67E-02	U	pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Bismuth-214	EPA 901.1 Modified	3.31E-01	1.18E-01	1.20E-01	1.89E-01		pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Cobalt-60	EPA 901.1 Modified	6.34E-02	5.37E-02	5.38E-02	1.02E-01	U	pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Cesium-134	EPA 901.1 Modified	-7.53E-02	6.57E-02	6.58E-02	6.89E-02	U	pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Cesium-137	EPA 901.1 Modified	4.44E-02	4.26E-02	4.27E-02	7.66E-02	U	pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Europium-152	EPA 901.1 Modified	2.72E-02	7.57E-02	7.57E-02	1.30E-01	U	pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Europium-154	EPA 901.1 Modified	1.03E-01	1.65E-01	1.65E-01	6.49E-02	U	pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Europium-155	EPA 901.1 Modified	8.51E-02	6.06E-02	6.07E-02	1.26E-01	U	pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Holmium-166m	EPA 901.1 Modified	-5.03E-02	6.87E-02	6.87E-02	5.87E-02	U	pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Iodine-129	EPA 901.1 Modified	7.18E-02	1.38E-01	1.38E-01	2.30E-01	U	pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Potassium-40	EPA 901.1 Modified	1.24E+01	2.44E+00	2.52E+00	8.62E-01		pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Manganese-54	EPA 901.1 Modified	4.00E-02	3.92E-02	3.93E-02	7.30E-02	U	pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Molybdenum-93	EPA 901.1 Modified	-1.63E-03	3.69E-02	3.69E-02	5.82E-02	U	pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Niobium-94	EPA 901.1 Modified	1.82E-02	3.41E-02	3.41E-02	6.04E-02	U	pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Lead-210	EPA 901.1 Modified	8.65E-01	6.11E-01	6.13E-01	9.55E-01	U	pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Lead-212	EPA 901.1 Modified	3.39E-01	7.25E-02	7.46E-02	1.62E-01		pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Lead-214	EPA 901.1 Modified	4.25E-01	1.03E-01	1.05E-01	1.56E-01		pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Promethium-145	EPA 901.1 Modified	5.27E-02	1.04E-01	1.04E-01	1.55E-01	U	pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Radium-226	EPA 901.1 Modified	3.31E-01	1.18E-01	1.20E-01	1.89E-01		pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Antimony-125	EPA 901.1 Modified	3.82E-02	1.17E-01	1.17E-01	1.71E-01	U	pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Thorium-234	EPA 901.1 Modified	7.67E-02	5.66E-01	5.67E-01	8.14E-01	U	pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Thallium-208	EPA 901.1 Modified	3.18E-01	1.51E-01	1.51E-01	2.29E-01		pCi/g
19-10019-03	DUP	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Uranium-235	EPA 901.1 Modified	-1.06E-01	1.99E-01	2.00E-01	2.84E-01	U	pCi/g

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Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Actinium-228	EPA 901.1 Modified	3.85E-01	1.66E-01	1.68E-01	3.88E-01	U	pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Silver-108m	EPA 901.1 Modified	5.25E-03	3.05E-02	3.05E-02	5.64E-02	U	pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Americium-241	EPA 901.1 Modified	-6.11E-02	6.19E-02	6.19E-02	8.39E-02	U	pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Barium-133	EPA 901.1 Modified	-5.28E-03	2.43E-02	2.43E-02	9.02E-02	U	pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Bismuth-214	EPA 901.1 Modified	3.72E-01	9.55E-02	9.74E-02	3.67E-01		pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Cobalt-60	EPA 901.1 Modified	1.57E-02	5.28E-02	5.28E-02	9.04E-02	U	pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Cesium-134	EPA 901.1 Modified	-9.66E-02	6.97E-02	6.98E-02	7.83E-02	U	pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Cesium-137	EPA 901.1 Modified	3.86E-02	4.55E-02	4.55E-02	7.98E-02	U	pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Europium-152	EPA 901.1 Modified	4.97E-02	1.01E-01	1.01E-01	1.35E-01	U	pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Europium-154	EPA 901.1 Modified	2.63E-02	1.49E-01	1.49E-01	6.81E-02	U	pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Europium-155	EPA 901.1 Modified	4.56E-02	6.69E-02	6.70E-02	9.94E-02	U	pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Holmium-166m	EPA 901.1 Modified	3.50E-02	7.29E-02	7.29E-02	5.43E-02	U	pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Iodine-129	EPA 901.1 Modified	-2.87E-02	1.56E-01	1.56E-01	2.26E-01	U	pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Potassium-40	EPA 901.1 Modified	1.19E+01	2.34E+00	2.42E+00	6.95E-01		pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Manganese-54	EPA 901.1 Modified	9.87E-03	3.89E-02	3.89E-02	6.53E-02	U	pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Molybdenum-93	EPA 901.1 Modified	-1.15E-03	2.03E-02	2.03E-02	6.01E-02	U	pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Niobium-94	EPA 901.1 Modified	1.43E-02	4.08E-02	4.08E-02	7.00E-02	U	pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Lead-210	EPA 901.1 Modified	4.02E-01	6.50E-01	6.51E-01	9.79E-01	U	pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Lead-212	EPA 901.1 Modified	3.45E-01	7.39E-02	7.60E-02	1.55E-01		pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Lead-214	EPA 901.1 Modified	4.19E-01	9.43E-02	9.67E-02	1.45E-01		pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Promethium-145	EPA 901.1 Modified	1.92E-02	1.07E-01	1.07E-01	1.57E-01	U	pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Radium-226	EPA 901.1 Modified	3.72E-01	9.55E-02	9.74E-02	3.67E-01		pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Antimony-125	EPA 901.1 Modified	7.63E-03	5.07E-02	5.07E-02	1.66E-01	U	pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Thorium-234	EPA 901.1 Modified	8.33E-01	5.37E-01	5.39E-01	8.37E-01	U	pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Thallium-208	EPA 901.1 Modified	3.63E-01	1.66E-01	1.67E-01	2.56E-01		pCi/g
19-10019-04	DO	L1-12202-C-FSGS-013-SB-A	09/16/19 08:30	10/4/2019	10/7/2019	19-10019	Uranium-235	EPA 901.1 Modified	8.95E-02	2.01E-01	2.01E-01	3.05E-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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Eberline Analytical Final Report of Analysis			Report To:					Work Order Details:						
			Patricia Giza					SDG:	19-10019					
			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
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Actinium-228	EPA 901.1 Modified	1.04E+00	2.44E-01	2.50E-01	4.43E-01		pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Silver-108m	EPA 901.1 Modified	2.00E-03	2.70E-02	2.70E-02	5.77E-02	U	pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Americium-241	EPA 901.1 Modified	8.32E-02	9.11E-02	9.12E-02	1.80E-01	U	pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Barium-133	EPA 901.1 Modified	3.93E-03	3.56E-02	3.56E-02	9.23E-02	U	pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Bismuth-214	EPA 901.1 Modified	1.21E+00	1.80E-01	1.91E-01	2.06E-01		pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Cobalt-60	EPA 901.1 Modified	-1.44E-02	7.16E-02	7.16E-02	9.44E-02	U	pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Cesium-134	EPA 901.1 Modified	8.37E-03	2.45E-02	2.45E-02	5.96E-02	U	pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Cesium-137	EPA 901.1 Modified	-3.31E-02	6.85E-02	6.85E-02	9.62E-02	U	pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Europium-152	EPA 901.1 Modified	1.16E-02	1.55E-01	1.55E-01	2.37E-01	U	pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Europium-154	EPA 901.1 Modified	-9.38E-02	2.06E-01	2.06E-01	1.21E-01	U	pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Europium-155	EPA 901.1 Modified	2.66E-01	1.44E-01	1.44E-01	1.83E-01	U	pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Holmium-166m	EPA 901.1 Modified	-5.15E-03	5.68E-02	5.68E-02	9.21E-02	U	pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Iodine-129	EPA 901.1 Modified	1.44E-01	3.97E+00	3.97E+00	3.91E+00	U	pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Potassium-40	EPA 901.1 Modified	2.76E+01	3.33E+00	3.62E+00	1.12E+00		pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Manganese-54	EPA 901.1 Modified	-2.18E-02	5.73E-02	5.74E-02	8.23E-02	U	pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Molybdenum-93	EPA 901.1 Modified	-1.28E-03	4.57E-02	4.57E-02	6.18E-02	U	pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Niobium-94	EPA 901.1 Modified	-3.91E-02	5.49E-02	5.49E-02	7.38E-02	U	pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Lead-210	EPA 901.1 Modified	2.53E+00	1.80E+00	1.80E+00	2.88E+00	U	pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Lead-212	EPA 901.1 Modified	8.42E-01	1.39E-01	1.46E-01	2.34E-01		pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Lead-214	EPA 901.1 Modified	1.32E+00	1.94E-01	2.06E-01	2.69E-01		pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Promethium-145	EPA 901.1 Modified	4.93E-01	5.82E-01	5.82E-01	1.05E+00	U	pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Radium-226	EPA 901.1 Modified	1.21E+00	1.80E-01	1.91E-01	2.06E-01		pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Antimony-125	EPA 901.1 Modified	-1.32E-02	1.16E-01	1.16E-01	1.89E-01	U	pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Thorium-234	EPA 901.1 Modified	2.10E+00	1.65E+00	1.65E+00	2.71E+00	U	pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Thallium-208	EPA 901.1 Modified	6.62E-01	1.44E-01	1.48E-01	1.55E-01		pCi/g
19-10019-05	TRG	L1-12202-D-FSGS-015-SB-A	09/16/19 13:00	10/4/2019	10/7/2019	19-10019	Uranium-235	EPA 901.1 Modified	1.55E-01	3.83E-01	3.83E-01	5.11E-01	U	pCi/g

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



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Eberline Analytical Final Report of Analysis			Report To:					Work Order Details:						
			Patricia Giza					SDG:	19-10019					
			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
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Actinium-228	EPA 901.1 Modified	1.96E-01	1.54E-01	1.54E-01	2.90E-01	U	pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Silver-108m	EPA 901.1 Modified	-2.41E-02	3.72E-02	3.73E-02	3.80E-02	U	pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Americium-241	EPA 901.1 Modified	9.25E-02	7.62E-02	7.63E-02	1.09E-01	U	pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Barium-133	EPA 901.1 Modified	9.38E-03	2.24E-02	2.24E-02	6.23E-02	U	pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Bismuth-214	EPA 901.1 Modified	2.61E-01	7.81E-02	7.92E-02	1.35E-01		pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Cobalt-60	EPA 901.1 Modified	-1.28E-02	4.43E-02	4.43E-02	5.95E-02	U	pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Cesium-134	EPA 901.1 Modified	-2.00E-03	1.65E-02	1.65E-02	3.92E-02	U	pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Cesium-137	EPA 901.1 Modified	-1.06E-02	3.16E-02	3.16E-02	4.67E-02	U	pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Europium-152	EPA 901.1 Modified	6.16E-02	1.38E-01	1.38E-01	1.34E-01	U	pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Europium-154	EPA 901.1 Modified	4.54E-02	1.21E-01	1.21E-01	6.57E-02	U	pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Europium-155	EPA 901.1 Modified	9.79E-02	7.02E-02	7.04E-02	1.07E-01	U	pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Holmium-166m	EPA 901.1 Modified	-6.42E-03	6.17E-02	6.17E-02	5.27E-02	U	pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Iodine-129	EPA 901.1 Modified	1.33E+00	6.05E+00	6.05E+00	2.77E+00	U	pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Potassium-40	EPA 901.1 Modified	1.16E+01	1.62E+00	1.73E+00	7.84E-01		pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Manganese-54	EPA 901.1 Modified	-9.54E-03	2.61E-02	2.61E-02	4.44E-02	U	pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Molybdenum-93	EPA 901.1 Modified	-1.04E-02	2.83E-02	2.83E-02	3.39E-02	U	pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Niobium-94	EPA 901.1 Modified	2.52E-02	3.38E-02	3.38E-02	5.56E-02	U	pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Lead-210	EPA 901.1 Modified	1.51E+00	1.09E+00	1.09E+00	1.78E+00	U	pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Lead-212	EPA 901.1 Modified	2.91E-01	7.08E-02	7.23E-02	1.39E-01		pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Lead-214	EPA 901.1 Modified	2.69E-01	7.08E-02	7.22E-02	2.20E-01		pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Promethium-145	EPA 901.1 Modified	2.70E-01	5.32E-01	5.32E-01	7.57E-01	U	pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Radium-226	EPA 901.1 Modified	2.61E-01	7.81E-02	7.92E-02	1.35E-01		pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Antimony-125	EPA 901.1 Modified	-2.27E-02	7.07E-02	7.07E-02	1.16E-01	U	pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Thorium-234	EPA 901.1 Modified	6.75E-01	7.48E-01	7.49E-01	1.04E+00	U	pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Thallium-208	EPA 901.1 Modified	2.02E-01	7.06E-02	7.13E-02	1.09E-01		pCi/g
19-10019-06	TRG	L1-12109-A-FSGS-008-SS-A	09/17/19 09:14	10/4/2019	10/7/2019	19-10019	Uranium-235	EPA 901.1 Modified	1.47E-01	2.11E-01	2.11E-01	2.96E-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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601 SCARBORO ROAD OAK RIDGE, TN 37830 865/481-0683 FAX 865/483-4621

Eberline Analytical Final Report of Analysis			Report To:					Work Order Details:						
			Patricia Giza					SDG:	19-10019					
			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
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Actinium-228	EPA 901.1 Modified	2.42E-01	2.17E-01	2.18E-01	3.99E-01	U	pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Silver-108m	EPA 901.1 Modified	3.60E-03	2.87E-02	2.87E-02	6.24E-02	U	pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Americium-241	EPA 901.1 Modified	-4.81E-02	7.72E-02	7.73E-02	1.08E-01	U	pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Barium-133	EPA 901.1 Modified	-1.65E-03	2.64E-02	2.64E-02	1.11E-01	U	pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Bismuth-214	EPA 901.1 Modified	3.02E-01	1.30E-01	1.31E-01	1.99E-01		pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Cobalt-60	EPA 901.1 Modified	5.35E-03	6.83E-02	6.83E-02	1.07E-01	U	pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Cesium-134	EPA 901.1 Modified	1.31E-02	2.85E-02	2.85E-02	8.15E-02	U	pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Cesium-137	EPA 901.1 Modified	-1.33E-02	6.10E-02	6.10E-02	8.39E-02	U	pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Europium-152	EPA 901.1 Modified	-8.22E-02	1.32E-01	1.32E-01	1.66E-01	U	pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Europium-154	EPA 901.1 Modified	-1.43E-02	1.81E-01	1.81E-01	8.75E-02	U	pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Europium-155	EPA 901.1 Modified	3.86E-02	9.04E-02	9.04E-02	1.33E-01	U	pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Holmium-166m	EPA 901.1 Modified	2.47E-02	1.04E-01	1.04E-01	5.43E-02	U	pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Iodine-129	EPA 901.1 Modified	2.37E-03	5.61E-02	5.61E-02	8.24E-02	U	pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Potassium-40	EPA 901.1 Modified	1.24E+01	1.80E+00	1.91E+00	1.13E-01		pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Manganese-54	EPA 901.1 Modified	-3.38E-02	5.65E-02	5.66E-02	8.25E-02	U	pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Molybdenum-93	EPA 901.1 Modified	1.24E-03	5.24E-02	5.24E-02	5.94E-02	U	pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Niobium-94	EPA 901.1 Modified	1.72E-02	4.06E-02	4.06E-02	7.07E-02	U	pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Lead-210	EPA 901.1 Modified	3.61E-01	5.73E-01	5.73E-01	8.80E-01	U	pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Lead-212	EPA 901.1 Modified	2.78E-01	7.53E-02	7.67E-02	1.62E-01		pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Lead-214	EPA 901.1 Modified	2.44E-01	1.00E-01	1.01E-01	1.94E-01		pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Promethium-145	EPA 901.1 Modified	-4.23E-02	6.86E-02	6.87E-02	9.63E-02	U	pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Radium-226	EPA 901.1 Modified	3.02E-01	1.30E-01	1.31E-01	1.99E-01		pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Antimony-125	EPA 901.1 Modified	8.50E-02	1.35E-01	1.35E-01	2.05E-01	U	pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Thorium-234	EPA 901.1 Modified	1.26E+00	6.83E-01	6.86E-01	1.09E+00	U	pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Thallium-208	EPA 901.1 Modified	2.66E-01	1.14E-01	1.15E-01	5.52E-02		pCi/g
19-10019-07	TRG	L1-12109-A-FSGS-013-SS-A	09/17/19 09:24	10/4/2019	10/7/2019	19-10019	Uranium-235	EPA 901.1 Modified	8.23E-02	2.22E-01	2.22E-01	3.38E-01	U	pCi/g

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			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
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Actinium-228	EPA 901.1 Modified	3.10E-01	1.07E-01	1.09E-01	2.83E-01		pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Silver-108m	EPA 901.1 Modified	6.23E-03	1.76E-02	1.76E-02	3.81E-02	U	pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Americium-241	EPA 901.1 Modified	1.38E-02	7.25E-02	7.25E-02	9.64E-02	U	pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Barium-133	EPA 901.1 Modified	-8.87E-03	1.89E-02	1.89E-02	4.96E-02	U	pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Bismuth-214	EPA 901.1 Modified	2.26E-01	7.52E-02	7.61E-02	1.27E-01		pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Cobalt-60	EPA 901.1 Modified	1.89E-02	4.21E-02	4.21E-02	5.06E-02	U	pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Cesium-134	EPA 901.1 Modified	1.67E-04	1.62E-02	1.62E-02	4.04E-02	U	pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Cesium-137	EPA 901.1 Modified	6.23E-02	4.56E-02	4.57E-02	7.25E-02	U	pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Europium-152	EPA 901.1 Modified	5.89E-02	1.36E-01	1.36E-01	1.23E-01	U	pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Europium-154	EPA 901.1 Modified	-5.61E-02	1.20E-01	1.20E-01	6.50E-02	U	pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Europium-155	EPA 901.1 Modified	6.95E-02	7.12E-02	7.12E-02	9.77E-02	U	pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Holmium-166m	EPA 901.1 Modified	-1.87E-02	5.24E-02	5.25E-02	5.61E-02	U	pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Iodine-129	EPA 901.1 Modified	-1.82E+00	7.95E+00	7.95E+00	2.68E+00	U	pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Potassium-40	EPA 901.1 Modified	7.96E+00	1.31E+00	1.37E+00	1.00E+00		pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Manganese-54	EPA 901.1 Modified	-2.47E-02	3.62E-02	3.62E-02	4.93E-02	U	pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Molybdenum-93	EPA 901.1 Modified	-2.52E-02	3.14E-02	3.14E-02	3.99E-02	U	pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Niobium-94	EPA 901.1 Modified	-1.57E-02	2.83E-02	2.83E-02	4.00E-02	U	pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Lead-210	EPA 901.1 Modified	5.46E-01	1.03E+00	1.03E+00	1.62E+00	U	pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Lead-212	EPA 901.1 Modified	2.95E-01	8.99E-02	9.12E-02	1.26E-01		pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Lead-214	EPA 901.1 Modified	2.38E-01	6.75E-02	6.86E-02	1.26E-01		pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Promethium-145	EPA 901.1 Modified	1.39E-01	5.17E-01	5.17E-01	7.56E-01	U	pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Radium-226	EPA 901.1 Modified	2.26E-01	7.52E-02	7.61E-02	1.27E-01		pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Antimony-125	EPA 901.1 Modified	8.00E-02	6.52E-02	6.53E-02	1.26E-01	U	pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Thorium-234	EPA 901.1 Modified	1.81E-01	7.22E-01	7.22E-01	9.65E-01	U	pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Thallium-208	EPA 901.1 Modified	1.66E-01	6.44E-02	6.50E-02	8.12E-02		pCi/g
19-10019-08	TRG	L1-12202-F-FJGS-005-SS-A	09/17/19 09:52	10/4/2019	10/7/2019	19-10019	Uranium-235	EPA 901.1 Modified	2.20E-01	1.96E-01	1.97E-01	2.88E-01	U	pCi/g

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			Patricia Giza					SDG:	19-10019					
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Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Actinium-228	EPA 901.1 Modified	1.81E-01	2.68E-01	2.68E-01	4.68E-01	U	pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Silver-108m	EPA 901.1 Modified	4.30E-02	5.73E-02	5.73E-02	8.38E-02	U	pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Americium-241	EPA 901.1 Modified	-1.69E-02	4.15E-02	4.15E-02	1.19E-01	U	pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Barium-133	EPA 901.1 Modified	1.16E-03	2.76E-02	2.76E-02	1.22E-01	U	pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Bismuth-214	EPA 901.1 Modified	3.77E-01	1.53E-01	1.54E-01	1.79E-01		pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Cobalt-60	EPA 901.1 Modified	6.80E-02	8.51E-02	8.52E-02	1.47E-01	U	pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Cesium-134	EPA 901.1 Modified	0.00E+00	2.51E-02	2.51E-02	9.79E-02	U	pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Cesium-137	EPA 901.1 Modified	4.30E-01	9.93E-02	1.02E-01	1.08E-01		pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Europium-152	EPA 901.1 Modified	-8.30E-03	1.30E-01	1.30E-01	1.87E-01	U	pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Europium-154	EPA 901.1 Modified	-1.12E-01	2.22E-01	2.22E-01	9.69E-02	U	pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Europium-155	EPA 901.1 Modified	5.78E-02	7.85E-02	7.85E-02	1.34E-01	U	pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Holmium-166m	EPA 901.1 Modified	1.20E-01	8.31E-02	8.33E-02	8.38E-02	U	pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Iodine-129	EPA 901.1 Modified	9.81E-02	2.29E-01	2.29E-01	3.42E-01	U	pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Potassium-40	EPA 901.1 Modified	1.55E+01	3.15E+00	3.25E+00	1.02E+00		pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Manganese-54	EPA 901.1 Modified	3.44E-02	5.84E-02	5.84E-02	1.03E-01	U	pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Molybdenum-93	EPA 901.1 Modified	1.43E-02	5.78E-02	5.78E-02	9.58E-02	U	pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Niobium-94	EPA 901.1 Modified	-2.74E-03	5.20E-02	5.20E-02	8.46E-02	U	pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Lead-210	EPA 901.1 Modified	1.52E+00	1.19E+00	1.20E+00	1.97E+00	U	pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Lead-212	EPA 901.1 Modified	5.23E-01	1.39E-01	1.42E-01	1.93E-01		pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Lead-214	EPA 901.1 Modified	3.72E-01	1.48E-01	1.49E-01	2.72E-01		pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Promethium-145	EPA 901.1 Modified	-1.43E-01	1.65E-01	1.65E-01	2.26E-01	U	pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Radium-226	EPA 901.1 Modified	3.77E-01	1.53E-01	1.54E-01	1.79E-01		pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Antimony-125	EPA 901.1 Modified	-1.05E-01	1.90E-01	1.90E-01	2.46E-01	U	pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Thorium-234	EPA 901.1 Modified	9.90E-01	8.19E-01	8.21E-01	1.35E+00	U	pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Thallium-208	EPA 901.1 Modified	4.18E-01	1.99E-01	2.00E-01	3.00E-01		pCi/g
19-10019-09	TRG	L1-10220-I-FIGS-011-SS-A	09/17/19 08:38	10/4/2019	10/7/2019	19-10019	Uranium-235	EPA 901.1 Modified	1.58E-01	2.63E-01	2.63E-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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601 SCARBORO ROAD OAK RIDGE, TN 37830 865/481-0683 FAX 865/483-4621

Eberline Analytical Final Report of Analysis			Report To:					Work Order Details:						
			Patricia Giza					SDG:	19-10019					
			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
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Actinium-228	EPA 901.1 Modified	3.51E-01	1.74E-01	1.75E-01	4.02E-01	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Silver-108m	EPA 901.1 Modified	-1.07E-02	5.71E-02	5.71E-02	6.15E-02	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Americium-241	EPA 901.1 Modified	-5.88E-02	7.44E-02	7.44E-02	1.03E-01	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Barium-133	EPA 901.1 Modified	4.38E-03	2.47E-02	2.47E-02	1.13E-01	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Bismuth-214	EPA 901.1 Modified	1.71E-01	1.16E-01	1.16E-01	1.96E-01	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Cobalt-60	EPA 901.1 Modified	2.97E-02	6.19E-02	6.19E-02	9.33E-02	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Cesium-134	EPA 901.1 Modified	-1.17E-03	3.12E-02	3.12E-02	7.81E-02	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Cesium-137	EPA 901.1 Modified	7.77E-03	4.20E-02	4.20E-02	8.80E-02	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Europium-152	EPA 901.1 Modified	8.18E-02	1.36E-01	1.36E-01	1.57E-01	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Europium-154	EPA 901.1 Modified	-7.26E-02	1.64E-01	1.64E-01	8.17E-02	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Europium-155	EPA 901.1 Modified	5.15E-02	6.37E-02	6.38E-02	1.07E-01	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Holmium-166m	EPA 901.1 Modified	6.30E-02	3.82E-02	3.83E-02	6.52E-02	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Iodine-129	EPA 901.1 Modified	-3.73E-02	5.49E-02	5.49E-02	7.76E-02	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Potassium-40	EPA 901.1 Modified	9.89E+00	1.62E+00	1.70E+00	1.05E+00		pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Manganese-54	EPA 901.1 Modified	-1.21E-02	5.03E-02	5.03E-02	8.00E-02	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Molybdenum-93	EPA 901.1 Modified	4.37E-02	4.24E-02	4.25E-02	6.90E-02	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Niobium-94	EPA 901.1 Modified	-3.19E-02	4.94E-02	4.95E-02	7.02E-02	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Lead-210	EPA 901.1 Modified	2.80E-01	5.57E-01	5.57E-01	8.47E-01	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Lead-212	EPA 901.1 Modified	3.30E-01	1.11E-01	1.13E-01	1.69E-01		pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Lead-214	EPA 901.1 Modified	2.60E-01	9.86E-02	9.95E-02	1.83E-01		pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Promethium-145	EPA 901.1 Modified	-3.51E-02	6.68E-02	6.68E-02	9.47E-02	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Radium-226	EPA 901.1 Modified	1.71E-01	1.16E-01	1.16E-01	1.96E-01	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Antimony-125	EPA 901.1 Modified	-7.49E-02	1.43E-01	1.43E-01	1.86E-01	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Thorium-234	EPA 901.1 Modified	4.59E-01	6.86E-01	6.87E-01	1.04E+00	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Thallium-208	EPA 901.1 Modified	1.36E-01	1.80E-01	1.80E-01	2.77E-01	U	pCi/g
19-10019-10	TRG	L1-12108-A-FSGS-015-SS-A	09/18/19 13:38	10/4/2019	10/7/2019	19-10019	Uranium-235	EPA 901.1 Modified	3.67E-01	2.07E-01	2.08E-01	3.45E-01	U	pCi/g

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



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			Patricia Giza					SDG:	19-10019					
			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
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Actinium-228	EPA 901.1 Modified	2.38E-01	2.40E-01	2.40E-01	4.35E-01	U	pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Silver-108m	EPA 901.1 Modified	-3.12E-02	5.27E-02	5.27E-02	7.27E-02	U	pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Americium-241	EPA 901.1 Modified	-4.18E-02	7.76E-02	7.76E-02	1.09E-01	U	pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Barium-133	EPA 901.1 Modified	4.80E-03	2.91E-02	2.91E-02	1.18E-01	U	pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Bismuth-214	EPA 901.1 Modified	2.50E-01	1.32E-01	1.33E-01	2.33E-01		pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Cobalt-60	EPA 901.1 Modified	-3.61E-02	7.71E-02	7.71E-02	1.07E-01	U	pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Cesium-134	EPA 901.1 Modified	-4.71E-03	3.62E-02	3.62E-02	8.80E-02	U	pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Cesium-137	EPA 901.1 Modified	5.78E-02	5.65E-02	5.66E-02	9.21E-02	U	pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Europium-152	EPA 901.1 Modified	-6.18E-02	1.87E-01	1.87E-01	1.80E-01	U	pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Europium-154	EPA 901.1 Modified	4.84E-02	1.93E-01	1.93E-01	9.27E-02	U	pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Europium-155	EPA 901.1 Modified	7.79E-02	6.97E-02	6.99E-02	1.38E-01	U	pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Holmium-166m	EPA 901.1 Modified	1.63E-02	1.07E-01	1.07E-01	6.63E-02	U	pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Iodine-129	EPA 901.1 Modified	-4.37E-02	5.83E-02	5.83E-02	8.16E-02	U	pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Potassium-40	EPA 901.1 Modified	1.31E+01	1.94E+00	2.05E+00	5.57E-01		pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Manganese-54	EPA 901.1 Modified	5.25E-03	5.59E-02	5.59E-02	9.26E-02	U	pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Molybdenum-93	EPA 901.1 Modified	8.50E-03	5.71E-02	5.71E-02	7.36E-02	U	pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Niobium-94	EPA 901.1 Modified	-1.66E-02	5.75E-02	5.75E-02	8.09E-02	U	pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Lead-210	EPA 901.1 Modified	-1.33E-01	6.57E-01	6.57E-01	9.57E-01	U	pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Lead-212	EPA 901.1 Modified	2.44E-01	1.28E-01	1.29E-01	2.06E-01		pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Lead-214	EPA 901.1 Modified	2.93E-01	1.03E-01	1.04E-01	1.92E-01		pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Promethium-145	EPA 901.1 Modified	-1.27E-02	7.33E-02	7.33E-02	1.07E-01	U	pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Radium-226	EPA 901.1 Modified	2.50E-01	1.32E-01	1.33E-01	2.33E-01		pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Antimony-125	EPA 901.1 Modified	2.82E-02	1.61E-01	1.61E-01	2.27E-01	U	pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Thorium-234	EPA 901.1 Modified	2.12E-01	7.32E-01	7.32E-01	1.10E+00	U	pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Thallium-208	EPA 901.1 Modified	1.63E-01	9.09E-02	9.13E-02	5.97E-02		pCi/g
19-10019-11	TRG	L1-12108-A-FSGS-005-SS-A	09/18/19 13:08	10/4/2019	10/7/2019	19-10019	Uranium-235	EPA 901.1 Modified	1.14E-01	2.43E-01	2.43E-01	3.72E-01	U	pCi/g

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



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REC'D OCT 04 2019

ZS-WM-131
Revision 0
Information Use

Attachment 1 – Chain-of-Custody Form

19-10019

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

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19-10019

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Laboratory: EBERLINE LABS	Date Submitted To Lab:	Ship Container No.: NA	Cooler Temperature: N/A	Airbill Number: FedEx First Overnight 8132-0224-0210	
Relinquished by: Jack Mucig	Date: 10/1/19 (mm/dd/yyyy):	Time: 1430	Received by: Richard F. Rinkert	Date: (mm/dd/yyyy): 10/4/2019	1430
Relinquished by: Richard F. Rinkert	Date: 10/02/2019 (mm/dd/yyyy):	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: Randolph Spencer	Date: (mm/dd/yyyy): 10/4/2019	D743
Relinquished by:	Date: (mm/dd/yyyy):	Time:	Received by:	Date: (mm/dd/yyyy):	
Comments Po # 67718 HTD'S 7 day Turn Around					

19-10019



EBERLINE ANALYTICAL CORPORATION
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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.

<u>CLIENT ID</u>	<u>LAB ID</u>	<u>CLIENT ID</u>	<u>LAB ID</u>
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

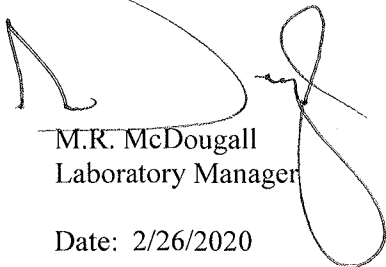
TOTAL STRONTIUM

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:						Work Order Details:						
			Jeffrey Graham Zion Solutions 2701 Deborah Ave Zion, IL 60099						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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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	EiChroM 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



EBERLINE ANALYTICAL CORPORATION

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L2-10213A-AJCS-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/16/2019	1234	FULL SUITE	NA	341.36g
L2-10213A-AJCS-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/16/2019	1236	FULL SUITE	NA	403.45g
L2-10213A-AJCS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/16/2019	1238	FULL SUITE	NA	519.02g
L1-10221D-FSCS-008-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/15/2019	0720	5 ROC HTD	NA	798.42g
L1-10209E-FICS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/17/2019	1035	5 ROC HTD	NA	683.69g
L1-10209E-QICS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/17/2019	1035	5 ROC HTD	NA	695.73g
L1-10209E-FICS-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/17/2019	1500	5 ROC HTD	NA	723.26g
L1-10209E-FICS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/17/2019	1510	5 ROC HTD	NA	704.72g
L1-10209E-FSCS-013-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/20/2019	0810	5 ROC HTD	NA	802.05g
L1-10209D-FSCS-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/21/2019	0820	5 ROC HTD	NA	637.16g
L1-10209D-FSCS-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/21/2019	0825	5 ROC HTD	NA	598.17g
L1-10209D-FSCS-015-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/21/2019	0920	5 ROC HTD	NA	708.91g
L1-10220I-FSGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/22/2019	0700	5 ROC HTD	NA	603.35g
L1-10220I-FSGS-010-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/23/2019	0745	5 ROC HTD	NA	672.61g
L1-10209D-FSGS-003-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/28/2019	0900	5 ROC HTD	NA	739.91g
L1-10220J-FSGS-005-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/28/2019	1325	5 ROC HTD	NA	678.76g
L1-10220G-FSGS-008-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/3/2019	0744	5 ROC HTD	NA	840.01g
L1-10220G-FSGS-014-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/3/2019	0756	5 ROC HTD	NA	902.77g
L1-10220A-FSGS-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
L1-102201-FJGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/9/2019	0830	5 ROC HTD	NA	572.09g
L1-102201-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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19-09001 y18

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	1109.36g
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	1309	5 ROC HTD	NA	1062.99g
L1-10209C-FIGS-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/25/2019	1306	5 ROC HTD	NA	945.02g
L1-10209C-FIGS-006-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/30/2019	1240	5 ROC HTD	NA	752.63g
L2-10213A-FSGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	0730	5 ROC HTD	NA	663.96g
L2-10213A-FSGS-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	0734	5 ROC HTD	NA	865.77g
L2-10213A-FSGS-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	0736	5 ROC HTD	NA	773.20g

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Sample ID	Sample Log	Matrix	Sample Type	Sample Container				Sample Date	Sample Time	Analysis Type	Preservative	Remarks
				Vol	Unit	Type	Qty					
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-FJGS-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

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Sample ID	Sample Log	Matrix	Sample Type	Vol	Unit	Sample Container 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-FSGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/17/19	0952	5 ROC HTD	NA	1017.40 g
L1-10220-I-FSGS-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

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Sample ID	Sample Log	Matrix	Sample Type	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-QIGS-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

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