





**ZION STATION RESTORATION PROJECT  
FINAL STATUS SURVEY RELEASE RECORD**

**SOUTH OF PROTECTED AREA - INLAND**

**SURVEY UNIT 10221D**

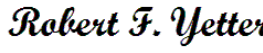

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**LIST OF ACRONYMS AND ABBREVIATIONS**

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

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

## 1. EXECUTIVE SUMMARY

This Final Status Survey (FSS) Release Record for Survey Unit 10221D, “South of Protected Area - Inland,” 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 (L1-10221D-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 one. A survey plan was designed based upon use of the Sign Test as the nonparametric statistical test for compliance. Both the Type I ( $\alpha$ ) and Type II ( $\beta$ ) decision error rates were set at 0.05. Seventeen (17) systematic surface soil samples were acquired from the survey unit. In addition, surface scanning was performed on 100% of the total accessible surface area in the survey unit. No areas of elevated activity were detected during the scans. The analytical results for the systematic soil samples taken in survey unit 10221D indicate that the Sum of Fractions (SOF) for each sample, when compared to the Operational Derived Concentration Guideline Levels (OpDCGL), was less than 1.0, with a maximum Operational SOF (OpSOF) of 0.110. However, an area of elevated activity above an OpSOF of 1.0 was discovered after collecting a judgmental surface soil sample in the drainage ditch on the south side of the railroad ballast at the discharge point of a steel culvert running under the ballast. This sample (judgmental sample point #7) had an OpSOF of 2.820. An investigation was performed which identified an elevated area of 10 m<sup>2</sup>. The elevated area also extended into survey unit 10220I where a separate investigation was conducted. The survey unit passed the Elevated Measurement Comparison (EMC), with a calculated dose for the survey unit of 5.738 mrem/year Total Effective Dose Equivalent (TEDE) (see Section 9 for a full discussion of the investigation). Although the survey unit would have passed the EMC, it was decided, as a conservative measure, to remediate the elevated area (See Section 10 for a discussion of the remediation).

Following remediation, the mean OpSOF for the systematic samples was 0.045. The mean Base Case SOF (BcSOF), when the analytical results were compared to the Base Case DCGLs (BcDCGL), was 0.011, which results in a dose assigned to the survey unit of 0.286 mrem/year TEDE. Therefore, the null hypothesis is rejected and survey unit 10221D is acceptable for unrestricted release.

## 2. SURVEY UNIT DESCRIPTION

Survey unit 10221D, “South of Protected Area - Inland,” is a Class 1 open land survey unit and is 1,697 m<sup>2</sup> in size. It is bounded on the west by survey unit 10221C, the south by survey unit 10220I, the east by survey units 10221E through 10221H, and the north by survey units 10209E, 10210A and 10210B.

The topography of the survey unit is mainly flat with some small dips and depressions. The soil is mostly loam. A rail spur, with a ballast made up of gravel, runs through the southern part of the survey unit and a drainage ditch runs north to south through the survey unit.

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

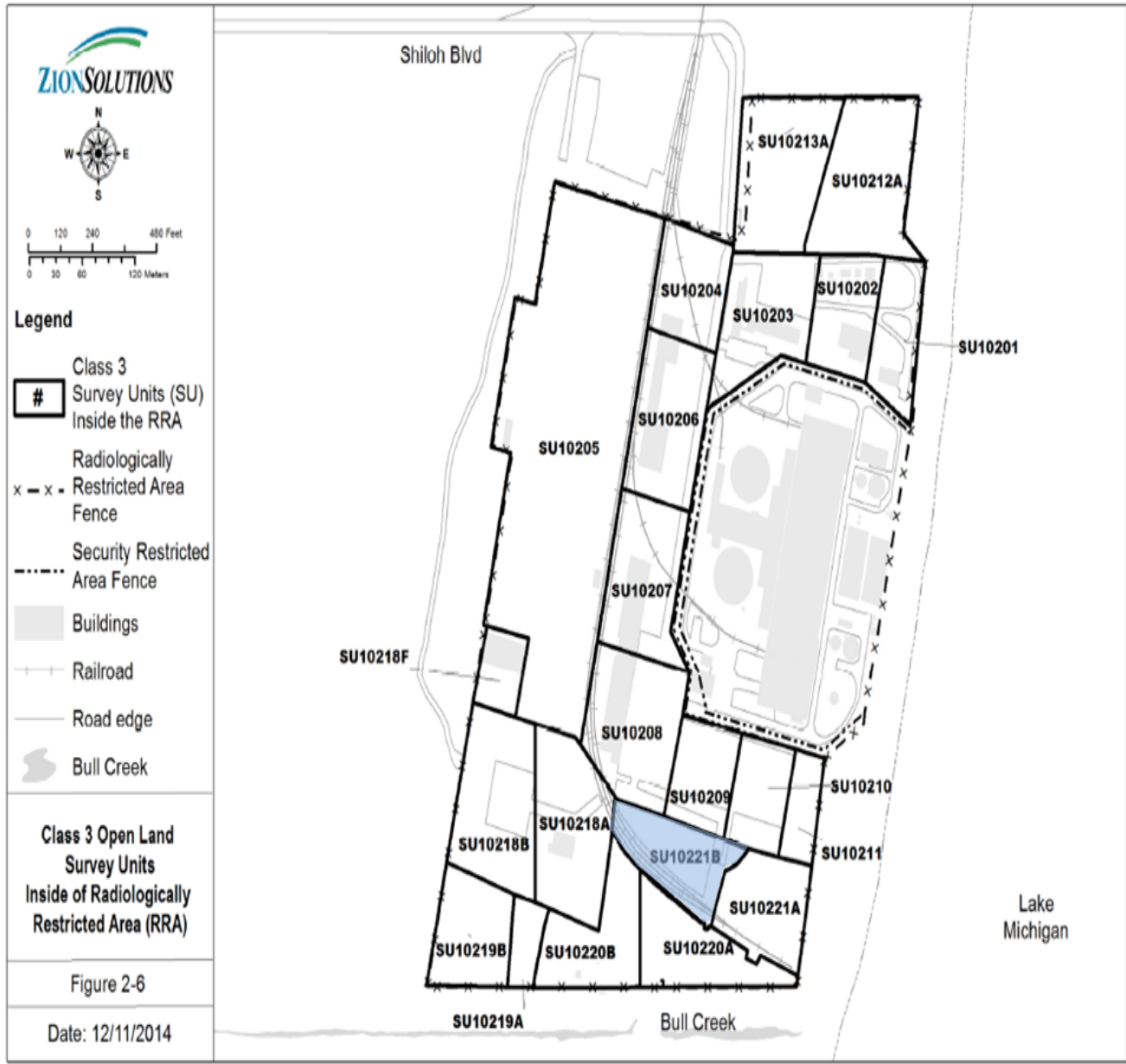
## 3. CLASSIFICATION BASIS

Survey unit 10221D was classified in accordance with *Zion Solutions* procedure ZS-LT-300-001-002, “*Survey Unit Classification*” (Reference 5).

The area encompassing this survey unit was described as “South of Fenced Area - Lakeshore” and was located within survey unit 10221 as identified in the “*Zion Station Historical Site Assessment*” (HSA) (Reference 6). Subsequently, this area was described as “South of Protected Area - Inland” (survey unit 10221B) in Table 2-29 and Figure 2-6 of the LTP, which is replicated below as Figure 1. This area was initially classified in both the HSA and LTP as Class 3.



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



The HSA states that this area contained a parking area. It also discusses the potential for low levels of radiological contamination due to elevated environmental sample results from the 1970s. The elevated environmental samples appeared to have consisted primarily of tritium with the highest concentration (80 pCi/ml) found in the “south ditch.” The source was believed to be backup of the storm drains which tied into the south oil separator into which was also connected the fire sump system.

A characterization survey was performed in May and June of 2013 for the Class 3 survey unit 10221B. The following data was obtained:

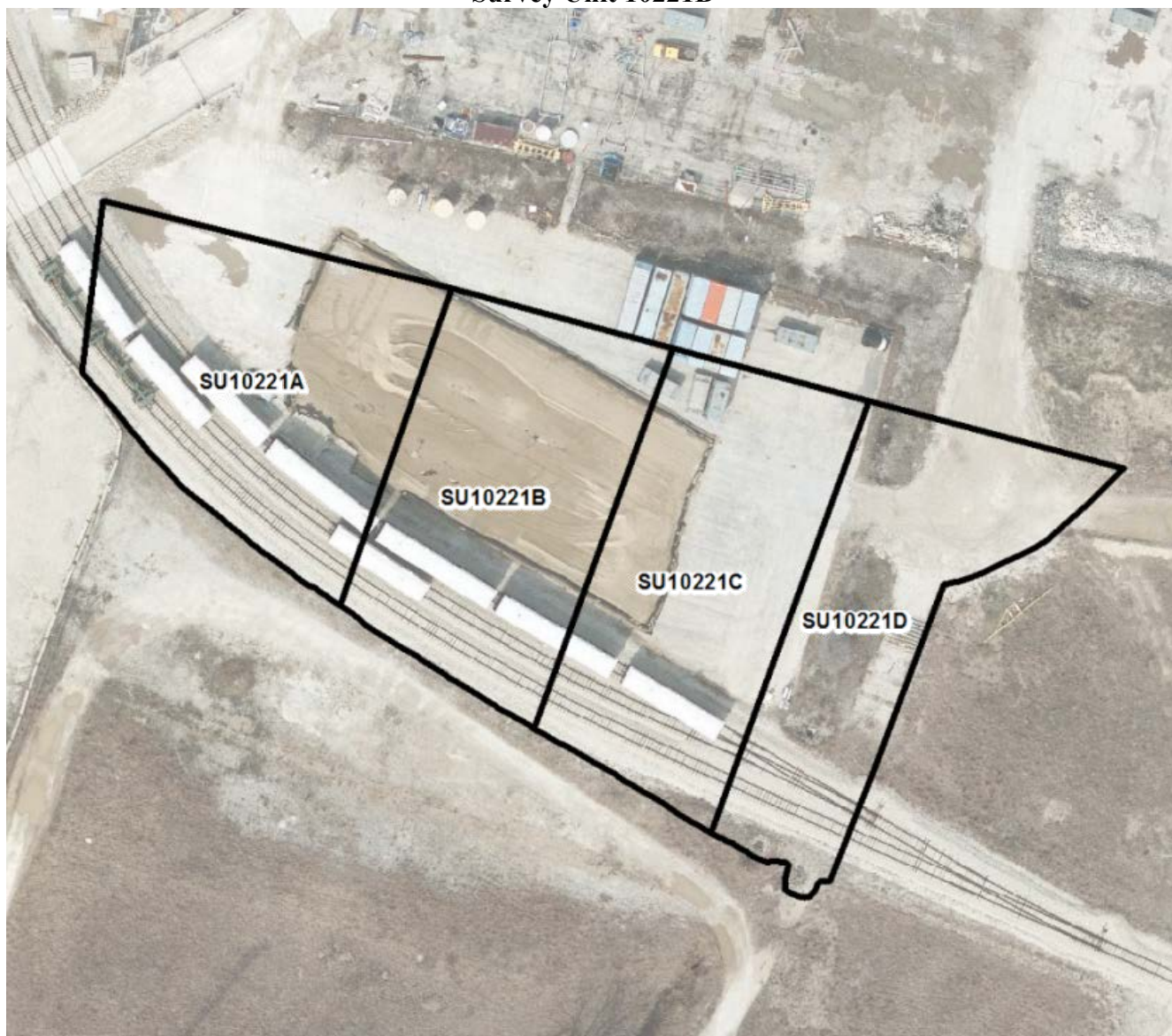
- Five (5) judgmental surface samples taken in the drainage ditch on the east side of the survey unit.
- Twenty (20) random surface samples and two (2) random subsurface samples.
- One (1) investigation surface sample and one (1) investigation subsurface sample taken in an area identified by a scan alarm.
- NaI walkover scans of approximately 26% of the survey unit.

The results of the characterization survey were:

- Two (2) of the five (5) judgmental surface samples were positive for Cs-137 with the highest activity being 0.068 pCi/g.
- All twenty (20) of the random surface samples and the two (2) random subsurface samples were less than the Minimum Detectable Concentration (MDC) for the Radionuclides of Concern (ROC).
- The one (1) investigation surface sample and one (1) investigation subsurface sample were both <MDC for the ROC.

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 10221B was reclassified as a Class 1 open land survey unit, and divided into 4 survey units: 10221A, 10221B, 10221C and 10221D to comply with the survey unit size recommendations from MARSSIM Section 4.6. Figure 2 below shows the boundaries of the resulting Class 1 survey units. The change in classification was a conservative response and ensured that the survey unit was surveyed with the appropriate rigor.

**Figure 2 - The Four Class 1 Open Land Survey Units Created from the Original Class 3 Survey Unit 10221B**



A Radiological Engineer (RE) and a Characterization/License Termination (C/LT) Supervisor performed a visual inspection and walk-down of the survey unit on May 7, 2019, prior to performing FSS. The purpose of the walk-down was to assess the physical condition of the survey unit, evaluate access points and travel paths and identify potentially hazardous conditions. A final classification assessment was performed in accordance with ZS-LT-300-001-002 as part of the survey design for FSS. The assessment confirmed that survey unit 10221D was correctly classified as Class 1.

#### 4. DATA QUALITY OBJECTIVES

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

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

The primary objective of the FSS sample plan is to demonstrate that the level of residual radioactivity in survey unit 10221D 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 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) <sup>(1)(2)</sup>
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 BcDCGL in this Release Record).

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

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

**Table 2 - Base Case DCGLs for Surface Soils (BcDCGL<sub>SS</sub>)**

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<sub>SB</sub>)**

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<sub>SS</sub>)**

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<sub>SB</sub>)**

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

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

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

As part of the DQOs applied to laboratory processes, analysis results were reported as actual calculated results. The actual recorded value was used as the recorded FSS result for measurement and/or sample values that are less than MDC. Negative values were recorded as “zero.” For radionuclides less than MDC, the value representing the highest abundance was selected. Results were not reported as “less than MDC.” Sample report summaries included

unique sample identification, analytical method, radionuclide, result, uncertainty, laboratory data qualifiers, units, and the observed MDC.

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

**5. SURVEY DESIGN**

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

The DQO process determined that Co-60, Ni-63, Sr-90, Cs-134 and Cs-137 would be the ROC in survey unit 10221D. During FSS, concentrations for Hard-to-Detect (HTD) ROC Ni-63 and Sr-90 were 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 TSD 14-019, “*Radionuclides of Concern for Soil and Basement Fill Model Source Terms,*” and are presented in Table 6. The maximum ratios will be used in the surrogate calculations during FSS unless area specific ratios are determined by continuing characterization.

**Table 6 - Surrogate Ratios**

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

For the FSS of survey unit 10221D, 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<sub>Sur</sub> = Surrogate radionuclide DCGL  
 DCGL<sub>2,3...n</sub> = DCGL for radionuclides to be represented by the surrogate  
 R<sub>n</sub> = 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<sub>EMC</sub> 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<sub>EMC</sub> 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 <sub>scan</sub> if MDC <sub>scan</sub> is greater than Operational DCGL	> Operational DCGL

The MDC<sub>scan</sub> for the 2350-1/44-10 was calculated using the methodology of ZionSolutions 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<sub>scan</sub> value was 3.75 pCi/g, which was greater than the calculated Surrogate DCGLs, therefore the scan investigation level was set at the MDC<sub>scan</sub> of the 2350-1/44-10. The collimator was used during the scan surveys to lower the background count rate.

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

The number of soil samples for FSS was determined in accordance with ZS-LT-300-001-001. The relative shift ( $\Delta/\sigma$ ) for the survey unit data set is defined as shift ( $\Delta$ ), 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 ( $\sigma$ ), which is the standard deviation of the data set used for survey design. The optimal value for  $\Delta/\sigma$  should range between one and three. The largest value the  $\Delta/\sigma$  can have is three. If the  $\Delta/\sigma$  exceeds three, then the value of three will

be used for  $\Delta/\sigma$ . For this survey design, a conservative estimate of the sample variability of 0.30 was used as the coefficient of variation to calculate  $\Delta/\sigma$ .

The calculated relative shift was 1.67. Both the Type I error, or  $\alpha$  value and the Type II error, or  $\beta$  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:  $A = \frac{A_{SU}}{N} = \frac{1697}{17} = 99.8 \text{ m}^2$
- From the LTP, Table 5-16, the Area Factors for the next larger area (100 m<sup>2</sup>) were used:
  - Cs-137 - 1.62
  - Cs-134 - 1.44
  - Co-60 - 1.29
- The  $DCGL_{EMC}$  is the Surrogate Base Case DCGL times the Area Factor:
  - The  $DCGL_{EMC}$  for Cs-137 = 1.62 \* 14.15 = 22.92 pCi/g
  - The  $DCGL_{EMC}$  for Cs-134 = 1.44 \* 6.77 = 9.75 pCi/g
  - The  $DCGL_{EMC}$  for Co-60 = 1.29 \* 3.51 = 4.53 pCi/g

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

The implementation of quality control (QC) measures as referenced by LTP, Section 5.9 and ZionSolutions procedure 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 (L1-10221D-FQGS-009-SS) was selected randomly for split sample analysis for the FSS of this survey unit. Two (2) additional QC samples (L1-10221D-QJGS-001-SS and L1-10221D-QIGS-013-SS) were collected as part of the investigations in the 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 L1-10221D-FSGS-001-SB and L1-10221D-FSGS-004-SB were selected for this survey unit.

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

**Table 8 - Systematic Sample Measurement Locations**

MEASUREMENT ID	NORTHING (meters)	EASTING (meters)
L1-10221D-FSGS-001-SS	641467.23	343592.71
L1-10221D-FSGS-002-SS	641476.53	343587.34
L1-10221D-FSGS-003-SS	641476.53	343598.08
L1-10221D-FSGS-004-SS	641485.83	343592.71
L1-10221D-FSGS-005-SS	641485.83	343603.45
L1-10221D-FSGS-006-SS	641495.12	343587.34
L1-10221D-FSGS-007-SS	641495.12	343598.08
L1-10221D-FSGS-008-SS	641504.42	343592.71
L1-10221D-FSGS-009-SS	641504.42	343603.45
L1-10221D-FSGS-010-SS	641513.72	343598.08
L1-10221D-FSGS-011-SS	641513.72	343608.81
L1-10221D-FSGS-012-SS	641523.02	343603.45
L1-10221D-FSGS-013-SS	641523.02	343614.18
L1-10221D-FSGS-014-SS	641523.02	343624.92
L1-10221D-FSGS-015-SS	641532.32	343608.81
L1-10221D-FSGS-016-SS	641532.32	343619.55
L1-10221D-FSGS-017-SS	641532.32	343630.29
L1-10221D-FSGS-001-SB	641467.23	343592.71
L1-10221D-FSGS-004-SB	641485.83	343592.71

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. One (1) systematic sample, one (1) judgmental sample and seventeen (17) investigation samples exceeded on OpSOF of 0.1 during the FSS of survey unit 10221D. The nineteen (19) samples are listed in Table 9 below along with their respective OpSOF.

**Table 9 - Samples selected for HTD Analysis**

Sample	OpSOF
L1-10221D-FSGS-008-SS	0.11
L1-10221D-FJGS-007-SS	2.82
L1-10221D-FIGS-001-SS	3.73
L1-10221D-FIGS-002-SS	2.79
L1-10221D-FIGS-003-SS	1.82
L1-10221D-FIGS-004-SS	2.14
L1-10221D-FIGS-005-SS	0.55
L1-10221D-FIGS-006-SS	0.12
L1-10221D-FIGS-007-SS	0.32
L1-10221D-FIGS-008-SS	0.28
L1-10221D-FIGS-010-SS	2.47
L1-10221D-FIGS-012-SS	0.11
L1-10221D-FIGS-013-SS	0.26
L1-10221D-QIGS-013-SS	0.20
L1-10221D-FIGS-014-SS	0.19
L1-10221D-FIGS-018-SS	0.13
L1-10221D-FIGS-021-SS	0.56
L1-10221D-FIGS-022-SS	0.74
L1-10221D-FIGS-010-SB	0.20

These nineteen (19) soil samples met the requirement that 10% of the samples collected for the FSS of survey unit 10221D 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 10 provides a synopsis of the survey design for survey unit 10221D.

**Table 10 - Synopsis of Survey Design**

FEATURE	DESIGN CRITERIA	BASIS
Survey Unit Area	1,697 m <sup>2</sup>	GPS measurements of area
Number of Surface Soil Samples	17 (Systematic)	<ul style="list-style-type: none"> <li>• <math>\sigma = 0.30</math></li> <li>• UBGR = SOF of 1</li> <li>• LBGR = SOF of 0.5</li> <li>• Type I error = 0.05</li> <li>• Type II error = 0.05</li> <li>• <math>\Delta/\sigma = 1.67</math></li> </ul> (MARSSIM Table 5.5)
Grid Spacing	10.7 m	(LTP, Section 5.6.4.5.2)
DCGLs	<ul style="list-style-type: none"> <li>• Co-60 – 1.091 pCi/g</li> <li>• Cs-134 – 1.733 pCi/g</li> <li>• Cs-137 – 3.630 pCi/g</li> <li>• Ni-63 – 914.458 pCi/g</li> <li>• Sr-90 – 3.095 pCi/g</li> </ul>	Operational DCGLs for Surface Soils, (LTP, Table 5-7)
HTD ROC Analysis	A minimum of two (2) soil samples selected for HTD ROC analysis	(LTP, Section 5.1)
Measurement Investigation Level	Operational DCGL	(LTP, Table 5-25)
Scan Survey Area Coverage	100%	(LTP, Table 5-24)
QC	One (1) surface soil sample selected randomly for split sample analysis 3 actually obtained (1 systematic, 2 judgmental/investigation)	(LTP, Section 5.9)
Number of Subsurface Soil Samples	Two (2) - systematic surface soil sample locations 1 and 4	(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 L1-10221D-F, which was developed in accordance with ZS-LT-300-001-001. 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 10221D, 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. Also, if during the performance of FSS, the analysis of a surface soil sample, or the results of a surface gamma scan indicated the potential presence of residual radioactivity at a concentration of 75% of the subsurface OpDCGL, then a biased subsurface soil sample(s) would have been taken to the appropriate depth within the area of concern as part of the investigation. An area of elevated activity above an OpSOF of 1.0 was discovered after collecting a judgmental surface soil sample, L1-10221D-FJGS-007-SS, in the drainage ditch on the south side of the railroad ballast at the discharge point of a steel culvert running under the ballast. During the investigation of this area, six (6) surface samples on the south side of the ballast and one (1) surface sample on the north side exceeded 75% of the subsurface OpDCGL. A biased subsurface sample, L1-10221D-FSGS-010-SB, was taken at the location of surface sample L1-10221D-FSGS-010-SS on the south side of the ballast. This was the only suitable location due to the remediation of the area exposing a metal scoop which extended from the steel culvert where the other five (5) surface samples which exceeded 75% of the subsurface OpDCGL were located. An additional biased subsurface sample, L1-10221D-FSGS-005-SB, was taken on the north side of the ballast directly north of the steel culvert (surface sample L1-10221D-FSGS-005-SS, which exceeded 75% of the subsurface OpDCGL, was located inside the steel culvert).

FSS field activities were conducted under FSS sample plan L1-10221D-F. A “Field Log” (ZS-LT-300-001-001, Attachment 14) was used to document field activities and other information pertaining to the performance of the FSS. FSS field activities were projected to take four (4) working days to complete. Daily briefings were conducted to discuss the expectations for job performance and to review safety aspects of the job. The survey required field activities were performed during normal working hours starting on May 14, 2019, and concluding on July 30, 2019.

The seventeen (17) systematic surface soil sample locations were marked with flags based on GPS coordinates provided by VSP. Two (2) samples were relocated because they fell on the railroad ballast, which consists of gravel and not soil. The relocated sample points are listed in Table 25 and are shown on the systematic sample map in Attachment 1 and the posting plot in Attachment 6.

Gamma scans were performed on 100% of the accessible surface area of the survey unit using a Ludlum 2350-1 paired with a Model 44-10 2”x 2” NaI detector operated in the rate-meter mode and using audio response. The probe was positioned within 2 inches to the ground and was moved at a scan speed of approximately 0.5 meters per second. No areas of elevated activity were detected on the scans.

Daily, prior to and following use, each detector was subjected to an Operational Response Check in accordance with ZionSolutions procedure ZS-RP-108-004-011, “Operation of the Ludlum Model 2350-1 Data Logger” (Reference 14). The daily Operational Response Check compared the background response and the response to check source ranges established for normal background and detector source response to ensure that the detector was working properly.

The instruments and detectors used for this survey are presented in Table 11. The instruments and detectors were verified to be properly calibrated prior to use.

**Table 11 - Instruments and Detectors**

<b>Instrument/Detector Type</b>	<b>Serial #</b>	<b>Calibration Due Date</b>
Ludlum 2350-1/Ludlum 44-10	304712/PR372143	12/18/2019
Ludlum 2350-1/Ludlum 44-10	304726/PR363452	09/06/2019
Ludlum 2350-1/Ludlum 44-10	304718/PR363311	12/13/2019
Ludlum 2350-1/Ludlum 44-10	266656/PR311750	01/08/20
Ludlum 2350-1/Ludlum 44-10	304708/PR321892	12/10/19
Ludlum 2350-1/Ludlum 44-10	266669/PR311756	12/12/19

In accordance with the survey design, seventeen (17) surface soil samples were collected at the designated systematic sample points along with two (2) subsurface samples taken at randomly selected locations. Six (6) judgmental surface samples were taken adjacent to the railroad ballast on both sides, and one (1) judgmental surface sample was taken on the south side of the railroad ballast at the discharge point of a steel culvert that runs under the ballast. Twenty-two (22) investigation surface samples were taken as part of the investigation and the subsequent remediation of the elevated activity at judgmental sample point #7. Two (2) subsurface samples were taken in two areas as a result of the surface sample activities exceeding 75% of the subsurface OpDCGLs.

Nineteen (19) samples were selected for HTD radionuclide analysis. One (1) surface soil sample (L1-10221D-FQGS-009-SS) was selected randomly for split sample analysis for the FSS of this survey unit. Two (2) additional QC samples (L1-10221D-QJGS-001-SS and L1-10221D-QIGS-013-SS) were collected as part of the investigations in the survey unit.



**7. SURVEY RESULTS**

One hundred percent (100%) of the accessible surface area of the survey unit was scanned for elevated radiation levels. Seventy-five (75) 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 12 provides an overview of the scan results. Complete scan results are provided in Attachment 2.

**Table 12 - Synopsis of Scan Results**

<b>Scan Area</b>	<b>Highest Logged Reading (cpm)</b>	<b>Action Level<sup>(1)</sup> (cpm)</b>	<b># of Scan Alarms</b>	<b>Investigation Samples</b>
Row 1	2655	2935	None	None
Row 2	2642	2935	None	None
Row 3	2631	2935	None	None
Row 4	2770	2935	None	None
Row 5	2841	2935	None	None
Row 6	2807	2935	None	None
Row 7	2729	2935	None	None
Row 8	2672	2935	None	None
Row 9	2613	2935	None	None
Row 10	2518	2699	None	None
Row 11	2375	2699	None	None
Row 12	2299	2699	None	None
Row 13	2277	2699	None	None
Row 14	2311	2699	None	None
Row 15	2118	2699	None	None
Row 16	2224	2699	None	None
Row 17	2168	2699	None	None
Row 18	2307	2699	None	None
Row 19	2296	2699	None	None
Row 20	2531	2699	None	None
Row 21	2541	2762	None	None
Row 22	2622	2689	None	None
Row 23	2601	2689	None	None
Row 24	2654	2689	None	None
Row 25	2594	2689	None	None
Row 26	2467	2689	None	None
Row 27	2521	2689	None	None
Row 28	2442	2689	None	None

**Table 12 (continued) - Synopsis of Scan Results**

<b>Scan Area</b>	<b>Highest Logged Reading (cpm)</b>	<b>Action Level<sup>(1)</sup> (cpm)</b>	<b># of Scan Alarms</b>	<b>Investigation Samples</b>
Row 29	2488	2689	None	None
Row 30	2490	2689	None	None
Row 31	2671	2762	None	None
Row 32	2506	2689	None	None
Row 33	2319	2689	None	None
Row 34	2492	2689	None	None
Row 35	2447	2689	None	None
Row 36	2302	2689	None	None
Row 37	2219	2689	None	None
Row 38	2487	2862	None	None
Row 39	2356	2862	None	None
Row 40	2365	2862	None	None
Row 41	2508	2862	None	None
Row 42	2481	2862	None	None
Row 43	2486	2862	None	None
Row 44	2379	2862	None	None
Row 45	2351	2862	None	None
Row 46	2442	2862	None	None
Row 47	2353	2862	None	None
Row 48	2429	2862	None	None
Row 49	2493	2668	None	None
Row 50	2399	2862	None	None
Row 51	2295	2862	None	None
Row 52	2278	2862	None	None
Row 53	2404	2862	None	None
Row 54	2313	2862	None	None
Row 55	2314	2862	None	None
Row 56	1783	1841	None	None
Row 57	1520	1841	None	None
Row 58	1457	1841	None	None
Row 59	1447	1841	None	None
Row 60	1536	1841	None	None
Row 61	1424	1841	None	None
Row 62	1465	1841	None	None
Row 63	1442	1841	None	None

**Table 12 (continued) - Synopsis of Scan Results**

Scan Area	Highest Logged Reading (cpm)	Action Level <sup>(1)</sup> (cpm)	# of Scan Alarms	Investigation Samples
Row 64	1650	1841	None	None
Row 65	1902	2259	None	None
Row 66	1919	2259	None	None
Row 67	2084	2259	None	None
Row 68	2038	2259	None	None
Row 69	2123	2259	None	None
Row 70	3745	4296	None	None
Row 71	2091	2259	None	None
Row 72	2179	2259	None	None
Row 73	2142	2259	None	None
Row 74	2233	2259	None	None
Row 75	2153	2259	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) systematic surface soil samples taken for non-parametric statistical testing, the twenty-nine (29) biased surface soil samples (investigation and judgmental) and the four (4) subsurface soil samples were analyzed using the on-site gamma spectroscopy system. Summaries of the sample analysis results are provided in Tables 13, 14 and 15, respectively. The basic statistics for the systematic sample population are summarized in Table 22. For the systematic samples, the gamma spectroscopy results revealed five (5) samples with activity levels above MDC for Cs-137 and no samples with activity levels above 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 systematic sample population indicated that Cs-137 was present at levels lower than the concentrations of Cs-137 expected to be found in off-site soil in the vicinity of the ZNPS as presented in *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 13 - Summary of Gamma Spectroscopy Results for Surface Soil Samples Comprising the Statistical Sample Population**

MEASUREMENT ID	Co-60 <sup>(1)</sup> (pCi/g)	Cs-134 <sup>(1)</sup> (pCi/g)	Cs-137 <sup>(1)</sup> (pCi/g)	Ni-63 <sup>(2)</sup> (pCi/g)	Sr-90 <sup>(2)</sup> (pCi/g)
L1-10221D-FSGS-001-SS	4.18E-02	0.00E+00	0.00E+00	7.54E+00	0.00E+00
L1-10221D-FSGS-002-SS	9.58E-03	4.51E-03	2.76E-02	1.73E+00	5.52E-05
L1-10221D-FSGS-003-SS	1.49E-02	2.46E-02	1.87E-02	2.69E+00	3.74E-05
L1-10221D-FSGS-004-SS	2.48E-02	0.00E+00	5.61E-02	4.48E+00	1.12E-04
L1-10221D-FSGS-005-SS	7.78E-03	0.00E+00	3.44E-02	1.40E+00	6.88E-05
L1-10221D-FSGS-006-SS	2.61E-02	1.08E-02	<b>7.40E-02</b>	4.71E+00	1.48E-04
L1-10221D-FSGS-007-SS	4.45E-02	4.55E-03	1.88E-03	8.03E+00	3.76E-06
L1-10221D-FSGS-008-SS	2.92E-02	2.59E-02	<b>2.28E-01</b>	5.27E+00	4.56E-04
L1-10221D-FSGS-009-SS	2.39E-02	0.00E+00	0.00E+00	4.31E+00	0.00E+00
L1-10221D-FSGS-010-SS	2.84E-02	1.62E-02	<b>9.25E-02</b>	5.12E+00	1.85E-04
L1-10221D-FSGS-011-SS	3.79E-02	2.96E-02	2.99E-02	6.84E+00	5.98E-05
L1-10221D-FSGS-012-SS	3.14E-02	9.18E-03	<b>5.25E-02</b>	5.67E+00	1.05E-04
L1-10221D-FSGS-013-SS	2.49E-02	2.73E-02	1.59E-02	4.49E+00	3.18E-05
L1-10221D-FSGS-014-SS	2.43E-02	8.22E-03	1.32E-02	4.38E+00	2.64E-05
L1-10221D-FSGS-015-SS	2.99E-02	2.79E-02	<b>4.25E-02</b>	5.40E+00	8.50E-05
L1-10221D-FSGS-016-SS	0.00E+00	0.00E+00	1.66E-02	0.00E+00	3.32E-05
L1-10221D-FSGS-017-SS	0.00E+00	0.00E+00	3.69E-02	0.00E+00	7.38E-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 14 - Summary of Gamma Spectroscopy Results for the Biased Samples**

MEASUREMENT ID	Co-60 <sup>(1)</sup> (pCi/g)	Cs-134 <sup>(1)</sup> (pCi/g)	Cs-137 <sup>(1)</sup> (pCi/g)	Ni-63 <sup>(2)</sup> (pCi/g)	Sr-90 <sup>(2)</sup> (pCi/g)
L1-10221D-FJGS-001-SS	1.09E-03	0.00E+00	1.01E-02	1.97E-01	2.02E-05
L1-10221D-FJGS-002-SS	1.22E-02	9.06E-03	<b>4.52E-02</b>	2.20E+00	9.04E-05
L1-10221D-FJGS-003-SS	1.95E-02	2.85E-02	0.00E+00	3.52E+00	0.00E+00
L1-10221D-FJGS-004-SS	2.36E-02	1.01E-02	4.52E-02	4.26E+00	9.04E-05
L1-10221D-FJGS-005-SS	1.84E-03	0.00E+00	1.73E-02	3.32E-01	3.46E-05
L1-10221D-FJGS-006-SS	0.00E+00	2.54E-02	4.70E-02	0.00E+00	9.40E-05
L1-10221D-FJGS-007-SS	<b>1.07E+00</b>	1.32E-01	<b>5.62E+00</b>	1.93E+02	1.12E-02
L1-10221D-FJGS-001-SS	<b>1.58E+00</b>	4.79E-02	<b>7.03E+00</b>	2.85E+02	1.41E-02
L1-10221D-FJGS-002-SS	<b>1.05E+00</b>	6.18E-02	<b>5.75E+00</b>	1.89E+02	1.15E-02
L1-10221D-FJGS-003-SS	<b>7.11E-01</b>	8.08E-03	<b>3.70E+00</b>	1.28E+02	7.40E-03

**Table 14 (continued) - Summary of Gamma Spectroscopy Results for the Biased Samples**

MEASUREMENT ID	Co-60 <sup>(1)</sup> (pCi/g)	Cs-134 <sup>(1)</sup> (pCi/g)	Cs-137 <sup>(1)</sup> (pCi/g)	Ni-63 <sup>(2)</sup> (pCi/g)	Sr-90 <sup>(2)</sup> (pCi/g)
L1-10221D-FIGS-004-SS	<b>8.46E-01</b>	3.52E-02	<b>4.26E+00</b>	1.53E+02	8.52E-03
L1-10221D-FIGS-005-SS	<b>2.55E-01</b>	0.00E+00	<b>9.59E-01</b>	4.60E+01	1.92E-03
L1-10221D-FIGS-006-SS	3.70E-02	8.65E-03	<b>2.60E-01</b>	6.68E+00	5.20E-04
L1-10221D-FIGS-007-SS	<b>1.01E-01</b>	4.32E-02	<b>6.53E-01</b>	1.82E+01	1.31E-03
L1-10221D-FIGS-008-SS	1.28E-01	4.86E-02	<b>3.90E-01</b>	2.31E+01	7.80E-04
L1-10221D-FIGS-009-SS	3.10E-02	2.02E-02	<b>1.20E-01</b>	5.59E+00	2.40E-04
L1-10221D-FIGS-010-SS	<b>1.23E+00</b>	1.91E-03	<b>3.97E+00</b>	2.22E+02	7.94E-03
L1-10221D-FIGS-011-SS	3.39E-03	2.48E-02	3.82E-02	6.12E-01	7.64E-05
L1-10221D-FIGS-012-SS	5.20E-02	3.13E-02	<b>1.27E-01</b>	9.38E+00	2.54E-04
L1-10221D-FIGS-013-SS	6.20E-02	6.18E-02	<b>5.75E-01</b>	1.12E+01	1.15E-03
L1-10221D-FIGS-014-SS	6.89E-02	4.22E-02	<b>3.21E-01</b>	1.24E+01	6.42E-04
L1-10221D-FIGS-015-SS	4.90E-02	0.00E+00	1.31E-02	8.84E+00	2.62E-05
L1-10221D-FIGS-016-SS	4.11E-03	3.24E-02	2.63E-02	7.42E-01	5.26E-05
L1-10221D-FIGS-017-SS	3.32E-02	4.14E-03	<b>9.52E-02</b>	5.99E+00	1.90E-04
L1-10221D-FIGS-018-SS	7.29E-02	3.34E-02	<b>1.14E-01</b>	1.32E+01	2.28E-04
L1-10221D-FIGS-019-SS	0.00E+00	3.00E-02	3.23E-02	0.00E+00	6.46E-05
L1-10221D-FIGS-020-SS	2.44E-02	2.11E-02	4.24E-02	4.40E+00	8.48E-05
L1-10221D-FIGS-021-SS	<b>1.66E-01</b>	1.10E-03	<b>1.34E+00</b>	3.00E+01	2.68E-03
L1-10221D-FIGS-022-SS	<b>3.10E-01</b>	5.83E-02	<b>1.32E+00</b>	5.59E+01	2.64E-03

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

**Table 15 - Summary of Gamma Spectroscopy Results for Subsurface Soil Samples**

MEASUREMENT ID	Co-60 <sup>(1)</sup> (pCi/g)	Cs-134 <sup>(1)</sup> (pCi/g)	Cs-137 <sup>(1)</sup> (pCi/g)	Ni-63 <sup>(2)</sup> (pCi/g)	Sr-90 <sup>(2)</sup> (pCi/g)
L1-10221D-FSGS-001-SB	2.12E-02	0.00E+00	3.22E-02	3.83E+00	6.44E-05
L1-10221D-FSGS-004-SB	1.99E-02	9.56E-03	3.16E-02	3.59E+00	6.32E-05
L1-10221D-FIGS-005-SB	2.20E-02	1.63E-02	5.10E-02	3.97E+00	1.02E-04
L1-10221D-FIGS-010-SB	<b>4.49E-02</b>	0.00E+00	<b>2.02E-01</b>	8.10E+00	4.04E-04

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

The off-site laboratory, Eberline Analytical, processed the nineteen (19) samples selected for HTD ROC analysis as listed in Table 9. Only HTD radionuclides included as ROC (Ni-63 and Sr-90 for soils) were included in the analysis. All analyses met the required MDC. Co-60 and Ni-63 were positively detected in three (3) samples at a concentration greater than MDC. The highest HTD to surrogate ratio of the three (3) samples was 3.443 (see sample L1-10221D-FIGS-002SS-

A) which is well below the maximum Ni-63/Co-60 ratio of 180.450 listed in Table 6. The off-site analysis results are provided in Table 16.

**Table 16 - Off-Site Analysis Results**

**Sample # L1-10221D-FSGS-008-SS-A**

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	8.10E-02	4.75E-02	1.22E-01	No
Cs-134	2.16E-02	2.85E-02	1.05E-01	No
Cs-137	4.09E-01	9.67E-02	2.10E-01	Yes
Ni-63	-3.53E-01	1.88E+00	3.26E+00	No
Sr-90	3.92E-01	4.03E-01	8.20E-01	No

**Sample # L1-10221D-FJGS-007-SS-A**

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	2.16E+00	2.38E-01	2.65E-01	Yes
Cs-134	3.45E-02	9.81E-02	2.43E-01	No
Cs-137	1.06E+01	1.22E+00	4.28E-01	Yes
Ni-63	3.04E+00	2.13E+00	3.52E+00	No
Sr-90	7.41E-01	3.63E-01	8.34E-01	No

**Sample # L1-10221D-FIGS-001-SS-A**

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	3.10E+00	3.30E-01	3.03E-01	Yes
Cs-134	1.17E-02	6.03E-02	2.09E-01	No
Cs-137	1.20E+01	1.16E+00	3.04E-01	Yes
Ni-63	6.56E+00	2.03E+00	3.17E+00	Yes
Sr-90	2.13E-01	3.20E-01	6.60E-01	No

**Sample # L1-10221D-FIGS-002-SS-A**

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	2.21E+00	2.22E-01	1.69E-01	Yes
Cs-134	3.17E-02	5.28E-02	1.05E-01	No
Cs-137	1.11E+01	1.26E+00	2.41E-01	Yes
Ni-63	7.61E+00	1.99E+00	3.04E+00	Yes
Sr-90	3.26E-02	3.99E-01	8.50E-01	No

**Table 16 (continued) -Off-Site Analysis Results**

**Sample # L1-10221D-FIGS-003-SS-A**

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	1.26E+00	2.26E-01	2.60E-01	Yes
Cs-134	-4.99E-01	2.71E-01	2.64E-01	No
Cs-137	8.02E+00	9.86E-01	3.16E-01	Yes
Ni-63	3.70E+00	1.84E+00	2.99E+00	Yes
Sr-90	6.97E-01	3.66E-01	7.06E-01	No

**Sample # L1-10221D-FIGS-004-SS-A**

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	2.28E+00	2.45E-01	2.29E-01	Yes
Cs-134	7.64E-03	4.93E-02	1.10E-01	No
Cs-137	9.65E+00	1.12E+00	2.84E-01	Yes
Ni-63	7.63E-01	2.14E+00	3.65E+00	No
Sr-90	1.98E-01	3.63E-01	9.06E-01	No

**Sample # L1-10221D-FIGS-005-SS-A**

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	2.58E-01	6.06E-02	4.98E-02	Yes
Cs-134	-8.27E-03	2.05E-02	6.88E-02	No
Cs-137	1.39E+00	2.09E-01	1.48E-01	Yes
Ni-63	2.33E+00	2.04E+00	3.40E+00	No
Sr-90	1.84E-01	3.61E-01	7.52E-01	No

**Sample # L1-10221D-FIGS-006-SS-A**

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	2.01E-01	1.39E-01	2.37E-01	No
Cs-134	5.54E-02	5.45E-02	1.79E-01	No
Cs-137	8.30E-01	1.70E-01	1.40E-01	Yes
Ni-63	7.33E-01	1.96E+00	3.34E+00	No
Sr-90	1.68E-01	2.90E-01	6.01E-01	No

**Table 16 (continued) -Off-Site Analysis Results**

**Sample # L1-10221D-FIGS-007-SS-A**

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	1.93E-01	1.56E-01	2.84E-01	No
Cs-134	-3.13E-02	4.76E-02	1.58E-01	No
Cs-137	1.22E+00	1.88E-01	3.59E-01	Yes
Ni-63	1.82E+00	2.08E+00	3.49E+00	No
Sr-90	4.47E-01	2.81E-01	5.52E-01	No

**Sample # L1-10221D-FIGS-008-SS-A**

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	1.68E-01	7.73E-02	1.33E-01	Yes
Cs-134	-1.07E-01	7.61E-02	9.47E-02	No
Cs-137	9.93E-01	1.63E-01	1.94E-01	Yes
Ni-63	7.09E-01	1.92E+00	3.27E+00	No
Sr-90	5.25E-01	3.38E-01	6.57E-01	No

**Sample # L1-10221D-FIGS-010-SS-A**

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	1.90E+00	2.34E-01	2.06E-01	Yes
Cs-134	-2.08E-02	8.08E-02	2.41E-01	No
Cs-137	8.29E+00	9.80E-01	4.18E-01	Yes
Ni-63	2.67E+00	2.12E+00	3.53E+00	No
Sr-90	4.57E-01	4.70E-01	1.14E+00	No

**Sample # L1-10221D-FIGS-012-SS-A**

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	7.69E-02	4.95E-02	1.12E-01	No
Cs-134	-1.64E-01	8.20E-02	7.40E-02	No
Cs-137	2.42E-01	7.93E-02	1.11E-01	Yes
Ni-63	6.45E+00	2.00E+00	3.11E+00	Yes
Sr-90	0.00E+00	3.63E-01	7.76E-01	No



**Table 16 (continued) -Off-Site Analysis Results**

**Sample # L1-10221D-FIGS-013-SS-A**

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	1.91E-01	9.78E-02	2.07E-01	No
Cs-134	2.47E-02	5.54E-02	1.51E-01	No
Cs-137	1.08E+00	2.06E-01	2.03E-01	Yes
Ni-63	-1.13E+00	2.07E+00	3.61E+00	No
Sr-90	-2.51E-01	3.85E-01	1.02E+00	No

**Sample # L1-10221D-QIGS-013-SS-A**

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	1.42E-01	7.86E-02	1.46E-01	No
Cs-134	-1.05E-02	3.05E-02	9.66E-02	No
Cs-137	6.57E-01	1.17E-01	1.18E-01	Yes
Ni-63	-1.24E+00	1.93E+00	3.39E+00	No
Sr-90	-2.54E-01	4.10E-01	1.08E+00	No

**Sample # L1-10221D-FIGS-014-SS-A**

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	6.43E-02	4.09E-02	1.01E-01	No
Cs-134	7.17E-03	2.18E-02	5.12E-02	No
Cs-137	4.74E-01	9.73E-02	1.02E-01	Yes
Ni-63	-1.05E+00	1.92E+00	3.37E+00	No
Sr-90	3.49E-01	3.29E-01	7.96E-01	No

**Sample # L1-10221D-FIGS-018-SS-A**

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	2.75E-01	6.17E-02	1.04E-01	Yes
Cs-134	1.05E-02	2.56E-02	5.31E-02	No
Cs-137	1.86E-01	7.19E-02	1.02E-01	Yes
Ni-63	-2.87E-01	2.12E+00	3.66E+00	No
Sr-90	2.38E-01	3.78E-01	9.38E-01	No

**Table 16 (continued) -Off-Site Analysis Results**

**Sample # L1-10221D-FIGS-021-SS-A**

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	3.75E-01	7.71E-02	1.23E-01	Yes
Cs-134	6.56E-03	2.28E-02	7.06E-02	No
Cs-137	2.41E+00	3.09E-01	1.07E-01	Yes
Ni-63	2.67E+00	1.87E+00	3.09E+00	No
Sr-90	-2.67E-01	3.28E-01	7.34E-01	No

**Sample # L1-10221D-FIGS-022-SS-A**

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	5.95E+00	5.64E-01	2.67E-01	Yes
Cs-134	3.88E-02	5.78E-02	1.66E-01	No
Cs-137	2.56E+00	3.13E-01	2.39E-01	Yes
Ni-63	2.44E+00	1.83E+00	3.02E+00	No
Sr-90	-3.22E-01	3.29E-01	7.37E-01	No

**Sample # L1-10221D-FIGS-010-SB-A**

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	4.32E-01	1.10E-01	1.69E-01	Yes
Cs-134	6.10E-03	3.88E-02	1.09E-01	No
Cs-137	3.53E-01	8.66E-02	2.25E-01	Yes
Ni-63	-4.60E-01	1.94E+00	3.36E+00	No
Sr-90 <sup>(1)</sup>	2.11E-02	3.05E-02	6.29E-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 (L1-10221D-FQGS-009-SS) and two (2) biased samples (L1-10221D-QJGS-001-SS and L1-10221D-QIGS-013-SS) for “split sample” analysis. The on-site laboratory analyzed the designated QC samples using the on-site gamma spectroscopy system. Gamma spectroscopy results are summarized in Table 17. The concentrations for Ni-63 and Sr-90 were inferred based on the maximum ratios as specified in Table 6.

**Table 17 - Summary of Gamma Spectroscopy Results for QC Surface Soil Samples**

MEASUREMENT ID	Co-60 <sup>(1)</sup> (pCi/g)	Cs-134 <sup>(1)</sup> (pCi/g)	Cs-137 <sup>(1)</sup> (pCi/g)	Ni-63 <sup>(2)</sup> (pCi/g)	Sr-90 <sup>(2)</sup> (pCi/g)
L1-10221D-FQGS-009-SS	4.23E-02	2.19E-02	1.37E-02	7.63E+00	2.74E-05
L1-10221D-QJGS-001-SS	1.03E-02	1.81E-02	3.87E-03	1.86E+00	7.74E-06
L1-10221D-QIGS-013-SS	9.04E-02	2.20E-02	<b>3.23E-01</b>	1.63E+01	6.46E-04

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

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

**Equation 6**

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

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 10221D are provided in Table 18. The results of the unity rule calculations for the ROC for the biased samples are provided in Table 19, the results for the subsurface samples are provided in Table 20, and the results for the QC samples are presented in Table 21.

**Table 18 - 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	
L1-10221D-FSGS-001-SS	3.83E-02	0.00E+00	0.00E+00	8.25E-03	0.00E+00	0.047
L1-10221D-FSGS-002-SS	8.78E-03	2.60E-03	7.60E-03	1.89E-03	1.78E-05	0.021
L1-10221D-FSGS-003-SS	1.37E-02	1.42E-02	5.15E-03	2.94E-03	1.21E-05	0.036
L1-10221D-FSGS-004-SS	2.27E-02	0.00E+00	1.55E-02	4.89E-03	3.63E-05	0.043
L1-10221D-FSGS-005-SS	7.13E-03	0.00E+00	9.48E-03	1.54E-03	2.22E-05	0.018
L1-10221D-FSGS-006-SS	2.39E-02	6.23E-03	2.04E-02	5.15E-03	4.78E-05	0.056
L1-10221D-FSGS-007-SS	4.08E-02	2.63E-03	5.18E-04	8.78E-03	1.21E-06	0.053
L1-10221D-FSGS-008-SS	2.68E-02	1.49E-02	6.28E-02	5.76E-03	1.47E-04	0.110
L1-10221D-FSGS-009-SS	2.19E-02	0.00E+00	0.00E+00	4.72E-03	0.00E+00	0.027
L1-10221D-FSGS-010-SS	2.60E-02	9.35E-03	2.55E-02	5.60E-03	5.98E-05	0.067

**Table 18 (continued) - 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	
L1-10221D-FSGS-011-SS	3.47E-02	1.71E-02	8.24E-03	7.48E-03	1.93E-05	0.068
L1-10221D-FSGS-012-SS	2.88E-02	5.30E-03	1.45E-02	6.20E-03	3.39E-05	0.055
L1-10221D-FSGS-013-SS	2.28E-02	1.58E-02	4.38E-03	4.91E-03	1.03E-05	0.048
L1-10221D-FSGS-014-SS	2.23E-02	4.74E-03	3.64E-03	4.80E-03	8.53E-06	0.035
L1-10221D-FSGS-015-SS	2.74E-02	1.61E-02	1.17E-02	5.90E-03	2.75E-05	0.061
L1-10221D-FSGS-016-SS	0.00E+00	0.00E+00	4.57E-03	0.00E+00	1.07E-05	0.005
L1-10221D-FSGS-017-SS	0.00E+00	0.00E+00	1.02E-02	0.00E+00	2.38E-05	0.010

**Systematic Measurements**

Number of Systematic Measurements =	17
# of Systematic Measurements with OpSOF ≥ 1 =	0
# of Systematic Measurements with OpSOF > 0.1 (HTD Assessment) =	1
Max Individual Systematic Measurement OpSOF =	0.110
Mean Systematic Measurement OpSOF =	0.045

**Table 19 - Sum of Fractions for the Biased 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	
L1-10221D-FJGS-001-SS	9.99E-04	0.00E+00	2.78E-03	2.15E-04	6.53E-06	0.004
L1-10221D-FJGS-002-SS	1.12E-02	5.23E-03	1.25E-02	2.41E-03	2.92E-05	0.031
L1-10221D-FJGS-003-SS	1.79E-02	1.64E-02	0.00E+00	3.85E-03	0.00E+00	0.038
L1-10221D-FJGS-004-SS	2.16E-02	5.83E-03	1.25E-02	4.66E-03	2.92E-05	0.045
L1-10221D-FJGS-005-SS	1.69E-03	0.00E+00	4.77E-03	3.63E-04	1.12E-05	0.007
L1-10221D-FJGS-006-SS	0.00E+00	1.47E-02	1.29E-02	0.00E+00	3.04E-05	0.028
L1-10221D-FJGS-007-SS	9.81E-01	7.62E-02	1.55E+00	2.11E-01	3.63E-03	2.820
L1-10221D-FIGS-001-SS	1.45E+00	2.76E-02	1.94E+00	3.12E-01	4.54E-03	3.729
L1-10221D-FIGS-002-SS	9.62E-01	3.57E-02	1.58E+00	2.07E-01	3.72E-03	2.793
L1-10221D-FIGS-003-SS	6.52E-01	4.66E-03	1.02E+00	1.40E-01	2.39E-03	1.818
L1-10221D-FIGS-004-SS	7.75E-01	2.03E-02	1.17E+00	1.67E-01	2.75E-03	2.139
L1-10221D-FIGS-005-SS	2.34E-01	0.00E+00	2.64E-01	5.03E-02	6.20E-04	0.549
L1-10221D-FIGS-006-SS	3.39E-02	4.99E-03	7.16E-02	7.30E-03	1.68E-04	0.118
L1-10221D-FIGS-007-SS	9.26E-02	2.49E-02	1.80E-01	1.99E-02	4.22E-04	0.318
L1-10221D-FIGS-008-SS	1.17E-01	2.80E-02	1.07E-01	2.53E-02	2.52E-04	0.278
L1-10221D-FIGS-009-SS	2.84E-02	1.17E-02	3.31E-02	6.12E-03	7.75E-05	0.079
L1-10221D-FIGS-010-SS	1.13E+00	1.10E-03	1.09E+00	2.43E-01	2.57E-03	2.467

**Table 19 (continued) - Sum of Fractions for the Biased 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	
L1-10221D-FIGS-011-SS	3.11E-03	1.43E-02	1.05E-02	6.69E-04	2.47E-05	0.029
L1-10221D-FIGS-012-SS	4.77E-02	1.81E-02	3.50E-02	1.03E-02	8.21E-05	0.111
L1-10221D-FIGS-013-SS	5.68E-02	3.57E-02	1.58E-01	1.22E-02	3.72E-04	0.263
L1-10221D-FIGS-014-SS	6.32E-02	2.44E-02	8.84E-02	1.36E-02	2.07E-04	0.190
L1-10221D-FIGS-015-SS	4.49E-02	0.00E+00	3.61E-03	9.67E-03	8.47E-06	0.058
L1-10221D-FIGS-016-SS	3.77E-03	1.87E-02	7.25E-03	8.11E-04	1.70E-05	0.031
L1-10221D-FIGS-017-SS	3.04E-02	2.39E-03	2.62E-02	6.55E-03	6.15E-05	0.066
L1-10221D-FIGS-018-SS	6.68E-02	1.93E-02	3.14E-02	1.44E-02	7.37E-05	0.132
L1-10221D-FIGS-019-SS	0.00E+00	1.73E-02	8.90E-03	0.00E+00	2.09E-05	0.026
L1-10221D-FIGS-020-SS	2.24E-02	1.22E-02	1.17E-02	4.81E-03	2.74E-05	0.051
L1-10221D-FIGS-021-SS	1.52E-01	6.35E-04	3.69E-01	3.28E-02	8.66E-04	0.556
L1-10221D-FIGS-022-SS	2.84E-01	3.36E-02	3.64E-01	6.12E-02	8.53E-04	0.743

**Table 20 - Sum of Fractions for the 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	
L1-10221D-FSGS-001-SB	2.41E-02	0.00E+00	1.62E-02	1.96E-02	1.52E-04	0.060
L1-10221D-FSGS-004-SB	2.26E-02	8.41E-03	1.59E-02	1.84E-02	1.49E-04	0.065
L1-10221D-FIGS-005-SB	2.50E-02	1.43E-02	2.57E-02	2.03E-02	2.40E-04	0.086
L1-10221D-FIGS-010-SB	5.10E-02	0.00E+00	1.02E-01	4.15E-02	9.51E-04	0.195

**Table 21 - 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	
L1-10221D-FQGS-009-SS	3.88E-02	1.26E-02	3.77E-03	8.35E-03	8.85E-06	0.064
L1-10221D-QJGS-001-SS	9.44E-03	1.04E-02	1.07E-03	2.03E-03	2.50E-06	0.023
L1-10221D-QIGS-013-SS	8.29E-02	1.27E-02	8.90E-02	1.78E-02	2.09E-04	0.203

**Table 22 - 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	2.35E-02	2.49E-02	4.45E-02	0.00E+00	0.013	4.26	5.51E-03	1.38E-01
Cs-134	1.11E-02	8.22E-03	2.96E-02	0.00E+00	0.012	6.77	1.64E-03	4.10E-02
Cs-137	4.36E-02	2.99E-02	2.28E-01	0.00E+00	0.054	14.18	3.07E-03	7.68E-02
Ni-63	4.24E+00	4.49E+00	8.03E+00	0.00E+00	2.376	3572.1	1.19E-03	2.97E-02
Sr-90	8.71E-05	5.98E-05	4.56E-04	0.00E+00	0.000	12.09	7.21E-06	1.80E-04

The mean BcSOF for survey unit 10221D is 0.011, which equates to a dose of 0.286 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 from the systematic sample population, L1-10221D-FQGS-009-SS, and two (2) split samples from the biased samples, L1-10221D-QJGS-001-SS and L1-10221D-QIGS-013-SS, using gamma spectroscopy analysis. The data was evaluated using acceptance criteria specified in ZS-LT-01.

For L1-10221D-QIGS-0013-SS there was not acceptable agreement between field split results when using Cs-137 due to the fact that it is present in the samples at relatively low concentrations. However, when using K-40 (which is present in the samples at higher concentrations), there was acceptable agreement. No further action was deemed necessary.

For the remaining samples, there was acceptable agreement between the field split results. Refer to Attachment 5 for data and QC analysis results.

## 9. INVESTIGATIONS AND RESULTS

An area of elevated activity above an OpSOF of 1.0 was discovered after collecting a judgmental surface soil sample, L1-10221D-FJGS-007-SS, in the drainage ditch on the south side of the railroad ballast at the discharge point of a steel culvert running under the ballast. The OpSOF for sample L1-10221D-FJGS-007-SS was 2.820. From June 27, 2019 to July 11, 2019, seventeen (17) investigation surface samples (L1-10221D-FIGS-001-SS to L1-10221D-FIGS-017-SS) were taken to bound the area of elevated activity. Five (5) of the investigation samples (L1-10221D-FIGS-001-SS, L1-10221D-FIGS-002-SS, L1-10221D-FIGS-003-SS, L1-10221D-FIGS-004-SS and L1-10221D-FIGS-010-SS) also had activity above an OpSOF of 1.0: 3.729, 2.793, 1.818, 2.139 and 2.467, respectively. The remaining samples were all below an OpSOF of 1.0.

The elevated area extended into survey unit 10220I where a separate investigation was performed.

The bounded area was designated as Elevated Area #1 as documented in an Attachment 13 (from ZS-LT-300-001-004), “*Final Status Survey Investigation.*” The area was calculated to be approximately 10 m<sup>2</sup> based on the GPS coordinates of the bounding samples. The average OpSOF in the bounded area was 2.628.

The calculated DCGL<sub>EMC</sub> values are shown in the following table:

**Table 23 - DCGL<sub>EMC</sub> Values for a 10 m<sup>2</sup> Area**

<b>DCGL<sub>EMC</sub> Values for a 10 m<sup>2</sup> Area</b>				
<b>Co-60</b>	<b>Cs-134</b>	<b>Cs-137</b>	<b>Ni-63</b>	<b>Sr-90</b>
<b>pCi/g</b>	<b>pCi/g</b>	<b>pCi/g</b>	<b>pCi/g</b>	<b>pCi/g</b>
10.52	18.41	43.39	2.94E+06	1.25E+03

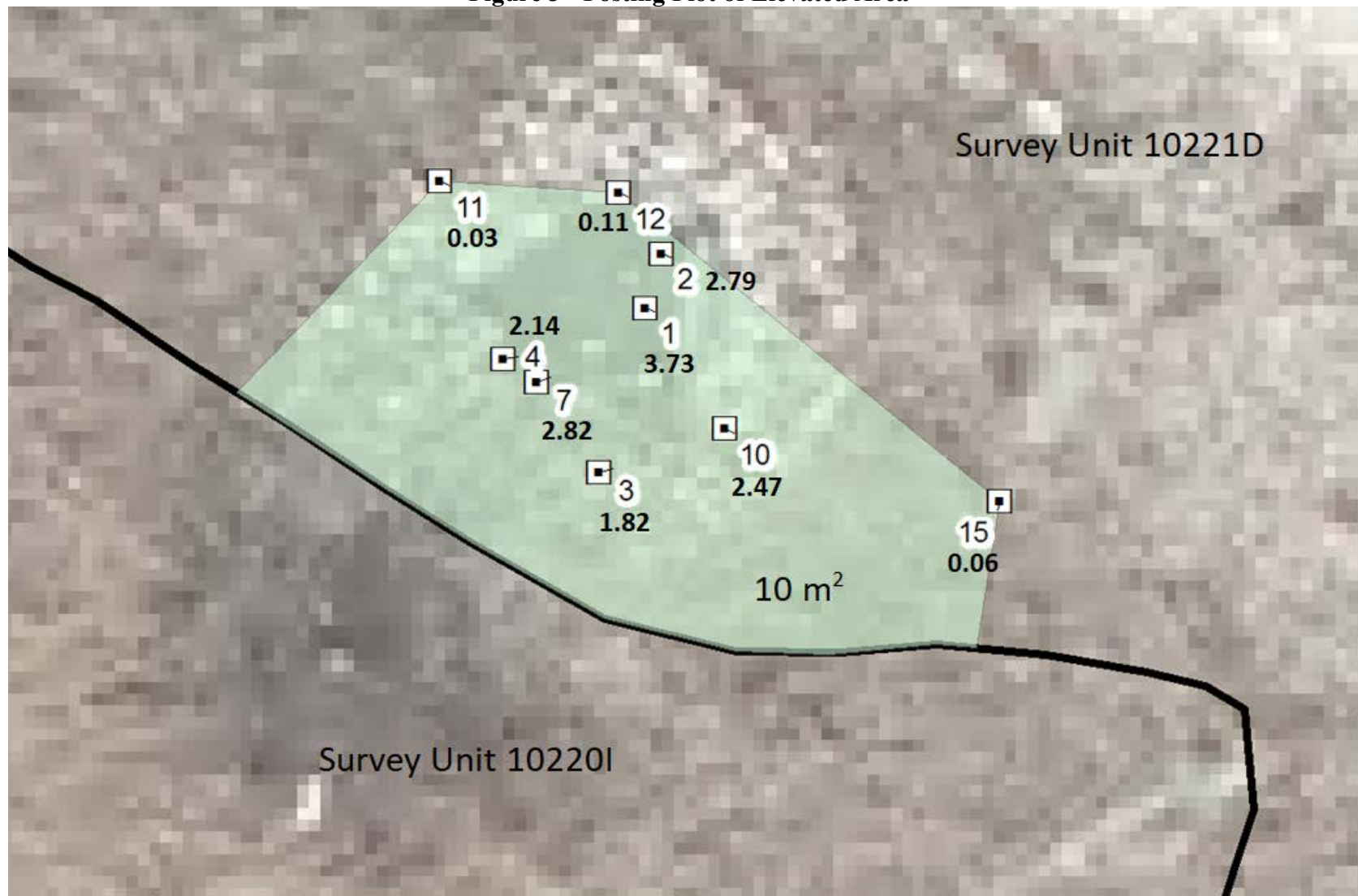
From the investigation, the average activities for the ROC in Elevated Area #1 were:

**Table 24 - Elevated Area #1 Activities**

<b>Elevated Area #1 Average Activities</b>				
<b>Co-60</b>	<b>Cs-134</b>	<b>Cs-137</b>	<b>Ni-63</b>	<b>Sr-90</b>
<b>pCi/g</b>	<b>pCi/g</b>	<b>pCi/g</b>	<b>pCi/g</b>	<b>pCi/g</b>
1.08E+00	4.78E-02	5.06E+00	1.95E+02	1.01E-02

The average activities for all ROC were below the DCGL<sub>EMC</sub> values. The conclusion of the investigation was that the survey unit passed the EMC, with a final dose for the survey unit of 5.738 mrem/year TEDE. Figure 3 below shows a posting plot of the samples taken in the area. The gamma spectroscopy results are summarized in Table 14, and the OpSOF summarized in Table 19. Also included in Table 14 and Table 19 are the results of six (6) judgmental surface soil samples that were taken adjacent to the railroad ballast (a map of the judgmental sample locations is included in Attachment 1).

Figure 3 - Posting Plot of Elevated Area





## 10. REMEDIATION AND RESULTS

It was decided to perform remediation of this area along with the elevated area in survey unit 10220I.

An area approximately 25 m<sup>2</sup> was remediated in the two survey units. The following picture shows the area during remediation.



Post-remediation scans showed no areas above the scan MDCR of the instrument. Five (5) soil samples were taken in the remediated area, L1-10221D-FIGS-018-SS to L1-10221D-FIGS-022-SS. The maximum OpSOF of the post-remediation investigation surface soil samples was 0.743. The gamma spectroscopy results for the post-remediation samples are summarized in Table 14 and the OpSOF summarized in Table 19.

## 11. CHANGES FROM THE SURVEY PLAN

Two (2) systematic samples were relocated to the closest adjacent suitable location due to the original locations falling on the railroad ballast which is made up of gravel and not soil. The coordinates of the relocated samples are listed in the table below. The map included in Attachment 1 shows the original and relocated sample points.

**Table 25 - Relocated Systematic Sample Locations**

MEASUREMENT ID	NORTHING (meters)	EASTING (meters)
L1-10221D-FSGS-003SS	641473.28	343597.08
L1-10221D-FSGS-004SS	641488.15	343594.04

**12. DATA QUALITY ASSESSMENT**

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

The analytical results of all systematic 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 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. For the systematic sample population, the mean and median values for each ROC were well below the respective OpDCGLs. Also, the retrospective power curve shows that a sufficient number of samples were collected to achieve the desired power. Therefore, the survey unit meets the unrestricted release criteria with adequate power as required by the DQOs.

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

The EMC was not used to demonstrate compliance in survey unit 10221D. The identified elevated area was remediated, the contaminated soils with concentrations exceeding the OpDCGLs was removed and the post-remediation samples taken indicated that the as-left concentrations for the ROC were less than an OpSOF of one.

**13. ANOMALIES**

The previously discussed elevated area, which was remediated, was bounded on all sides except the north side where it is physically bounded by a steel culvert and the railroad ballast which

consists of gravel and not soil. However, as part of the bounding process, three (3) investigation surface soil samples were taken inside the steel culvert on the north and south sides (L-1-10221D-FIGS-005-SS, L-1-10221D-FIGS-006-SS and L-1-10221D-FIGS-012-SS) and five (5) investigation samples were taken in the drainage ditch on the north side (L-1-10221D-FIGS-007-SS through L-1-10221D-FIGS-009-SS, L-1-10221D-FIGS-013-SS and L-1-10221D-FIGS-014-SS). All of these samples results were below an OpSOF of 1.0. Also, the ballast was scanned during FSS and no areas above the scan MDCR of the instrument were detected.

A 0.2 meter x 8 meter area (1.6 m<sup>2</sup>) between rows 22 and 30 was not accessible for survey due to standing water. This inaccessibility of this area is documented on the applicable field log.

#### 14. CONCLUSION

Survey unit 10221D has met the DQOs of the FSS plan. Following the remediation of the elevated area, the ALARA criteria for soils as specified in Chapter 4 of the LTP were achieved.

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

The systematic sample data passed the Sign Test. The null hypothesis was rejected. The Retrospective Power Curve showed that adequate power was achieved. An elevated area was identified and the EMC was applied. However, as a conservative measure, the identified elevated area was remediated and the EMC was rescinded.

The mean BcSOF, when the analytical results of the systematic samples were compared to the BcDCGLs, was 0.011, which results in a dose contribution from soil in survey unit 10221D of 0.286 mrem/year TEDE, based on the average concentration of the ROC in samples used for non-parametric statistical sampling.

The conclusion of this Release Record is that survey unit 10221D 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”

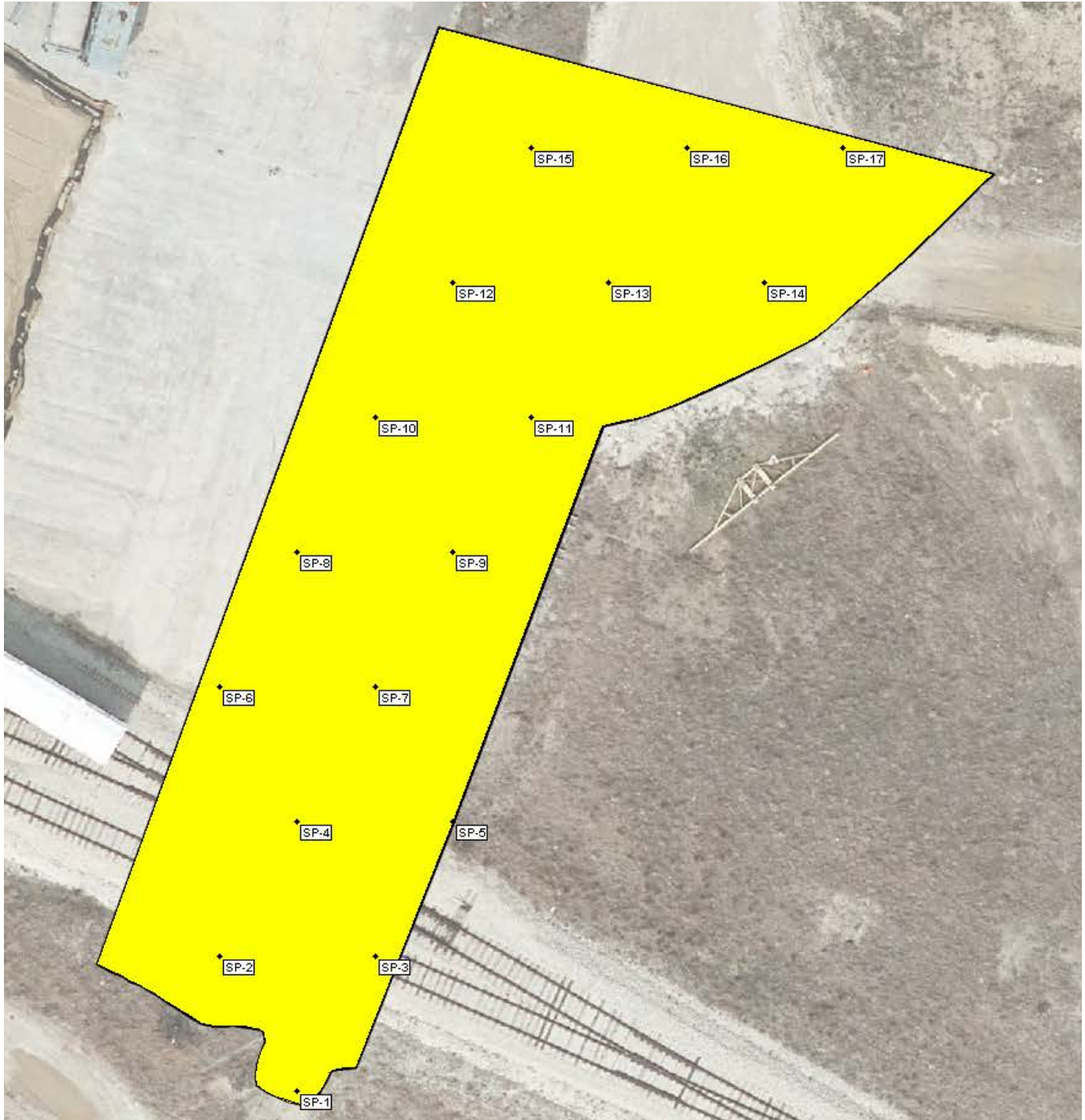
7. *ZionSolutions* TSD 11-001, “Technical Support Document for Potential Radionuclides of Concern During the Decommissioning of the Zion Station”
8. *ZionSolutions* TSD 14-019, “Radionuclides of Concern for Soil and Basement Fill Model Source Terms”
9. *ZionSolutions* TSD 14-011, “Soil Area Factors”
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**

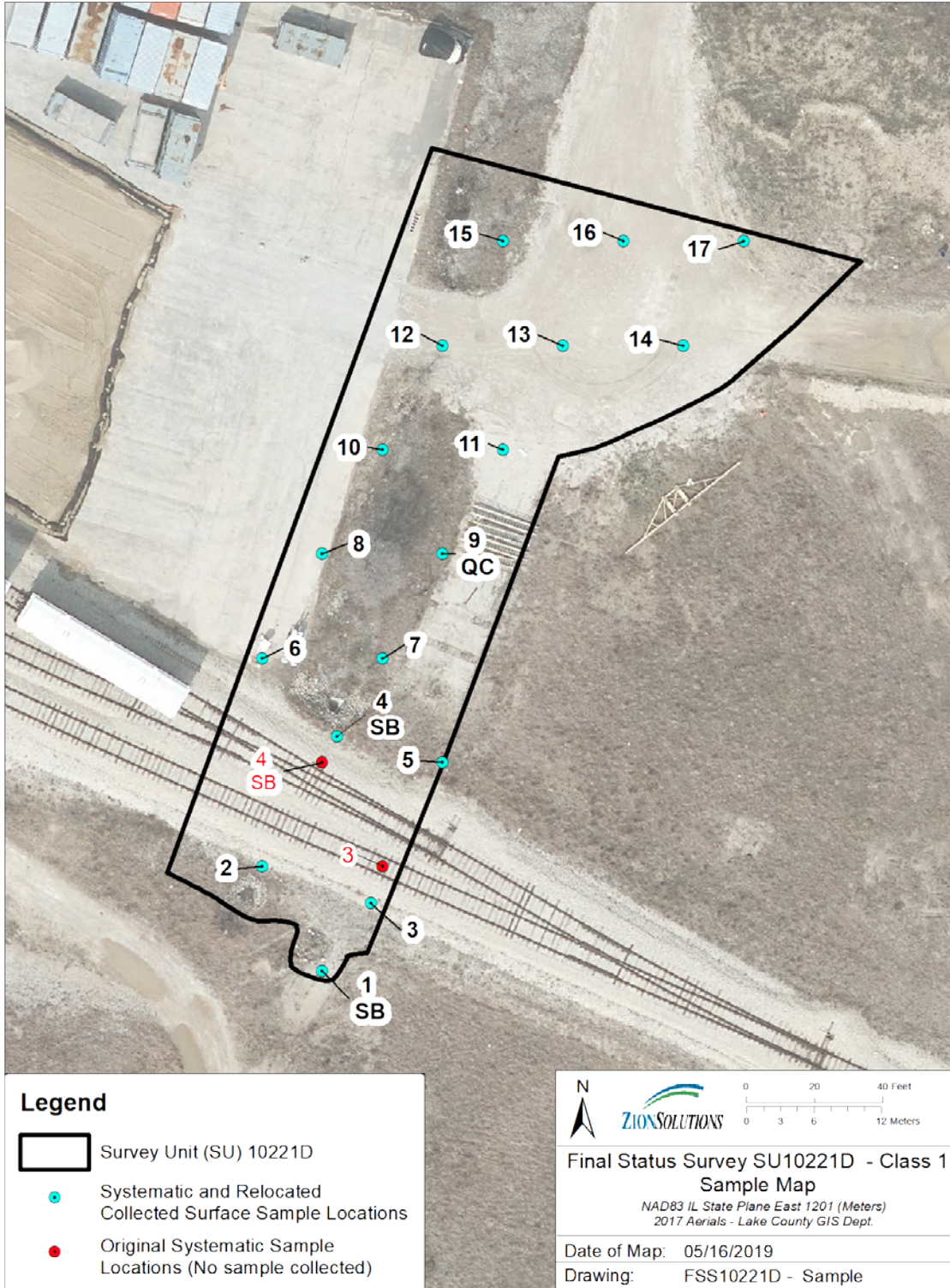
1. Attachment 1 - Figures and Map
2. Attachment 2 - Scan Data
3. Attachment 3 - Consultation Triggers for Residential and Commercial/Industrial Soil Contamination
4. Attachment 4 - Sign Test
5. Attachment 5 - QC Sample Assessment
6. Attachment 6 - Graphical Presentations
7. Attachment 7 - Sample Analytical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

**ATTACHMENT 1  
FIGURES AND MAP**

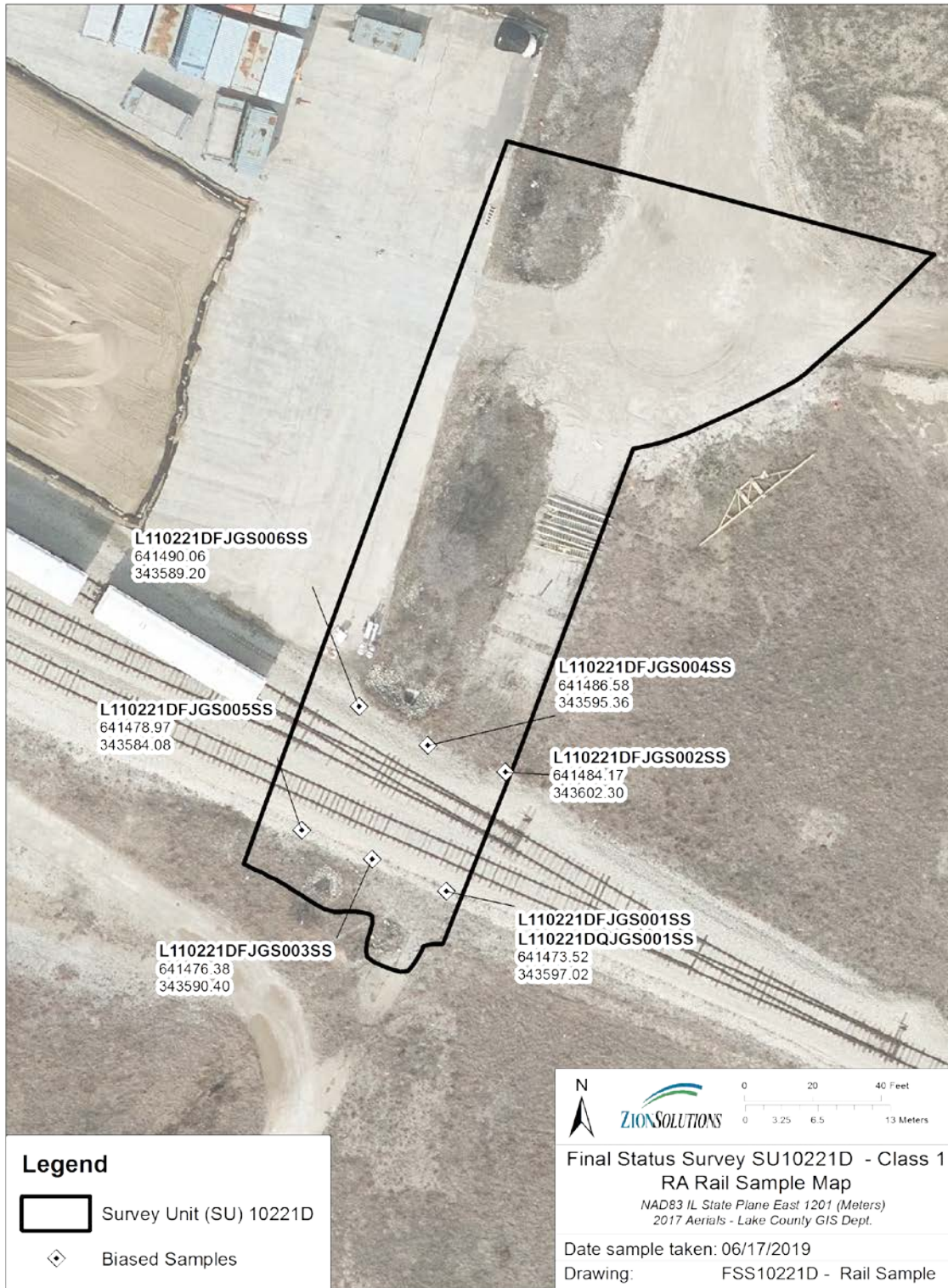
### Survey Unit 10221D Final Status Survey Boundaries and Systematic Sample Points



### Survey Unit 10221D Final Status Survey Boundaries with Relocated Systematic Sample Points



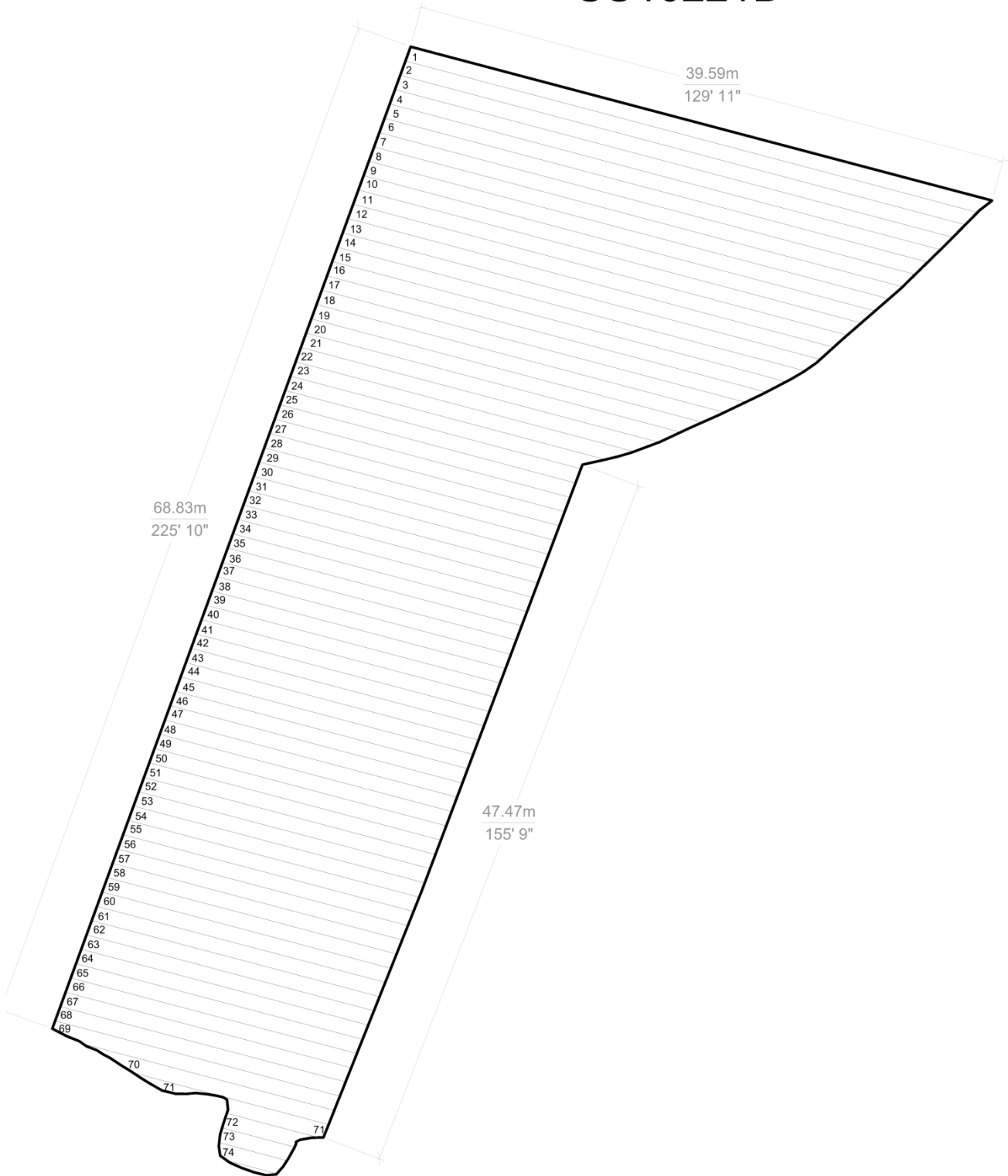
### Survey Unit 10221D Judgmental Sample Points taken Adjacent to Railroad Ballast





### Survey Unit 10221D Final Status Survey Scan Rows

## SU10221D



**ATTACHMENT 2**  
**SCAN DATA**

FSS RELEASE RECORD – REV. 1  
 SOUTH OF PROTECTED AREA - INLAND  
 SURVEY UNIT 10221D



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	PR372143	304712	10221D	GS001	5/14/2019 8:13	2479	2222	2935	No
44-10	PR372143	304712	10221D	GS001	5/14/2019 8:16	2456	2222	2935	No
44-10	PR372143	304712	10221D	GS001	5/14/2019 8:25	2655	2222	2935	No
44-10	PR372143	304712	10221D	GS001	5/14/2019 8:28	2506	2222	2935	No
44-10	PR372143	304712	10221D	GS002	5/14/2019 8:32	2642	2222	2935	No
44-10	PR372143	304712	10221D	GS002	5/14/2019 8:35	2348	2222	2935	No
44-10	PR372143	304712	10221D	GS002	5/14/2019 8:41	2266	2222	2935	No
44-10	PR372143	304712	10221D	GS002	5/14/2019 8:43	2453	2222	2935	No
44-10	PR372143	304712	10221D	GS003	5/14/2019 8:47	2349	2222	2935	No
44-10	PR372143	304712	10221D	GS003	5/14/2019 8:50	2238	2222	2935	No
44-10	PR372143	304712	10221D	GS003	5/14/2019 8:53	2558	2222	2935	No
44-10	PR372143	304712	10221D	GS003	5/14/2019 8:57	2500	2222	2935	No
44-10	PR372143	304712	10221D	GS004	5/14/2019 9:00	2770	2222	2935	No
44-10	PR372143	304712	10221D	GS004	5/14/2019 9:03	2291	2222	2935	No
44-10	PR372143	304712	10221D	GS004	5/14/2019 9:06	2463	2222	2935	No
44-10	PR372143	304712	10221D	GS004	5/14/2019 9:09	2354	2222	2935	No
44-10	PR372143	304712	10221D	GS005	5/14/2019 9:11	2540	2222	2935	No
44-10	PR372143	304712	10221D	GS005	5/14/2019 9:14	2493	2222	2935	No
44-10	PR372143	304712	10221D	GS005	5/14/2019 9:17	2358	2222	2935	No
44-10	PR372143	304712	10221D	GS005	5/14/2019 9:21	2841	2222	2935	No
44-10	PR372143	304712	10221D	GS006	5/14/2019 9:51	2807	2222	2935	No
44-10	PR372143	304712	10221D	GS006	5/14/2019 9:54	2275	2222	2935	No
44-10	PR372143	304712	10221D	GS006	5/14/2019 10:00	2623	2222	2935	No
44-10	PR372143	304712	10221D	GS006	5/14/2019 10:05	2433	2222	2935	No
44-10	PR372143	304712	10221D	GS007	5/14/2019 10:12	2393	2222	2935	No
44-10	PR372143	304712	10221D	GS007	5/14/2019 10:17	2443	2222	2935	No
44-10	PR372143	304712	10221D	GS007	5/14/2019 10:19	2313	2222	2935	No
44-10	PR372143	304712	10221D	GS007	5/14/2019 10:22	2644	2222	2935	No
44-10	PR372143	304712	10221D	GS008	5/14/2019 10:25	2672	2222	2935	No
44-10	PR372143	304712	10221D	GS008	5/14/2019 10:29	2195	2222	2935	No
44-10	PR372143	304712	10221D	GS008	5/14/2019 10:32	2238	2222	2935	No
44-10	PR372143	304712	10221D	GS008	5/14/2019 10:35	2271	2222	2935	No
44-10	PR372143	304712	10221D	GS009	5/14/2019 12:37	2528	2222	2935	No
44-10	PR372143	304712	10221D	GS009	5/14/2019 12:41	2269	2222	2935	No
44-10	PR372143	304712	10221D	GS009	5/14/2019 12:45	2448	2222	2935	No

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 SURVEY UNIT 10221D



Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
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44-10	PR372143	304712	10221D	GS001	5/14/2019 13:59	2630	2222	2935	No
44-10	PR372143	304712	10221D	GS002	5/14/2019 14:01	2551	2222	2935	No
44-10	PR372143	304712	10221D	GS003	5/14/2019 14:03	2631	2222	2935	No
44-10	PR372143	304712	10221D	GS004	5/14/2019 14:05	2614	2222	2935	No
44-10	PR372143	304712	10221D	GS005	5/14/2019 14:08	2832	2222	2935	No
44-10	PR372143	304712	10221D	GS006	5/14/2019 14:10	2552	2222	2935	No
44-10	PR372143	304712	10221D	GS007	5/14/2019 14:12	2729	2222	2935	No
44-10	PR372143	304712	10221D	GS008	5/14/2019 14:14	2548	2222	2935	No
44-10	PR372143	304712	10221D	GS009	5/14/2019 14:16	2613	2222	2935	No
44-10	PR321892	304708	10221D	GS010	5/14/2019 8:08	2266	2019	2699	No
44-10	PR321892	304708	10221D	GS010	5/14/2019 8:10	2339	2019	2699	No
44-10	PR321892	304708	10221D	GS010	5/14/2019 8:12	2267	2019	2699	No
44-10	PR321892	304708	10221D	GS010	5/14/2019 8:14	2404	2019	2699	No
44-10	PR321892	304708	10221D	GS011	5/14/2019 8:16	2218	2019	2699	No
44-10	PR321892	304708	10221D	GS011	5/14/2019 8:18	2288	2019	2699	No
44-10	PR321892	304708	10221D	GS011	5/14/2019 8:20	2243	2019	2699	No
44-10	PR321892	304708	10221D	GS011	5/14/2019 8:22	2375	2019	2699	No
44-10	PR321892	304708	10221D	GS012	5/14/2019 8:25	2299	2019	2699	No
44-10	PR321892	304708	10221D	GS012	5/14/2019 8:27	2159	2019	2699	No
44-10	PR321892	304708	10221D	GS012	5/14/2019 8:29	2256	2019	2699	No
44-10	PR321892	304708	10221D	GS012	5/14/2019 8:31	2063	2019	2699	No
44-10	PR321892	304708	10221D	GS013	5/14/2019 8:33	2084	2019	2699	No
44-10	PR321892	304708	10221D	GS013	5/14/2019 8:35	2155	2019	2699	No
44-10	PR321892	304708	10221D	GS013	5/14/2019 8:37	2277	2019	2699	No
44-10	PR321892	304708	10221D	GS013	5/14/2019 8:39	2196	2019	2699	No
44-10	PR321892	304708	10221D	GS014	5/14/2019 8:42	2311	2019	2699	No
44-10	PR321892	304708	10221D	GS014	5/14/2019 8:44	2271	2019	2699	No
44-10	PR321892	304708	10221D	GS014	5/14/2019 8:46	2299	2019	2699	No
44-10	PR321892	304708	10221D	GS014	5/14/2019 8:48	2143	2019	2699	No
44-10	PR321892	304708	10221D	GS015	5/14/2019 8:50	2088	2019	2699	No
44-10	PR321892	304708	10221D	GS015	5/14/2019 8:52	2118	2019	2699	No
44-10	PR321892	304708	10221D	GS015	5/14/2019 8:54	2061	2019	2699	No
44-10	PR321892	304708	10221D	GS016	5/14/2019 8:56	2209	2019	2699	No
44-10	PR321892	304708	10221D	GS016	5/14/2019 8:58	2123	2019	2699	No
44-10	PR321892	304708	10221D	GS016	5/14/2019 9:00	2224	2019	2699	No

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 SOUTH OF PROTECTED AREA - INLAND  
 SURVEY UNIT 10221D



Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
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44-10	PR321892	304708	10221D	GS017	5/14/2019 9:04	2124	2019	2699	No
44-10	PR321892	304708	10221D	GS017	5/14/2019 9:06	2168	2019	2699	No
44-10	PR321892	304708	10221D	GS018	5/14/2019 9:08	2262	2019	2699	No
44-10	PR321892	304708	10221D	GS018	5/14/2019 9:10	2221	2019	2699	No
44-10	PR321892	304708	10221D	GS018	5/14/2019 9:12	2307	2019	2699	No
44-10	PR321892	304708	10221D	GS019	5/14/2019 9:15	2296	2019	2699	No
44-10	PR321892	304708	10221D	GS019	5/14/2019 9:17	2176	2019	2699	No
44-10	PR321892	304708	10221D	GS019	5/14/2019 9:19	2134	2019	2699	No
44-10	PR321892	304708	10221D	GS020	5/14/2019 9:21	2198	2019	2699	No
44-10	PR321892	304708	10221D	GS020	5/14/2019 9:23	2396	2019	2699	No
44-10	PR321892	304708	10221D	GS020	5/14/2019 9:25	2531	2019	2699	No
44-10	PR321892	304708	10221D	GS010	5/14/2019 13:35	2518	2019	2699	No
44-10	PR363452	304726	10221D	GS065	5/14/2019 10:06	1902	1646	2259	No
44-10	PR363452	304726	10221D	GS066	5/14/2019 10:30	1919	1646	2259	No
44-10	PR363452	304726	10221D	GS066	5/14/2019 10:33	1820	1646	2259	No
44-10	PR363452	304726	10221D	GS067	5/14/2019 10:37	2084	1646	2259	No
44-10	PR363452	304726	10221D	GS067	5/14/2019 10:40	2041	1646	2259	No
44-10	PR363452	304726	10221D	GS068	5/14/2019 12:27	2038	1646	2259	No
44-10	PR363452	304726	10221D	GS068	5/14/2019 12:30	2006	1646	2259	No
44-10	PR363452	304726	10221D	GS069	5/14/2019 12:34	2123	1646	2259	No
44-10	PR363452	304726	10221D	GS070	5/14/2019 12:48	2156	1646	2259	No
44-10	PR363452	304726	10221D	GS070	5/14/2019 12:53	2232	1646	2259	No
44-10	PR363452	304726	10221D	GS069	5/14/2019 12:38	2114	1646	2259	No
44-10	PR363452	304726	10221D	GS071	5/14/2019 13:01	2091	1646	2259	No
44-10	PR363452	304726	10221D	GS072	5/14/2019 13:05	2179	1646	2259	No
44-10	PR363452	304726	10221D	GS073	5/14/2019 13:08	2142	1646	2259	No
44-10	PR363452	304726	10221D	GS074	5/14/2019 13:13	2233	1646	2259	No
44-10	PR363452	304726	10221D	GS075	5/14/2019 13:16	2153	1646	2259	No
44-10	PR363452	304726	10221D	GS070	5/14/2019 14:45	3745	3413	4296	No
44-10	PR363452	304726	10221D	GS070	5/14/2019 14:47	3701	3413	4296	No
44-10	PR311756	266669	10221D	GS021	5/14/2019 8:30	2108	2011	2689	No
44-10	PR311756	266669	10221D	GS021	5/14/2019 8:33	2103	2011	2689	No
44-10	PR311756	266669	10221D	GS022	5/14/2019 8:36	2214	2011	2689	No
44-10	PR311756	266669	10221D	GS022	5/14/2019 8:39	2100	2011	2689	No
44-10	PR311756	266669	10221D	GS022	5/14/2019 8:42	2622	2011	2689	No

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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	PR311756	266669	10221D	GS023	5/14/2019 8:48	2601	2011	2689	No
44-10	PR311756	266669	10221D	GS023	5/14/2019 8:52	2170	2011	2689	No
44-10	PR311756	266669	10221D	GS023	5/14/2019 8:54	2140	2011	2689	No
44-10	PR311756	266669	10221D	GS024	5/14/2019 8:59	2200	2011	2689	No
44-10	PR311756	266669	10221D	GS024	5/14/2019 9:02	2654	2011	2689	No
44-10	PR311756	266669	10221D	GS025	5/14/2019 9:06	2594	2011	2689	No
44-10	PR311756	266669	10221D	GS025	5/14/2019 9:08	2149	2011	2689	No
44-10	PR311756	266669	10221D	GS026	5/14/2019 9:12	2239	2011	2689	No
44-10	PR311756	266669	10221D	GS026	5/14/2019 9:15	2467	2011	2689	No
44-10	PR311756	266669	10221D	GS027	5/14/2019 9:18	2521	2011	2689	No
44-10	PR311756	266669	10221D	GS027	5/14/2019 9:20	2196	2011	2689	No
44-10	PR311756	266669	10221D	GS028	5/14/2019 9:22	2269	2011	2689	No
44-10	PR311756	266669	10221D	GS028	5/14/2019 9:25	2442	2011	2689	No
44-10	PR311756	266669	10221D	GS029	5/14/2019 9:28	2488	2011	2689	No
44-10	PR311756	266669	10221D	GS029	5/14/2019 9:31	2328	2011	2689	No
44-10	PR311756	266669	10221D	GS030	5/14/2019 9:34	2247	2011	2689	No
44-10	PR311756	266669	10221D	GS030	5/14/2019 9:36	2490	2011	2689	No
44-10	PR311756	266669	10221D	GS032	5/14/2019 9:40	2506	2011	2689	No
44-10	PR311756	266669	10221D	GS032	5/14/2019 9:43	2138	2011	2689	No
44-10	PR311756	266669	10221D	GS033	5/14/2019 9:46	2273	2011	2689	No
44-10	PR311756	266669	10221D	GS033	5/14/2019 9:49	2319	2011	2689	No
44-10	PR311756	266669	10221D	GS034	5/14/2019 9:53	2492	2011	2689	No
44-10	PR311756	266669	10221D	GS034	5/14/2019 9:56	2231	2011	2689	No
44-10	PR311756	266669	10221D	GS035	5/14/2019 9:59	2214	2011	2689	No
44-10	PR311756	266669	10221D	GS035	5/14/2019 10:01	2447	2011	2689	No
44-10	PR311756	266669	10221D	GS036	5/14/2019 10:03	1880	2011	2689	No
44-10	PR311756	266669	10221D	GS036	5/14/2019 12:28	2302	2011	2689	No
44-10	PR311756	266669	10221D	GS037	5/14/2019 12:36	2219	2011	2689	No
44-10	PR311756	266669	10221D	GS037	5/14/2019 12:38	2105	2011	2689	No
44-10	PR363311	304718	10221D	GS038	5/14/2019 8:29	2487	2160	2862	No
44-10	PR363311	304718	10221D	GS038	5/14/2019 8:31	2372	2160	2862	No
44-10	PR363311	304718	10221D	GS039	5/14/2019 8:33	2356	2160	2862	No
44-10	PR363311	304718	10221D	GS039	5/14/2019 8:35	2295	2160	2862	No
44-10	PR363311	304718	10221D	GS040	5/14/2019 8:37	2330	2160	2862	No
44-10	PR363311	304718	10221D	GS040	5/14/2019 8:39	2365	2160	2862	No
44-10	PR363311	304718	10221D	GS041	5/14/2019 8:41	2451	2160	2862	No

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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	PR363311	304718	10221D	GS041	5/14/2019 8:43	2508	2160	2862	No
44-10	PR363311	304718	10221D	GS042	5/14/2019 8:45	2336	2160	2862	No
44-10	PR363311	304718	10221D	GS042	5/14/2019 8:47	2481	2160	2862	No
44-10	PR363311	304718	10221D	GS043	5/14/2019 8:49	2486	2160	2862	No
44-10	PR363311	304718	10221D	GS043	5/14/2019 8:51	2232	2160	2862	No
44-10	PR363311	304718	10221D	GS044	5/14/2019 9:05	2276	2160	2862	No
44-10	PR363311	304718	10221D	GS044	5/14/2019 9:07	2379	2160	2862	No
44-10	PR363311	304718	10221D	GS045	5/14/2019 9:09	2351	2160	2862	No
44-10	PR363311	304718	10221D	GS045	5/14/2019 9:11	2239	2160	2862	No
44-10	PR363311	304718	10221D	GS046	5/14/2019 9:13	2299	2160	2862	No
44-10	PR363311	304718	10221D	GS046	5/14/2019 9:15	2442	2160	2862	No
44-10	PR363311	304718	10221D	GS047	5/14/2019 9:17	2353	2160	2862	No
44-10	PR363311	304718	10221D	GS047	5/14/2019 9:19	2314	2160	2862	No
44-10	PR363311	304718	10221D	GS048	5/14/2019 9:21	2281	2160	2862	No
44-10	PR363311	304718	10221D	GS048	5/14/2019 9:23	2429	2160	2862	No
44-10	PR363311	304718	10221D	GS050	5/14/2019 9:49	2399	2160	2862	No
44-10	PR363311	304718	10221D	GS050	5/14/2019 9:51	2249	2160	2862	No
44-10	PR363311	304718	10221D	GS051	5/14/2019 9:54	2228	2160	2862	No
44-10	PR363311	304718	10221D	GS051	5/14/2019 9:56	2295	2160	2862	No
44-10	PR363311	304718	10221D	GS052	5/14/2019 12:19	2278	2160	2862	No
44-10	PR363311	304718	10221D	GS052	5/14/2019 12:21	2234	2160	2862	No
44-10	PR363311	304718	10221D	GS053	5/14/2019 12:23	2334	2160	2862	No
44-10	PR363311	304718	10221D	GS053	5/14/2019 12:25	2404	2160	2862	No
44-10	PR363311	304718	10221D	GS054	5/14/2019 12:33	2239	2160	2862	No
44-10	PR363311	304718	10221D	GS054	5/14/2019 12:35	2313	2160	2862	No
44-10	PR363311	304718	10221D	GS055	5/14/2019 12:38	2314	2160	2862	No
44-10	PR363311	304718	10221D	GS055	5/14/2019 12:40	2275	2160	2862	No
44-10	PR311756	266669	10221D	GS021	5/15/2019 8:43	2541	2074	2762	No
44-10	PR311756	266669	10221D	GS021	5/15/2019 8:45	2212	2074	2762	No
44-10	PR311756	266669	10221D	GS021	5/15/2019 8:48	2278	2074	2762	No
44-10	PR311756	266669	10221D	GS031	5/15/2019 8:52	2476	2074	2762	No
44-10	PR311756	266669	10221D	GS031	5/15/2019 8:57	2671	2074	2762	No
44-10	PR363452	304726	10221D	GS056	5/15/2019 14:12	1783	1297	1841	No
44-10	PR363452	304726	10221D	GS056	5/15/2019 14:15	1470	1297	1841	No
44-10	PR363452	304726	10221D	GS057	5/15/2019 14:18	1477	1297	1841	No
44-10	PR363452	304726	10221D	GS057	5/15/2019 14:21	1520	1297	1841	No

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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	PR363452	304726	10221D	GS058	5/15/2019 14:25	1457	1297	1841	No
44-10	PR363452	304726	10221D	GS058	5/15/2019 14:28	1395	1297	1841	No
44-10	PR363452	304726	10221D	GS059	5/15/2019 14:32	1447	1297	1841	No
44-10	PR363452	304726	10221D	GS059	5/15/2019 14:36	1300	1297	1841	No
44-10	PR363452	304726	10221D	GS060	5/15/2019 14:40	1452	1297	1841	No
44-10	PR363452	304726	10221D	GS060	5/15/2019 14:43	1536	1297	1841	No
44-10	PR363452	304726	10221D	GS061	5/15/2019 14:49	1424	1297	1841	No
44-10	PR363452	304726	10221D	GS061	5/15/2019 14:53	1356	1297	1841	No
44-10	PR363452	304726	10221D	GS062	5/15/2019 14:57	1382	1297	1841	No
44-10	PR363452	304726	10221D	GS062	5/15/2019 15:00	1465	1297	1841	No
44-10	PR363452	304726	10221D	GS063	5/15/2019 15:04	1442	1297	1841	No
44-10	PR363452	304726	10221D	GS063	5/15/2019 15:07	1384	1297	1841	No
44-10	PR363452	304726	10221D	GS064	5/15/2019 15:11	1448	1297	1841	No
44-10	PR363452	304726	10221D	GS064	5/15/2019 15:14	1650	1297	1841	No
44-10	PR363452	304726	10221D	GS065	5/15/2019 15:22	1648	1297	1841	No
44-10	PR372143	304712	10221D	GS049	5/18/2019 13:16	2493	1993	2668	No
44-10	PR372143	304712	10221D	GS049	5/18/2019 13:21	2228	1993	2668	No
44-10	PR311750	266656	10221D	DITCH	7/15/2019 15:01	1598	1430	2002	No



**ATTACHMENT 3**  
**CONSULTATION TRIGGERS FOR RESIDENTIAL AND  
COMMERCIAL/INDUSTRIAL SOIL CONTAMINATION**

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

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

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

**ATTACHMENT 4**  
**SIGN TEST**

Attachment 12  
 Sign Statistical Test

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

Survey Area: No. 10200 Description: Radiological Restricted Area Grounds  
 Survey Unit: No. 10221D Description: South of Protected Area - Inland  
 Classification: 1 Type I ( $\alpha$ ) Error: 0.05 Number of Samples: 17

#	Fraction of the Release Criterion					Activity or SOF (as applicable)	Weighted Sum ( $W_s$ )	1- $W_s$	Sign
	Radionuclides of Concern								
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90				
1	3.83E-02	0.00E+00	0.00E+00	8.25E-03	0.00E+00	SOF	0.047	0.953	+
2	8.78E-03	2.60E-03	7.60E-03	1.89E-03	1.78E-05	SOF	0.021	0.979	+
3	1.37E-02	1.42E-02	5.15E-03	2.94E-03	1.21E-05	SOF	0.036	0.964	+
4	2.27E-02	0.00E+00	1.55E-02	4.89E-03	3.63E-05	SOF	0.043	0.957	+
5	7.13E-03	0.00E+00	9.48E-03	1.54E-03	2.22E-05	SOF	0.018	0.982	+
6	2.39E-02	6.23E-03	2.04E-02	5.15E-03	4.78E-05	SOF	0.056	0.944	+
7	4.08E-02	2.63E-03	5.18E-04	8.78E-03	1.21E-06	SOF	0.053	0.947	+
8	2.68E-02	1.49E-02	6.28E-02	5.76E-03	1.47E-04	SOF	0.110	0.890	+
9	2.19E-02	0.00E+00	0.00E+00	4.72E-03	0.00E+00	SOF	0.027	0.973	+
10	2.60E-02	9.35E-03	2.55E-02	5.60E-03	5.98E-05	SOF	0.067	0.933	+
11	3.47E-02	1.71E-02	8.24E-03	7.48E-03	1.93E-05	SOF	0.068	0.932	+
12	2.88E-02	5.30E-03	1.45E-02	6.20E-03	3.39E-05	SOF	0.055	0.945	+
13	2.28E-02	1.58E-02	4.38E-03	4.91E-03	1.03E-05	SOF	0.048	0.952	+
14	2.23E-02	4.74E-03	3.64E-03	4.80E-03	8.53E-06	SOF	0.035	0.965	+
15	2.74E-02	1.61E-02	1.17E-02	5.90E-03	2.75E-05	SOF	0.061	0.939	+
16	0.00E+00	0.00E+00	4.57E-03	0.00E+00	1.07E-05	SOF	0.005	0.995	+
17	0.00E+00	0.00E+00	1.02E-02	0.00E+00	2.38E-05	SOF	0.010	0.990	+

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

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

Prepared By (RE): R. S. Mandis [Signature] 1-15-20  
 (Print Name) (Signature) (Date)

Peer Reviewed By (RE): J. Brakam [Signature] 1/15/2020  
 (Print Name) (Signature) (Date)

**ATTACHMENT 5**  
**QC SAMPLE ASSESSMENT**

**Duplicate Sample Assessment Form**

Survey Area #:	10200	Survey Unit #	10221D	Survey Unit Name:	South of Protected Area - Inland																	
Sample Plan#:	L1-10221D-F																					
Sample Description: Comparison of split samples collected from systematic surface soil sample location #9 and judgmental surface soil sample #1. The samples were analyzed using gamma spectroscopy by on-site HPGe system. The standard/comparison samples were L1-10221D-FSGS-009SS/L1-10221D-FQGS-009SS and L1-10221D-FJGS-001SS/L1-10221D-QJGS-001SS.																						
STANDARD					COMPARISON																	
Radionuclide	Activity Value	Standard Error	Resolution	Agreement Range	Activity Value	Standard Error	Comparison Ratio	Acceptable (Y/N)														
<b>Systematic Sample #9</b>																						
K-40	5.67E+00	4.53E-01	12.50	0.6-1.66	5.00E+00	4.34E-01	1.13	Y														
<b>Judgmental Sample #1</b>																						
K-40	2.34E+00	2.69E-01	8.70	0.6-1.66	2.48E+00	2.56E-01	0.94	Y														
Comments/Corrective Actions:					Table 4-1 from the QAPP is reproduced below to show acceptance criteria used to assess split samples.																	
<p>The standard sample and QC sample did not both have a positive result for a gamma emitting ROC, therefore K-40 was used in the QC comparison. There was acceptable agreement when using K-40. No further action is necessary.</p> <p>For judgmental sample #1, the standard sample and QC sample did not both have a positive result for a gamma emitting ROC, therefore K-40 was used in the QC comparison. There was acceptable agreement when using K-40. No further action is necessary.</p>					<table border="1"> <thead> <tr> <th>Resolution</th> <th>Acceptable Ratio</th> </tr> </thead> <tbody> <tr> <td>&lt;4</td> <td>not comparable</td> </tr> <tr> <td>4-7</td> <td>0.5-2.0</td> </tr> <tr> <td>8-15</td> <td>0.6-1.66</td> </tr> <tr> <td>16-50</td> <td>0.75-1.33</td> </tr> <tr> <td>51-200</td> <td>0.80-1.25</td> </tr> <tr> <td>&gt;200</td> <td>0.85-1.18</td> </tr> </tbody> </table>				Resolution	Acceptable Ratio	<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
Resolution	Acceptable Ratio																					
<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>R.S. Mandis/gmat</i>		Date:	1-15-20	Reviewed by:	<i>J. Kradon</i>		Date:	1/15/2020													

**Duplicate Sample Assessment Form**

Survey Area #: 10200	Survey Unit # 10221D	Survey Unit Name: South of Protected Area - Inland
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Sample Plan#: L1-10221D-F
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Sample Description: Comparison of split samples collected from investigation surface soil sample location #13 and analyzed using gamma spectroscopy by on-site HPGe system. The standard sample was L1-10221D-FIGS-013SS and the comparison sample was L1-10221D-QIGS-013SS.

STANDARD					COMPARISON			
Radionuclide	Activity Value	Standard Error	Resolution	Agreement Range	Activity Value	Standard Error	Comparison Ratio	Acceptable (Y/N)
Cs-137	5.75E-01	4.90E-02	11.73	0.6-1.66	3.23E-01	3.17E-02	1.78	N
K-40	6.32E+00	4.79E-01	13.19	0.6-1.66	6.07E+00	4.55E-01	1.04	Y

Comments/Corrective Actions:  
 There was not acceptable agreement between the standard sample and QC sample when using Cs-137. This is due to the fact that Cs-137 is present at low concentrations in both samples. However, when using K-40, which is present in the samples at a higher concentration, there was acceptable agreement. No further action is necessary.

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

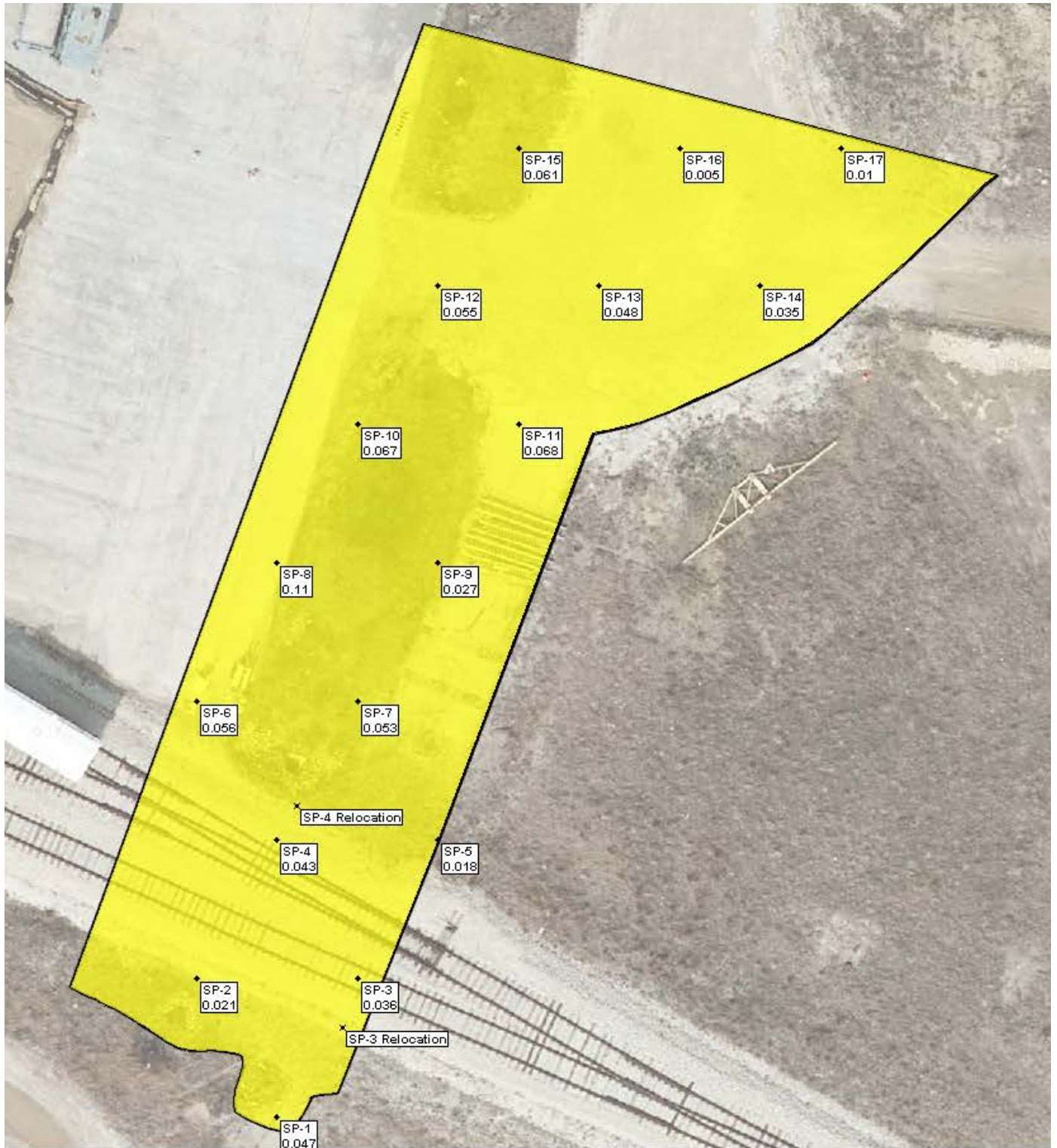
Resolution	Acceptable Ratio
<4	not comparable
4-7	0.5-2.0
8-15	0.6-1.66
16-50	0.75-1.33
51-200	0.80-1.25
>200	0.85-1.18

Performed by: <i>R.S. Mandic / jmark</i>	Date: <i>1-15-20</i>	Reveiwed by: <i>[Signature]</i>	Date: <i>1-15-2020</i>
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**ATTACHMENT 6**  
**GRAPHICAL PRESENTATIONS**



### Posting Plot

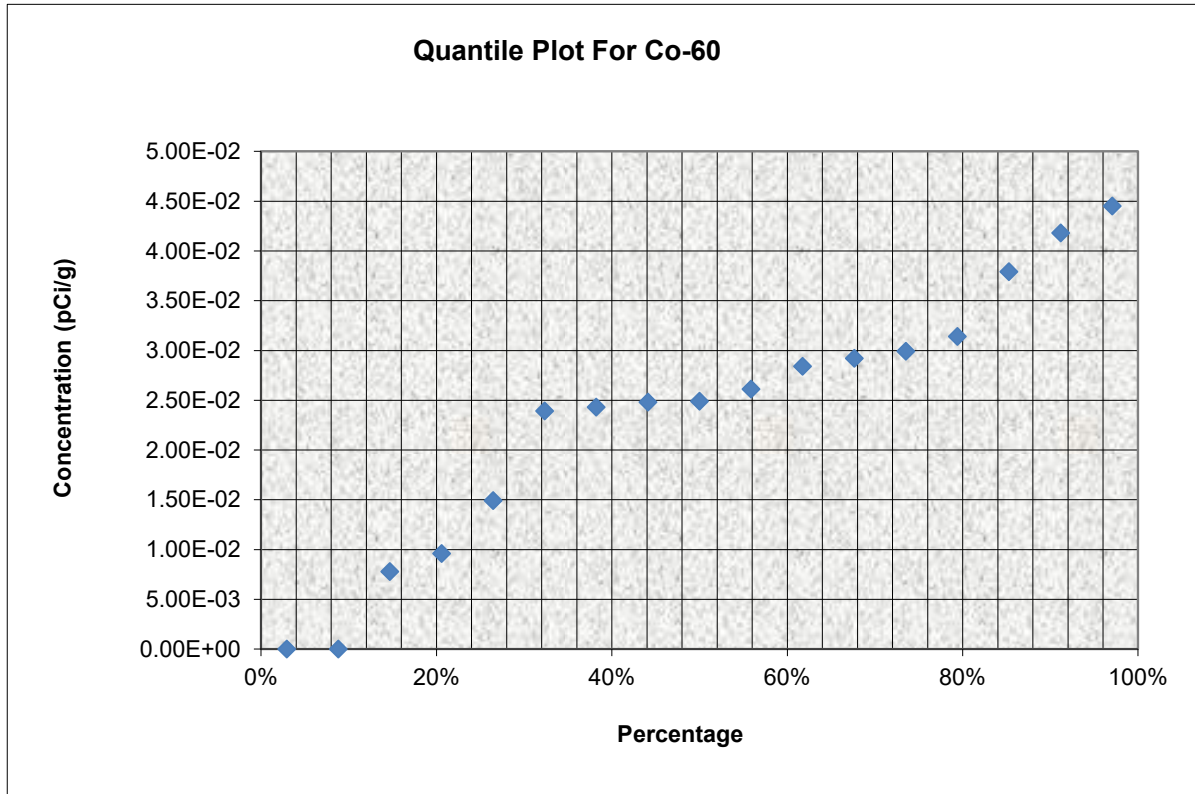


**QUANTILE PLOT FOR Co-60**

**Survey Unit:** 10221D

**Survey Unit Name:** South of Protected Area - Inland

**Mean:** 2.35E-02 pCi/g

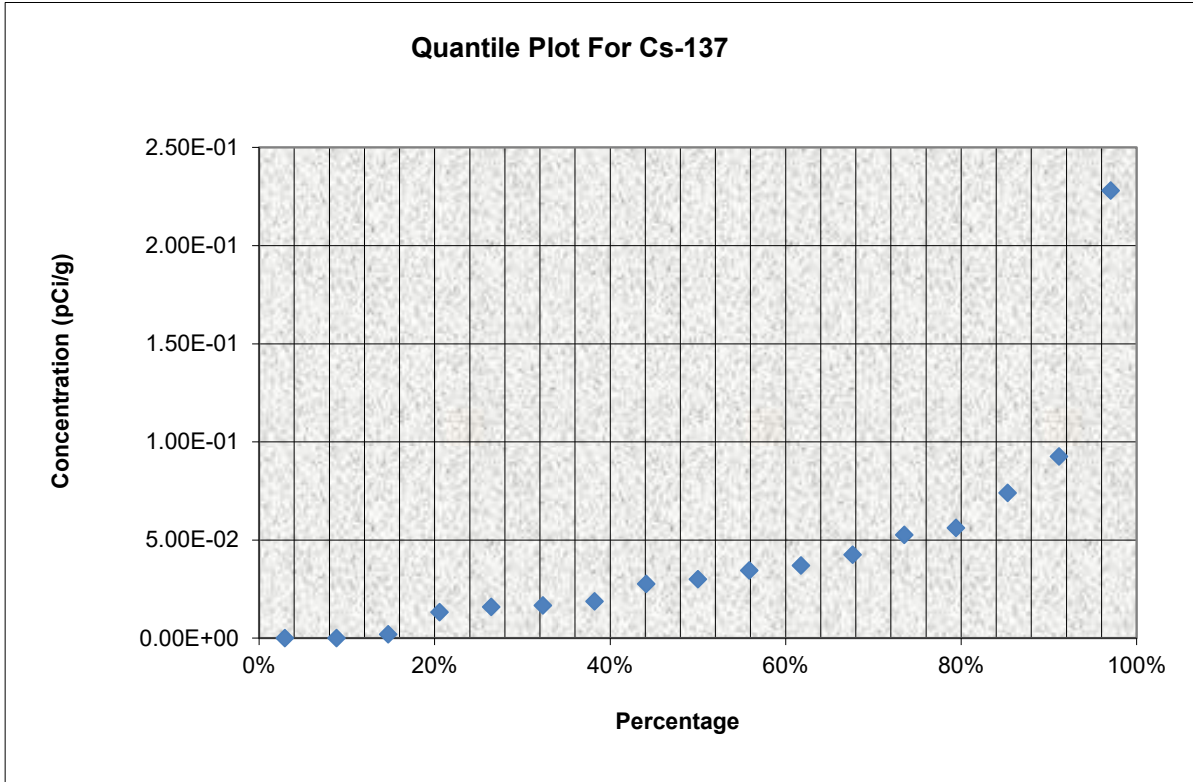


**QUANTILE PLOT FOR Cs-137**

**Survey Unit:** 10221D

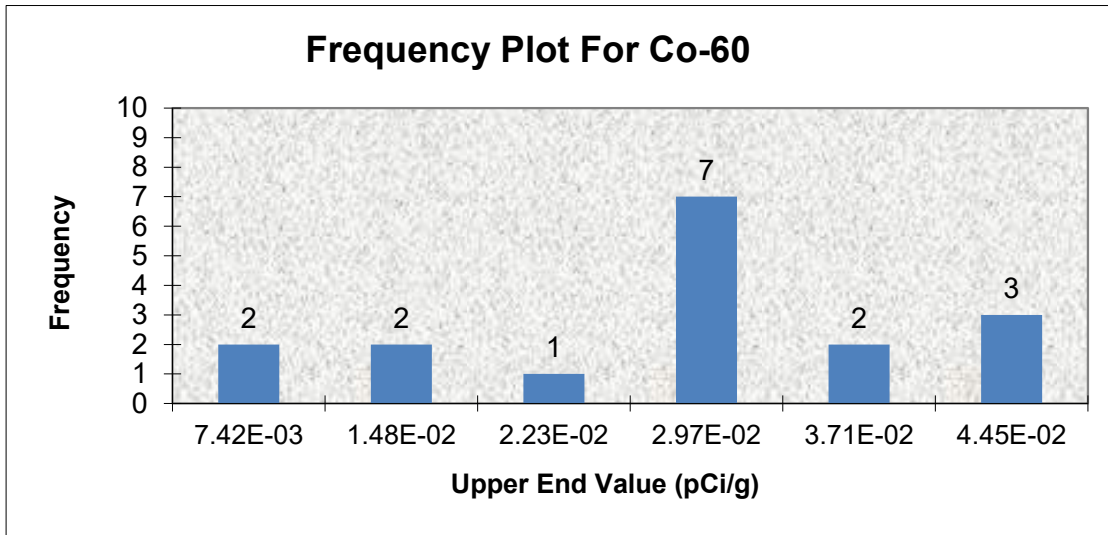
**Survey Unit Name:** South of Protected Area - Inland

**Mean:** 4.36E-02 pCi/g



**HISTOGRAM FOR Co-60**

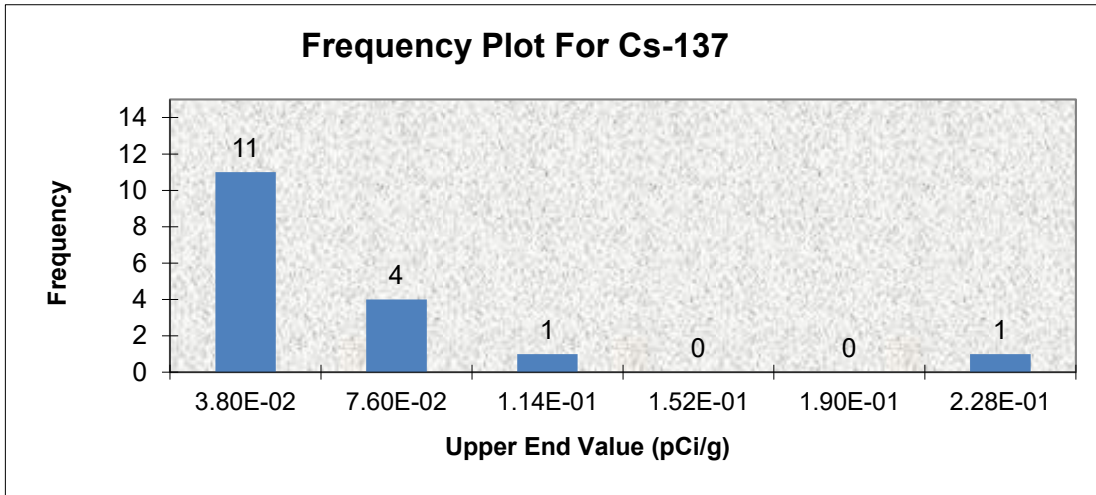
**Survey Unit:** 10221D  
**Survey Unit Name:** South of Protected Area - Inland  
**Mean:** 2.35E-02 pCi/g  
**Median:** 2.49E-02 pCi/g  
**ST DEV:** 0.013  
**Skew:** -0.424



Upper Value	Observation Frequency	Observation %
7.42E-03	2	12%
1.48E-02	2	12%
2.23E-02	1	6%
2.97E-02	7	41%
3.71E-02	2	12%
4.45E-02	3	18%
<b>TOTAL</b>	<b>17</b>	<b>100%</b>

**HISTOGRAM FOR Cs-137**

**Survey Unit:** 10221D  
**Survey Unit Name:** South of Protected Area - Inland  
**Mean:** 4.36E-02 pCi/g  
**Median:** 2.99E-02 pCi/g  
**ST DEV:** 0.054  
**Skew:** 2.735

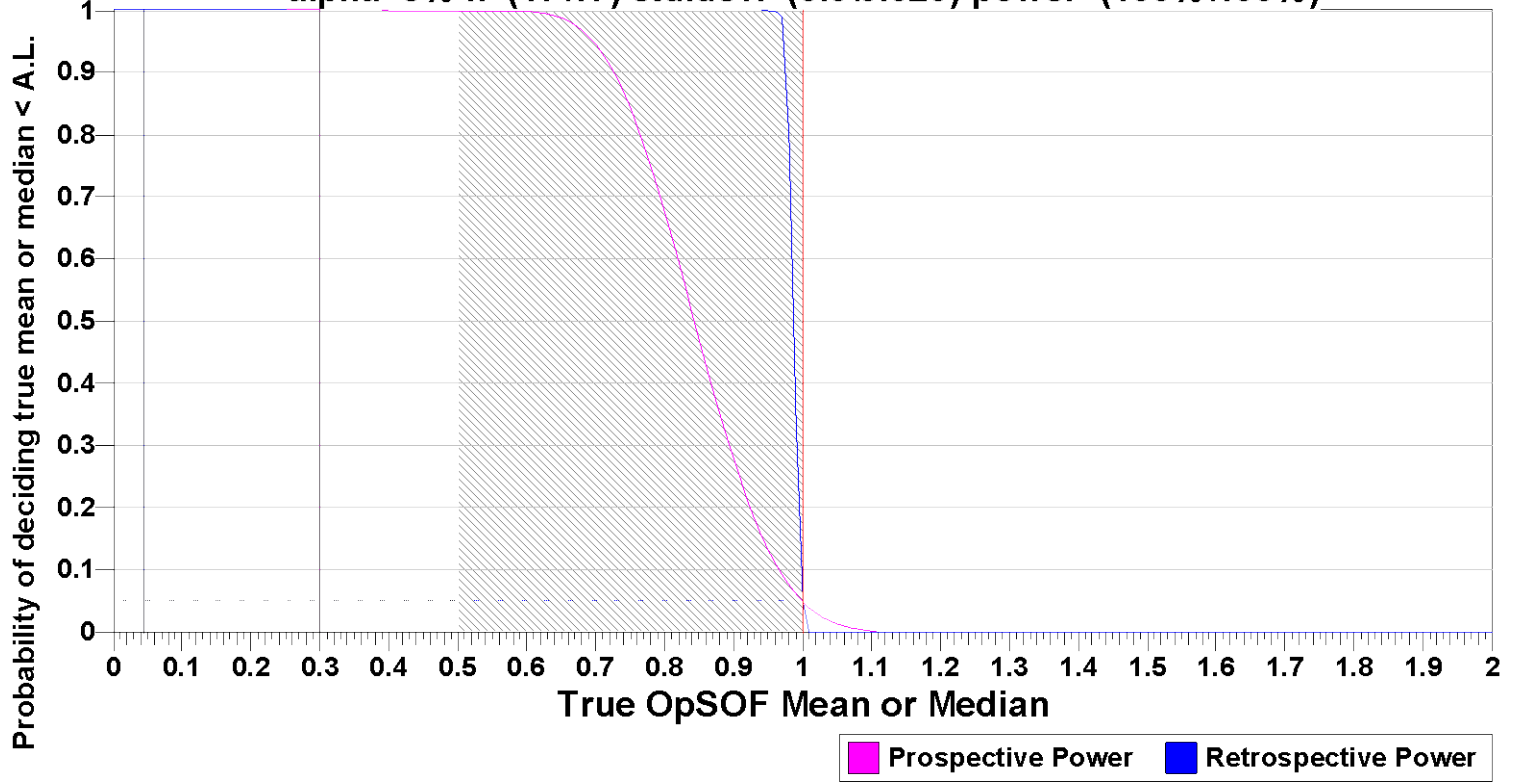


Upper Value	Observation Frequency	Observation %
3.80E-02	11	65%
7.60E-02	4	24%
1.14E-01	1	6%
1.52E-01	0	0%
1.90E-01	0	0%
2.28E-01	1	6%
<b>TOTAL</b>	<b>17</b>	<b>100%</b>

## Prospective and Retrospective Power Curves for Survey Unit 10221D

### MARSSIM Sign Test (Pro\Retrospective) Power

alpha=5% n=(17\17) std.dev.=(0.3\0.026) power=(100%\100%)



**ATTACHMENT 7**  
**SAMPLE ANALYTICAL REPORTS**

Analysis Report for 16-May-19-10028  
L1-10221D-FSGS-001SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 16-May-19-10028  
Sample Description : L1-10221D-FSGS-001SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.605E+03 grams  
Facility : Default  
  
Sample Taken On : 5/15/2019 6:45:00AM  
Acquisition Started : 5/16/2019 10:01:41AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P11314  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.2 seconds  
  
Dead Time : 0.03 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/24/2019  
Efficiency Calibration Used Done On : 5/16/2019  
Efficiency Calibration Description :  
  
Sample Number : 76617  
Fill Height : 1605.07 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 12/22/2008 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 5/16/2019 10:16:55AM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 8192

DATA VALIDATED 5/16/19 1500  
J. Brokan / C. J.



Analysis Report for 16-May-19-10028  
L1-10221D-FSGS-001SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.45	306 -	313	310.35	3.70E+01	12.17	5.40E+01	0.38
2	238.81	949 -	962	954.80	1.25E+02	19.17	8.36E+01	1.03
3	295.37	1174 -	1188	1180.76	6.01E+01	10.28	1.59E+01	1.04
4	352.05	1400 -	1414	1407.21	8.81E+01	12.76	2.59E+01	1.04
5	609.22	2429 -	2442	2434.91	6.44E+01	9.80	1.16E+01	1.22
6	911.00	3636 -	3647	3641.46	3.06E+01	8.01	1.34E+01	0.57
7	1460.30	5829 -	5851	5839.13	2.57E+02	17.63	1.40E+01	1.56

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.95	1460.82 *	10.66	5.69E+00	4.62E-01
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	1.97E-01	3.41E-02
		300.09	3.30		
Pb212-XR	0.99	74.82	10.28		
		77.11 *	17.10	2.57E-01	8.86E-02
		87.35	3.97		
		89.78	1.46		
Bi-214	0.99	609.32 *	45.49	1.84E-01	3.02E-02
		768.36	4.89		

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Analysis Report for 16-May-19-10028

L1-10221D-FSGS-001SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Bi-214	0.99	806.18	1.26		
		934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	0.99	241.99	7.25		
		295.22 *	18.42	2.54E-01	4.81E-02
		351.93 *	35.60	2.20E-01	3.63E-02
Pb214-XR	0.99	785.96	1.06		
		74.82	5.80		
		77.11 *	9.70	4.53E-01	1.58E-01
Ac-228	0.99	87.35	2.24		
		89.78	0.82		
		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	2.03E-01	5.39E-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 16-May-19-10028  
L1-10221D-FSGS-001SS

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## INTERFERENCE CORRECTED REPORT

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	<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
	K-40	0.957	5.69E+00	4.62E-01	
X	Bi-211	0.857			
	Pb-212	0.996	1.97E-01	3.41E-02	
?	Pb212-XR	0.990	2.57E-01	8.86E-02	
	Bi-214	0.999	1.84E-01	3.02E-02	
	Pb-214	0.998	2.32E-01	2.90E-02	
?	Pb214-XR	0.990	4.53E-01	1.58E-01	
	Ac-228	0.998	2.03E-01	5.39E-02	

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

Errors quoted at 1.000sigma

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Analysis Report for 16-May-19-10028  
L1-10221D-FSGS-001SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/16/2019 10:16:55AM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

<i>Peak No.</i>	<i>Energy (keV)</i>	<i>Peak Size (CPS)</i>	<i>Peak CPS (%) Uncertainty</i>	<i>Peak Type</i>	<i>Tolerance Nuclide</i>
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

	<i>Nuclide Name</i>	<i>Energy (keV)</i>	<i>Yield(%)</i>	<i>Activity (pCi/grams)</i>	<i>Nuclide MDA (pCi/grams)</i>	<i>Line MDA (pCi/grams)</i>
	An Pk	511.00	100.00	3.30E-02	4.83E-02	4.83E-02
	BE-7	477.60	10.44	2.11E-02	3.26E-01	3.26E-01
+	K-40	1460.82	* 10.66	5.69E+00	6.15E-01	6.15E-01
	Mn-54	834.85	99.98	-2.88E-02	4.26E-02	4.26E-02
	Co-60	1173.23	99.85	2.53E-03	5.24E-02	5.44E-02
		1332.49	99.98	4.18E-02		5.24E-02
	Nb-94	702.65	99.81	-1.45E-02	4.19E-02	4.19E-02
		871.09	99.89	2.52E-03		4.69E-02
	Ag-108m	79.13	6.60	-7.57E-01	3.56E-02	1.11E+00
		433.94	90.50	3.29E-03		3.56E-02
		614.28	89.80	-1.65E-02		5.80E-02
		722.94	90.80	1.46E-02		5.23E-02
	Sb-125	176.31	6.84	2.99E-01	1.09E-01	4.67E-01
		380.45	1.52	1.69E+00		2.40E+00
		427.87	29.60	3.36E-02		1.09E-01
		463.36	10.49	4.78E-02		3.57E-01
		600.60	17.65	6.27E-03		2.07E-01
		606.71	4.98	1.80E+00		1.32E+00
		635.95	11.22	-2.69E-02		3.33E-01

Analysis Report for 16-May-19-10028

L1-10221D-FSGS-001SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-9.73E-03	1.09E-01	2.05E+00
Ba-133	79.61	2.65	-2.01E+00	6.80E-02	2.69E+00
	81.00	32.90	-2.42E-01		1.78E-01
	276.40	7.16	1.06E-01		4.68E-01
	302.85	18.34	1.65E-01		1.85E-01
	356.01	62.05	-3.32E-02		6.80E-02
	383.85	8.94	-2.07E-01		3.93E-01
Cs-134	475.36	1.48	5.03E-01	4.64E-02	2.33E+00
	563.25	8.34	1.55E-01		4.75E-01
	569.33	15.37	5.57E-02		2.47E-01
	604.72	97.62	-2.42E-02		5.87E-02
	795.86	85.46	-2.16E-03		4.64E-02
	801.95	8.69	1.31E-01		4.77E-01
	1038.61	0.99	2.22E+00		4.89E+00
	1167.97	1.79	1.45E-01		3.14E+00
	1365.19	3.02	-2.04E-01		1.34E+00
Cs-137	661.66	85.10	-2.29E-03	4.58E-02	4.58E-02
Eu-152	121.78	28.67	-3.57E-02	1.15E-01	1.15E-01
	244.70	7.61	3.62E-01		5.05E-01
	295.94	0.45	2.36E+00		8.83E+00
	344.28	26.60	-7.44E-02		1.19E-01
	367.79	0.86	-4.68E-01		3.49E+00
	411.12	2.24	-1.80E-01		1.56E+00
	443.96	2.83	7.24E-01		1.23E+00
	488.68	0.42	3.22E+00		8.65E+00
	563.99	0.49	-7.49E+00		6.88E+00
	586.26	0.46	1.71E+01		1.29E+01
	678.62	0.47	-3.85E+00		8.27E+00
	688.67	0.86	-7.01E-01		4.43E+00
	719.35	0.28	3.58E+00		1.57E+01
	778.90	12.96	-5.45E-02		3.01E-01
	810.45	0.32	-5.52E+00		1.37E+01
	867.37	4.26	3.99E-01		1.06E+00
	919.33	0.43	-4.44E+00		1.04E+01
	964.08	14.65	1.57E-01		4.59E-01
	1085.87	10.24	1.80E-02		4.47E-01
	1089.74	1.73	-1.20E+00		2.59E+00
	1112.07	13.69	-2.85E-01		3.62E-01
	1212.95	1.43	9.43E-01		4.29E+00
	1249.94	0.19	3.66E+01		3.91E+01
	1299.14	1.63	-1.54E+00		3.02E+00
	1408.01	21.07	-6.28E-03		2.20E-01
	1457.64	0.50	1.32E+02		3.91E+01
	1528.10	0.28	1.18E+00		1.35E+01
Eu-154	123.07	40.40	4.31E-03	8.34E-02	8.34E-02
	247.93	6.89	-1.84E-02		4.41E-01
	591.76	4.95	1.68E-01		6.42E-01
	692.42	1.78	-2.60E-01		2.19E+00
	723.30	20.06	1.96E-01		2.45E-01
	756.80	4.52	1.28E-01		9.59E-01
	873.18	12.08	-1.60E-01		4.01E-01

Analysis Report for 16-May-19-10028  
L1-10221D-FSGS-001SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	1.52E-01	8.34E-02	4.75E-01
	1004.76	18.01	6.47E-02		2.92E-01
	1274.43	34.80	-2.10E-01		1.35E-01
	1596.48	1.80	-1.62E-01		1.91E+00
Eu-155	45.30	1.31	1.68E+00	1.80E-01	1.08E+01
	60.01	1.22	9.17E+00		1.27E+01
	86.55	30.70	5.56E-02		1.83E-01
	105.31	21.10	4.07E-02		1.80E-01
Ra-226	186.21	3.64	3.62E-01	9.54E-01	9.54E-01
Pa-231	27.36	10.30	8.27E-01	1.16E+00	1.16E+00
	283.69	1.70	-2.71E+00		1.89E+00
	300.07	2.47	3.36E-01		1.24E+00
	302.65	2.20	1.20E+00		1.54E+00
	330.06	1.40	1.77E+00		2.78E+00
U-235	143.76	10.96	1.43E-01	6.17E-02	3.14E-01
	163.33	5.08	2.10E-01		6.41E-01
	185.71	57.20	4.76E-02		6.17E-02
	202.11	1.08	1.68E+00		2.79E+00
	205.31	5.01	-9.87E-02		6.16E-01
Am-241	59.54	35.90	1.34E-01	4.32E-01	4.32E-01

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

Analysis Report for 16-May-19-10029  
L1-10221D-FSGS-002SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 16-May-19-10029  
Sample Description : L1-10221D-FSGS-002SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.353E+03 grams  
Facility : Default  
  
Sample Taken On : 5/15/2019 6:50:00AM  
Acquisition Started : 5/16/2019 10:01:48AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : 352  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.3 seconds  
  
Dead Time : 0.03 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 9/29/2018  
Efficiency Calibration Used Done On : 5/16/2019  
Efficiency Calibration Description :  
  
Sample Number : 76618  
Fill Height : 1352.74 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/7/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

---

Peak Analysis Performed on : 5/16/2019 10:16:54AM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 8192

DATA VALIDATED 5/16/19 1500  
J. Brogan / C. J. H.

Analysis Report for 16-May-19-10029  
L1-10221D-FSGS-002SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.21	306 -	315	310.14	4.42E+01	11.40	3.78E+01	1.04
2	185.73	737 -	751	743.66	3.87E+01	12.80	4.33E+01	0.59
3	238.61	949 -	962	954.91	1.08E+02	17.55	7.12E+01	0.98
4	295.05	1175 -	1188	1180.44	4.41E+01	10.36	2.29E+01	1.27
5	351.77	1399 -	1413	1407.06	8.02E+01	11.59	1.88E+01	1.09
6	582.79	2324 -	2338	2330.47	3.98E+01	8.84	1.32E+01	1.03
7	608.92	2428 -	2442	2434.94	5.78E+01	8.85	7.21E+00	1.14
8	1460.26	5829 -	5851	5841.41	2.67E+02	18.24	1.71E+01	1.50

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.95	1460.82 *	10.66	5.80E+00	4.70E-01
Tl-208	0.97	583.19 *	85.00	5.87E-02	1.35E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.73E-01	3.14E-02
		300.09	3.30		
Pb212-XR	0.99	74.82	10.28		
		77.11 *	17.10	4.17E-01	1.16E-01
		87.35	3.97		
		89.78	1.46		

[80]



Analysis Report for 16-May-19-10029

L1-10221D-FSGS-002SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>		<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Bi-214	0.99	609.32	*	45.49	1.64E-01	2.70E-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	1.88E-01	4.67E-02
		295.22	*	18.42		
		351.93	*	35.60		
Pb214-XR	0.99	785.96		1.06	7.36E-01	2.07E-01
		74.82		5.80		
		77.11	*	9.70		
		87.35		2.24		
		89.78		0.82		
Ra-226	0.96	186.21	*	3.64	6.65E-01	2.26E-01
U-235	1.00	143.76		10.96	4.23E-02	1.44E-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

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## INTERFERENCE CORRECTED REPORT

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Analysis Report for 16-May-19-10029

L1-10221D-FSGS-002SS

	<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
	K-40	0.951	5.80E+00	4.70E-01	
	Tl-208	0.975	5.87E-02	1.35E-02	
X	Bi-211	0.926			
	Pb-212	1.000	1.73E-01	3.14E-02	
?	Pb212-XR	0.999	4.17E-01	1.16E-01	
	Bi-214	0.990	1.64E-01	2.70E-02	
	Pb-214	0.996	1.97E-01	2.70E-02	
?	Pb214-XR	0.999	7.36E-01	2.07E-01	
?	Ra-226	0.964	6.65E-01	2.26E-01	
?	U-235	1.000	4.23E-02	1.44E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 1.000sigma

Analysis Report for 16-May-19-10029  
L1-10221D-FSGS-002SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/16/2019 10:16:54AM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

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

## NUCLIDE MDA REPORT

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

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
An Pk	511.00	100.00	8.36E-02	5.39E-02	5.39E-02
BE-7	477.60	10.44	2.29E-01	3.62E-01	3.62E-01
+ K-40	1460.82	* 10.66	5.80E+00	6.60E-01	6.60E-01
Mn-54	834.85	99.98	4.01E-02	4.65E-02	4.65E-02
Co-60	1173.23	99.85	-1.47E-02	3.91E-02	5.98E-02
	1332.49	99.98	9.58E-03		3.91E-02
Nb-94	702.65	99.81	1.67E-02	3.68E-02	3.68E-02
	871.09	99.89	-2.38E-02		3.71E-02
Ag-108m	79.13	6.60	3.25E-01	3.46E-02	1.33E+00
	433.94	90.50	-2.73E-02		3.46E-02
	614.28	89.80	-3.23E-02		6.05E-02
	722.94	90.80	2.62E-02		4.78E-02
Sb-125	176.31	6.84	-9.03E-02	1.17E-01	4.53E-01
	380.45	1.52	-4.94E-01		2.13E+00
	427.87	29.60	4.72E-02		1.17E-01
	463.36	10.49	-8.76E-02		3.44E-01
	600.60	17.65	-1.58E-01		2.38E-01
	606.71	4.98	1.62E+00		1.25E+00
	635.95	11.22	-8.12E-02		3.89E-01

Analysis Report for 16-May-19-10029  
L1-10221D-FSGS-002SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-2.04E+00	1.17E-01	2.21E+00
Ba-133	79.61	2.65	-7.11E-01	6.93E-02	3.31E+00
	81.00	32.90	-1.29E-01		2.17E-01
	276.40	7.16	1.90E-01		4.56E-01
	302.85	18.34	1.15E-02		1.79E-01
	356.01	62.05	-3.23E-02		6.93E-02
	383.85	8.94	1.16E-01		3.82E-01
Cs-134	475.36	1.48	-6.07E-01	4.93E-02	2.35E+00
	563.25	8.34	-6.74E-02		5.00E-01
	569.33	15.37	7.35E-02		2.45E-01
	604.72	97.62	-1.74E-02		6.27E-02
	795.86	85.46	4.51E-03		4.93E-02
	801.95	8.69	9.34E-02		4.62E-01
	1038.61	0.99	2.60E+00		5.25E+00
	1167.97	1.79	1.39E+00		3.68E+00
	1365.19	3.02	-1.00E+00		1.20E+00
Cs-137	661.66	85.10	2.76E-02	5.62E-02	5.62E-02
Eu-152	121.78	28.67	5.68E-02	1.20E-01	1.40E-01
	244.70	7.61	3.34E-01		5.43E-01
	295.94	0.45	3.65E+00		9.11E+00
	344.28	26.60	1.92E-03		1.20E-01
	367.79	0.86	1.72E-02		3.74E+00
	411.12	2.24	7.91E-01		1.65E+00
	443.96	2.83	-1.09E-01		1.33E+00
	488.68	0.42	6.23E+00		9.20E+00
	563.99	0.49	2.59E+00		8.48E+00
	586.26	0.46	-3.65E+00		1.20E+01
	678.62	0.47	-1.55E+00		7.75E+00
	688.67	0.86	-2.38E+00		5.10E+00
	719.35	0.28	-1.04E+01		1.31E+01
	778.90	12.96	-1.60E-01		3.31E-01
	810.45	0.32	9.35E-01		1.18E+01
	867.37	4.26	-5.99E-01		9.31E-01
	919.33	0.43	-2.53E+01		1.03E+01
	964.08	14.65	2.04E-01		4.15E-01
	1085.87	10.24	-4.99E-02		4.59E-01
	1089.74	1.73	2.28E+00		3.10E+00
	1112.07	13.69	-1.22E-01		4.15E-01
	1212.95	1.43	2.01E+00		4.40E+00
	1249.94	0.19	1.12E+01		3.20E+01
	1299.14	1.63	1.64E+00		3.19E+00
	1408.01	21.07	3.70E-02		2.09E-01
	1457.64	0.50	1.31E+02		3.92E+01
	1528.10	0.28	6.80E+00		1.40E+01
Eu-154	123.07	40.40	2.85E-02	9.79E-02	9.79E-02
	247.93	6.89	2.75E-01		5.10E-01
	591.76	4.95	-2.45E-02		8.10E-01
	692.42	1.78	7.86E-01		2.57E+00
	723.30	20.06	1.07E-01		2.19E-01
	756.80	4.52	-2.14E-01		7.47E-01
	873.18	12.08	2.19E-02		3.30E-01

Analysis Report for 16-May-19-10029  
L1-10221D-FSGS-002SS

	<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
	Eu-154	996.29	10.48	-1.07E-01	9.79E-02	5.05E-01
		1004.76	18.01	7.64E-02		2.96E-01
		1274.43	34.80	-2.79E-02		1.73E-01
		1596.48	1.80	6.90E-01		1.88E+00
	Eu-155	45.30	1.31	1.43E+01	2.00E-01	1.87E+01
		60.01	1.22	-1.10E+01		2.08E+01
		86.55	30.70	5.22E-02		2.10E-01
		105.31	21.10	-7.86E-02		2.00E-01
+	Ra-226	186.21	* 3.64	6.65E-01	7.01E-01	7.01E-01
	Pa-231	27.36	10.30	2.14E+00	1.46E+00	2.17E+00
		283.69	1.70	-2.60E-01		1.99E+00
		300.07	2.47	-4.03E-02		1.46E+00
		302.65	2.20	-4.05E-01		1.46E+00
		330.06	1.40	-1.53E+00		2.58E+00
+	U-235	143.76	10.96	-9.77E-02	4.46E-02	3.28E-01
		163.33	5.08	2.28E-01		6.45E-01
		185.71	* 57.20	4.23E-02		4.46E-02
		202.11	1.08	-3.66E+00		2.67E+00
		205.31	5.01	-3.98E-01		6.44E-01
	Am-241	59.54	35.90	2.88E-01	7.42E-01	7.42E-01

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

Analysis Report for 16-May-19-10030  
L1-10221D-FSGS-003SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 16-May-19-10030  
Sample Description : L1-10221D-FSGS-003SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.463E+03 grams  
Facility : Default  
  
Sample Taken On : 5/15/2019 6:55:00AM  
Acquisition Started : 5/16/2019 10:19:58AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : 324  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.8 seconds  
  
Dead Time : 0.09 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 4096  
Peak Area Range (in channels) : 120 - 4096  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 9/29/2018  
Efficiency Calibration Used Done On : 5/16/2019  
Efficiency Calibration Description :  
  
Sample Number : 76619  
Fill Height : 1462.50 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/30/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 5/16/2019 10:35:01AM

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

DATA VALIDATED 5/16/19 1500  
J. Brogan / C. J.

Analysis Report for 16-May-19-10030  
L1-10221D-FSGS-003SS

<b>Peak No.</b>	<b>Energy (keV)</b>	<b>ROI start</b>	<b>ROI end</b>	<b>Peak Centroid</b>	<b>Net Peak Area</b>	<b>Net Area Uncertainty</b>	<b>Continuum Counts</b>	<b>FWHM (keV)</b>
1	238.55	472 -	481	477.29	6.76E+01	16.18	8.34E+01	1.14
2	351.92	700 -	708	703.78	6.40E+01	10.84	2.50E+01	1.58
3	609.22	1213 -	1223	1218.01	4.25E+01	9.04	1.65E+01	1.61
4	1460.62	2914 -	2928	2921.30	1.71E+02	13.49	3.75E+00	1.82

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

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
K-40	0.99	1460.82 *	10.66	3.26E+00	2.93E-01
Bi-211	0.89	351.07 *	13.02	3.87E-01	7.25E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	9.55E-02	2.41E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.06E-01	2.35E-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 16-May-19-10030  
L1-10221D-FSGS-003SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
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	1.42E-01	2.65E-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

<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	0.994	3.26E+00	2.93E-01	
? Bi-211	0.892	3.87E-01	7.25E-02	
Pb-212	0.999	9.55E-02	2.41E-02	
Bi-214	0.999	1.06E-01	2.35E-02	
? Pb-214	1.000	1.42E-01	2.65E-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 16-May-19-10030  
L1-10221D-FSGS-003SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/16/2019 10:35:01AM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 4096

<b>Peak No.</b>	<b>Energy (keV)</b>	<b>Peak Size (CPS)</b>	<b>Peak CPS (%) Uncertainty</b>	<b>Peak Type</b>	<b>Tolerance Nuclide</b>
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

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
An Pk	511.00	100.00	7.61E-02	5.08E-02	5.08E-02
BE-7	477.60	10.44	2.04E-01	3.13E-01	3.13E-01
+ K-40	1460.82	* 10.66	3.26E+00	2.67E-01	2.67E-01
Mn-54	834.85	99.98	-1.25E-02	3.01E-02	3.01E-02
Co-60	1173.23	99.85	1.49E-02	4.07E-02	4.25E-02
	1332.49	99.98	-1.24E-02		4.07E-02
Nb-94	702.65	99.81	1.23E-03	3.18E-02	3.18E-02
	871.09	99.89	-4.32E-03		3.18E-02
Ag-108m	79.13	6.60	1.25E-01	2.97E-02	9.10E-01
	433.94	90.50	-1.21E-03		2.97E-02
	614.28	89.80	-7.80E-03		4.56E-02
	722.94	90.80	-5.11E-04		3.56E-02
Sb-125	176.31	6.84	4.19E-03	8.60E-02	4.02E-01
	380.45	1.52	5.55E-01		2.25E+00
	427.87	29.60	1.67E-02		8.60E-02
	463.36	10.49	1.58E-01		2.60E-01
	600.60	17.65	1.23E-01		2.08E-01
	606.71	4.98	-1.75E-01		9.89E-01
	635.95	11.22	4.18E-02		2.65E-01

Analysis Report for 16-May-19-10030  
L1-10221D-FSGS-003SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-1.53E-01	8.60E-02	1.79E+00
Ba-133	79.61	2.65	-1.08E+00	5.50E-02	2.05E+00
	81.00	32.90	-1.57E-01		1.44E-01
	276.40	7.16	1.98E-01		3.87E-01
	302.85	18.34	1.06E-01		1.50E-01
	356.01	62.05	-2.94E-02		5.50E-02
	383.85	8.94	1.15E-02		3.63E-01
Cs-134	475.36	1.48	-7.20E-02	4.04E-02	1.91E+00
	563.25	8.34	-1.38E-01		3.23E-01
	569.33	15.37	1.95E-02		1.87E-01
	604.72	97.62	1.17E-02		4.55E-02
	795.86	85.46	2.46E-02		4.04E-02
	801.95	8.69	2.85E-02		3.47E-01
	1038.61	0.99	-1.68E-01		3.89E+00
	1167.97	1.79	3.73E-01		2.26E+00
	1365.19	3.02	6.04E-01		1.49E+00
Cs-137	661.66	85.10	1.87E-02	4.91E-02	4.91E-02
Eu-152	121.78	28.67	-3.37E-02	9.15E-02	9.15E-02
	244.70	7.61	-2.17E-02		3.94E-01
	295.94	0.45	4.53E+00		7.42E+00
	344.28	26.60	-8.07E-02		9.92E-02
	367.79	0.86	3.05E-01		3.27E+00
	411.12	2.24	3.40E-02		1.14E+00
	443.96	2.83	-1.81E-02		1.03E+00
	488.68	0.42	2.05E+00		6.83E+00
	563.99	0.49	-1.49E+00		5.71E+00
	586.26	0.46	8.40E+00		8.81E+00
	678.62	0.47	9.78E-01		6.58E+00
	688.67	0.86	-1.94E+00		3.65E+00
	719.35	0.28	-2.06E+00		9.19E+00
	778.90	12.96	-1.64E-02		2.15E-01
	810.45	0.32	-2.36E+00		1.06E+01
	867.37	4.26	-1.44E-01		7.64E-01
	919.33	0.43	-2.66E+00		7.91E+00
	964.08	14.65	-1.60E-02		2.62E-01
	1085.87	10.24	7.90E-02		3.28E-01
	1089.74	1.73	2.93E-01		1.81E+00
	1112.07	13.69	-1.82E-01		2.65E-01
	1212.95	1.43	-1.20E+00		3.70E+00
	1249.94	0.19	1.32E+00		2.12E+01
	1299.14	1.63	6.07E-01		2.39E+00
	1408.01	21.07	9.38E-02		1.69E-01
	1457.64	0.50	-4.70E-01		2.70E+01
	1528.10	0.28	4.47E+00		1.09E+01
Eu-154	123.07	40.40	-1.54E-02	6.54E-02	6.54E-02
	247.93	6.89	-6.47E-03		3.92E-01
	591.76	4.95	-2.63E-01		5.62E-01
	692.42	1.78	-1.02E-01		1.81E+00
	723.30	20.06	8.79E-02		1.77E-01
	756.80	4.52	-1.39E-01		6.59E-01
	873.18	12.08	7.80E-02		2.63E-01

Analysis Report for 16-May-19-10030  
L1-10221D-FSGS-003SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	2.06E-01	6.54E-02	4.04E-01
	1004.76	18.01	2.75E-02		1.71E-01
	1274.43	34.80	1.43E-02		1.47E-01
	1596.48	1.80	-7.05E-02		2.09E+00
Eu-155	45.30	1.31	9.48E-01	1.40E-01	1.00E+01
	60.01	1.22	-1.46E+00		9.69E+00
	86.55	30.70	-3.54E-02		1.40E-01
	105.31	21.10	3.00E-02		1.59E-01
Ra-226	186.21	3.64	4.53E-01	9.13E-01	9.13E-01
Pa-231	27.36	10.30	4.43E-01	9.02E-01	9.02E-01
	283.69	1.70	2.26E-01		1.53E+00
	300.07	2.47	-4.57E-01		1.18E+00
	302.65	2.20	8.80E-01		1.25E+00
	330.06	1.40	5.40E-01		2.08E+00
U-235	143.76	10.96	-1.35E-01	5.80E-02	2.29E-01
	163.33	5.08	-7.80E-02		5.83E-01
	185.71	57.20	3.20E-02		5.80E-02
	202.11	1.08	2.33E+00		2.93E+00
	205.31	5.01	2.42E-02		6.00E-01
Am-241	59.54	35.90	-1.12E-01	3.36E-01	3.36E-01

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

Analysis Report for 16-May-19-10031  
L1-10221D-FSGS-004SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 16-May-19-10031  
Sample Description : L1-10221D-FSGS-004SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.521E+03 grams  
Facility : Default  
  
Sample Taken On : 5/15/2019 7:00:00AM  
Acquisition Started : 5/16/2019 10:20:05AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P40818B  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 901.0 seconds  
  
Dead Time : 0.11 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/29/2019  
Efficiency Calibration Used Done On : 5/16/2019  
Efficiency Calibration Description :  
  
Sample Number : 76620  
Fill Height : 1521.49 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/30/2012 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 5/16/2019 10:35:09AM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 8192

DATA VALIDATED 5/16/19 1500  
J. Brogan / C. J.

Analysis Report for 16-May-19-10031  
L1-10221D-FSGS-004SS

<b>Peak No.</b>	<b>Energy (keV)</b>	<b>ROI start</b>	<b>ROI end</b>	<b>Peak Centroid</b>	<b>Net Peak Area</b>	<b>Net Area Uncertainty</b>	<b>Continuum Counts</b>	<b>FWHM (keV)</b>
1	238.68	949 -	961	954.82	8.79E+01	13.42	3.51E+01	1.07
2	351.88	1400 -	1413	1407.26	5.60E+01	10.68	2.10E+01	1.05
3	582.99	2327 -	2338	2331.18	2.86E+01	5.86	2.39E+00	0.65
4	609.21	2429 -	2443	2436.03	4.32E+01	7.77	5.80E+00	0.73
5	1460.66	5832 -	5852	5842.46	1.48E+02	13.62	1.05E+01	2.03

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
K-40	0.99	1460.82 *	10.66	3.68E+00	3.76E-01
Tl-208	0.99	583.19 *	85.00	4.78E-02	1.02E-02
Bi-211	0.90	351.07 *	13.02	4.29E-01	8.88E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.57E-01	2.72E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.39E-01	2.64E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		

Analysis Report for 16-May-19-10031  
L1-10221D-FSGS-004SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Bi-214	0.99	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			1.57E-01	3.25E-02
785.96	1.06				

\* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

## INTERFERENCE CORRECTED REPORT

<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	0.996	3.68E+00	3.76E-01	
Tl-208	0.994	4.78E-02	1.02E-02	
? Bi-211	0.900	4.29E-01	8.88E-02	
Pb-212	1.000	1.57E-01	2.72E-02	
Bi-214	0.999	1.39E-01	2.64E-02	
? Pb-214	1.000	1.57E-01	3.25E-02	

Analysis Report for 16-May-19-10031

L1-10221D-FSGS-004SS

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

Errors quoted at 1.000sigma

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Analysis Report for 16-May-19-10031  
L1-10221D-FSGS-004SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/16/2019 10:35:09AM  
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	3.58E-02	5.70E-02	5.70E-02
	BE-7	477.60	10.44	3.59E-01	3.95E-01	3.95E-01
+	K-40	1460.82	* 10.66	3.68E+00	5.94E-01	5.94E-01
	Mn-54	834.85	99.98	2.15E-02	4.11E-02	4.11E-02
	Co-60	1173.23	99.85	2.39E-02	4.48E-02	5.17E-02
		1332.49	99.98	2.48E-02		4.48E-02
	Nb-94	702.65	99.81	-5.45E-03	3.50E-02	3.57E-02
		871.09	99.89	7.42E-03		3.50E-02
	Ag-108m	79.13	6.60	8.01E-01	3.67E-02	1.68E+00
		433.94	90.50	2.05E-02		3.67E-02
		614.28	89.80	-2.09E-02		5.06E-02
		722.94	90.80	2.71E-02		4.78E-02
	Sb-125	176.31	6.84	1.03E-01	1.11E-01	5.28E-01
		380.45	1.52	-3.23E+00		2.23E+00
		427.87	29.60	-1.08E-01		1.11E-01
		463.36	10.49	2.46E-01		3.56E-01
		600.60	17.65	-1.48E-01		2.25E-01
		606.71	4.98	1.43E+00		1.23E+00
		635.95	11.22	-5.38E-02		3.27E-01



Analysis Report for 16-May-19-10031  
L1-10221D-FSGS-004SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-1.45E+00	1.11E-01	2.17E+00
Ba-133	79.61	2.65	1.45E+00	6.13E-02	4.02E+00
	81.00	32.90	-1.88E-01		2.62E-01
	276.40	7.16	-9.13E-02		4.83E-01
	302.85	18.34	1.56E-01		1.89E-01
	356.01	62.05	-6.41E-02		6.13E-02
	383.85	8.94	-9.19E-02		3.86E-01
Cs-134	475.36	1.48	2.81E-01	4.14E-02	2.65E+00
	563.25	8.34	-8.32E-03		3.87E-01
	569.33	15.37	-8.51E-02		1.89E-01
	604.72	97.62	-2.41E-02		5.79E-02
	795.86	85.46	-1.58E-02		4.14E-02
	801.95	8.69	-1.35E-01		3.82E-01
	1038.61	0.99	2.81E+00		5.06E+00
	1167.97	1.79	-3.45E+00		2.65E+00
	1365.19	3.02	5.87E-01		1.31E+00
Cs-137	661.66	85.10	5.61E-02	6.05E-02	6.05E-02
Eu-152	121.78	28.67	-8.84E-02	1.39E-01	1.48E-01
	244.70	7.61	2.57E-01		4.93E-01
	295.94	0.45	5.77E+00		9.76E+00
	344.28	26.60	3.56E-03		1.39E-01
	367.79	0.86	-8.24E-01		3.38E+00
	411.12	2.24	3.54E-01		1.58E+00
	443.96	2.83	-4.49E-01		1.12E+00
	488.68	0.42	1.42E+00		8.85E+00
	563.99	0.49	1.36E+00		6.57E+00
	586.26	0.46	8.76E+00		1.08E+01
	678.62	0.47	-3.54E+00		7.16E+00
	688.67	0.86	-3.56E-01		3.74E+00
	719.35	0.28	-3.90E+00		1.01E+01
	778.90	12.96	9.20E-02		2.86E-01
	810.45	0.32	-4.90E+00		8.61E+00
	867.37	4.26	-6.93E-02		9.09E-01
	919.33	0.43	3.95E+00		1.05E+01
	964.08	14.65	-2.17E-02		3.86E-01
	1085.87	10.24	2.48E-01		4.67E-01
	1089.74	1.73	2.51E+00		3.05E+00
	1112.07	13.69	1.57E-01		3.82E-01
	1212.95	1.43	2.54E+00		4.15E+00
	1249.94	0.19	3.14E-01		2.54E+01
	1299.14	1.63	-1.13E-01		2.93E+00
	1408.01	21.07	-1.31E-01		2.02E-01
	1457.64	0.50	8.77E+01		3.42E+01
	1528.10	0.28	-4.24E+00		1.09E+01
Eu-154	123.07	40.40	4.81E-02	1.08E-01	1.08E-01
	247.93	6.89	2.39E-01		5.02E-01
	591.76	4.95	1.11E-01		7.50E-01
	692.42	1.78	8.77E-01		2.19E+00
	723.30	20.06	1.60E-01		2.24E-01
	756.80	4.52	-3.46E-01		8.05E-01
	873.18	12.08	-1.19E-01		2.67E-01

Analysis Report for 16-May-19-10031  
L1-10221D-FSGS-004SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	-6.42E-02	1.08E-01	4.07E-01
	1004.76	18.01	1.30E-01		2.52E-01
	1274.43	34.80	-5.82E-02		1.30E-01
	1596.48	1.80	4.76E-01		1.78E+00
Eu-155	45.30	1.31	-1.53E+01	2.40E-01	2.59E+01
	60.01	1.22	-1.83E+01		2.39E+01
	86.55	30.70	1.51E-01		2.40E-01
	105.31	21.10	-6.99E-02		2.46E-01
Ra-226	186.21	3.64	6.54E-01	1.09E+00	1.09E+00
Pa-231	27.36	10.30	3.03E+00	1.43E+00	3.32E+00
	283.69	1.70	1.07E-01		2.05E+00
	300.07	2.47	-1.93E+00		1.43E+00
	302.65	2.20	1.11E+00		1.57E+00
	330.06	1.40	-5.56E-01		2.22E+00
U-235	143.76	10.96	6.08E-02	6.90E-02	3.52E-01
	163.33	5.08	3.60E-01		7.25E-01
	185.71	57.20	5.79E-02		6.90E-02
	202.11	1.08	1.69E-01		3.26E+00
	205.31	5.01	-3.24E-01		6.54E-01
Am-241	59.54	35.90	-1.19E-01	9.11E-01	9.11E-01

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

Analysis Report for 16-May-19-10032  
L1-10221D-FSGS-005SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 16-May-19-10032  
Sample Description : L1-10221D-FSGS-005SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.547E+03 grams  
Facility : Default  
  
Sample Taken On : 5/15/2019 7:05:00AM  
Acquisition Started : 5/16/2019 10:20:12AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P11314  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.3 seconds  
  
Dead Time : 0.03 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/24/2019  
Efficiency Calibration Used Done On : 5/16/2019  
Efficiency Calibration Description :  
  
Sample Number : 76621  
Fill Height : 1547.16 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 12/22/2008 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 5/16/2019 10:35:30AM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 8192

DATA VALIDATED 5/16/19 1500  
J. Brogan / C. J.

Analysis Report for 16-May-19-10032  
L1-10221D-FSGS-005SS

	<b>Peak No.</b>	<b>Energy (keV)</b>	<b>ROI start</b>	<b>ROI end</b>	<b>Peak Centroid</b>	<b>Net Peak Area</b>	<b>Net Area Uncertainty</b>	<b>Continuum Counts</b>	<b>FWHM (keV)</b>
	1	77.32	305 -	314	309.82	5.06E+01	13.71	5.74E+01	0.62
M	2	238.77	947 -	973	954.64	1.45E+02	13.22	6.77E+01	1.04
m	3	242.01	947 -	973	967.60	2.08E+01	7.54	6.86E+01	1.05
	4	295.30	1175 -	1186	1180.49	4.38E+01	11.63	3.63E+01	0.47
	5	338.43	1348 -	1358	1352.78	3.08E+01	8.77	1.93E+01	0.34
	6	352.03	1399 -	1414	1407.12	1.09E+02	13.67	2.59E+01	1.36
	7	583.06	2325 -	2338	2330.37	5.09E+01	10.45	2.01E+01	1.34
	8	609.11	2427 -	2442	2434.48	6.26E+01	10.73	1.74E+01	0.65
	9	968.70	3866 -	3878	3872.22	2.11E+01	6.37	6.89E+00	0.82
	10	1460.34	5829 -	5850	5839.31	2.83E+02	17.85	1.00E+01	1.83

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

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
K-40	0.96	1460.82 *	10.66	6.33E+00	4.85E-01
Tl-208	0.99	583.19 *	85.00	7.64E-02	1.63E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	2.29E-01	2.80E-02
		300.09	3.30		
Pb212-XR	0.99	74.82	10.28		
		77.11 *	17.10	3.55E-01	1.03E-01 <sup>[100]</sup>

Analysis Report for 16-May-19-10032

L1-10221D-FSGS-005SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>		<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Pb212-XR	0.99	87.35		3.97		
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	1.81E-01	3.29E-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	1.99E-01	7.41E-02
		295.22	*	18.42	1.87E-01	5.18E-02
		351.93	*	35.60	2.74E-01	4.07E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	6.26E-01	1.84E-01
		87.35		2.24		
		89.78		0.82		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	2.37E-01	7.03E-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	2.41E-01	7.34E-02
		1588.20		3.22		

\* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

Analysis Report for 16-May-19-10032  
L1-10221D-FSGS-005SS

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## INTERFERENCE CORRECTED REPORT

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<i><b>Nuclide Name</b></i>	<i><b>Nuclide Id Confidence</b></i>	<i><b>Wt mean Activity (pCi/grams)</b></i>	<i><b>Wt mean Activity Uncertainty</b></i>	<i><b>Comments</b></i>
	0.964	6.33E+00	4.85E-01	
	0.998	7.64E-02	1.63E-02	
X	0.864			
	0.997	2.29E-01	2.80E-02	
?	0.996	3.55E-01	1.03E-01	
	0.997	1.81E-01	3.29E-02	
	0.999	2.34E-01	2.94E-02	
?	0.996	6.26E-01	1.84E-01	
	0.998	2.39E-01	5.08E-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

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Analysis Report for 16-May-19-10032  
L1-10221D-FSGS-005SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/16/2019 10:35:30AM  
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	6.81E-02	5.53E-02	5.53E-02
	BE-7	477.60	10.44	-8.86E-03	3.54E-01	3.54E-01
+	K-40	1460.82	* 10.66	6.33E+00	5.18E-01	5.18E-01
	Mn-54	834.85	99.98	4.08E-03	4.22E-02	4.22E-02
	Co-60	1173.23	99.85	-1.94E-02	5.04E-02	5.69E-02
		1332.49	99.98	7.78E-03		5.04E-02
	Nb-94	702.65	99.81	9.15E-03	4.42E-02	4.59E-02
		871.09	99.89	8.34E-03		4.42E-02
	Ag-108m	79.13	6.60	-7.57E-01	3.59E-02	1.05E+00
		433.94	90.50	-2.15E-02		3.59E-02
		614.28	89.80	-1.27E-02		5.16E-02
		722.94	90.80	2.26E-02		4.88E-02
	Sb-125	176.31	6.84	3.20E-01	1.27E-01	4.64E-01
		380.45	1.52	1.40E+00		2.50E+00
		427.87	29.60	7.91E-02		1.27E-01
		463.36	10.49	1.43E-01		3.92E-01
		600.60	17.65	1.29E-01		2.34E-01
		606.71	4.98	1.54E+00		1.36E+00
		635.95	11.22	-1.21E-01		3.47E-01

Analysis Report for 16-May-19-10032

L1-10221D-FSGS-005SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-1.66E-01	1.27E-01	2.32E+00
Ba-133	79.61	2.65	-1.37E+00	6.92E-02	2.58E+00
	81.00	32.90	-1.15E-01		1.69E-01
	276.40	7.16	6.49E-04		4.50E-01
	302.85	18.34	1.31E-02		1.66E-01
	356.01	62.05	-1.54E-02		6.92E-02
	383.85	8.94	3.55E-02		4.13E-01
Cs-134	475.36	1.48	-1.73E+00	5.69E-02	2.34E+00
	563.25	8.34	-3.99E-01		4.61E-01
	569.33	15.37	9.29E-02		2.38E-01
	604.72	97.62	-2.74E-04		6.52E-02
	795.86	85.46	-2.43E-02		5.69E-02
	801.95	8.69	4.20E-02		4.72E-01
	1038.61	0.99	-1.51E+00		4.64E+00
	1167.97	1.79	-1.17E+00		3.06E+00
	1365.19	3.02	-4.56E-01		1.61E+00
Cs-137	661.66	85.10	3.44E-02	6.29E-02	6.29E-02
Eu-152	121.78	28.67	-3.02E-02	1.11E-01	1.11E-01
	244.70	7.61	1.46E-01		5.34E-01
	295.94	0.45	7.09E+00		9.66E+00
	344.28	26.60	-2.35E-02		1.19E-01
	367.79	0.86	-9.93E-01		3.43E+00
	411.12	2.24	-9.87E-01		1.55E+00
	443.96	2.83	-3.37E-01		1.28E+00
	488.68	0.42	-8.60E-01		8.92E+00
	563.99	0.49	-1.87E+01		6.82E+00
	586.26	0.46	-6.37E+00		1.31E+01
	678.62	0.47	-3.54E+00		7.61E+00
	688.67	0.86	-1.16E+00		4.99E+00
	719.35	0.28	-4.62E+00		1.34E+01
	778.90	12.96	-2.28E-01		3.04E-01
	810.45	0.32	-8.50E+00		1.18E+01
	867.37	4.26	-5.18E-01		9.74E-01
	919.33	0.43	1.13E+00		1.18E+01
	964.08	14.65	-6.68E-02		4.64E-01
	1085.87	10.24	-2.74E-02		5.36E-01
	1089.74	1.73	8.83E-01		3.08E+00
	1112.07	13.69	3.45E-02		3.73E-01
	1212.95	1.43	1.54E+00		4.58E+00
	1249.94	0.19	2.90E+01		3.66E+01
	1299.14	1.63	5.72E-01		3.05E+00
	1408.01	21.07	-4.59E-04		1.61E-01
	1457.64	0.50	1.30E+02		4.08E+01
	1528.10	0.28	2.50E-01		1.36E+01
Eu-154	123.07	40.40	-7.16E-02	7.43E-02	7.43E-02
	247.93	6.89	-2.46E-01		4.91E-01
	591.76	4.95	-2.61E-01		6.05E-01
	692.42	1.78	-6.46E-01		2.42E+00
	723.30	20.06	1.08E-01		2.24E-01
	756.80	4.52	3.20E-01		9.82E-01
	873.18	12.08	4.28E-02		4.11E-01



Analysis Report for 16-May-19-10032  
L1-10221D-FSGS-005SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	-9.64E-02	7.43E-02	3.97E-01
	1004.76	18.01	1.10E-01		2.71E-01
	1274.43	34.80	-3.12E-02		1.33E-01
	1596.48	1.80	-1.19E+00		2.67E+00
Eu-155	45.30	1.31	4.76E+00	1.85E-01	1.10E+01
	60.01	1.22	-2.09E+00		1.27E+01
	86.55	30.70	8.06E-02		1.86E-01
	105.31	21.10	-4.86E-02		1.85E-01
Ra-226	186.21	3.64	9.75E-01	9.49E-01	9.49E-01
Pa-231	27.36	10.30	1.17E+00	1.20E+00	1.43E+00
	283.69	1.70	4.56E-01		1.86E+00
	300.07	2.47	-1.14E+00		1.20E+00
	302.65	2.20	2.24E-01		1.39E+00
	330.06	1.40	2.40E+00		2.69E+00
	U-235	143.76	10.96		8.69E-02
U-235	163.33	5.08	2.03E-01	5.87E-02	6.26E-01
	185.71	57.20	3.53E-02		5.87E-02
	202.11	1.08	-1.14E+00		2.88E+00
	205.31	5.01	-3.84E-01		6.54E-01
Am-241	59.54	35.90	1.34E-01	4.56E-01	4.56E-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 16-May-19-10033  
L1-10221D-FSGS-006SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 16-May-19-10033  
Sample Description : L1-10221D-FSGS-006SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.476E+03 grams  
Facility : Default  
  
Sample Taken On : 5/15/2019 7:10:00AM  
Acquisition Started : 5/16/2019 10:20:19AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : 352  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.3 seconds  
  
Dead Time : 0.03 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 9/29/2018  
Efficiency Calibration Used Done On : 5/16/2019  
Efficiency Calibration Description :  
  
Sample Number : 76622  
Fill Height : 1476.27 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/7/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 5/16/2019 10:35:22AM

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

DATA VALIDATED 5/16/19 1500  
J. Brogan / C. J.

Analysis Report for 16-May-19-10033  
L1-10221D-FSGS-006SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.63	947 -	961	954.98	9.97E+01	16.01	5.23E+01	0.89
2	351.71	1401 -	1414	1406.85	3.10E+01	9.29	2.00E+01	0.71
3	511.11	2039 -	2050	2043.93	1.98E+01	8.35	1.92E+01	0.55
4	582.93	2325 -	2336	2331.03	4.30E+01	8.10	8.98E+00	0.33
5	609.16	2429 -	2443	2435.91	4.33E+01	8.26	8.74E+00	0.40
6	661.49	2638 -	2652	2645.13	4.73E+01	7.62	3.75E+00	1.09
7	1460.36	5829 -	5852	5841.81	1.86E+02	13.64	0.00E+00	2.23

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.99	511.00 *	100.00	2.26E-02	9.66E-03
K-40	0.96	1460.82 *	10.66	3.93E+00	3.35E-01
Cs-137	0.99	661.66 *	85.10	7.40E-02	1.27E-02
Tl-208	0.98	583.19 *	85.00	6.20E-02	1.23E-02
Bi-211	0.93	351.07 *	13.02	2.08E-01	6.45E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.57E-01	2.82E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.20E-01	2.40E-02
		768.36	4.89		

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Analysis Report for 16-May-19-10033  
L1-10221D-FSGS-006SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Bi-214	0.99	806.18	1.26		
		934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	0.99	241.99	7.25		
		295.22	18.42		
		351.93 *	35.60	7.60E-02	2.36E-02
		785.96	1.06		

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

## INTERFERENCE CORRECTED REPORT

<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
An Pk	0.998	2.26E-02	9.66E-03	
K-40	0.967	3.93E+00	3.35E-01	
Cs-137	0.995	7.40E-02	1.27E-02	
Tl-208	0.989	6.20E-02	1.23E-02	
? Bi-211	0.936	2.08E-01	6.45E-02	
Pb-212	1.000	1.57E-01	2.82E-02	
Bi-214	0.998	1.20E-01	2.40E-02	

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Analysis Report for 16-May-19-10033  
L1-10221D-FSGS-006SS

<i><b>Nuclide Name</b></i>	<i><b>Nuclide Id Confidence</b></i>	<i><b>Wt mean Activity (pCi/grams)</b></i>	<i><b>Wt mean Activity Uncertainty</b></i>	<i><b>Comments</b></i>
? Pb-214	0.996	7.60E-02	2.36E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 16-May-19-10033  
L1-10221D-FSGS-006SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/16/2019 10:35:22AM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

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

## NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	* 100.00	2.26E-02	3.07E-02	3.07E-02
	BE-7	477.60	10.44	2.70E-01	3.70E-01	3.70E-01
+	K-40	1460.82	* 10.66	3.93E+00	6.08E-02	6.08E-02
	Mn-54	834.85	99.98	-3.50E-02	3.70E-02	3.70E-02
	Co-60	1173.23	99.85	-1.40E-02	5.01E-02	5.48E-02
		1332.49	99.98	2.61E-02		5.01E-02
	Nb-94	702.65	99.81	3.53E-02	4.13E-02	4.45E-02
		871.09	99.89	2.76E-03		4.13E-02
	Ag-108m	79.13	6.60	-1.20E+00	3.39E-02	1.35E+00
		433.94	90.50	-6.22E-03		3.39E-02
		614.28	89.80	-1.88E-02		5.43E-02
		722.94	90.80	2.76E-02		4.46E-02
	Sb-125	176.31	6.84	3.42E-01	1.07E-01	4.58E-01
		380.45	1.52	8.66E-01		2.24E+00
		427.87	29.60	2.21E-02		1.07E-01
		463.36	10.49	1.80E-02		3.49E-01
		600.60	17.65	-1.12E-01		1.76E-01
		606.71	4.98	1.25E+00		1.10E+00
		635.95	11.22	4.95E-02		2.88E-01

Analysis Report for 16-May-19-10033

L1-10221D-FSGS-006SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-1.04E+00	1.07E-01	1.61E+00
Ba-133	79.61	2.65	1.22E+00	5.81E-02	3.36E+00
	81.00	32.90	-2.09E-01		2.37E-01
	276.40	7.16	-9.52E-02		4.24E-01
	302.85	18.34	4.34E-03		1.88E-01
	356.01	62.05	3.51E-03		5.81E-02
	383.85	8.94	-1.14E-01		3.60E-01
Cs-134	475.36	1.48	1.25E+00	4.64E-02	2.62E+00
	563.25	8.34	3.60E-01		3.87E-01
	569.33	15.37	2.55E-02		2.42E-01
	604.72	97.62	-3.28E-02		5.39E-02
	795.86	85.46	1.08E-02		4.64E-02
	801.95	8.69	-3.25E-02		4.92E-01
	1038.61	0.99	9.51E-01		4.21E+00
	1167.97	1.79	1.43E+00		3.00E+00
	1365.19	3.02	-1.60E-01		1.39E+00
+ Cs-137	661.66	* 85.10	7.40E-02	2.20E-02	2.20E-02
Eu-152	121.78	28.67	5.55E-02	1.15E-01	1.18E-01
	244.70	7.61	3.21E-01		4.66E-01
	295.94	0.45	-9.59E-01		8.11E+00
	344.28	26.60	-5.70E-02		1.15E-01
	367.79	0.86	5.49E-02		3.39E+00
	411.12	2.24	9.13E-02		1.58E+00
	443.96	2.83	-3.62E-02		1.17E+00
	488.68	0.42	6.17E+00		8.02E+00
	563.99	0.49	-6.11E-02		6.45E+00
	586.26	0.46	1.40E+01		1.20E+01
	678.62	0.47	-6.87E+00		6.33E+00
	688.67	0.86	-7.15E-01		4.28E+00
	719.35	0.28	-8.52E+00		1.14E+01
	778.90	12.96	-1.75E-01		3.13E-01
	810.45	0.32	1.62E+00		1.20E+01
	867.37	4.26	2.73E-01		1.00E+00
	919.33	0.43	2.01E-01		1.06E+01
	964.08	14.65	3.21E-02		3.92E-01
	1085.87	10.24	-1.14E-01		3.51E-01
	1089.74	1.73	9.99E-01		2.60E+00
	1112.07	13.69	-4.23E-01		2.93E-01
	1212.95	1.43	-2.19E-01		3.80E+00
	1249.94	0.19	1.52E+01		3.02E+01
	1299.14	1.63	2.42E+00		3.03E+00
	1408.01	21.07	-1.93E-01		1.88E-01
	1457.64	0.50	8.55E+01		3.10E+01
	1528.10	0.28	-8.79E+00		1.36E+01
Eu-154	123.07	40.40	-6.01E-02	8.05E-02	8.05E-02
	247.93	6.89	2.68E-01		4.78E-01
	591.76	4.95	-1.98E-01		6.84E-01
	692.42	1.78	4.55E-01		2.18E+00
	723.30	20.06	1.18E-01		1.99E-01
	756.80	4.52	6.44E-01		7.83E-01
	873.18	12.08	-1.07E-01		3.22E-01

Analysis Report for 16-May-19-10033  
L1-10221D-FSGS-006SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	-3.01E-01	8.05E-02	3.47E-01
	1004.76	18.01	2.78E-03		2.03E-01
	1274.43	34.80	7.01E-02		1.40E-01
	1596.48	1.80	-7.04E-01		2.42E+00
Eu-155	45.30	1.31	-1.62E+00	1.79E-01	1.68E+01
	60.01	1.22	-2.54E+00		1.65E+01
	86.55	30.70	-7.26E-02		1.90E-01
	105.31	21.10	-4.29E-02		1.79E-01
Ra-226	186.21	3.64	7.59E-01	9.54E-01	9.54E-01
Pa-231	27.36	10.30	9.18E-01	1.38E+00	1.98E+00
	283.69	1.70	-5.06E-01		1.65E+00
	300.07	2.47	-1.96E+00		1.38E+00
	302.65	2.20	2.16E-01		1.58E+00
	330.06	1.40	-3.54E-01		2.22E+00
U-235	143.76	10.96	1.20E-01	6.04E-02	3.19E-01
	163.33	5.08	-3.54E-01		5.66E-01
	185.71	57.20	2.50E-02		6.04E-02
	202.11	1.08	-5.06E-01		3.00E+00
	205.31	5.01	-3.50E-01		6.17E-01
Am-241	59.54	35.90	-1.03E-01	5.87E-01	5.87E-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 16-May-19-10034  
L1-10221D-FSGS-007SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 16-May-19-10034  
Sample Description : L1-10221D-FSGS-007SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.526E+03 grams  
Facility : Default  
  
Sample Taken On : 5/15/2019 7:15:00AM  
Acquisition Started : 5/16/2019 10:38:34AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : 324  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.9 seconds  
  
Dead Time : 0.10 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 4096  
Peak Area Range (in channels) : 120 - 4096  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 9/29/2018  
Efficiency Calibration Used Done On : 5/16/2019  
Efficiency Calibration Description :  
  
Sample Number : 76623  
Fill Height : 1525.75 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/30/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 5/16/2019 10:53:37AM

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

DATA VALIDATED 5/16/19, 1500  
J. Brogan / C. J. H.

Analysis Report for 16-May-19-10034  
L1-10221D-FSGS-007SS

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	477.53	1.24E+02	19.71	1.20E+02	1.13
2	295.24	585 -	595	590.54	6.55E+01	14.07	5.35E+01	1.28
3	337.99	671 -	680	675.96	3.50E+01	12.00	4.60E+01	0.68
4	351.84	700 -	708	703.63	1.02E+02	13.23	3.38E+01	1.01
5	583.33	1160 -	1171	1166.27	4.40E+01	10.92	3.00E+01	1.51
6	609.48	1213 -	1224	1218.54	7.25E+01	11.12	2.05E+01	1.76
7	1120.72	2237 -	2244	2240.99	1.76E+01	6.12	8.38E+00	1.46
8	1460.68	2914 -	2927	2921.41	2.77E+02	17.20	6.83E+00	1.79
9	1763.98	3524 -	3534	3528.81	2.75E+01	5.61	1.54E+00	1.66

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82 *	10.66	5.21E+00	3.95E-01
Tl-208	0.99	583.19 *	85.00	5.68E-02	1.45E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.73E-01	3.10E-02
		300.09	3.30		
Bi-214	0.98	609.32 *	45.49	1.80E-01	2.96E-02
		768.36	4.89		
		806.18	1.26		

[114]

Analysis Report for 16-May-19-10034  
L1-10221D-FSGS-007SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Bi-214	0.98	934.06	3.11		
		1120.29 *	14.92	1.98E-01	6.93E-02
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49 *	15.30	4.14E-01	8.63E-02
		1847.43	2.03		
		2118.51	1.16		
Pb-214	0.99	241.99	7.25		
		295.22 *	18.42	2.45E-01	5.62E-02
		351.93 *	35.60	2.24E-01	3.41E-02
Ac-228	0.57	785.96	1.06		
		129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32 *	11.27	2.35E-01	8.30E-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 16-May-19-10034

L1-10221D-FSGS-007SS

<i><b>Nuclide Name</b></i>	<i><b>Nuclide Id Confidence</b></i>	<i><b>Wt mean Activity (pCi/grams)</b></i>	<i><b>Wt mean Activity Uncertainty</b></i>	<i><b>Comments</b></i>
K-40	0.997	5.21E+00	3.95E-01	
Tl-208	0.997	5.68E-02	1.45E-02	
X Bi-211	0.909			
Pb-212	1.000	1.73E-01	3.10E-02	
Bi-214	0.989	2.04E-01	2.60E-02	
Pb-214	0.999	2.30E-01	2.92E-02	
Ac-228	0.570	2.35E-01	8.30E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 1.000sigma

Analysis Report for 16-May-19-10034  
L1-10221D-FSGS-007SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/16/2019 10:53:37AM  
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	5.02E-02	4.64E-02	4.64E-02
	BE-7	477.60	10.44	1.03E-01	3.14E-01	3.14E-01
+	K-40	1460.82	* 10.66	5.21E+00	3.29E-01	3.29E-01
	Mn-54	834.85	99.98	2.13E-02	4.29E-02	4.29E-02
	Co-60	1173.23	99.85	7.15E-04	4.96E-02	4.96E-02
		1332.49	99.98	4.45E-02		5.46E-02
	Nb-94	702.65	99.81	3.54E-03	3.76E-02	4.12E-02
		871.09	99.89	1.65E-02		3.76E-02
	Ag-108m	79.13	6.60	5.12E-01	3.15E-02	1.22E+00
		433.94	90.50	-1.12E-02		3.15E-02
		614.28	89.80	-1.72E-02		5.06E-02
		722.94	90.80	-1.77E-02		4.23E-02
	Sb-125	176.31	6.84	-3.22E-02	1.14E-01	4.84E-01
		380.45	1.52	4.48E-01		2.02E+00
		427.87	29.60	5.30E-02		1.14E-01
		463.36	10.49	2.00E-01		3.36E-01
		600.60	17.65	2.52E-02		2.11E-01
		606.71	4.98	8.08E-03		1.21E+00
		635.95	11.22	-1.85E-01		2.88E-01

Analysis Report for 16-May-19-10034

L1-10221D-FSGS-007SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	1.70E-01	1.14E-01	1.93E+00
Ba-133	79.61	2.65	6.53E-01	6.95E-02	2.85E+00
	81.00	32.90	-1.54E-01		1.97E-01
	276.40	7.16	7.20E-02		4.52E-01
	302.85	18.34	8.49E-03		1.71E-01
	356.01	62.05	-1.38E-02		6.95E-02
	383.85	8.94	-2.20E-01		3.15E-01
Cs-134	475.36	1.48	5.47E-01	4.45E-02	2.10E+00
	563.25	8.34	-1.09E-01		4.17E-01
	569.33	15.37	-6.41E-02		1.99E-01
	604.72	97.62	-4.17E-03		5.08E-02
	795.86	85.46	4.55E-03		4.45E-02
	801.95	8.69	-1.91E-01		3.87E-01
	1038.61	0.99	1.42E+00		4.42E+00
	1167.97	1.79	7.86E-01		2.76E+00
	1365.19	3.02	-1.78E-01		1.09E+00
Cs-137	661.66	85.10	1.88E-03	4.38E-02	4.38E-02
Eu-152	121.78	28.67	-5.04E-02	1.07E-01	1.07E-01
	244.70	7.61	-3.56E-02		4.45E-01
	295.94	0.45	5.21E-01		9.04E+00
	344.28	26.60	-3.09E-02		1.18E-01
	367.79	0.86	5.78E-02		3.65E+00
	411.12	2.24	7.48E-02		1.48E+00
	443.96	2.83	6.46E-01		1.19E+00
	488.68	0.42	-7.22E-01		7.62E+00
	563.99	0.49	-1.70E-01		7.09E+00
	586.26	0.46	-1.08E+00		1.15E+01
	678.62	0.47	1.48E+00		7.59E+00
	688.67	0.86	-1.15E+00		3.89E+00
	719.35	0.28	2.00E+00		1.43E+01
	778.90	12.96	-4.09E-02		3.15E-01
	810.45	0.32	1.17E+00		1.07E+01
	867.37	4.26	-2.12E-01		8.96E-01
	919.33	0.43	-8.93E+00		8.03E+00
	964.08	14.65	9.89E-02		3.46E-01
	1085.87	10.24	-3.08E-01		3.64E-01
	1089.74	1.73	-4.80E-01		2.42E+00
	1112.07	13.69	-2.29E-01		3.39E-01
	1212.95	1.43	1.42E-02		3.96E+00
	1249.94	0.19	-6.77E+00		2.89E+01
	1299.14	1.63	2.75E+00		3.15E+00
	1408.01	21.07	6.39E-02		1.93E-01
	1457.64	0.50	-8.96E-01		3.36E+01
	1528.10	0.28	-1.66E+00		9.17E+00
Eu-154	123.07	40.40	-1.50E-02	7.82E-02	7.82E-02
	247.93	6.89	-1.29E-01		4.03E-01
	591.76	4.95	-1.84E-01		6.99E-01
	692.42	1.78	5.01E-01		2.04E+00
	723.30	20.06	-8.09E-03		1.97E-01
	756.80	4.52	-7.19E-02		7.87E-01
	873.18	12.08	1.54E-01		3.12E-01

Analysis Report for 16-May-19-10034  
L1-10221D-FSGS-007SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	1.86E-02	7.82E-02	3.62E-01
	1004.76	18.01	1.07E-01		2.34E-01
	1274.43	34.80	-2.39E-02		1.27E-01
	1596.48	1.80	7.92E-01		2.24E+00
Eu-155	45.30	1.31	3.46E+00	1.74E-01	1.14E+01
	60.01	1.22	-5.75E+00		1.18E+01
	86.55	30.70	6.41E-02		1.79E-01
	105.31	21.10	-2.38E-02		1.74E-01
Ra-226	186.21	3.64	3.60E-01	9.73E-01	9.73E-01
Pa-231	27.36	10.30	6.54E-01	1.18E+00	1.18E+00
	283.69	1.70	-7.16E-01		1.75E+00
	300.07	2.47	3.71E-02		1.32E+00
	302.65	2.20	7.07E-02		1.43E+00
	330.06	1.40	2.11E+00		2.52E+00
U-235	143.76	10.96	7.75E-03	6.28E-02	2.86E-01
	163.33	5.08	5.62E-02		7.06E-01
	185.71	57.20	2.68E-02		6.28E-02
	202.11	1.08	-2.36E-01		3.12E+00
	205.31	5.01	-4.66E-01		6.84E-01
Am-241	59.54	35.90	-8.64E-02	4.26E-01	4.26E-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 16-May-19-10035  
L1-10221D-FSGS-008SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 16-May-19-10035  
Sample Description : L1-10221D-FSGS-008SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.510E+03 grams  
Facility : Default  
  
Sample Taken On : 5/15/2019 7:20:00AM  
Acquisition Started : 5/16/2019 10:38:41AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P40818B  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 901.2 seconds  
  
Dead Time : 0.13 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/29/2019  
Efficiency Calibration Used Done On : 5/16/2019  
Efficiency Calibration Description :  
  
Sample Number : 76624  
Fill Height : 1509.59 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/30/2012 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 5/16/2019 10:53:45AM

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

DATA VALIDATED 5/16/19 1500  
J. Brokan / C. J.



Analysis Report for 16-May-19-10035  
L1-10221D-FSGS-008SS

<b>Peak No.</b>	<b>Energy (keV)</b>	<b>ROI start</b>	<b>ROI end</b>	<b>Peak Centroid</b>	<b>Net Peak Area</b>	<b>Net Area Uncertainty</b>	<b>Continuum Counts</b>	<b>FWHM (keV)</b>
1	238.62	948 -	960	954.56	6.42E+01	14.36	5.38E+01	0.65
2	583.21	2327 -	2338	2332.06	2.03E+01	5.72	4.72E+00	0.79
3	661.52	2637 -	2652	2645.16	1.25E+02	12.70	1.19E+01	1.58
4	1460.60	5832 -	5852	5842.22	1.53E+02	12.75	2.55E+00	1.55

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
K-40	0.99	1460.82 *	10.66	3.84E+00	3.60E-01
Cs-137	0.99	661.66 *	85.10	2.28E-01	2.69E-02
Tl-208	1.00	583.19 *	85.00	3.40E-02	9.79E-03
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.15E-01	2.74E-02
		300.09	3.30		

Analysis Report for 16-May-19-10035  
L1-10221D-FSGS-008SS

\* = 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

<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	0.992	3.84E+00	3.60E-01	
Cs-137	0.997	2.28E-01	2.69E-02	
Tl-208	1.000	3.40E-02	9.79E-03	
Pb-212	1.000	1.15E-01	2.74E-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 16-May-19-10035  
L1-10221D-FSGS-008SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/16/2019 10:53:45AM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

<b>Peak No.</b>	<b>Energy (keV)</b>	<b>Peak Size (CPS)</b>	<b>Peak CPS (%) Uncertainty</b>	<b>Peak Type</b>	<b>Tolerance Nuclide</b>
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

	<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
	An Pk	511.00	100.00	6.66E-02	5.59E-02	5.59E-02
	BE-7	477.60	10.44	6.42E-01	5.35E-01	5.35E-01
+	K-40	1460.82	* 10.66	3.84E+00	3.28E-01	3.28E-01
	Mn-54	834.85	99.98	2.47E-03	4.52E-02	4.52E-02
	Co-60	1173.23	99.85	2.92E-02	5.49E-02	6.15E-02
		1332.49	99.98	1.20E-02		5.49E-02
	Nb-94	702.65	99.81	2.14E-02	3.94E-02	3.94E-02
		871.09	99.89	-7.65E-03		4.45E-02
	Ag-108m	79.13	6.60	1.46E+00	4.32E-02	1.82E+00
		433.94	90.50	2.64E-02		4.54E-02
		614.28	89.80	-4.39E-02		5.33E-02
		722.94	90.80	-7.26E-03		4.32E-02
	Sb-125	176.31	6.84	-4.78E-01	1.37E-01	4.93E-01
		380.45	1.52	1.06E+00		2.42E+00
		427.87	29.60	4.90E-02		1.37E-01
		463.36	10.49	2.23E-01		3.89E-01
		600.60	17.65	7.82E-02		2.36E-01
		606.71	4.98	7.04E-01		1.17E+00
		635.95	11.22	7.75E-02		4.21E-01

Analysis Report for 16-May-19-10035  
L1-10221D-FSGS-008SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-8.19E-01	1.37E-01	2.13E+00
Ba-133	79.61	2.65	1.51E+00	7.17E-02	4.23E+00
	81.00	32.90	-3.07E-01		2.84E-01
	276.40	7.16	-2.81E-02		5.83E-01
	302.85	18.34	-9.56E-02		2.09E-01
	356.01	62.05	-6.52E-02		7.17E-02
	383.85	8.94	-3.37E-01		4.00E-01
Cs-134	475.36	1.48	2.70E+00	5.12E-02	3.74E+00
	563.25	8.34	4.10E-01		5.08E-01
	569.33	15.37	-2.14E-01		2.31E-01
	604.72	97.62	-3.01E-02		5.51E-02
	795.86	85.46	2.59E-02		5.12E-02
	801.95	8.69	1.21E-01		4.37E-01
	1038.61	0.99	1.76E+00		5.19E+00
	1167.97	1.79	1.50E+00		3.36E+00
	1365.19	3.02	8.41E-01		1.52E+00
+ Cs-137	661.66	* 85.10	2.28E-01	4.25E-02	4.25E-02
Eu-152	121.78	28.67	3.42E-03	1.39E-01	1.51E-01
	244.70	7.61	-4.77E-02		5.53E-01
	295.94	0.45	1.52E+00		9.78E+00
	344.28	26.60	1.05E-01		1.39E-01
	367.79	0.86	1.73E+00		4.79E+00
	411.12	2.24	-1.26E-01		1.68E+00
	443.96	2.83	8.33E-02		1.33E+00
	488.68	0.42	-3.66E+00		9.49E+00
	563.99	0.49	2.59E+00		8.26E+00
	586.26	0.46	3.76E+00		9.96E+00
	678.62	0.47	5.44E+00		9.15E+00
	688.67	0.86	-1.36E+00		4.31E+00
	719.35	0.28	3.99E+00		1.46E+01
	778.90	12.96	-2.00E-01		3.72E-01
	810.45	0.32	4.16E-01		1.29E+01
	867.37	4.26	-6.01E-01		1.06E+00
	919.33	0.43	-7.70E+00		9.45E+00
	964.08	14.65	1.85E-01		4.33E-01
	1085.87	10.24	1.92E-01		5.27E-01
	1089.74	1.73	2.42E-01		3.06E+00
	1112.07	13.69	4.63E-02		3.55E-01
	1212.95	1.43	-2.28E-03		3.80E+00
	1249.94	0.19	5.17E+00		3.20E+01
	1299.14	1.63	4.05E-01		2.60E+00
	1408.01	21.07	5.23E-02		2.79E-01
	1457.64	0.50	8.58E+01		3.43E+01
	1528.10	0.28	-2.03E+01		1.22E+01
Eu-154	123.07	40.40	5.27E-02	1.09E-01	1.09E-01
	247.93	6.89	3.36E-02		5.53E-01
	591.76	4.95	-7.59E-02		7.37E-01
	692.42	1.78	8.53E-01		2.42E+00
	723.30	20.06	2.67E-02		1.95E-01
	756.80	4.52	2.09E-01		8.07E-01
	873.18	12.08	1.36E-01		3.77E-01

Analysis Report for 16-May-19-10035  
L1-10221D-FSGS-008SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	2.07E-01	1.09E-01	4.08E-01
	1004.76	18.01	-1.48E-03		3.18E-01
	1274.43	34.80	-6.86E-02		1.20E-01
	1596.48	1.80	-9.95E-02		2.33E+00
Eu-155	45.30	1.31	5.71E+00	2.36E-01	2.85E+01
	60.01	1.22	-7.26E+00		2.95E+01
	86.55	30.70	-1.09E-01		2.36E-01
	105.31	21.10	1.81E-01		2.84E-01
Ra-226	186.21	3.64	-2.24E-01	1.06E+00	1.06E+00
Pa-231	27.36	10.30	3.09E+00	1.56E+00	3.43E+00
	283.69	1.70	1.15E+00		2.13E+00
	300.07	2.47	-1.52E+00		1.56E+00
	302.65	2.20	-3.59E-01		1.76E+00
	330.06	1.40	3.09E-01		2.70E+00
U-235	143.76	10.96	-2.50E-01	6.89E-02	3.61E-01
	163.33	5.08	4.97E-02		7.51E-01
	185.71	57.20	2.88E-02		6.89E-02
	202.11	1.08	-1.54E+00		3.49E+00
	205.31	5.01	-4.58E-01		7.61E-01
Am-241	59.54	35.90	-6.63E-02	1.09E+00	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 16-May-19-10036  
L1-10221D-FSGS-009SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 16-May-19-10036  
Sample Description : L1-10221D-FSGS-009SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.520E+03 grams  
Facility : Default  
  
Sample Taken On : 5/15/2019 7:25:00AM  
Acquisition Started : 5/16/2019 10:38:47AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P11314  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.3 seconds  
  
Dead Time : 0.03 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/24/2019  
Efficiency Calibration Used Done On : 5/16/2019  
Efficiency Calibration Description :  
  
Sample Number : 76625  
Fill Height : 1519.53 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 12/22/2008 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 5/16/2019 10:53:58AM

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

DATA VALIDATED 5/16/19 1500  
J. Brogan / C. J. H.

Analysis Report for 16-May-19-10036  
L1-10221D-FSGS-009SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.29	306 -	315	309.67	4.98E+01	14.45	6.92E+01	0.59
2	238.73	949 -	961	954.49	1.44E+02	17.84	6.19E+01	0.98
3	295.34	1173 -	1187	1180.63	5.32E+01	12.52	3.58E+01	1.33
4	338.57	1347 -	1360	1353.36	4.33E+01	8.58	1.07E+01	0.82
5	351.88	1399 -	1414	1406.52	9.27E+01	12.90	2.43E+01	1.26
6	583.06	2325 -	2337	2330.36	4.55E+01	9.14	1.45E+01	1.01
7	609.22	2426 -	2441	2434.92	8.59E+01	9.62	2.11E+00	0.77
8	911.12	3635 -	3649	3641.95	3.43E+01	6.71	3.75E+00	0.38
9	968.49	3866 -	3876	3871.36	2.06E+01	7.08	1.24E+01	0.45
10	1460.45	5828 -	5850	5839.72	2.52E+02	16.90	8.57E+00	1.52

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.97	1460.82 *	10.66	5.67E+00	4.53E-01
Tl-208	0.99	583.19 *	85.00	6.87E-02	1.44E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	2.29E-01	3.39E-02
		300.09	3.30		
Pb212-XR	0.99	74.82	10.28		
		77.11 *	17.10	3.50E-01	1.08E-01 <sup>[127]</sup>

Analysis Report for 16-May-19-10036  
L1-10221D-FSGS-009SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>		<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Pb212-XR	0.99	87.35		3.97		
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	2.49E-01	3.17E-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	2.28E-01	5.66E-02
		351.93	*	35.60	2.34E-01	3.75E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	6.17E-01	1.92E-01
		87.35		2.24		
		89.78		0.82		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	3.35E-01	7.18E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.31E-01	4.63E-02
		964.77		4.99		
		968.97	*	15.80	2.36E-01	8.18E-02
		1588.20		3.22		

\* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma



Analysis Report for 16-May-19-10036  
L1-10221D-FSGS-009SS

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## INTERFERENCE CORRECTED REPORT

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<i><b>Nuclide Name</b></i>	<i><b>Nuclide Id Confidence</b></i>	<i><b>Wt mean Activity (pCi/grams)</b></i>	<i><b>Wt mean Activity Uncertainty</b></i>	<i><b>Comments</b></i>
	0.978	5.67E+00	4.53E-01	
	0.997	6.87E-02	1.44E-02	
X	0.901			
	0.999	2.29E-01	3.39E-02	
?	0.997	3.50E-01	1.08E-01	
	0.999	2.49E-01	3.17E-02	
	0.999	2.32E-01	3.13E-02	
?	0.997	6.17E-01	1.92E-01	
	0.991	2.57E-01	3.51E-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

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Analysis Report for 16-May-19-10036  
L1-10221D-FSGS-009SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/16/2019 10:53:58AM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

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

## NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	6.05E-02	5.49E-02	5.49E-02
	BE-7	477.60	10.44	-2.14E-01	3.47E-01	3.47E-01
+	K-40	1460.82	* 10.66	5.67E+00	5.03E-01	5.03E-01
	Mn-54	834.85	99.98	-6.73E-04	4.63E-02	4.63E-02
	Co-60	1173.23	99.85	2.39E-02	4.80E-02	5.43E-02
		1332.49	99.98	1.90E-02		4.80E-02
	Nb-94	702.65	99.81	-3.45E-03	3.81E-02	4.44E-02
		871.09	99.89	2.11E-02		3.81E-02
	Ag-108m	79.13	6.60	-1.51E-01	4.08E-02	1.18E+00
		433.94	90.50	8.36E-03		4.08E-02
		614.28	89.80	-6.46E-02		5.34E-02
		722.94	90.80	2.15E-04		5.30E-02
	Sb-125	176.31	6.84	2.15E-01	1.06E-01	4.61E-01
		380.45	1.52	1.29E+00		2.26E+00
		427.87	29.60	-3.95E-02		1.06E-01
		463.36	10.49	-1.78E-02		2.94E-01
		600.60	17.65	1.32E-01		2.22E-01
		606.71	4.98	2.03E+00		1.36E+00
		635.95	11.22	-1.44E-01		3.14E-01

Analysis Report for 16-May-19-10036  
L1-10221D-FSGS-009SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	9.07E-01	1.06E-01	2.33E+00
Ba-133	79.61	2.65	-2.15E-01	6.48E-02	2.87E+00
	81.00	32.90	-9.44E-02		1.85E-01
	276.40	7.16	5.29E-03		4.64E-01
	302.85	18.34	1.08E-01		1.82E-01
	356.01	62.05	6.64E-03		6.48E-02
	383.85	8.94	-3.48E-02		3.47E-01
Cs-134	475.36	1.48	3.01E-01	4.41E-02	2.47E+00
	563.25	8.34	-6.37E-01		5.42E-01
	569.33	15.37	4.74E-02		2.43E-01
	604.72	97.62	-4.88E-03		6.20E-02
	795.86	85.46	-2.09E-02		4.41E-02
	801.95	8.69	2.42E-01		4.92E-01
	1038.61	0.99	-7.51E-01		5.06E+00
	1167.97	1.79	-2.12E-01		3.18E+00
	1365.19	3.02	-4.85E-02		1.18E+00
Cs-137	661.66	85.10	-1.39E-02	4.93E-02	4.93E-02
Eu-152	121.78	28.67	-3.04E-02	1.20E-01	1.20E-01
	244.70	7.61	4.90E-02		5.20E-01
	295.94	0.45	5.71E+00		9.69E+00
	344.28	26.60	1.61E-02		1.31E-01
	367.79	0.86	-9.11E-01		3.77E+00
	411.12	2.24	2.91E-01		1.49E+00
	443.96	2.83	-9.24E-01		1.26E+00
	488.68	0.42	2.84E+00		8.21E+00
	563.99	0.49	-8.00E+00		8.37E+00
	586.26	0.46	-6.47E+00		1.24E+01
	678.62	0.47	9.68E-02		7.49E+00
	688.67	0.86	-4.73E-01		4.24E+00
	719.35	0.28	-2.52E+00		1.45E+01
	778.90	12.96	-2.46E-01		3.05E-01
	810.45	0.32	-7.06E+00		1.36E+01
	867.37	4.26	5.30E-02		9.14E-01
	919.33	0.43	1.66E+00		1.04E+01
	964.08	14.65	-1.14E-01		4.66E-01
	1085.87	10.24	-4.21E-01		4.43E-01
	1089.74	1.73	-2.10E+00		2.63E+00
	1112.07	13.69	3.77E-02		3.68E-01
	1212.95	1.43	-2.06E+00		4.60E+00
	1249.94	0.19	-1.22E+01		2.76E+01
	1299.14	1.63	4.06E-01		2.73E+00
	1408.01	21.07	-1.06E-01		1.91E-01
	1457.64	0.50	1.19E+02		3.87E+01
	1528.10	0.28	-6.67E+00		9.84E+00
Eu-154	123.07	40.40	-1.85E-03	8.43E-02	8.43E-02
	247.93	6.89	-1.52E-01		4.71E-01
	591.76	4.95	-1.89E-01		6.50E-01
	692.42	1.78	3.28E-01		2.14E+00
	723.30	20.06	2.52E-02		2.49E-01
	756.80	4.52	-6.86E-01		9.41E-01
	873.18	12.08	2.32E-01		3.54E-01

Analysis Report for 16-May-19-10036  
L1-10221D-FSGS-009SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	6.86E-02	8.43E-02	4.98E-01
	1004.76	18.01	5.57E-02		2.67E-01
	1274.43	34.80	-1.00E-02		1.48E-01
	1596.48	1.80	-1.36E+00		2.09E+00
Eu-155	45.30	1.31	-4.91E+00	1.81E-01	9.73E+00
	60.01	1.22	-5.33E+00		1.20E+01
	86.55	30.70	1.48E-01		1.88E-01
Ra-226	105.31	21.10	-3.44E-02	9.26E-01	1.81E-01
Ra-226	186.21	3.64	-1.19E-01	9.26E-01	9.26E-01
Pa-231	27.36	10.30	6.11E-01	1.22E+00	1.22E+00
	283.69	1.70	9.85E-01		2.02E+00
	300.07	2.47	1.51E-01		1.39E+00
	302.65	2.20	4.47E-01		1.49E+00
	330.06	1.40	2.06E+00		2.65E+00
U-235	143.76	10.96	-3.28E-02	5.89E-02	3.05E-01
	163.33	5.08	-2.57E-01		5.89E-01
	185.71	57.20	2.10E-02		5.89E-02
	202.11	1.08	-1.31E+00		2.87E+00
	205.31	5.01	7.92E-02		6.41E-01
Am-241	59.54	35.90	-9.53E-02	4.22E-01	4.22E-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 16-May-19-10037  
L1-10221D-FQGS-009SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 16-May-19-10037  
Sample Description : L1-10221D-FQGS-009SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.539E+03 grams  
Facility : Default  
  
Sample Taken On : 5/15/2019 7:25:00AM  
Acquisition Started : 5/16/2019 10:57:36AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P11314  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.3 seconds  
  
Dead Time : 0.03 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/24/2019  
Efficiency Calibration Used Done On : 5/16/2019  
Efficiency Calibration Description :  
  
Sample Number : 76627  
Fill Height : 1538.82 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 12/22/2008 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 5/16/2019 11:12:39AM

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

DATA VALIDATED 5/16/19 1500  
J. Brokan / C. J.

Analysis Report for 16-May-19-10037  
L1-10221D-FQGS-009SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.72	948 -	960	954.44	1.57E+02	17.03	5.04E+01	1.13
2	295.12	1173 -	1185	1179.78	7.66E+01	11.86	2.44E+01	0.64
3	338.54	1349 -	1358	1353.23	1.76E+01	8.85	2.64E+01	0.36
4	351.96	1400 -	1413	1406.83	9.37E+01	13.14	2.83E+01	1.02
5	583.14	2325 -	2337	2330.68	5.43E+01	9.36	1.27E+01	1.42
6	609.23	2429 -	2442	2434.95	7.05E+01	10.23	1.25E+01	0.75
7	910.79	3634 -	3648	3640.60	4.57E+01	8.51	9.32E+00	0.74
8	1460.29	5829 -	5851	5839.12	2.23E+02	16.77	1.46E+01	1.76
9	1764.22	7049 -	7062	7055.93	1.25E+01	4.72	3.50E+00	0.81

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.95	1460.82 *	10.66	5.00E+00	4.34E-01
Tl-208	1.00	583.19 *	85.00	8.16E-02	1.49E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	2.48E-01	3.36E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	2.04E-01	3.20E-02
		768.36	4.89		
		806.18	1.26		

[134]

Analysis Report for 16-May-19-10037

L1-10221D-FQGS-009SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Bi-214	0.99	934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49 *	15.30	2.26E-01	8.57E-02
		1847.43	2.03		
		2118.51	1.16		
Pb-214	0.99	241.99	7.25		
		295.22 *	18.42	3.27E-01	5.70E-02
		351.93 *	35.60	2.36E-01	3.80E-02
Ac-228	0.99	785.96	1.06		
		129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32 *	11.27	1.36E-01	6.92E-02
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	3.06E-01	5.87E-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

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## INTERFERENCE CORRECTED REPORT

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Analysis Report for 16-May-19-10037

L1-10221D-FQGS-009SS

<i><b>Nuclide Name</b></i>	<i><b>Nuclide Id Confidence</b></i>	<i><b>Wt mean Activity (pCi/grams)</b></i>	<i><b>Wt mean Activity Uncertainty</b></i>	<i><b>Comments</b></i>
K-40	0.956	5.00E+00	4.34E-01	
Tl-208	1.000	8.16E-02	1.49E-02	
X Bi-211	0.882			
Pb-212	0.999	2.48E-01	3.36E-02	
Bi-214	0.998	2.07E-01	3.00E-02	
Pb-214	0.999	2.64E-01	3.16E-02	
Ac-228	0.990	2.35E-01	4.47E-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 16-May-19-10037  
L1-10221D-FQGS-009SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/16/2019 11:12:39AM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

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

## NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	4.86E-02	5.51E-02	5.51E-02
	BE-7	477.60	10.44	-1.25E-01	3.46E-01	3.46E-01
+	K-40	1460.82	* 10.66	5.00E+00	6.42E-01	6.42E-01
	Mn-54	834.85	99.98	-2.08E-02	4.06E-02	4.06E-02
	Co-60	1173.23	99.85	-1.90E-02	5.30E-02	5.60E-02
		1332.49	99.98	4.23E-02		5.30E-02
	Nb-94	702.65	99.81	-8.97E-03	3.70E-02	4.17E-02
		871.09	99.89	-7.55E-03		3.70E-02
	Ag-108m	79.13	6.60	1.17E+00	4.15E-02	1.22E+00
		433.94	90.50	-5.17E-03		4.15E-02
		614.28	89.80	7.80E-04		5.27E-02
		722.94	90.80	-2.47E-02		4.75E-02
	Sb-125	176.31	6.84	-1.60E-01	1.27E-01	4.49E-01
		380.45	1.52	1.68E+00		2.26E+00
		427.87	29.60	-2.78E-02		1.27E-01
		463.36	10.49	3.10E-02		3.33E-01
		600.60	17.65	6.17E-02		2.22E-01
		606.71	4.98	1.77E+00		1.36E+00
		635.95	11.22	6.35E-02		2.59E-01

Analysis Report for 16-May-19-10037

L1-10221D-FQGS-009SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-1.77E-01	1.27E-01	2.19E+00
Ba-133	79.61	2.65	1.50E+00	7.29E-02	2.90E+00
	81.00	32.90	-4.38E-01		1.79E-01
	276.40	7.16	-2.01E-01		4.66E-01
	302.85	18.34	-1.06E-01		1.68E-01
	356.01	62.05	-3.65E-03		7.29E-02
	383.85	8.94	6.13E-02		3.82E-01
Cs-134	475.36	1.48	-3.58E-01	5.22E-02	2.49E+00
	563.25	8.34	-8.53E-02		4.80E-01
	569.33	15.37	-1.93E-01		2.27E-01
	604.72	97.62	-2.40E-02		6.25E-02
	795.86	85.46	2.19E-02		5.22E-02
	801.95	8.69	-2.86E-01		5.40E-01
	1038.61	0.99	-1.60E+00		4.65E+00
	1167.97	1.79	-9.97E-01		2.84E+00
	1365.19	3.02	-8.65E-01		1.47E+00
Cs-137	661.66	85.10	1.37E-02	4.98E-02	4.98E-02
Eu-152	121.78	28.67	2.68E-02	1.17E-01	1.23E-01
	244.70	7.61	8.11E-02		4.60E-01
	295.94	0.45	1.26E+01		1.03E+01
	344.28	26.60	8.64E-04		1.17E-01
	367.79	0.86	-1.13E+00		3.56E+00
	411.12	2.24	1.72E+00		1.72E+00
	443.96	2.83	-1.59E-01		1.12E+00
	488.68	0.42	-2.43E+00		8.83E+00
	563.99	0.49	-2.05E+00		7.84E+00
	586.26	0.46	-6.19E+00		1.32E+01
	678.62	0.47	5.48E+00		8.48E+00
	688.67	0.86	-3.03E+00		3.68E+00
	719.35	0.28	4.62E+00		1.26E+01
	778.90	12.96	3.24E-01		3.34E-01
	810.45	0.32	6.54E+00		1.43E+01
	867.37	4.26	2.29E-01		9.96E-01
	919.33	0.43	-4.37E+00		1.17E+01
	964.08	14.65	-2.83E-02		4.60E-01
	1085.87	10.24	-2.50E-01		4.08E-01
	1089.74	1.73	-2.06E+00		2.55E+00
	1112.07	13.69	-7.58E-02		4.21E-01
	1212.95	1.43	3.84E-01		4.28E+00
	1249.94	0.19	-1.24E+01		2.75E+01
	1299.14	1.63	2.40E-01		2.97E+00
	1408.01	21.07	-1.93E-02		2.07E-01
	1457.64	0.50	1.14E+02		3.69E+01
	1528.10	0.28	-2.61E+01		1.58E+01
Eu-154	123.07	40.40	3.71E-02	8.88E-02	8.88E-02
	247.93	6.89	-1.33E-01		4.30E-01
	591.76	4.95	3.26E-02		7.49E-01
	692.42	1.78	8.59E-01		2.21E+00
	723.30	20.06	-2.24E-02		2.21E-01
	756.80	4.52	-1.19E-01		8.03E-01
	873.18	12.08	-8.84E-02		3.46E-01

Analysis Report for 16-May-19-10037  
L1-10221D-FQGS-009SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	1.01E-01	8.88E-02	4.45E-01
	1004.76	18.01	-1.18E-01		2.33E-01
	1274.43	34.80	1.66E-02		1.67E-01
	1596.48	1.80	-4.63E-01		1.59E+00
Eu-155	45.30	1.31	-2.05E+00	1.81E-01	1.02E+01
	60.01	1.22	-6.02E+00		1.15E+01
	86.55	30.70	1.87E-03		1.86E-01
Ra-226	105.31	21.10	3.46E-02	9.81E-01	1.81E-01
Pa-231	186.21	3.64	6.33E-01	9.81E-01	9.81E-01
	27.36	10.30	1.16E+00		1.29E+00
U-235	283.69	1.70	-1.71E-01	6.30E-02	1.93E+00
	300.07	2.47	-1.32E+00		1.32E+00
	302.65	2.20	-5.81E-01		1.41E+00
	330.06	1.40	1.39E+00		2.44E+00
	143.76	10.96	4.05E-03		3.29E-01
	163.33	5.08	4.46E-02		5.88E-01
Am-241	185.71	57.20	4.17E-02	4.04E-01	6.30E-02
	202.11	1.08	-2.76E-01		2.87E+00
	205.31	5.01	-4.95E-02		6.27E-01
	59.54	35.90	-1.90E-01		4.04E-01

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

Analysis Report for 16-May-19-10038  
L1-10221D-FSGS-010SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 16-May-19-10038  
Sample Description : L1-10221D-FSGS-010SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.298E+03 grams  
Facility : Default  
  
Sample Taken On : 5/15/2019 7:30:00AM  
Acquisition Started : 5/16/2019 10:39:09AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : 352  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.3 seconds  
  
Dead Time : 0.03 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 9/29/2018  
Efficiency Calibration Used Done On : 5/16/2019  
Efficiency Calibration Description :  
  
Sample Number : 76626  
Fill Height : 1297.80 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/7/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 5/16/2019 10:54:18AM

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

DATA VALIDATED 5/16/19 1500  
J. Brogan / C. J. H.

Analysis Report for 16-May-19-10038  
L1-10221D-FSGS-010SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	92.52	368 -	376	371.29	2.68E+01	12.12	5.63E+01	0.51
2	186.07	739 -	753	745.02	7.56E+01	14.26	4.24E+01	0.99
3	238.60	949 -	960	954.86	1.31E+02	19.09	9.13E+01	0.92
4	295.13	1174 -	1188	1180.76	6.42E+01	13.59	4.18E+01	0.68
5	338.37	1344 -	1358	1353.51	3.46E+01	10.83	2.84E+01	0.99
6	351.68	1398 -	1414	1406.72	1.37E+02	14.03	1.92E+01	1.11
7	582.89	2324 -	2336	2330.89	4.94E+01	9.81	1.76E+01	1.30
8	609.06	2427 -	2443	2435.49	8.30E+01	13.76	3.40E+01	1.42
9	661.45	2637 -	2652	2645.00	5.70E+01	9.69	1.20E+01	1.41
10	911.11	3638 -	3651	3643.50	3.82E+01	9.21	1.68E+01	0.42
11	968.77	3869 -	3880	3874.16	2.15E+01	6.55	8.50E+00	0.47
12	1460.18	5828 -	5853	5841.09	3.84E+02	20.28	6.50E+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
K-40	0.93	1460.82 *	10.66	8.45E+00	5.78E-01
Cs-137	0.99	661.66 *	85.10	9.25E-02	1.67E-02
Tl-208	0.98	583.19 *	85.00	7.38E-02	1.53E-02
Pb-212	1.00	115.18 *	0.60		
		238.63 *	43.60	2.12E-01	3.54E-02 <sup>[141]</sup>

Analysis Report for 16-May-19-10038

L1-10221D-FSGS-010SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Pb-212	1.00	300.09	3.30		
Bi-214	0.99	609.32 *	45.49	2.38E-01	4.20E-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	2.77E-01	6.27E-02
		351.93 *	35.60	3.46E-01	4.50E-02
		785.96	1.06		
Ra-226	0.99	186.21 *	3.64	1.31E+00	2.69E-01
Ac-228	0.99	129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32 *	11.27	2.69E-01	8.70E-02
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	2.53E-01	6.20E-02
		964.77	4.99		
		968.97 *	15.80	2.42E-01	7.45E-02
		1588.20	3.22		
Ac228-XR	0.93	89.96	1.90		
		93.35 *	3.10	8.68E-01	4.18E-01
Th-234	0.99	92.38 *	2.13	1.30E+00	6.18E-01
		92.80	2.10		
		112.81	0.21		
U-235	0.98	143.76	10.96		
		163.33	5.08		
		185.71 *	57.20	8.33E-02	1.71E-02
		202.11	1.08		
		205.31	5.01		
U235-XR	0.94	89.96	3.47		
		93.35 *	5.60	4.80E-01	2.23E-01
		105.60	1.32		

Analysis Report for 16-May-19-10038  
L1-10221D-FSGS-010SS

\* = 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

	<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
	K-40	0.936	8.45E+00	5.78E-01	
	Cs-137	0.993	9.25E-02	1.67E-02	
	Tl-208	0.986	7.38E-02	1.53E-02	
X	Bi-211	0.942			
	Pb-212	1.000	2.12E-01	3.54E-02	
	Bi-214	0.995	2.38E-01	4.20E-02	
	Pb-214	0.994	3.22E-01	3.65E-02	
?	Ra-226	0.997	1.31E+00	2.69E-01	
	Ac-228	0.998	2.53E-01	4.18E-02	
?	Ac228-XR	0.933	8.68E-01	4.18E-01	
?	Th-234	0.999	1.30E+00	6.18E-01	
?	U-235	0.985	8.33E-02	1.71E-02	
?	U235-XR	0.942	4.80E-01	2.23E-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 16-May-19-10038  
L1-10221D-FSGS-010SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/16/2019 10:54:18AM  
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	3.83E-02	5.82E-02	5.82E-02
	BE-7	477.60	10.44	3.33E-01	4.58E-01	4.58E-01
+	K-40	1460.82	* 10.66	8.45E+00	4.56E-01	4.56E-01
	Mn-54	834.85	99.98	-2.35E-02	4.41E-02	4.41E-02
	Co-60	1173.23	99.85	2.84E-02	5.90E-02	6.79E-02
		1332.49	99.98	2.36E-02		5.90E-02
	Nb-94	702.65	99.81	3.18E-02	4.78E-02	4.78E-02
		871.09	99.89	4.32E-02		5.75E-02
	Ag-108m	79.13	6.60	2.67E-01	4.49E-02	1.74E+00
		433.94	90.50	4.35E-03		4.49E-02
		614.28	89.80	-3.87E-02		8.33E-02
		722.94	90.80	4.61E-02		5.77E-02
	Sb-125	176.31	6.84	3.52E-02	1.25E-01	5.26E-01
		380.45	1.52	1.91E+00		2.29E+00
		427.87	29.60	-2.25E-02		1.25E-01
		463.36	10.49	3.45E-01		4.22E-01
		600.60	17.65	-2.88E-01		2.47E-01
		606.71	4.98	2.78E+00		1.60E+00
		635.95	11.22	2.80E-01		4.29E-01



Analysis Report for 16-May-19-10038

L1-10221D-FSGS-010SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-1.61E-01	1.25E-01	2.50E+00
Ba-133	79.61	2.65	1.69E-01	8.11E-02	4.14E+00
	81.00	32.90	-2.79E-01		2.79E-01
	276.40	7.16	-1.47E-01		5.15E-01
	302.85	18.34	-5.69E-02		2.07E-01
	356.01	62.05	-4.28E-02		8.11E-02
	383.85	8.94	-2.83E-01		4.01E-01
Cs-134	475.36	1.48	2.62E-01	6.47E-02	3.05E+00
	563.25	8.34	2.19E-01		5.48E-01
	569.33	15.37	-7.03E-02		2.76E-01
	604.72	97.62	-1.55E-02		7.70E-02
	795.86	85.46	1.62E-02		6.47E-02
	801.95	8.69	-3.23E-01		5.10E-01
	1038.61	0.99	-1.35E+00		5.06E+00
	1167.97	1.79	1.15E+00		3.69E+00
	1365.19	3.02	-4.60E-01		1.59E+00
+ Cs-137	661.66	* 85.10	9.25E-02	3.81E-02	3.81E-02
Eu-152	121.78	28.67	4.17E-03	1.32E-01	1.45E-01
	244.70	7.61	2.24E-01		5.88E-01
	295.94	0.45	1.27E+01		1.13E+01
	344.28	26.60	3.34E-02		1.32E-01
	367.79	0.86	2.05E+00		4.28E+00
	411.12	2.24	1.10E+00		1.80E+00
	443.96	2.83	1.77E-01		1.15E+00
	488.68	0.42	5.25E+00		1.07E+01
	563.99	0.49	3.16E+00		9.22E+00
	586.26	0.46	-6.27E+00		1.42E+01
	678.62	0.47	-6.16E+00		9.42E+00
	688.67	0.86	4.74E+00		5.85E+00
	719.35	0.28	6.22E+00		1.74E+01
	778.90	12.96	-8.51E-02		3.46E-01
	810.45	0.32	5.36E+00		1.41E+01
	867.37	4.26	-1.28E+00		1.21E+00
	919.33	0.43	-7.65E+00		1.38E+01
	964.08	14.65	-2.05E-01		4.77E-01
	1085.87	10.24	-1.73E-04		5.21E-01
	1089.74	1.73	-3.52E+00		3.14E+00
	1112.07	13.69	-6.41E-01		4.21E-01
	1212.95	1.43	-5.96E+00		5.56E+00
	1249.94	0.19	-4.99E+00		3.19E+01
	1299.14	1.63	2.74E+00		3.75E+00
	1408.01	21.07	-6.26E-02		2.39E-01
	1457.64	0.50	1.85E+02		4.59E+01
	1528.10	0.28	2.18E+00		1.56E+01
Eu-154	123.07	40.40	3.65E-02	1.04E-01	1.04E-01
	247.93	6.89	-9.62E-02		4.88E-01
	591.76	4.95	-7.21E-01		8.80E-01
	692.42	1.78	1.05E+00		2.69E+00
	723.30	20.06	8.95E-02		2.59E-01
	756.80	4.52	5.43E-01		1.03E+00
	873.18	12.08	6.06E-01		5.05E-01

Analysis Report for 16-May-19-10038  
L1-10221D-FSGS-010SS

	<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
	Eu-154	996.29	10.48	1.60E-01	1.04E-01	4.39E-01
		1004.76	18.01	-3.94E-02		2.57E-01
		1274.43	34.80	3.06E-03		1.73E-01
		1596.48	1.80	-8.05E-02		2.53E+00
	Eu-155	45.30	1.31	6.95E+00	2.21E-01	2.29E+01
		60.01	1.22	-2.27E+01		2.28E+01
		86.55	30.70	3.22E-02		2.54E-01
		105.31	21.10	-9.90E-02		2.21E-01
+	Ra-226	186.21	* 3.64	1.31E+00	7.14E-01	7.14E-01
	Pa-231	27.36	10.30	1.18E+00	1.57E+00	2.32E+00
		283.69	1.70	-5.30E-01		2.15E+00
		300.07	2.47	-6.51E-01		1.57E+00
		302.65	2.20	1.93E-01		1.72E+00
		330.06	1.40	-6.20E-01		2.68E+00
+	U-235	143.76	10.96	-4.45E-02	4.54E-02	3.59E-01
		163.33	5.08	5.27E-02		7.44E-01
		185.71	* 57.20	8.33E-02		4.54E-02
		202.11	1.08	-1.95E-01		3.66E+00
		205.31	5.01	-5.75E-01		7.90E-01
	Am-241	59.54	35.90	-8.88E-01	8.11E-01	8.11E-01

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

Analysis Report for 16-May-19-10039  
L1-10221D-FSGS-011SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 16-May-19-10039  
Sample Description : L1-10221D-FSGS-011SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.511E+03 grams  
Facility : Default  
  
Sample Taken On : 5/15/2019 7:35:00AM  
Acquisition Started : 5/16/2019 10:57:41AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : 324  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.8 seconds  
  
Dead Time : 0.09 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 4096  
Peak Area Range (in channels) : 120 - 4096  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 9/29/2018  
Efficiency Calibration Used Done On : 5/16/2019  
Efficiency Calibration Description :  
  
Sample Number : 76628  
Fill Height : 1510.96 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/30/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 5/16/2019 11:12:44AM

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

DATA VALIDATED 5/16/19 1500  
J. Brogan / C. J.

Analysis Report for 16-May-19-10039  
L1-10221D-FSGS-011SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.62	472 -	481	477.43	1.24E+02	20.58	1.30E+02	1.14
2	295.13	587 -	595	590.32	4.97E+01	13.30	5.83E+01	0.79
3	338.35	674 -	681	676.67	4.91E+01	10.48	2.99E+01	1.10
4	351.85	700 -	707	703.64	1.20E+02	14.24	4.15E+01	1.40
5	510.82	1015 -	1026	1021.34	5.70E+01	12.43	3.90E+01	1.14
6	583.18	1160 -	1171	1165.97	7.49E+01	10.38	1.31E+01	1.76
7	609.23	1213 -	1223	1218.05	7.58E+01	11.85	2.72E+01	1.46
8	911.25	1816 -	1828	1821.94	3.91E+01	9.43	1.89E+01	1.06
9	968.86	1933 -	1942	1937.19	3.47E+01	8.34	1.53E+01	1.07
10	1460.78	2914 -	2928	2921.61	2.96E+02	17.69	5.68E+00	2.27

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.99	511.00 *	100.00	5.84E-02	1.33E-02
K-40	1.00	1460.82 *	10.66	5.59E+00	4.13E-01
Tl-208	1.00	583.19 *	85.00	9.69E-02	1.46E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.75E-01	3.22E-02
		300.09	3.30		
Bi-214	1.00	609.32 *	45.49	1.88E-01	3.16E-02 <sup>[148]</sup>

Analysis Report for 16-May-19-10039

L1-10221D-FSGS-011SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Bi-214	1.00	768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	0.99	241.99	7.25		
		295.22 *	18.42	1.86E-01	5.21E-02
		351.93 *	35.60	2.63E-01	3.77E-02
Ac-228	1.00	785.96	1.06		
		129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32 *	11.27	3.32E-01	7.58E-02
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	2.23E-01	5.47E-02
		964.77	4.99		
968.97 *	15.80	3.37E-01	8.23E-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

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## INTERFERENCE CORRECTED REPORT

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Analysis Report for 16-May-19-10039

L1-10221D-FSGS-011SS

<i><b>Nuclide Name</b></i>	<i><b>Nuclide Id Confidence</b></i>	<i><b>Wt mean Activity (pCi/grams)</b></i>	<i><b>Wt mean Activity Uncertainty</b></i>	<i><b>Comments</b></i>
An Pk	0.995	5.84E-02	1.33E-02	
K-40	1.000	5.59E+00	4.13E-01	
Tl-208	1.000	9.69E-02	1.46E-02	
X Bi-211	0.908			
Pb-212	1.000	1.75E-01	3.22E-02	
Bi-214	1.000	1.88E-01	3.16E-02	
Pb-214	0.999	2.36E-01	3.05E-02	
Ac-228	1.000	2.78E-01	3.90E-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 16-May-19-10039  
L1-10221D-FSGS-011SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/16/2019 11:12:44AM  
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	5.84E-02	3.72E-02	3.72E-02
	BE-7	477.60	10.44	-4.49E-03	3.38E-01	3.38E-01
+	K-40	1460.82	* 10.66	5.59E+00	3.15E-01	3.15E-01
	Mn-54	834.85	99.98	-2.42E-03	3.61E-02	3.61E-02
	Co-60	1173.23	99.85	3.79E-02	5.35E-02	5.35E-02
		1332.49	99.98	1.35E-02		5.40E-02
	Nb-94	702.65	99.81	8.51E-03	3.63E-02	4.23E-02
		871.09	99.89	1.11E-02		3.63E-02
	Ag-108m	79.13	6.60	9.34E-01	3.35E-02	1.19E+00
		433.94	90.50	4.19E-03		3.35E-02
		614.28	89.80	-1.38E-02		5.37E-02
		722.94	90.80	1.46E-02		4.63E-02
	Sb-125	176.31	6.84	1.64E-01	1.00E-01	5.06E-01
		380.45	1.52	4.83E-01		2.18E+00
		427.87	29.60	-1.89E-02		1.00E-01
		463.36	10.49	1.09E-01		3.25E-01
		600.60	17.65	9.79E-03		2.04E-01
		606.71	4.98	-1.18E-01		1.27E+00
		635.95	11.22	1.52E-01		3.49E-01

Analysis Report for 16-May-19-10039  
L1-10221D-FSGS-011SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-8.43E-01	1.00E-01	1.90E+00
Ba-133	79.61	2.65	1.41E+00	7.07E-02	2.71E+00
	81.00	32.90	-2.46E-01		1.77E-01
	276.40	7.16	9.60E-02		4.11E-01
	302.85	18.34	8.57E-02		1.88E-01
	356.01	62.05	-8.81E-02		7.07E-02
	383.85	8.94	-2.26E-01		3.26E-01
Cs-134	475.36	1.48	7.69E-01	4.80E-02	2.46E+00
	563.25	8.34	-1.17E-01		3.34E-01
	569.33	15.37	9.54E-02		2.11E-01
	604.72	97.62	-1.15E-02		5.67E-02
	795.86	85.46	2.96E-02		4.80E-02
	801.95	8.69	-6.67E-02		3.62E-01
	1038.61	0.99	-1.13E+00		3.57E+00
	1167.97	1.79	6.03E-01		2.81E+00
	1365.19	3.02	-9.06E-03		1.32E+00
Cs-137	661.66	85.10	2.99E-02	5.16E-02	5.16E-02
Eu-152	121.78	28.67	-2.04E-02	1.10E-01	1.10E-01
	244.70	7.61	1.87E-01		4.84E-01
	295.94	0.45	3.43E+00		8.93E+00
	344.28	26.60	-8.07E-02		1.15E-01
	367.79	0.86	1.87E+00		3.89E+00
	411.12	2.24	1.81E-01		1.62E+00
	443.96	2.83	3.44E-01		1.24E+00
	488.68	0.42	-8.57E-01		7.47E+00
	563.99	0.49	7.67E-01		6.09E+00
	586.26	0.46	-3.49E+00		1.18E+01
	678.62	0.47	-5.89E-01		7.61E+00
	688.67	0.86	-1.17E+00		3.97E+00
	719.35	0.28	4.02E+00		1.41E+01
	778.90	12.96	5.03E-02		2.80E-01
	810.45	0.32	-2.87E+00		9.62E+00
	867.37	4.26	-6.30E-01		8.31E-01
	919.33	0.43	-1.95E+00		8.79E+00
	964.08	14.65	-8.93E-02		4.05E-01
	1085.87	10.24	3.91E-02		4.32E-01
	1089.74	1.73	-1.09E+00		2.65E+00
	1112.07	13.69	-3.53E-01		3.04E-01
	1212.95	1.43	-1.14E+00		3.97E+00
	1249.94	0.19	9.23E+00		3.02E+01
	1299.14	1.63	-1.20E+00		2.64E+00
	1408.01	21.07	4.18E-02		2.10E-01
	1457.64	0.50	-2.99E+00		3.46E+01
	1528.10	0.28	4.06E-01		1.33E+01
Eu-154	123.07	40.40	2.03E-02	7.98E-02	7.98E-02
	247.93	6.89	-7.24E-02		4.30E-01
	591.76	4.95	7.73E-04		6.44E-01
	692.42	1.78	-7.88E-01		1.96E+00
	723.30	20.06	1.12E-01		2.17E-01
	756.80	4.52	2.46E-01		8.41E-01
	873.18	12.08	-1.11E-02		2.94E-01



Analysis Report for 16-May-19-10039  
L1-10221D-FSGS-011SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	-1.07E-02	7.98E-02	4.41E-01
	1004.76	18.01	1.83E-02		2.34E-01
	1274.43	34.80	9.34E-03		1.38E-01
	1596.48	1.80	-3.89E-01		2.25E+00
Eu-155	45.30	1.31	2.22E+00	1.79E-01	1.13E+01
	60.01	1.22	-4.63E+00		1.18E+01
	86.55	30.70	8.24E-02		1.79E-01
	105.31	21.10	1.42E-01		1.92E-01
Ra-226	186.21	3.64	5.32E-01	1.00E+00	1.00E+00
Pa-231	27.36	10.30	6.69E-01	1.15E+00	1.15E+00
	283.69	1.70	1.39E+00		1.84E+00
	300.07	2.47	6.87E-01		1.42E+00
	302.65	2.20	7.14E-01		1.56E+00
	330.06	1.40	-2.77E-01		2.46E+00
U-235	143.76	10.96	-8.61E-02	6.46E-02	2.73E-01
	163.33	5.08	6.29E-02		6.66E-01
	185.71	57.20	5.70E-02		6.46E-02
	202.11	1.08	-7.15E-01		2.86E+00
	205.31	5.01	-3.26E-01		6.20E-01
Am-241	59.54	35.90	-1.82E-01	4.18E-01	4.18E-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 16-May-19-10040  
L1-10221D-FSGS-012SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 16-May-19-10040  
Sample Description : L1-10221D-FSGS-012SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.563E+03 grams  
Facility : Default  
  
Sample Taken On : 5/15/2019 7:40:00AM  
Acquisition Started : 5/16/2019 10:57:48AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P40818B  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 901.3 seconds  
  
Dead Time : 0.14 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/29/2019  
Efficiency Calibration Used Done On : 5/16/2019  
Efficiency Calibration Description :  
  
Sample Number : 76629  
Fill Height : 1563.05 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/30/2012 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 5/16/2019 11:13:01AM

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

DATA VALIDATED 5/16/19 1500  
J. Brokan / C. J.

Analysis Report for 16-May-19-10040  
L1-10221D-FSGS-012SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.60	949 -	959	954.50	9.47E+01	15.37	5.93E+01	0.90
2	295.26	1177 -	1187	1180.95	4.47E+01	10.27	2.53E+01	0.73
3	351.94	1402 -	1415	1407.50	8.60E+01	12.22	2.30E+01	0.88
4	583.05	2325 -	2337	2331.42	3.94E+01	8.82	1.46E+01	0.48
5	609.20	2428 -	2442	2435.97	5.70E+01	9.72	1.30E+01	0.71
6	661.49	2639 -	2651	2645.05	2.90E+01	7.06	7.97E+00	0.79
7	968.80	3868 -	3880	3874.16	2.33E+01	6.99	9.65E+00	1.26
8	1460.74	5833 -	5851	5842.79	1.95E+02	15.10	9.58E+00	2.01

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	4.84E+00	4.29E-01
Cs-137	0.99	661.66 *	85.10	5.25E-02	1.32E-02
Tl-208	0.99	583.19 *	85.00	6.54E-02	1.52E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.69E-01	3.06E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.82E-01	3.29E-02
		768.36	4.89		
		806.18	1.26		

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Analysis Report for 16-May-19-10040  
L1-10221D-FSGS-012SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Bi-214	0.99	934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	1.00	241.99	7.25		
		295.22 *	18.42	2.12E-01	5.16E-02
		351.93 *	35.60	2.40E-01	3.91E-02
Ac-228	0.57	785.96	1.06		
		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		
		964.77	4.99		
		968.97 *	15.80	2.95E-01	8.92E-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 16-May-19-10040

L1-10221D-FSGS-012SS

<i><b>Nuclide Name</b></i>	<i><b>Nuclide Id Confidence</b></i>	<i><b>Wt mean Activity (pCi/grams)</b></i>	<i><b>Wt mean Activity Uncertainty</b></i>	<i><b>Comments</b></i>
K-40	0.999	4.84E+00	4.29E-01	
Cs-137	0.995	5.25E-02	1.32E-02	
Tl-208	0.997	6.54E-02	1.52E-02	
X Bi-211	0.885			
Pb-212	1.000	1.69E-01	3.06E-02	
Bi-214	0.999	1.82E-01	3.29E-02	
Pb-214	1.000	2.30E-01	3.12E-02	
Ac-228	0.573	2.95E-01	8.92E-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 16-May-19-10040  
L1-10221D-FSGS-012SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/16/2019 11:13:01AM  
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	2.03E-02	5.55E-02	5.55E-02
	BE-7	477.60	10.44	4.78E-01	4.86E-01	4.86E-01
+	K-40	1460.82	* 10.66	4.84E+00	5.52E-01	5.52E-01
	Mn-54	834.85	99.98	2.84E-02	4.93E-02	4.93E-02
	Co-60	1173.23	99.85	3.14E-02	5.63E-02	5.63E-02
		1332.49	99.98	2.09E-02		6.38E-02
	Nb-94	702.65	99.81	2.69E-02	4.41E-02	4.46E-02
		871.09	99.89	3.29E-03		4.41E-02
	Ag-108m	79.13	6.60	7.94E-01	4.36E-02	1.82E+00
		433.94	90.50	1.01E-02		4.36E-02
		614.28	89.80	-4.55E-02		5.99E-02
		722.94	90.80	2.43E-02		5.24E-02
	Sb-125	176.31	6.84	-1.35E-01	1.40E-01	5.60E-01
		380.45	1.52	6.59E-01		2.50E+00
		427.87	29.60	7.82E-03		1.40E-01
		463.36	10.49	2.64E-01		4.38E-01
		600.60	17.65	2.01E-01		2.86E-01
		606.71	4.98	1.11E+00		1.36E+00
		635.95	11.22	-3.06E-01		3.59E-01

Analysis Report for 16-May-19-10040  
L1-10221D-FSGS-012SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	7.25E-01	1.40E-01	2.49E+00
Ba-133	79.61	2.65	-9.42E-01	8.24E-02	4.22E+00
	81.00	32.90	-4.63E-01		2.80E-01
	276.40	7.16	1.85E-01		5.42E-01
	302.85	18.34	5.05E-02		2.17E-01
	356.01	62.05	1.05E-03		8.24E-02
	383.85	8.94	-1.84E-01		4.35E-01
Cs-134	475.36	1.48	1.55E+00	5.48E-02	3.30E+00
	563.25	8.34	1.24E-01		5.17E-01
	569.33	15.37	-1.06E-01		2.67E-01
	604.72	97.62	-1.34E-02		6.47E-02
	795.86	85.46	9.18E-03		5.48E-02
	801.95	8.69	-2.19E-01		5.42E-01
	1038.61	0.99	-4.21E+00		4.40E+00
	1167.97	1.79	-7.66E-01		3.07E+00
	1365.19	3.02	-9.26E-01		1.22E+00
+ Cs-137	661.66	* 85.10	5.25E-02	3.32E-02	3.32E-02
Eu-152	121.78	28.67	6.63E-02	1.25E-01	1.58E-01
	244.70	7.61	3.95E-02		5.64E-01
	295.94	0.45	3.60E+00		1.03E+01
	344.28	26.60	5.59E-02		1.25E-01
	367.79	0.86	-4.29E+00		4.12E+00
	411.12	2.24	1.10E+00		1.77E+00
	443.96	2.83	-3.10E-02		1.42E+00
	488.68	0.42	2.89E+00		8.80E+00
	563.99	0.49	5.61E+00		8.90E+00
	586.26	0.46	-3.46E+00		1.33E+01
	678.62	0.47	4.50E+00		9.37E+00
	688.67	0.86	-4.23E+00		4.48E+00
	719.35	0.28	3.79E+00		1.62E+01
	778.90	12.96	1.56E-01		3.36E-01
	810.45	0.32	1.63E+01		1.69E+01
	867.37	4.26	-8.95E-01		1.10E+00
	919.33	0.43	1.27E+00		1.09E+01
	964.08	14.65	8.82E-02		5.04E-01
	1085.87	10.24	1.73E-01		5.11E-01
	1089.74	1.73	1.04E+00		3.10E+00
	1112.07	13.69	-3.38E-02		4.51E-01
	1212.95	1.43	1.10E+00		4.80E+00
	1249.94	0.19	-3.12E+00		3.23E+01
	1299.14	1.63	-7.45E-02		3.54E+00
	1408.01	21.07	-1.75E-01		2.29E-01
	1457.64	0.50	9.67E+01		3.82E+01
	1528.10	0.28	9.70E+00		1.75E+01
Eu-154	123.07	40.40	3.08E-02	1.12E-01	1.12E-01
	247.93	6.89	-3.20E-01		4.92E-01
	591.76	4.95	-7.38E-02		8.65E-01
	692.42	1.78	6.95E-01		2.52E+00
	723.30	20.06	1.12E-01		2.37E-01
	756.80	4.52	9.97E-01		1.19E+00
	873.18	12.08	1.19E-01		3.65E-01

Analysis Report for 16-May-19-10040  
L1-10221D-FSGS-012SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	2.08E-01	1.12E-01	4.92E-01
	1004.76	18.01	6.17E-02		2.29E-01
	1274.43	34.80	-5.15E-02		1.60E-01
	1596.48	1.80	-2.42E+00		2.30E+00
Eu-155	45.30	1.31	2.66E+00	2.54E-01	3.13E+01
	60.01	1.22	-1.61E+00		3.02E+01
	86.55	30.70	2.81E-02		2.83E-01
	105.31	21.10	-4.03E-01		2.54E-01
Ra-226	186.21	3.64	1.03E+00	1.20E+00	1.20E+00
Pa-231	27.36	10.30	2.88E+00	1.57E+00	3.85E+00
	283.69	1.70	-1.85E-01		2.22E+00
	300.07	2.47	-1.05E-01		1.57E+00
	302.65	2.20	4.46E-01		1.80E+00
	330.06	1.40	-1.32E+00		2.85E+00
U-235	143.76	10.96	9.42E-02	7.72E-02	4.17E-01
	163.33	5.08	1.64E-01		8.22E-01
	185.71	57.20	7.77E-02		7.72E-02
	202.11	1.08	3.43E-01		3.50E+00
	205.31	5.01	-4.20E-01		7.36E-01
Am-241	59.54	35.90	-3.13E-01	1.10E+00	1.10E+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 16-May-19-10041  
L1-10221D-FSGS-013SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 16-May-19-10041  
Sample Description : L1-10221D-FSGS-013SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.626E+03 grams  
Facility : Default  
  
Sample Taken On : 5/15/2019 7:45:00AM  
Acquisition Started : 5/16/2019 10:57:58AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : 352  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.3 seconds  
  
Dead Time : 0.03 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 9/29/2018  
Efficiency Calibration Used Done On : 5/16/2019  
Efficiency Calibration Description :  
  
Sample Number : 76630  
Fill Height : 1625.58 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/7/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 5/16/2019 11:13:01AM

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

DATA VALIDATED 5/16/19 1500  
J. Brogan / C. J.

Analysis Report for 16-May-19-10041  
L1-10221D-FSGS-013SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.65	945 -	961	955.07	1.20E+02	18.31	6.86E+01	1.06
2	295.10	1173 -	1186	1180.61	5.45E+01	11.65	2.95E+01	1.09
3	338.10	1346 -	1358	1352.46	3.69E+01	9.63	2.11E+01	0.62
4	351.72	1400 -	1415	1406.88	8.10E+01	12.88	2.80E+01	1.39
5	583.05	2325 -	2337	2331.53	4.63E+01	9.22	1.47E+01	1.16
6	608.98	2429 -	2443	2435.18	8.57E+01	10.71	1.03E+01	0.84
7	910.94	3637 -	3648	3642.78	3.50E+01	5.92	0.00E+00	0.61
8	1460.20	5828 -	5853	5841.17	2.59E+02	16.89	6.36E+00	1.78

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	5.33E+00	4.18E-01
Tl-208	0.99	583.19 *	85.00	6.54E-02	1.36E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.87E-01	3.21E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	2.32E-01	3.23E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		

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Analysis Report for 16-May-19-10041

L1-10221D-FSGS-013SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
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	0.99	241.99	7.25
295.22 *	18.42			2.24E-01	5.12E-02
351.93 *	35.60			1.95E-01	3.47E-02
Ac-228	0.99	785.96	1.06		
		129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32 *	11.27	2.73E-01	7.46E-02
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	2.18E-01	3.80E-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

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## INTERFERENCE CORRECTED REPORT

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Analysis Report for 16-May-19-10041

L1-10221D-FSGS-013SS

	<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
	K-40	0.940	5.33E+00	4.18E-01	
	Tl-208	0.997	6.54E-02	1.36E-02	
X	Bi-211	0.934			
	Pb-212	1.000	1.87E-01	3.21E-02	
	Bi-214	0.992	2.32E-01	3.23E-02	
	Pb-214	0.995	2.04E-01	2.87E-02	
	Ac-228	0.996	2.29E-01	3.39E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 1.000sigma

Analysis Report for 16-May-19-10041  
L1-10221D-FSGS-013SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/16/2019 11:13:01AM  
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	4.08E-02	4.70E-02	4.70E-02
	BE-7	477.60	10.44	-4.76E-02	3.44E-01	3.44E-01
+	K-40	1460.82	* 10.66	5.33E+00	4.21E-01	4.21E-01
	Mn-54	834.85	99.98	-1.71E-02	4.50E-02	4.50E-02
	Co-60	1173.23	99.85	-1.76E-02	4.88E-02	5.08E-02
		1332.49	99.98	2.49E-02		4.88E-02
	Nb-94	702.65	99.81	6.42E-03	3.71E-02	4.19E-02
		871.09	99.89	-8.58E-03		3.71E-02
	Ag-108m	79.13	6.60	-1.23E-01	3.94E-02	1.50E+00
		433.94	90.50	-1.09E-02		3.94E-02
		614.28	89.80	-3.64E-02		7.16E-02
		722.94	90.80	2.27E-02		4.63E-02
	Sb-125	176.31	6.84	2.17E-01	1.22E-01	4.78E-01
		380.45	1.52	-2.04E+00		2.07E+00
		427.87	29.60	8.48E-02		1.22E-01
		463.36	10.49	2.08E-02		3.78E-01
		600.60	17.65	-2.34E-01		2.08E-01
		606.71	4.98	2.56E+00		1.39E+00
		635.95	11.22	2.43E-02		3.30E-01

Analysis Report for 16-May-19-10041

L1-10221D-FSGS-013SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	5.29E-01	1.22E-01	2.30E+00
Ba-133	79.61	2.65	8.85E-01	7.11E-02	3.59E+00
	81.00	32.90	-1.34E-01		2.53E-01
	276.40	7.16	8.37E-02		5.20E-01
	302.85	18.34	6.63E-02		1.83E-01
	356.01	62.05	-7.93E-03		7.11E-02
	383.85	8.94	1.53E-01		3.81E-01
Cs-134	475.36	1.48	1.13E-01	5.09E-02	2.28E+00
	563.25	8.34	-4.17E-01		2.93E-01
	569.33	15.37	1.26E-01		2.24E-01
	604.72	97.62	-2.28E-02		6.76E-02
	795.86	85.46	2.73E-02		5.09E-02
	801.95	8.69	-8.61E-01		4.14E-01
	1038.61	0.99	-3.83E+00		4.75E+00
	1167.97	1.79	-2.69E-01		3.29E+00
	1365.19	3.02	-1.22E-01		1.61E+00
Cs-137	661.66	85.10	1.59E-02	5.64E-02	5.64E-02
Eu-152	121.78	28.67	2.66E-02	1.27E-01	1.27E-01
	244.70	7.61	4.95E-02		4.71E-01
	295.94	0.45	9.00E+00		1.00E+01
	344.28	26.60	-3.45E-02		1.27E-01
	367.79	0.86	1.50E+00		4.13E+00
	411.12	2.24	-9.00E-02		1.73E+00
	443.96	2.83	-1.33E+00		1.25E+00
	488.68	0.42	-7.02E+00		8.92E+00
	563.99	0.49	-3.87E+00		5.28E+00
	586.26	0.46	1.88E+01		1.23E+01
	678.62	0.47	7.45E-01		7.68E+00
	688.67	0.86	-1.07E+00		4.61E+00
	719.35	0.28	-7.37E+00		1.30E+01
	778.90	12.96	-2.78E-01		3.40E-01
	810.45	0.32	1.51E+00		1.29E+01
	867.37	4.26	-9.55E-01		8.05E-01
	919.33	0.43	-3.48E+00		9.78E+00
	964.08	14.65	2.72E-01		3.99E-01
	1085.87	10.24	5.62E-01		5.27E-01
	1089.74	1.73	3.13E+00		3.04E+00
	1112.07	13.69	-4.34E-01		3.32E-01
	1212.95	1.43	1.39E+00		4.34E+00
	1249.94	0.19	-3.80E+01		2.23E+01
	1299.14	1.63	-4.66E+00		2.51E+00
	1408.01	21.07	-3.30E-02		1.91E-01
	1457.64	0.50	1.16E+02		3.57E+01
	1528.10	0.28	-2.66E+00		1.10E+01
Eu-154	123.07	40.40	8.09E-03	8.70E-02	8.70E-02
	247.93	6.89	-2.60E-01		4.28E-01
	591.76	4.95	-3.12E-01		7.75E-01
	692.42	1.78	1.50E+00		2.54E+00
	723.30	20.06	5.26E-02		2.07E-01
	756.80	4.52	7.51E-01		9.84E-01
	873.18	12.08	4.91E-02		3.21E-01

Analysis Report for 16-May-19-10041  
L1-10221D-FSGS-013SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	4.17E-02	8.70E-02	4.52E-01
	1004.76	18.01	1.19E-01		2.56E-01
	1274.43	34.80	-8.20E-02		1.39E-01
	1596.48	1.80	-4.03E+00		1.91E+00
Eu-155	45.30	1.31	1.78E+00	2.05E-01	1.95E+01
	60.01	1.22	-5.75E+00		2.18E+01
	86.55	30.70	-9.82E-02		2.05E-01
Ra-226	105.31	21.10	3.39E-03		2.16E-01
Ra-226	186.21	3.64	6.90E-01	1.04E+00	1.04E+00
Pa-231	27.36	10.30	1.23E+00	1.50E+00	2.18E+00
	283.69	1.70	1.17E+00		2.04E+00
	300.07	2.47	-1.18E-01		1.50E+00
	302.65	2.20	4.35E-01		1.55E+00
	330.06	1.40	-2.23E-01		2.38E+00
	U-235	143.76	10.96		-3.07E-01
U-235	163.33	5.08	-1.15E-03		6.78E-01
	185.71	57.20	4.34E-02		6.66E-02
	202.11	1.08	-1.11E+00		3.11E+00
	205.31	5.01	-4.99E-01		6.42E-01
Am-241	59.54	35.90	-1.87E-01	7.63E-01	7.63E-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 16-May-19-10042  
L1-10221D-FSGS-014SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 16-May-19-10042  
Sample Description : L1-10221D-FSGS-014SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.656E+03 grams  
Facility : Default  
  
Sample Taken On : 5/15/2019 7:50:00AM  
Acquisition Started : 5/16/2019 11:28:13AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : 324  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.9 seconds  
  
Dead Time : 0.10 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 4096  
Peak Area Range (in channels) : 120 - 4096  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 9/29/2018  
Efficiency Calibration Used Done On : 5/16/2019  
Efficiency Calibration Description :  
  
Sample Number : 76633  
Fill Height : 1655.66 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/30/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 5/16/2019 11:43:18AM

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

DATA VALIDATED 5/16/19 1500  
J. Brogan / C. J. H.



Analysis Report for 16-May-19-10042  
L1-10221D-FSGS-014SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.68	474 -	481	477.55	9.30E+01	19.69	1.40E+02	1.14
2	295.22	586 -	594	590.49	7.87E+01	14.42	5.93E+01	1.13
3	351.88	698 -	708	703.70	7.80E+01	16.09	7.50E+01	1.50
4	510.64	1015 -	1026	1020.97	6.25E+01	10.90	2.25E+01	1.26
5	583.19	1160 -	1171	1165.98	9.31E+01	11.74	1.79E+01	1.61
6	609.50	1212 -	1223	1218.59	9.60E+01	11.88	1.80E+01	1.78
7	911.48	1815 -	1828	1822.42	4.78E+01	10.04	1.92E+01	1.19
8	969.04	1933 -	1944	1937.54	3.16E+01	8.84	1.84E+01	1.25
9	1460.71	2914 -	2929	2921.47	3.59E+02	19.74	1.01E+01	1.83

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	0.98	511.00 *	100.00	6.28E-02	1.17E-02
K-40	0.99	1460.82 *	10.66	6.61E+00	4.63E-01
Tl-208	1.00	583.19 *	85.00	1.18E-01	1.65E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.29E-01	2.92E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	2.34E-01	3.22E-02
		768.36	4.89		

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Analysis Report for 16-May-19-10042

L1-10221D-FSGS-014SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Bi-214	0.99	806.18	1.26		
		934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
		Pb-214	1.00	241.99	7.25
295.22 *	18.42			2.91E-01	5.81E-02
351.93 *	35.60			1.68E-01	3.73E-02
Ac-228	0.99	785.96	1.06		
		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	2.67E-01	5.73E-02
		964.77	4.99		
		968.97 *	15.80	3.00E-01	8.50E-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

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## INTERFERENCE CORRECTED REPORT

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Analysis Report for 16-May-19-10042

L1-10221D-FSGS-014SS

<i><b>Nuclide Name</b></i>	<i><b>Nuclide Id Confidence</b></i>	<i><b>Wt mean Activity (pCi/grams)</b></i>	<i><b>Wt mean Activity Uncertainty</b></i>	<i><b>Comments</b></i>
An Pk	0.980	6.28E-02	1.17E-02	
K-40	0.998	6.61E+00	4.63E-01	
Tl-208	1.000	1.18E-01	1.65E-02	
X Bi-211	0.901			
Pb-212	1.000	1.29E-01	2.92E-02	
Bi-214	0.998	2.34E-01	3.22E-02	
Pb-214	1.000	2.04E-01	3.14E-02	
Ac-228	0.996	2.78E-01	4.75E-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 16-May-19-10042  
L1-10221D-FSGS-014SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/16/2019 11:43:18AM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 4096

<i>Peak No.</i>	<i>Energy (keV)</i>	<i>Peak Size (CPS)</i>	<i>Peak CPS (%) Uncertainty</i>	<i>Peak Type</i>	<i>Tolerance Nuclide</i>
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

	<i>Nuclide Name</i>	<i>Energy (keV)</i>	<i>Yield(%)</i>	<i>Activity (pCi/grams)</i>	<i>Nuclide MDA (pCi/grams)</i>	<i>Line MDA (pCi/grams)</i>
+	An Pk	511.00	* 100.00	6.28E-02	2.84E-02	2.84E-02
	BE-7	477.60	10.44	-6.96E-02	3.35E-01	3.35E-01
+	K-40	1460.82	* 10.66	6.61E+00	3.98E-01	3.98E-01
	Mn-54	834.85	99.98	7.88E-03	4.42E-02	4.42E-02
	Co-60	1173.23	99.85	-1.62E-02	4.75E-02	4.94E-02
		1332.49	99.98	2.43E-02		4.75E-02
	Nb-94	702.65	99.81	5.59E-03	3.95E-02	4.27E-02
		871.09	99.89	1.67E-02		3.95E-02
	Ag-108m	79.13	6.60	4.56E-01	3.18E-02	1.24E+00
		433.94	90.50	-1.06E-02		3.18E-02
		614.28	89.80	-4.65E-02		5.51E-02
		722.94	90.80	1.36E-02		4.88E-02
	Sb-125	176.31	6.84	1.18E-02	1.11E-01	4.95E-01
		380.45	1.52	-6.87E-01		2.30E+00
		427.87	29.60	6.45E-02		1.11E-01
		463.36	10.49	2.95E-01		3.54E-01
		600.60	17.65	2.74E-02		2.16E-01
		606.71	4.98	-2.22E-01		1.26E+00
		635.95	11.22	-1.78E-01		2.63E-01

Analysis Report for 16-May-19-10042

L1-10221D-FSGS-014SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	4.00E-01	1.11E-01	2.22E+00
Ba-133	79.61	2.65	2.41E-01	7.27E-02	2.85E+00
	81.00	32.90	-3.13E-01		1.84E-01
	276.40	7.16	2.65E-01		4.61E-01
	302.85	18.34	-3.91E-03		1.90E-01
	356.01	62.05	6.63E-03		7.27E-02
	383.85	8.94	9.51E-02		4.06E-01
Cs-134	475.36	1.48	-2.36E-01	4.36E-02	2.33E+00
	563.25	8.34	1.05E-01		3.95E-01
	569.33	15.37	6.06E-02		2.07E-01
	604.72	97.62	-9.95E-03		5.42E-02
	795.86	85.46	8.22E-03		4.36E-02
	801.95	8.69	5.74E-02		3.95E-01
	1038.61	0.99	8.42E-01		4.33E+00
	1167.97	1.79	2.24E+00		3.06E+00
	1365.19	3.02	-2.17E-01		1.29E+00
Cs-137	661.66	85.10	1.32E-02	5.06E-02	5.06E-02
Eu-152	121.78	28.67	4.45E-02	1.13E-01	1.13E-01
	244.70	7.61	5.78E-02		4.97E-01
	295.94	0.45	8.62E+00		9.95E+00
	344.28	26.60	-1.79E-01		1.19E-01
	367.79	0.86	5.96E-01		3.96E+00
	411.12	2.24	-2.13E-01		1.38E+00
	443.96	2.83	6.38E-02		1.14E+00
	488.68	0.42	2.54E+00		8.26E+00
	563.99	0.49	3.35E-01		6.63E+00
	586.26	0.46	-4.60E+00		1.32E+01
	678.62	0.47	1.15E+00		6.89E+00
	688.67	0.86	1.08E+00		4.43E+00
	719.35	0.28	2.47E-01		1.37E+01
	778.90	12.96	-5.62E-02		2.79E-01
	810.45	0.32	-2.41E+00		1.12E+01
	867.37	4.26	-8.92E-01		7.78E-01
	919.33	0.43	-4.57E+00		9.42E+00
	964.08	14.65	-9.91E-03		3.68E-01
	1085.87	10.24	9.55E-03		3.91E-01
	1089.74	1.73	7.09E-01		2.51E+00
	1112.07	13.69	-8.27E-02		3.37E-01
	1212.95	1.43	9.60E-03		4.07E+00
	1249.94	0.19	-4.67E+00		2.67E+01
	1299.14	1.63	4.29E-01		3.04E+00
	1408.01	21.07	7.92E-02		2.16E-01
	1457.64	0.50	-2.40E+00		3.73E+01
	1528.10	0.28	1.01E+01		1.50E+01
Eu-154	123.07	40.40	4.08E-02	8.15E-02	8.15E-02
	247.93	6.89	-9.62E-02		4.61E-01
	591.76	4.95	-3.76E-01		6.87E-01
	692.42	1.78	-6.88E-01		2.25E+00
	723.30	20.06	3.86E-02		2.25E-01
	756.80	4.52	3.86E-01		9.16E-01
	873.18	12.08	1.31E-01		3.28E-01

Analysis Report for 16-May-19-10042  
L1-10221D-FSGS-014SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	1.51E-01	8.15E-02	4.18E-01
	1004.76	18.01	-1.49E-01		1.88E-01
	1274.43	34.80	-6.10E-02		1.30E-01
	1596.48	1.80	-9.92E-01		1.31E+00
Eu-155	45.30	1.31	4.22E-02	1.88E-01	1.17E+01
	60.01	1.22	8.04E-02		1.37E+01
	86.55	30.70	6.51E-02		1.88E-01
Ra-226	105.31	21.10	5.99E-02	9.79E-01	1.93E-01
Ra-226	186.21	3.64	2.47E-01	9.79E-01	9.79E-01
	Pa-231	27.36	10.30		5.18E-01
Pa-231	283.69	1.70	1.06E-01	1.15E+00	1.86E+00
	300.07	2.47	-6.57E-01		1.46E+00
	302.65	2.20	-3.26E-02		1.58E+00
	330.06	1.40	1.46E+00		2.47E+00
	U-235	143.76	10.96		-9.56E-02
U-235	163.33	5.08	-3.57E-01	6.34E-02	6.39E-01
	185.71	57.20	3.13E-02		6.34E-02
	202.11	1.08	-3.24E-01		2.93E+00
	205.31	5.01	-3.93E-01		6.26E-01
Am-241	59.54	35.90	-7.94E-02	4.73E-01	4.73E-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 16-May-19-10043  
L1-10221D-FSGS-015SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 16-May-19-10043  
Sample Description : L1-10221D-FSGS-015SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.182E+03 grams  
Facility : Default  
  
Sample Taken On : 5/15/2019 7:55:00AM  
Acquisition Started : 5/16/2019 11:28:19AM  
  
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 : 0.16 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/29/2019  
Efficiency Calibration Used Done On : 5/16/2019  
Efficiency Calibration Description :  
  
Sample Number : 76634  
Fill Height : 1182.27 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/30/2012 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 5/16/2019 11:43:23AM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 8192

DATA VALIDATED 5/16/19 1500  
J. Brogan / C. J.

Analysis Report for 16-May-19-10043  
L1-10221D-FSGS-015SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.65	946 -	962	954.71	1.55E+02	20.79	8.72E+01	1.08
2	295.31	1176 -	1186	1181.16	5.53E+01	11.03	2.77E+01	0.85
3	338.42	1349 -	1358	1353.44	2.70E+01	9.16	2.50E+01	0.97
4	351.89	1401 -	1415	1407.31	9.75E+01	13.60	3.05E+01	1.00
5	510.88	2038 -	2050	2042.87	4.04E+01	10.56	2.66E+01	1.33
6	582.99	2325 -	2337	2331.19	4.67E+01	8.81	1.13E+01	0.73
7	609.32	2430 -	2442	2436.44	5.26E+01	10.20	1.94E+01	1.21
8	661.76	2642 -	2651	2646.12	2.15E+01	6.40	8.45E+00	0.33
9	911.12	3635 -	3651	3643.42	4.70E+01	6.86	0.00E+00	0.95
10	1107.96	4425 -	4436	4430.93	1.21E+01	4.46	2.90E+00	0.42
11	1460.53	5830 -	5854	5841.96	2.93E+02	17.85	6.25E+00	1.70

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	5.76E-02	1.56E-02
K-40	0.98	1460.82 *	10.66	8.02E+00	6.00E-01
Cs-137	0.99	661.66 *	85.10	4.25E-02	1.29E-02
Tl-208	0.99	583.19 *	85.00	8.45E-02	1.67E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	2.96E-01	4.64E-02 <sup>[176]</sup>



Analysis Report for 16-May-19-10043

L1-10221D-FSGS-015SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>		<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Pb-212	1.00	300.09		3.30		
Bi-214	1.00	609.32	*	45.49	1.83E-01	3.72E-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	2.83E-01	6.08E-02
		351.93	*	35.60	2.94E-01	4.72E-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	2.50E-01	8.70E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	3.82E-01	5.81E-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

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**INTERFERENCE CORRECTED REPORT**

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Analysis Report for 16-May-19-10043  
L1-10221D-FSGS-015SS

<i><b>Nuclide Name</b></i>	<i><b>Nuclide Id Confidence</b></i>	<i><b>Wt mean Activity (pCi/grams)</b></i>	<i><b>Wt mean Activity Uncertainty</b></i>	<i><b>Comments</b></i>
An Pk	0.998	5.76E-02	1.56E-02	
K-40	0.987	8.02E+00	6.00E-01	
Cs-137	0.998	4.25E-02	1.29E-02	
Tl-208	0.994	8.45E-02	1.67E-02	
X Bi-211	0.897			
Pb-212	1.000	2.96E-01	4.64E-02	
Bi-214	1.000	1.83E-01	3.72E-02	
Pb-214	0.999	2.90E-01	3.73E-02	
Ac-228	0.999	3.41E-01	4.83E-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 16-May-19-10043  
L1-10221D-FSGS-015SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/16/2019 11:43:23AM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
10	1107.96	1.34444E-02	36.83		

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	5.76E-02	4.49E-02	4.49E-02
	BE-7	477.60	10.44	1.77E-01	4.32E-01	4.32E-01
+	K-40	1460.82	* 10.66	8.02E+00	5.51E-01	5.51E-01
	Mn-54	834.85	99.98	-2.49E-02	6.85E-02	6.85E-02
	Co-60	1173.23	99.85	2.59E-03	6.16E-02	7.49E-02
		1332.49	99.98	2.99E-02		6.16E-02
	Nb-94	702.65	99.81	-1.05E-02	5.36E-02	5.48E-02
		871.09	99.89	3.77E-02		5.36E-02
	Ag-108m	79.13	6.60	-4.98E-01	5.26E-02	2.00E+00
		433.94	90.50	-4.07E-02		5.26E-02
		614.28	89.80	-4.89E-02		7.48E-02
		722.94	90.80	-2.60E-02		6.38E-02
	Sb-125	176.31	6.84	2.38E-01	1.69E-01	6.19E-01
		380.45	1.52	1.84E+00		3.09E+00
		427.87	29.60	7.21E-02		1.69E-01
		463.36	10.49	-1.74E-02		4.24E-01
		600.60	17.65	-1.19E-01		2.30E-01
		606.71	4.98	2.12E+00		1.58E+00

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Analysis Report for 16-May-19-10043  
L1-10221D-FSGS-015SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>		
Sb-125	635.95	11.22	-4.26E-01	1.69E-01	4.79E-01		
	671.44	1.79	1.23E+00		2.88E+00		
Ba-133	79.61	2.65	6.00E-01	8.70E-02	4.81E+00		
	81.00	32.90	-4.73E-01		3.27E-01		
	276.40	7.16	3.06E-01		6.22E-01		
	302.85	18.34	1.30E-01		2.42E-01		
	356.01	62.05	-9.20E-04		8.70E-02		
	383.85	8.94	-1.21E-01		5.00E-01		
	475.36	1.48	-1.40E-01		6.80E-02	2.93E+00	
Cs-134	563.25	8.34	7.56E-02	6.80E-02	5.56E-01		
	569.33	15.37	1.36E-01		3.16E-01		
	604.72	97.62	-1.52E-02		7.19E-02		
	795.86	85.46	2.79E-02		6.80E-02		
	801.95	8.69	1.29E-01		6.24E-01		
	1038.61	0.99	-3.46E+00		5.89E+00		
	1167.97	1.79	9.12E-01		4.17E+00		
	1365.19	3.02	-1.38E+00		1.51E+00		
	+ Cs-137	661.66	*		85.10	3.51E-02	3.51E-02
	Eu-152	121.78	28.67		-3.50E-02	1.62E-01	1.72E-01
244.70		7.61	3.77E-01	6.54E-01			
295.94		0.45	7.28E+00	1.19E+01			
344.28		26.60	-2.68E-02	1.62E-01			
367.79		0.86	-1.54E+00	4.73E+00			
411.12		2.24	1.17E+00	2.25E+00			
443.96		2.83	-8.85E-01	1.52E+00			
488.68		0.42	1.43E+00	1.12E+01			
563.99		0.49	-3.49E+00	9.57E+00			
586.26		0.46	-6.26E+00	1.51E+01			
678.62		0.47	5.52E+00	9.73E+00			
688.67		0.86	-5.37E+00	5.68E+00			
719.35		0.28	-1.17E+01	1.71E+01			
778.90		12.96	-2.19E-02	3.89E-01			
810.45		0.32	4.66E+00	1.40E+01			
867.37		4.26	3.50E-01	1.25E+00			
919.33		0.43	3.49E+00	1.28E+01			
964.08		14.65	3.22E-01	4.89E-01			
1085.87		10.24	2.76E-01	6.64E-01			
1089.74		1.73	-1.54E+00	3.81E+00			
1112.07		13.69	-1.54E-01	5.56E-01			
1212.95	1.43	-3.38E+00	4.63E+00				
1249.94	0.19	-1.33E+01	3.49E+01				
1299.14	1.63	6.15E-01	4.34E+00				
1408.01	21.07	-3.54E-02	2.63E-01				
1457.64	0.50	1.69E+02	5.02E+01				
1528.10	0.28	1.94E+00	1.85E+01				
Eu-154	123.07	40.40	-6.04E-02	1.19E-01	1.19E-01		
	247.93	6.89	5.32E-02		6.38E-01		
	591.76	4.95	1.41E-01		8.28E-01		
	692.42	1.78	-3.66E-01		2.71E+00		
	723.30	20.06	-4.05E-02		2.96E-01		
	756.80	4.52	-3.57E-01		1.03E+00		

Analysis Report for 16-May-19-10043  
L1-10221D-FSGS-015SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	873.18	12.08	2.31E-01	1.19E-01	4.52E-01
	996.29	10.48	4.21E-01		6.30E-01
	1004.76	18.01	7.56E-02		3.63E-01
	1274.43	34.80	-9.78E-03		2.24E-01
	1596.48	1.80	6.23E-03		2.71E+00
Eu-155	45.30	1.31	1.41E+00	2.88E-01	3.26E+01
	60.01	1.22	-1.00E+01		3.11E+01
	86.55	30.70	2.90E-01		3.28E-01
	105.31	21.10	-1.21E-02		2.88E-01
Ra-226	186.21	3.64	1.20E+00	1.32E+00	1.32E+00
Pa-231	27.36	10.30	1.55E+00	1.63E+00	3.75E+00
	283.69	1.70	3.25E-01		2.51E+00
	300.07	2.47	-8.59E-01		1.63E+00
	302.65	2.20	5.87E-01		1.97E+00
	330.06	1.40	6.31E-03		3.36E+00
U-235	143.76	10.96	1.89E-01	8.35E-02	4.69E-01
	163.33	5.08	-2.39E-01		8.16E-01
	185.71	57.20	3.08E-02		8.35E-02
	202.11	1.08	-1.92E+00		4.11E+00
	205.31	5.01	-4.53E-01		8.82E-01
Am-241	59.54	35.90	-6.11E-01	1.13E+00	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 16-May-19-10044  
L1-10221D-FSGS-016SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 16-May-19-10044  
Sample Description : L1-10221D-FSGS-016SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.543E+03 grams  
Facility : Default  
  
Sample Taken On : 5/15/2019 8:00:00AM  
Acquisition Started : 5/16/2019 11:28:26AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P11314  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.3 seconds  
  
Dead Time : 0.03 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/24/2019  
Efficiency Calibration Used Done On : 5/16/2019  
Efficiency Calibration Description :  
  
Sample Number : 76635  
Fill Height : 1542.61 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 12/22/2008 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 5/16/2019 11:43:43AM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 8192

DATA VALIDATED 5/16/19 1500  
J. Brogan / C. J. H.

Analysis Report for 16-May-19-10044  
L1-10221D-FSGS-016SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.77	949 -	960	954.64	1.10E+02	15.92	5.64E+01	0.71
2	295.27	1174 -	1186	1180.38	8.64E+01	12.60	2.76E+01	0.81
3	352.08	1400 -	1414	1407.32	8.94E+01	13.36	3.06E+01	0.67
4	511.18	2038 -	2048	2043.07	2.01E+01	8.24	1.99E+01	0.37
5	583.18	2324 -	2337	2330.82	4.57E+01	9.31	1.43E+01	0.56
6	609.10	2428 -	2441	2434.43	5.40E+01	8.93	8.99E+00	0.99
7	1460.27	5828 -	5851	5839.04	2.91E+02	17.68	5.53E+00	2.06

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	2.38E-02	9.90E-03
K-40	0.95	1460.82 *	10.66	6.52E+00	4.87E-01
Tl-208	1.00	583.19 *	85.00	6.86E-02	1.46E-02
Pb-212	0.99	115.18 *	0.60		
		238.63 *	43.60	1.74E-01	2.89E-02
		300.09 *	3.30		
Bi-214	0.99	609.32 *	45.49	1.56E-01	2.75E-02
		768.36 *	4.89		
		806.18 *	1.26		
		934.06 *	3.11		

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Analysis Report for 16-May-19-10044

L1-10221D-FSGS-016SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
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	0.99	241.99	7.25
295.22 *	18.42			3.69E-01	6.13E-02
351.93 *	35.60			2.25E-01	3.81E-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

<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
An Pk	0.995	2.38E-02	9.90E-03	
K-40	0.953	6.52E+00	4.87E-01	
Tl-208	1.000	6.86E-02	1.46E-02	
Pb-212	0.997	1.74E-01	2.89E-02	
Bi-214	0.997	1.56E-01	2.75E-02	
Pb-214	0.998	2.65E-01	3.24E-02	



Analysis Report for 16-May-19-10044

L1-10221D-FSGS-016SS

- ? = 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

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Analysis Report for 16-May-19-10044  
L1-10221D-FSGS-016SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/16/2019 11:43:43AM  
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	2.38E-02	3.12E-02	3.12E-02
	BE-7	477.60	10.44	2.26E-01	4.33E-01	4.33E-01
+	K-40	1460.82	* 10.66	6.52E+00	4.12E-01	4.12E-01
	Mn-54	834.85	99.98	1.99E-02	4.54E-02	4.54E-02
	Co-60	1173.23	99.85	-4.61E-03	5.41E-02	6.23E-02
		1332.49	99.98	-1.74E-02		5.41E-02
	Nb-94	702.65	99.81	2.07E-02	3.83E-02	3.83E-02
		871.09	99.89	-2.96E-02		3.89E-02
	Ag-108m	79.13	6.60	-1.69E-01	3.55E-02	1.19E+00
		433.94	90.50	-2.58E-02		3.55E-02
		614.28	89.80	-5.47E-02		4.95E-02
		722.94	90.80	2.03E-03		4.88E-02
	Sb-125	176.31	6.84	1.40E-01	1.25E-01	4.39E-01
		380.45	1.52	8.66E-01		2.23E+00
		427.87	29.60	1.13E-02		1.25E-01
		463.36	10.49	2.18E-01		3.57E-01
		600.60	17.65	-1.31E-01		2.25E-01
		606.71	4.98	6.48E-01		1.21E+00
		635.95	11.22	-2.80E-01		3.83E-01

Analysis Report for 16-May-19-10044

L1-10221D-FSGS-016SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	8.07E-01	1.25E-01	2.29E+00
Ba-133	79.61	2.65	-6.81E-01	6.85E-02	2.91E+00
	81.00	32.90	-1.39E-01		2.03E-01
	276.40	7.16	2.09E-01		4.77E-01
	302.85	18.34	3.77E-02		1.92E-01
	356.01	62.05	-5.04E-03		6.85E-02
	383.85	8.94	-1.36E-01		3.58E-01
Cs-134	475.36	1.48	1.92E+00	3.96E-02	2.94E+00
	563.25	8.34	-4.24E-01		4.97E-01
	569.33	15.37	6.71E-02		2.56E-01
	604.72	97.62	-1.35E-02		5.69E-02
	795.86	85.46	-4.89E-02		3.96E-02
	801.95	8.69	-2.69E-02		4.24E-01
	1038.61	0.99	7.59E-01		4.75E+00
	1167.97	1.79	1.82E-01		3.12E+00
	1365.19	3.02	4.79E-01		1.47E+00
Cs-137	661.66	85.10	1.66E-02	5.68E-02	5.68E-02
Eu-152	121.78	28.67	-2.50E-02	1.14E-01	1.14E-01
	244.70	7.61	1.72E-01		5.21E-01
	295.94	0.45	3.12E+00		1.07E+01
	344.28	26.60	-4.13E-02		1.17E-01
	367.79	0.86	1.31E+00		3.39E+00
	411.12	2.24	9.40E-01		1.71E+00
	443.96	2.83	-3.92E-01		1.27E+00
	488.68	0.42	1.82E+00		7.61E+00
	563.99	0.49	-1.23E+01		7.41E+00
	586.26	0.46	-2.85E+00		1.26E+01
	678.62	0.47	-1.34E+00		7.92E+00
	688.67	0.86	2.55E-01		4.93E+00
	719.35	0.28	8.05E+00		1.54E+01
	778.90	12.96	3.40E-02		3.10E-01
	810.45	0.32	-2.01E+00		1.07E+01
	867.37	4.26	4.23E-02		9.33E-01
	919.33	0.43	8.62E+00		1.09E+01
	964.08	14.65	3.00E-01		4.80E-01
	1085.87	10.24	-6.72E-02		5.10E-01
	1089.74	1.73	1.38E+00		2.97E+00
	1112.07	13.69	-4.37E-01		3.73E-01
	1212.95	1.43	2.58E+00		4.27E+00
	1249.94	0.19	2.94E+00		2.80E+01
	1299.14	1.63	-5.94E-01		3.28E+00
	1408.01	21.07	-8.05E-02		2.15E-01
	1457.64	0.50	1.44E+02		4.10E+01
	1528.10	0.28	-3.72E+00		1.51E+01
Eu-154	123.07	40.40	9.06E-03	8.07E-02	8.07E-02
	247.93	6.89	3.57E-01		4.75E-01
	591.76	4.95	6.78E-02		7.25E-01
	692.42	1.78	8.42E-01		2.39E+00
	723.30	20.06	-1.97E-02		2.24E-01
	756.80	4.52	-6.82E-02		8.73E-01
	873.18	12.08	-2.75E-01		3.30E-01

Analysis Report for 16-May-19-10044  
L1-10221D-FSGS-016SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	7.08E-02	8.07E-02	3.65E-01
	1004.76	18.01	7.80E-02		2.55E-01
	1274.43	34.80	5.74E-02		1.58E-01
	1596.48	1.80	1.42E+00		2.57E+00
Eu-155	45.30	1.31	1.04E+01	1.70E-01	1.23E+01
	60.01	1.22	-2.54E+00		1.13E+01
	86.55	30.70	-2.80E-02		1.70E-01
	105.31	21.10	-1.13E-01		2.04E-01
Ra-226	186.21	3.64	2.67E-01	9.42E-01	9.42E-01
Pa-231	27.36	10.30	4.01E-01	1.28E+00	1.28E+00
	283.69	1.70	1.04E-01		1.85E+00
	300.07	2.47	-8.13E-01		1.39E+00
	302.65	2.20	4.67E-02		1.60E+00
	330.06	1.40	1.28E+00		2.59E+00
U-235	143.76	10.96	-1.70E-01	6.03E-02	3.00E-01
	163.33	5.08	3.36E-01		6.32E-01
	185.71	57.20	1.09E-02		6.03E-02
	202.11	1.08	-7.67E-01		2.73E+00
	205.31	5.01	1.12E-02		5.97E-01
Am-241	59.54	35.90	2.50E-02	3.99E-01	3.99E-01

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

Analysis Report for 16-May-19-10045  
L1-10221D-FSGS-017SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 16-May-19-10045  
Sample Description : L1-10221D-FSGS-017SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.494E+03 grams  
Facility : Default  
  
Sample Taken On : 5/15/2019 8:05:00AM  
Acquisition Started : 5/16/2019 11:28:34AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : 352  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.3 seconds  
  
Dead Time : 0.03 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 9/29/2018  
Efficiency Calibration Used Done On : 5/16/2019  
Efficiency Calibration Description :  
  
Sample Number : 76636  
Fill Height : 1493.97 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/7/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 5/16/2019 11:43:41AM

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

DATA VALIDATED 5/16/19 1500  
J. Brogan / C. J.

Analysis Report for 16-May-19-10045  
L1-10221D-FSGS-017SS

	<b>Peak No.</b>	<b>Energy (keV)</b>	<b>ROI start</b>	<b>ROI end</b>	<b>Peak Centroid</b>	<b>Net Peak Area</b>	<b>Net Area Uncertainty</b>	<b>Continuum Counts</b>	<b>FWHM (keV)</b>
M	1	238.55	947 -	971	954.65	1.25E+02	12.27	4.90E+01	1.00
m	2	241.65	947 -	971	967.04	2.37E+01	7.05	4.20E+01	1.00
	3	295.10	1174 -	1186	1180.62	3.39E+01	10.53	2.91E+01	0.58
	4	351.70	1400 -	1415	1406.78	7.81E+01	10.94	1.39E+01	1.48
	5	477.47	1904 -	1915	1909.45	1.67E+01	8.54	2.23E+01	0.56
	6	583.02	2324 -	2339	2331.41	5.00E+01	9.92	1.60E+01	1.00
	7	609.03	2427 -	2444	2435.40	7.75E+01	9.60	4.50E+00	0.90
	8	727.00	2902 -	2913	2907.08	1.94E+01	5.60	4.65E+00	0.44
	9	910.56	3636 -	3647	3641.27	2.77E+01	7.26	9.32E+00	1.02
	10	1119.78	4473 -	4484	4478.38	1.60E+01	5.58	6.00E+00	1.19
	11	1460.21	5829 -	5853	5841.19	2.86E+02	17.27	3.01E+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

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
BE-7	0.99	477.60 *	10.44	1.74E-01	8.99E-02
K-40	0.94	1460.82 *	10.66	6.02E+00	4.48E-01
Tl-208	0.99	583.19 *	85.00	7.19E-02	1.49E-02
Bi-212	0.98	39.86	1.06		
		727.33 *	6.67	4.10E-01	1.21E-01
		785.37	1.10		[190]

Analysis Report for 16-May-19-10045  
L1-10221D-FSGS-017SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Bi-212	0.98	1620.50	1.47		
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	1.97E-01	2.50E-02
		300.09	3.30		
Bi-214	0.98	609.32 *	45.49	2.14E-01	2.95E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29 *	14.92	2.01E-01	7.06E-02
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	0.99	241.99 *	7.25	2.26E-01	6.95E-02
		295.22 *	18.42	1.42E-01	4.54E-02
		351.93 *	35.60	1.91E-01	3.08E-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	1.76E-01	4.68E-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 16-May-19-10045  
L1-10221D-FSGS-017SS

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## INTERFERENCE CORRECTED REPORT

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<i><b>Nuclide Name</b></i>	<i><b>Nuclide Id Confidence</b></i>	<i><b>Wt mean Activity (pCi/grams)</b></i>	<i><b>Wt mean Activity Uncertainty</b></i>	<i><b>Comments</b></i>
BE-7	0.997	1.74E-01	8.99E-02	
K-40	0.941	6.02E+00	4.48E-01	
Tl-208	0.996	7.19E-02	1.49E-02	
X Bi-211	0.939			
Bi-212	0.989	4.10E-01	1.21E-01	
Pb-212	0.999	1.97E-01	2.50E-02	
Bi-214	0.989	2.12E-01	2.72E-02	
Pb-214	0.992	1.81E-01	2.39E-02	
Ac-228	0.980	1.76E-01	4.68E-02	

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

Errors quoted at 1.000sigma

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Analysis Report for 16-May-19-10045  
L1-10221D-FSGS-017SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/16/2019 11:43:41AM  
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	6.32E-02	5.33E-02	5.33E-02
+	BE-7	477.60	* 10.44	1.74E-01	2.95E-01	2.95E-01
+	K-40	1460.82	* 10.66	6.02E+00	3.09E-01	3.09E-01
	Mn-54	834.85	99.98	3.38E-02	4.78E-02	4.78E-02
	Co-60	1173.23	99.85	-1.74E-02	5.20E-02	5.20E-02
		1332.49	99.98	-3.00E-03		5.22E-02
	Nb-94	702.65	99.81	-1.24E-02	4.16E-02	4.16E-02
		871.09	99.89	1.03E-02		4.71E-02
	Ag-108m	79.13	6.60	2.47E-01	3.90E-02	1.40E+00
		433.94	90.50	-1.39E-03		3.90E-02
		614.28	89.80	-2.29E-02		6.74E-02
		722.94	90.80	-2.78E-02		5.09E-02
	Sb-125	176.31	6.84	-6.20E-02	1.04E-01	4.47E-01
		380.45	1.52	1.85E+00		2.41E+00
		427.87	29.60	-1.12E-01		1.04E-01
		463.36	10.49	1.94E-01		3.66E-01
		600.60	17.65	1.09E-01		2.32E-01
		606.71	4.98	1.47E+00		1.28E+00
		635.95	11.22	2.00E-01		3.37E-01

Analysis Report for 16-May-19-10045  
L1-10221D-FSGS-017SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	1.03E-01	1.04E-01	2.31E+00
Ba-133	79.61	2.65	-1.42E+00	6.95E-02	3.36E+00
	81.00	32.90	-3.43E-01		2.28E-01
	276.40	7.16	2.65E-01		4.69E-01
	302.85	18.34	8.17E-02		1.92E-01
	356.01	62.05	-1.84E-02		6.95E-02
	383.85	8.94	-7.00E-02		4.01E-01
Cs-134	475.36	1.48	2.45E+00	4.27E-02	3.10E+00
	563.25	8.34	-1.44E-01		4.66E-01
	569.33	15.37	-1.26E-01		2.48E-01
	604.72	97.62	-1.14E-02		6.37E-02
	795.86	85.46	-2.89E-02		4.27E-02
	801.95	8.69	3.39E-02		4.83E-01
	1038.61	0.99	1.61E+00		4.85E+00
	1167.97	1.79	-8.42E-01		3.04E+00
	1365.19	3.02	-3.97E-01		1.56E+00
Cs-137	661.66	85.10	3.69E-02	5.13E-02	5.13E-02
Eu-152	121.78	28.67	-5.04E-02	1.20E-01	1.29E-01
	244.70	7.61	-3.11E-01		4.81E-01
	295.94	0.45	5.60E+00		9.58E+00
	344.28	26.60	-4.50E-02		1.20E-01
	367.79	0.86	1.11E-01		3.58E+00
	411.12	2.24	8.41E-01		1.59E+00
	443.96	2.83	-9.36E-01		1.24E+00
	488.68	0.42	8.82E+00		8.00E+00
	563.99	0.49	6.08E-01		8.09E+00
	586.26	0.46	1.17E+00		1.23E+01
	678.62	0.47	3.27E+00		7.96E+00
	688.67	0.86	-1.96E+00		3.60E+00
	719.35	0.28	2.23E+00		1.44E+01
	778.90	12.96	-7.13E-02		3.28E-01
	810.45	0.32	3.51E-01		1.38E+01
	867.37	4.26	-1.85E-01		1.02E+00
	919.33	0.43	-4.59E+00		9.59E+00
	964.08	14.65	3.10E-01		4.28E-01
	1085.87	10.24	-3.17E-01		4.17E-01
	1089.74	1.73	-3.73E+00		2.70E+00
	1112.07	13.69	-2.04E-01		3.98E-01
	1212.95	1.43	-1.05E-01		4.70E+00
	1249.94	0.19	9.05E+00		3.28E+01
	1299.14	1.63	-4.60E-01		2.88E+00
	1408.01	21.07	1.35E-01		2.09E-01
	1457.64	0.50	1.25E+02		3.80E+01
	1528.10	0.28	1.28E+00		1.42E+01
Eu-154	123.07	40.40	5.86E-03	9.02E-02	9.02E-02
	247.93	6.89	-1.15E-01		4.62E-01
	591.76	4.95	3.14E-02		7.05E-01
	692.42	1.78	1.29E+00		2.18E+00
	723.30	20.06	2.60E-01		2.36E-01
	756.80	4.52	6.82E-01		9.77E-01
	873.18	12.08	-3.30E-01		3.54E-01

Analysis Report for 16-May-19-10045  
L1-10221D-FSGS-017SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	1.48E-01	9.02E-02	3.66E-01
	1004.76	18.01	5.72E-02		2.61E-01
	1274.43	34.80	1.65E-02		1.63E-01
	1596.48	1.80	-1.50E+00		2.41E+00
Eu-155	45.30	1.31	-9.02E+00	2.12E-01	1.76E+01
	60.01	1.22	-1.70E+01		1.70E+01
	86.55	30.70	-4.56E-02		2.12E-01
	105.31	21.10	9.13E-03		2.14E-01
Ra-226	186.21	3.64	4.23E-01	1.03E+00	1.03E+00
Pa-231	27.36	10.30	2.86E+00	1.53E+00	2.33E+00
	283.69	1.70	8.77E-01		1.88E+00
	300.07	2.47	-4.31E-01		1.53E+00
	302.65	2.20	5.21E-01		1.61E+00
	330.06	1.40	-1.23E+00		2.51E+00
U-235	143.76	10.96	-1.31E-01	6.64E-02	3.19E-01
	163.33	5.08	-1.26E-01		6.50E-01
	185.71	57.20	5.86E-02		6.64E-02
	202.11	1.08	8.31E-01		3.07E+00
	205.31	5.01	-1.56E-02		6.51E-01
Am-241	59.54	35.90	-5.15E-01	6.01E-01	6.01E-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 31-May-19-10016  
L1-10221D-FSGS-001SB

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 31-May-19-10016  
Sample Description : L1-10221D-FSGS-001SB  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.761E+03 grams  
Facility : Default  
  
Sample Taken On : 5/29/2019 7:45:00AM  
Acquisition Started : 5/31/2019 7:49:44AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : 352  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.3 seconds  
  
Dead Time : 0.03 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 9/29/2018  
Efficiency Calibration Used Done On : 5/31/2019  
Efficiency Calibration Description :  
  
Sample Number : 76971  
Fill Height : 1760.79 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/7/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 5/31/2019 8:04:47AM

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

*Jmk*  
Data Validated  
0930 5/31/19

Analysis Report for 31-May-19-10016  
L1-10221D-FSGS-001SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	185.86	740 -	749	744.15	1.96E+01	10.11	3.64E+01	0.44
2	238.58	948 -	960	954.78	9.97E+01	14.98	4.73E+01	1.08
3	295.16	1176 -	1186	1180.86	3.69E+01	9.42	2.11E+01	0.70
4	338.27	1348 -	1358	1353.11	2.30E+01	8.83	2.30E+01	0.69
5	351.78	1399 -	1414	1407.10	6.50E+01	11.45	2.20E+01	1.53
6	582.93	2324 -	2339	2331.05	4.12E+01	9.09	1.38E+01	0.37
7	609.17	2428 -	2443	2435.94	6.07E+01	10.01	1.33E+01	1.09
8	968.30	3867 -	3878	3872.27	2.40E+01	5.61	3.00E+00	0.40
9	1460.37	5828 -	5853	5841.83	2.52E+02	16.71	6.50E+00	1.84

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.96	1460.82 *	10.66	5.08E+00	4.03E-01
Tl-208	0.99	583.19 *	85.00	5.73E-02	1.31E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.53E-01	2.61E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.62E-01	2.85E-02
		768.36	4.89		
		806.18	1.26		

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Analysis Report for 31-May-19-10016

L1-10221D-FSGS-001SB

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Bi-214	0.99	934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	0.99	241.99	7.25		
		295.22 *	18.42	1.50E-01	4.02E-02
		351.93 *	35.60	1.54E-01	2.99E-02
		785.96	1.06		
Ra-226	0.98	186.21 *	3.64	3.23E-01	1.69E-01
Ac-228	0.98	129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32 *	11.27	1.68E-01	6.59E-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	2.50E-01	5.95E-02
		1588.20	3.22		
U-235	0.99	143.76	10.96		
		163.33	5.08		
		185.71 *	57.20	2.06E-02	1.07E-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 31-May-19-10016  
L1-10221D-FSGS-001SB

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## INTERFERENCE CORRECTED REPORT

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<i><b>Nuclide Name</b></i>	<i><b>Nuclide Id Confidence</b></i>	<i><b>Wt mean Activity (pCi/grams)</b></i>	<i><b>Wt mean Activity Uncertainty</b></i>	<i><b>Comments</b></i>
	0.967	5.08E+00	4.03E-01	
	0.990	5.73E-02	1.31E-02	
X	0.923			
	1.000	1.53E-01	2.61E-02	
	0.999	1.62E-01	2.85E-02	
	0.998	1.53E-01	2.40E-02	
?	0.980	3.23E-01	1.69E-01	
	0.986	2.13E-01	4.42E-02	
?	0.998	2.06E-02	1.07E-02	

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

Errors quoted at 1.000sigma

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Analysis Report for 31-May-19-10016  
L1-10221D-FSGS-001SB

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/31/2019 8:04:47AM  
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	4.60E-02	4.85E-02	4.85E-02
	BE-7	477.60	10.44	2.69E-01	3.47E-01	3.47E-01
+	K-40	1460.82	* 10.66	5.08E+00	4.18E-01	4.18E-01
	Mn-54	834.85	99.98	8.57E-03	4.17E-02	4.17E-02
	Co-60	1173.23	99.85	2.12E-02	3.64E-02	5.58E-02
		1332.49	99.98	-2.16E-02		3.64E-02
	Nb-94	702.65	99.81	2.39E-02	3.65E-02	3.78E-02
		871.09	99.89	1.88E-03		3.65E-02
	Ag-108m	79.13	6.60	-2.63E-01	3.45E-02	1.39E+00
		433.94	90.50	-1.27E-02		3.45E-02
		614.28	89.80	1.03E-02		6.09E-02
		722.94	90.80	4.27E-03		3.64E-02
	Sb-125	176.31	6.84	2.21E-01	1.11E-01	4.80E-01
		380.45	1.52	-1.06E+00		2.02E+00
		427.87	29.60	5.92E-02		1.11E-01
		463.36	10.49	2.24E-01		3.67E-01
		600.60	17.65	-1.45E-01		1.99E-01
		606.71	4.98	1.44E+00		1.21E+00
		635.95	11.22	-1.03E-01		3.71E-01



Analysis Report for 31-May-19-10016  
L1-10221D-FSGS-001SB

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	8.78E-02	1.11E-01	1.72E+00
Ba-133	79.61	2.65	1.36E+00	6.26E-02	3.44E+00
	81.00	32.90	-4.27E-01		2.32E-01
	276.40	7.16	-4.87E-02		4.63E-01
	302.85	18.34	6.35E-02		1.84E-01
	356.01	62.05	-3.85E-02		6.26E-02
	383.85	8.94	1.40E-01		3.41E-01
Cs-134	475.36	1.48	-1.32E+00	4.13E-02	2.22E+00
	563.25	8.34	-1.52E-01		4.34E-01
	569.33	15.37	1.41E-01		2.63E-01
	604.72	97.62	-3.30E-02		5.82E-02
	795.86	85.46	-5.93E-03		4.13E-02
	801.95	8.69	-7.64E-01		3.80E-01
	1038.61	0.99	3.94E-01		4.42E+00
	1167.97	1.79	-1.78E+00		2.93E+00
	1365.19	3.02	-9.73E-03		1.06E+00
Cs-137	661.66	85.10	3.22E-02	5.18E-02	5.18E-02
Eu-152	121.78	28.67	2.62E-02	1.05E-01	1.32E-01
	244.70	7.61	-1.32E-01		4.59E-01
	295.94	0.45	9.17E+00		8.96E+00
	344.28	26.60	-3.56E-02		1.05E-01
	367.79	0.86	4.72E-01		3.55E+00
	411.12	2.24	9.27E-01		1.36E+00
	443.96	2.83	-8.69E-01		1.13E+00
	488.68	0.42	-6.37E-01		6.86E+00
	563.99	0.49	3.01E+00		7.74E+00
	586.26	0.46	-1.74E+00		1.09E+01
	678.62	0.47	5.81E+00		6.88E+00
	688.67	0.86	2.42E+00		4.27E+00
	719.35	0.28	1.49E+00		1.10E+01
	778.90	12.96	-1.62E-01		3.11E-01
	810.45	0.32	5.59E+00		1.20E+01
	867.37	4.26	-4.57E-01		9.29E-01
	919.33	0.43	-1.81E+01		9.43E+00
	964.08	14.65	3.88E-01		4.16E-01
	1085.87	10.24	4.32E-01		4.64E-01
	1089.74	1.73	2.63E-01		2.60E+00
	1112.07	13.69	-3.20E-01		3.59E-01
	1212.95	1.43	-1.69E-01		4.05E+00
	1249.94	0.19	1.36E+01		2.80E+01
	1299.14	1.63	-2.50E+00		2.01E+00
	1408.01	21.07	2.92E-02		1.94E-01
	1457.64	0.50	1.12E+02		3.44E+01
	1528.10	0.28	3.95E+00		1.08E+01
Eu-154	123.07	40.40	6.23E-04	9.14E-02	9.14E-02
	247.93	6.89	-5.66E-02		4.46E-01
	591.76	4.95	-4.32E-01		6.60E-01
	692.42	1.78	4.10E-01		1.96E+00
	723.30	20.06	-1.70E-02		1.65E-01
	756.80	4.52	3.00E-01		8.47E-01
	873.18	12.08	-2.47E-01		2.95E-01

Analysis Report for 31-May-19-10016  
L1-10221D-FSGS-001SB

	<b>Nuclide Name</b>	<b>Energy (keV)</b>		<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
	Eu-154	996.29		10.48	-3.17E-01	9.14E-02	3.89E-01
		1004.76		18.01	8.51E-03		2.37E-01
		1274.43		34.80	3.87E-03		1.24E-01
		1596.48		1.80	-2.14E-01		1.87E+00
	Eu-155	45.30		1.31	-6.76E+00	1.84E-01	1.70E+01
		60.01		1.22	-9.26E+00		1.99E+01
		86.55		30.70	-9.79E-02		2.05E-01
		105.31		21.10	-9.86E-03		1.84E-01
+	Ra-226	186.21	*	3.64	3.23E-01	5.56E-01	5.56E-01
	Pa-231	27.36		10.30	1.08E+00	1.42E+00	2.02E+00
		283.69		1.70	-7.45E-01		1.70E+00
		300.07		2.47	-8.51E-01		1.42E+00
		302.65		2.20	6.19E-02		1.52E+00
		330.06		1.40	-7.10E-01		2.45E+00
+	U-235	143.76		10.96	-1.35E-01	3.54E-02	2.99E-01
		163.33		5.08	2.80E-01		6.22E-01
		185.71	*	57.20	2.06E-02		3.54E-02
		202.11		1.08	-9.06E-02		2.92E+00
		205.31		5.01	2.08E-01		6.53E-01
	Am-241	59.54		35.90	6.09E-02	6.91E-01	6.91E-01

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

Analysis Report for 30-May-19-10032  
L1-10221D-FSGS-004SB

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 30-May-19-10032  
Sample Description : L1-10221D-FSGS-004SB  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.516E+03 grams  
Facility : Default  
  
Sample Taken On : 5/28/2019 9:55:00AM  
Acquisition Started : 5/30/2019 1:01:31PM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : 324  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.4 seconds  
  
Dead Time : 0.05 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 4096  
Peak Area Range (in channels) : 120 - 4096  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 9/29/2018  
Efficiency Calibration Used Done On : 5/30/2019  
Efficiency Calibration Description :  
  
Sample Number : 76936  
Fill Height : 1516.23 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/30/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 5/30/2019 1:16:40PM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 4096

DATA VALIDATED 5/30/19 - 1600  
J. Bichon / [Signature]

Analysis Report for 30-May-19-10032  
L1-10221D-FSGS-004SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.79	473 -	482	477.77	7.80E+01	18.30	1.10E+02	0.94
2	351.87	698 -	708	703.69	7.04E+01	12.91	3.96E+01	1.43
3	609.36	1213 -	1222	1218.29	5.92E+01	9.51	1.38E+01	1.46
4	910.96	1816 -	1824	1821.38	1.51E+01	6.20	1.09E+01	0.74
5	1460.85	2915 -	2929	2921.76	2.04E+02	14.80	5.44E+00	2.12

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.82	* 10.66	3.84E+00	3.25E-01
Bi-211	0.90	351.07	* 13.02	4.23E-01	8.46E-02
Pb-212	0.99	115.18	0.60		
		238.63	* 43.60	1.10E-01	2.72E-02
		300.09	3.30		
Bi-214	1.00	609.32	* 45.49	1.47E-01	2.52E-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		

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Analysis Report for 30-May-19-10032  
L1-10221D-FSGS-004SB

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Bi-214	1.00	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			1.55E-01	3.09E-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	8.59E-02	3.55E-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

<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
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Analysis Report for 30-May-19-10032  
 L1-10221D-FSGS-004SB

	<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
	K-40	1.000	3.84E+00	3.25E-01	
?	Bi-211	0.903	4.23E-01	8.46E-02	
	Pb-212	0.996	1.10E-01	2.72E-02	
	Bi-214	1.000	1.47E-01	2.52E-02	
?	Pb-214	1.000	1.55E-01	3.09E-02	
	Ac-228	0.997	8.59E-02	3.55E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 30-May-19-10032  
L1-10221D-FSGS-004SB

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/30/2019 1:16:40PM  
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	8.04E-02	5.68E-02	5.68E-02
	BE-7	477.60	10.44	-7.77E-02	2.59E-01	2.59E-01
+	K-40	1460.82	* 10.66	3.84E+00	3.05E-01	3.05E-01
	Mn-54	834.85	99.98	8.72E-03	3.54E-02	3.54E-02
	Co-60	1173.23	99.85	1.92E-02	3.91E-02	4.21E-02
		1332.49	99.98	1.99E-02		3.91E-02
	Nb-94	702.65	99.81	-9.01E-03	3.15E-02	3.40E-02
		871.09	99.89	9.28E-03		3.15E-02
	Ag-108m	79.13	6.60	5.76E-01	3.15E-02	1.04E+00
		433.94	90.50	-4.03E-03		3.15E-02
		614.28	89.80	-4.08E-02		4.87E-02
		722.94	90.80	3.05E-03		4.73E-02
	Sb-125	176.31	6.84	-2.15E-01	9.45E-02	4.18E-01
		380.45	1.52	2.16E+00		2.13E+00
		427.87	29.60	5.03E-02		9.45E-02
		463.36	10.49	2.82E-01		3.18E-01
		600.60	17.65	-8.30E-02		1.91E-01
		606.71	4.98	-1.16E-01		1.08E+00
		635.95	11.22	-7.26E-02		2.47E-01

Analysis Report for 30-May-19-10032  
L1-10221D-FSGS-004SB

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	1.01E-01	9.45E-02	1.78E+00
Ba-133	79.61	2.65	1.24E+00	5.78E-02	2.49E+00
	81.00	32.90	-1.24E-01		1.64E-01
	276.40	7.16	-7.45E-02		3.81E-01
	302.85	18.34	7.05E-02		1.61E-01
	356.01	62.05	-2.78E-02		5.78E-02
	383.85	8.94	-6.28E-02		3.36E-01
Cs-134	475.36	1.48	9.63E-02	3.48E-02	1.78E+00
	563.25	8.34	-6.23E-03		3.76E-01
	569.33	15.37	3.87E-02		2.08E-01
	604.72	97.62	-4.62E-03		4.83E-02
	795.86	85.46	9.56E-03		3.48E-02
	801.95	8.69	-2.12E-02		3.88E-01
	1038.61	0.99	-2.26E-01		3.37E+00
	1167.97	1.79	2.97E-01		2.35E+00
	1365.19	3.02	2.83E-01		1.19E+00
Cs-137	661.66	85.10	3.16E-02	4.21E-02	4.21E-02
Eu-152	121.78	28.67	2.21E-02	1.04E-01	1.04E-01
	244.70	7.61	-5.54E-02		4.16E-01
	295.94	0.45	-1.67E+00		6.95E+00
	344.28	26.60	-6.00E-02		1.11E-01
	367.79	0.86	-5.82E-01		3.24E+00
	411.12	2.24	-3.61E-01		1.23E+00
	443.96	2.83	3.18E-01		1.19E+00
	488.68	0.42	5.23E-01		7.27E+00
	563.99	0.49	-2.50E+00		6.28E+00
	586.26	0.46	3.30E+00		9.44E+00
	678.62	0.47	-1.05E+00		6.91E+00
	688.67	0.86	-1.19E+00		3.69E+00
	719.35	0.28	3.04E+00		1.37E+01
	778.90	12.96	-5.65E-02		2.70E-01
	810.45	0.32	-1.70E+00		9.85E+00
	867.37	4.26	-2.05E-01		7.57E-01
	919.33	0.43	9.95E-01		8.04E+00
	964.08	14.65	2.08E-02		2.75E-01
	1085.87	10.24	3.15E-02		3.64E-01
	1089.74	1.73	-5.39E-01		2.05E+00
	1112.07	13.69	-7.28E-02		2.54E-01
	1212.95	1.43	3.50E-01		3.39E+00
	1249.94	0.19	-5.31E+00		2.32E+01
	1299.14	1.63	9.62E-01		2.51E+00
	1408.01	21.07	2.78E-02		1.81E-01
	1457.64	0.50	-1.94E+00		2.89E+01
	1528.10	0.28	1.29E+00		1.00E+01
Eu-154	123.07	40.40	-1.83E-02	7.20E-02	7.20E-02
	247.93	6.89	-7.80E-02		3.94E-01
	591.76	4.95	3.09E-01		7.77E-01
	692.42	1.78	-5.08E-01		1.76E+00
	723.30	20.06	8.77E-02		2.21E-01
	756.80	4.52	-2.49E-01		8.27E-01
	873.18	12.08	-2.81E-02		2.46E-01



Analysis Report for 30-May-19-10032  
L1-10221D-FSGS-004SB

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	5.58E-02	7.20E-02	3.62E-01
	1004.76	18.01	1.58E-02		2.12E-01
	1274.43	34.80	1.83E-02		1.16E-01
	1596.48	1.80	-6.77E-01		1.75E+00
Eu-155	45.30	1.31	1.74E+00	1.53E-01	9.53E+00
	60.01	1.22	-3.17E+00		1.04E+01
	86.55	30.70	6.45E-02		1.64E-01
	105.31	21.10	1.11E-02		1.53E-01
Ra-226	186.21	3.64	4.07E-01	9.43E-01	9.43E-01
Pa-231	27.36	10.30	3.89E-01	9.97E-01	9.97E-01
	283.69	1.70	4.92E-01		1.77E+00
	300.07	2.47	-8.70E-01		1.13E+00
	302.65	2.20	5.87E-01		1.34E+00
	330.06	1.40	3.71E-01		2.23E+00
U-235	143.76	10.96	4.86E-03	6.20E-02	2.50E-01
	163.33	5.08	1.48E-01		6.64E-01
	185.71	57.20	5.44E-02		6.20E-02
	202.11	1.08	7.65E-02		2.87E+00
	205.31	5.01	-5.84E-02		5.91E-01
Am-241	59.54	35.90	-4.91E-03	3.67E-01	3.67E-01

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

Analysis Report for 18-Jun-19-10045  
L1-10221D-FJGS-001SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 18-Jun-19-10045  
Sample Description : L1-10221D-FJGS-001SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.643E+03 grams  
Facility : Default  
  
Sample Taken On : 6/17/2019 8:00:00AM  
Acquisition Started : 6/18/2019 1:10:42PM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P11314  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.2 seconds  
  
Dead Time : 0.02 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/24/2019  
Efficiency Calibration Used Done On : 6/18/2019  
Efficiency Calibration Description :  
  
Sample Number : 77478  
Fill Height : 1643.21 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 12/22/2008 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 6/18/2019 1:25:44PM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 8192

*J. Mark*  
Data Validated  
1130 6/21/19

Analysis Report for 18-Jun-19-10045  
L1-10221D-FJGS-001SS

<b>Peak No.</b>	<b>Energy (keV)</b>	<b>ROI start</b>	<b>ROI end</b>	<b>Peak Centroid</b>	<b>Net Peak Area</b>	<b>Net Area Uncertainty</b>	<b>Continuum Counts</b>	<b>FWHM (keV)</b>
1	238.71	947 -	961	954.40	5.58E+01	11.48	2.62E+01	0.73
2	338.34	1349 -	1356	1352.44	2.22E+01	6.47	9.80E+00	0.39
3	352.00	1401 -	1411	1407.03	4.42E+01	9.33	1.78E+01	0.42
4	609.14	2430 -	2441	2434.59	4.00E+01	7.43	6.00E+00	1.33
5	1460.51	5831 -	5849	5840.00	1.06E+02	11.30	6.52E+00	1.56

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

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
K-40	0.98	1460.82	*	10.66	2.34E+00
Bi-211	0.87	351.07	*	13.02	3.00E-01
Pb-212	0.99	115.18		0.60	
		238.63	*	43.60	8.75E-02
		300.09		3.30	
Bi-214	0.99	609.32	*	45.49	1.14E-01
		768.36		4.89	
		806.18		1.26	
		934.06		3.11	
		1120.29		14.92	
		1155.21		1.63	
		1238.12		5.83	

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Analysis Report for 18-Jun-19-10045  
L1-10221D-FJGS-001SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Bi-214	0.99	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	1.10E-01	2.48E-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	1.69E-01	5.12E-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

<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
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Analysis Report for 18-Jun-19-10045  
L1-10221D-FJGS-001SS

	<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
	K-40	0.985	2.34E+00	2.69E-01	
?	Bi-211	0.870	3.00E-01	6.78E-02	
	Pb-212	0.999	8.75E-02	1.93E-02	
	Bi-214	0.998	1.14E-01	2.23E-02	
?	Pb-214	1.000	1.10E-01	2.48E-02	
	Ac-228	1.000	1.69E-01	5.12E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 1.000sigma

Analysis Report for 18-Jun-19-10045  
L1-10221D-FJGS-001SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/18/2019 1:25:44PM  
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	7.39E-02	5.22E-02	5.22E-02
	BE-7	477.60	10.44	9.51E-02	3.42E-01	3.42E-01
+	K-40	1460.82	* 10.66	2.34E+00	4.07E-01	4.07E-01
	Mn-54	834.85	99.98	-3.85E-03	3.64E-02	3.64E-02
	Co-60	1173.23	99.85	-1.03E-02	2.98E-02	4.45E-02
		1332.49	99.98	1.09E-03		2.98E-02
	Nb-94	702.65	99.81	1.73E-02	3.24E-02	3.24E-02
		871.09	99.89	-3.15E-02		3.44E-02
	Ag-108m	79.13	6.60	2.68E-01	3.35E-02	8.15E-01
		433.94	90.50	2.52E-02		3.35E-02
		614.28	89.80	-8.17E-03		4.71E-02
		722.94	90.80	-3.48E-03		4.38E-02
	Sb-125	176.31	6.84	6.53E-03	9.39E-02	3.40E-01
		380.45	1.52	-1.14E-01		1.66E+00
		427.87	29.60	5.92E-02		9.39E-02
		463.36	10.49	2.55E-01		2.94E-01
		600.60	17.65	-2.75E-02		1.77E-01
		606.71	4.98	1.88E-01		1.03E+00
		635.95	11.22	-7.56E-02		1.96E-01

Analysis Report for 18-Jun-19-10045  
L1-10221D-FJGS-001SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-6.14E-01	9.39E-02	1.21E+00
Ba-133	79.61	2.65	9.78E-01	5.84E-02	2.03E+00
	81.00	32.90	-1.59E-01		1.41E-01
	276.40	7.16	6.13E-02		3.65E-01
	302.85	18.34	8.38E-02		1.46E-01
	356.01	62.05	-6.10E-02		5.84E-02
	383.85	8.94	-3.47E-02		2.67E-01
Cs-134	475.36	1.48	2.42E+00	4.42E-02	2.65E+00
	563.25	8.34	-4.33E-01		4.30E-01
	569.33	15.37	-2.50E-01		1.92E-01
	604.72	97.62	-5.70E-02		4.78E-02
	795.86	85.46	-1.09E-02		4.42E-02
	801.95	8.69	2.52E-01		3.74E-01
	1038.61	0.99	-7.52E-02		3.39E+00
	1167.97	1.79	1.79E+00		2.47E+00
	1365.19	3.02	-4.99E-01		1.08E+00
Cs-137	661.66	85.10	1.01E-02	3.56E-02	3.56E-02
Eu-152	121.78	28.67	2.21E-02	8.77E-02	8.77E-02
	244.70	7.61	1.29E-01		3.71E-01
	295.94	0.45	5.15E-01		7.75E+00
	344.28	26.60	-4.36E-02		8.94E-02
	367.79	0.86	-1.77E+00		2.69E+00
	411.12	2.24	-1.07E-01		1.38E+00
	443.96	2.83	2.03E-01		9.53E-01
	488.68	0.42	1.14E+00		7.37E+00
	563.99	0.49	-5.70E+00		6.61E+00
	586.26	0.46	8.25E+00		1.06E+01
	678.62	0.47	-1.57E-01		6.70E+00
	688.67	0.86	-8.96E-01		3.81E+00
	719.35	0.28	5.07E+00		1.27E+01
	778.90	12.96	6.70E-02		2.13E-01
	810.45	0.32	3.26E+00		9.54E+00
	867.37	4.26	-9.85E-01		8.28E-01
	919.33	0.43	4.18E+00		8.59E+00
	964.08	14.65	-3.35E-02		3.24E-01
	1085.87	10.24	-2.38E-01		2.91E-01
	1089.74	1.73	-9.56E-01		1.62E+00
	1112.07	13.69	1.73E-01		3.74E-01
	1212.95	1.43	-4.16E+00		2.91E+00
	1249.94	0.19	1.04E+01		2.38E+01
	1299.14	1.63	2.83E-01		2.29E+00
	1408.01	21.07	-5.41E-04		1.47E-01
	1457.64	0.50	5.07E+01		2.56E+01
	1528.10	0.28	-4.52E+00		1.42E+01
Eu-154	123.07	40.40	-7.86E-03	5.96E-02	5.96E-02
	247.93	6.89	1.53E-01		3.53E-01
	591.76	4.95	1.72E-01		6.25E-01
	692.42	1.78	1.19E+00		1.71E+00
	723.30	20.06	-2.30E-02		1.99E-01
	756.80	4.52	1.36E-01		6.92E-01
	873.18	12.08	-8.27E-02		3.10E-01

Analysis Report for 18-Jun-19-10045  
L1-10221D-FJGS-001SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	-9.49E-02	5.96E-02	3.36E-01
	1004.76	18.01	-3.97E-02		1.90E-01
	1274.43	34.80	-4.18E-02		1.23E-01
	1596.48	1.80	-1.75E-01		1.90E+00
Eu-155	45.30	1.31	6.09E+00	1.35E-01	9.38E+00
	60.01	1.22	7.63E+00		1.03E+01
	86.55	30.70	3.05E-04		1.35E-01
	105.31	21.10	-1.69E-02		1.43E-01
Ra-226	186.21	3.64	6.82E-01	7.60E-01	7.60E-01
Pa-231	27.36	10.30	3.66E-01	1.08E+00	1.08E+00
	283.69	1.70	-4.83E-01		1.42E+00
	300.07	2.47	-1.99E+00		1.17E+00
	302.65	2.20	1.72E-01		1.22E+00
	330.06	1.40	6.03E-01		2.03E+00
U-235	143.76	10.96	7.60E-02	4.83E-02	2.56E-01
	163.33	5.08	-8.44E-02		4.61E-01
	185.71	57.20	4.16E-02		4.83E-02
	202.11	1.08	-4.97E-01		2.01E+00
	205.31	5.01	-2.71E-01		4.24E-01
Am-241	59.54	35.90	2.86E-01	3.67E-01	3.67E-01

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



Analysis Report for 18-Jun-19-10046  
L1-10221D-QJGS-001SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 18-Jun-19-10046  
Sample Description : L1-10221D-QJGS-001SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.671E+03 grams  
Facility : Default  
  
Sample Taken On : 6/17/2019 8:00:00AM  
Acquisition Started : 6/18/2019 1:29:48PM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P11314  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.2 seconds  
  
Dead Time : 0.02 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/24/2019  
Efficiency Calibration Used Done On : 6/18/2019  
Efficiency Calibration Description :  
  
Sample Number : 77479  
Fill Height : 1671.09 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 12/22/2008 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 6/18/2019 1:44:51PM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 8192

*J. Mark*  
Data Validated  
1130 6 [219] 79

Analysis Report for 18-Jun-19-10046  
L1-10221D-QJGS-001SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.33	306 -	316	309.86	2.63E+01	10.76	3.57E+01	0.66
2	238.80	948 -	961	954.79	7.42E+01	12.50	2.98E+01	1.09
3	352.16	1401 -	1413	1407.64	3.22E+01	8.88	1.78E+01	0.93
4	558.13	2226 -	2235	2230.73	2.00E+01	5.83	6.05E+00	0.70
5	1460.44	5830 -	5850	5839.70	1.13E+02	10.63	0.00E+00	0.70

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.97	1460.82 *	10.66	2.48E+00	2.56E-01
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	1.16E-01	2.17E-02
		300.09	3.30		
Pb212-XR	0.99	74.82	10.28		
		77.11 *	17.10	1.83E-01	7.72E-02
		87.35	3.97		
		89.78	1.46		
Pb-214	0.99	241.99	7.25		
		295.22	18.42		
		351.93 *	35.60	7.98E-02	2.29E-02
		785.96	1.06		

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Analysis Report for 18-Jun-19-10046  
L1-10221D-QJGS-001SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Pb214-XR	0.99	74.82	5.80		
		77.11 *	9.70	3.22E-01	1.37E-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

<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	0.977	2.48E+00	2.56E-01	
Pb-212	0.996	1.16E-01	2.17E-02	
? Pb212-XR	0.996	1.83E-01	7.72E-02	
Pb-214	0.995	7.98E-02	2.29E-02	
? Pb214-XR	0.996	3.22E-01	1.37E-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-Jun-19-10046  
L1-10221D-QJGS-001SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/18/2019 1:44:51PM  
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	558.13	2.21688E-02	29.24		

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	4.38E-02	4.94E-02	4.94E-02
	BE-7	477.60	10.44	2.69E-01	4.09E-01	4.09E-01
+	K-40	1460.82	* 10.66	2.48E+00	6.30E-02	6.30E-02
	Mn-54	834.85	99.98	3.17E-02	4.30E-02	4.30E-02
	Co-60	1173.23	99.85	1.03E-02	3.76E-02	5.09E-02
		1332.49	99.98	-8.17E-03		3.76E-02
	Nb-94	702.65	99.81	-1.16E-02	3.15E-02	3.15E-02
		871.09	99.89	4.52E-03		3.32E-02
	Ag-108m	79.13	6.60	-1.43E-01	2.92E-02	8.11E-01
		433.94	90.50	-5.18E-03		2.92E-02
		614.28	89.80	-4.59E-03		4.28E-02
		722.94	90.80	1.38E-02		4.21E-02
	Sb-125	176.31	6.84	-5.90E-02	8.86E-02	3.45E-01
		380.45	1.52	-1.99E+00		1.77E+00
		427.87	29.60	-6.01E-02		8.86E-02
		463.36	10.49	-7.48E-02		2.25E-01
		600.60	17.65	1.10E-01		2.02E-01
		606.71	4.98	6.64E-01		1.02E+00

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Analysis Report for 18-Jun-19-10046  
L1-10221D-QJGS-001SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>		
Sb-125	635.95	11.22	5.05E-02	8.86E-02	2.47E-01		
	671.44	1.79	-1.03E+00		1.45E+00		
Ba-133	79.61	2.65	-3.32E-01	4.92E-02	1.97E+00		
	81.00	32.90	-1.19E-01		1.26E-01		
	276.40	7.16	-7.48E-02		3.40E-01		
	302.85	18.34	3.60E-02		1.49E-01		
	356.01	62.05	-2.44E-02		4.92E-02		
	383.85	8.94	-4.20E-02		3.01E-01		
	475.36	1.48	2.25E+00		3.27E-02	2.77E+00	
Cs-134	563.25	8.34	-4.14E-01	3.27E-02	2.97E-01		
	569.33	15.37	1.14E-01		1.87E-01		
	604.72	97.62	-7.48E-02		4.53E-02		
	795.86	85.46	1.81E-02		3.27E-02		
	801.95	8.69	1.79E-01		3.23E-01		
	1038.61	0.99	6.14E-01		4.13E+00		
	1167.97	1.79	-2.36E+00		2.78E+00		
	1365.19	3.02	1.31E-01		1.21E+00		
	Cs-137	661.66	85.10		3.87E-03	4.08E-02	4.08E-02
		121.78	28.67		3.47E-02	8.29E-02	9.33E-02
Eu-152	244.70	7.61	1.27E-01	8.29E-02	3.62E-01		
	295.94	0.45	2.55E+00		7.13E+00		
	344.28	26.60	3.47E-02		8.29E-02		
	367.79	0.86	-3.79E+00		2.57E+00		
	411.12	2.24	4.74E-01		1.30E+00		
	443.96	2.83	-4.31E-01		9.13E-01		
	488.68	0.42	-1.28E+00		6.71E+00		
	563.99	0.49	-7.87E+00		4.69E+00		
	586.26	0.46	9.58E+00		8.56E+00		
	678.62	0.47	3.54E+00		5.74E+00		
	688.67	0.86	1.57E+00		3.80E+00		
	719.35	0.28	-9.20E+00		1.05E+01		
	778.90	12.96	6.54E-04		2.03E-01		
	810.45	0.32	1.51E+00		6.64E+00		
	867.37	4.26	1.83E-01		8.25E-01		
	919.33	0.43	6.98E-01		8.05E+00		
	964.08	14.65	-3.24E-02		3.23E-01		
	1085.87	10.24	-3.66E-01		3.50E-01		
	1089.74	1.73	4.50E-01		2.23E+00		
	1112.07	13.69	6.01E-02		3.12E-01		
1212.95	1.43	7.15E-01	2.80E+00				
1249.94	0.19	1.10E+01	1.99E+01				
1299.14	1.63	-2.19E+00	2.38E+00				
1408.01	21.07	1.21E-02	1.58E-01				
1457.64	0.50	4.91E+01	2.52E+01				
1528.10	0.28	-3.22E+00	6.58E+00				
Eu-154	123.07	40.40	-7.93E-03	6.54E-02	6.54E-02		
	247.93	6.89	3.58E-03	6.54E-02	3.52E-01		
	591.76	4.95	-1.78E-01		5.65E-01		
	692.42	1.78	-1.20E+00		1.75E+00		
	723.30	20.06	1.06E-01		1.98E-01		
	756.80	4.52	-8.94E-02		7.10E-01		

Analysis Report for 18-Jun-19-10046  
L1-10221D-QJGS-001SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	873.18	12.08	4.14E-02	6.54E-02	2.75E-01
	996.29	10.48	6.48E-02		3.47E-01
	1004.76	18.01	-1.12E-01		2.28E-01
	1274.43	34.80	-1.00E-01		1.05E-01
	1596.48	1.80	5.38E-01		2.61E+00
Eu-155	45.30	1.31	-2.31E+00	1.37E-01	8.87E+00
	60.01	1.22	2.71E+00		9.33E+00
	86.55	30.70	5.42E-02		1.37E-01
	105.31	21.10	-2.63E-02		1.49E-01
Ra-226	186.21	3.64	5.73E-01	7.18E-01	7.18E-01
Pa-231	27.36	10.30	3.41E-01	8.77E-01	8.77E-01
	283.69	1.70	9.07E-01		1.64E+00
	300.07	2.47	-7.85E-01		1.11E+00
	302.65	2.20	1.50E-01		1.24E+00
	330.06	1.40	-5.97E-01		2.03E+00
U-235	143.76	10.96	5.75E-02	4.44E-02	2.41E-01
	163.33	5.08	-3.71E-01		4.53E-01
	185.71	57.20	1.23E-02		4.44E-02
	202.11	1.08	-1.01E+00		2.34E+00
	205.31	5.01	-1.66E-02		4.88E-01
Am-241	59.54	35.90	-7.10E-02	3.13E-01	3.13E-01

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

Analysis Report for 18-Jun-19-10047  
L1-10221D-FJGS-002SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 18-Jun-19-10047  
Sample Description : L1-10221D-FJGS-002SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.519E+03 grams  
Facility : Default  
  
Sample Taken On : 6/17/2019 8:02:00AM  
Acquisition Started : 6/18/2019 1:30:21PM  
  
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 : 6/18/2019  
Efficiency Calibration Description :  
  
Sample Number : 77480  
Fill Height : 1518.76 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/30/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 6/18/2019 1:45:24PM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 4096

*J. Mark*  
Data Validated  
1130 6 [223] 19

Analysis Report for 18-Jun-19-10047  
L1-10221D-FJGS-002SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.58	473 -	481	477.35	1.08E+02	19.41	1.20E+02	0.83
2	295.23	588 -	595	590.51	5.20E+01	11.76	4.20E+01	1.22
3	352.04	701 -	708	704.03	1.13E+02	13.27	3.08E+01	0.99
4	583.24	1161 -	1171	1166.08	6.35E+01	10.60	2.05E+01	1.52
5	609.40	1214 -	1224	1218.38	8.53E+01	10.63	1.17E+01	1.21
6	661.76	1318 -	1327	1323.06	3.23E+01	8.91	2.07E+01	1.18
7	911.35	1818 -	1827	1822.14	4.06E+01	8.84	1.64E+01	1.60
8	1461.04	2915 -	2929	2922.13	3.14E+02	18.01	3.54E+00	2.23

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty	
K-40	0.99	1460.82	*	10.66	5.92E+00	4.26E-01
Cs-137	0.99	661.66	*	85.10	4.52E-02	1.28E-02
Tl-208	1.00	583.19	*	85.00	8.20E-02	1.45E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.52E-01	2.99E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	2.12E-01	2.93E-02
		768.36		4.89		
		806.18		1.26		

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Analysis Report for 18-Jun-19-10047  
L1-10221D-FJGS-002SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
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	1.95E-01	4.68E-02
		351.93 *	35.60	2.49E-01	3.53E-02
Ac-228	0.99	785.96	1.06		
		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	2.31E-01	5.14E-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 18-Jun-19-10047  
L1-10221D-FJGS-002SS

<i><b>Nuclide Name</b></i>	<i><b>Nuclide Id Confidence</b></i>	<i><b>Wt mean Activity (pCi/grams)</b></i>	<i><b>Wt mean Activity Uncertainty</b></i>	<i><b>Comments</b></i>
K-40	0.993	5.92E+00	4.26E-01	
Cs-137	0.998	4.52E-02	1.28E-02	
Tl-208	1.000	8.20E-02	1.45E-02	
X Bi-211	0.859			
Pb-212	1.000	1.52E-01	2.99E-02	
Bi-214	1.000	2.12E-01	2.93E-02	
Pb-214	0.999	2.29E-01	2.82E-02	
Ac-228	0.999	2.31E-01	5.14E-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-Jun-19-10047  
L1-10221D-FJGS-002SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/18/2019 1:45:24PM  
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	6.89E-02	5.43E-02	5.43E-02
	BE-7	477.60	10.44	7.02E-02	3.14E-01	3.14E-01
+	K-40	1460.82	* 10.66	5.92E+00	2.55E-01	2.55E-01
	Mn-54	834.85	99.98	9.74E-03	3.80E-02	3.80E-02
	Co-60	1173.23	99.85	-1.48E-03	4.46E-02	5.34E-02
		1332.49	99.98	1.22E-02		4.46E-02
	Nb-94	702.65	99.81	-2.57E-02	2.59E-02	2.59E-02
		871.09	99.89	-3.00E-03		3.06E-02
	Ag-108m	79.13	6.60	2.99E-01	3.38E-02	1.12E+00
		433.94	90.50	-1.18E-02		3.38E-02
		614.28	89.80	-2.02E-02		5.37E-02
		722.94	90.80	-4.07E-02		4.12E-02
	Sb-125	176.31	6.84	4.30E-01	1.16E-01	5.34E-01
		380.45	1.52	-1.91E-01		1.93E+00
		427.87	29.60	8.65E-03		1.16E-01
		463.36	10.49	6.92E-02		3.28E-01
		600.60	17.65	3.49E-02		1.96E-01
		606.71	4.98	-3.16E-01		1.22E+00
		635.95	11.22	9.76E-02		3.44E-01

Analysis Report for 18-Jun-19-10047  
L1-10221D-FJGS-002SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-3.34E-01	1.16E-01	1.93E+00
Ba-133	79.61	2.65	3.04E-01	7.55E-02	2.59E+00
	81.00	32.90	-2.12E-01		1.70E-01
	276.40	7.16	2.90E-04		4.63E-01
	302.85	18.34	-1.70E-02		1.69E-01
	356.01	62.05	-5.45E-02		7.55E-02
	383.85	8.94	5.40E-04		3.19E-01
Cs-134	475.36	1.48	3.93E-01	4.99E-02	2.25E+00
	563.25	8.34	1.53E-01		4.23E-01
	569.33	15.37	-4.52E-02		2.02E-01
	604.72	97.62	-3.14E-02		4.99E-02
	795.86	85.46	9.06E-03		5.17E-02
	801.95	8.69	-4.39E-01		4.18E-01
	1038.61	0.99	-7.93E-02		4.35E+00
	1167.97	1.79	1.79E-01		2.97E+00
	1365.19	3.02	-3.95E-01		1.19E+00
+ Cs-137	661.66	* 85.10	4.52E-02	3.67E-02	3.67E-02
Eu-152	121.78	28.67	-1.20E-02	1.14E-01	1.14E-01
	244.70	7.61	3.31E-02		4.49E-01
	295.94	0.45	5.95E+00		8.69E+00
	344.28	26.60	-8.78E-02		1.19E-01
	367.79	0.86	9.90E-02		3.71E+00
	411.12	2.24	3.53E-01		1.51E+00
	443.96	2.83	-7.28E-02		1.06E+00
	488.68	0.42	6.39E-01		7.81E+00
	563.99	0.49	-4.92E-01		6.92E+00
	586.26	0.46	4.35E-01		1.22E+01
	678.62	0.47	3.54E+00		7.82E+00
	688.67	0.86	-2.84E+00		3.69E+00
	719.35	0.28	2.23E+00		1.23E+01
	778.90	12.96	-9.42E-02		2.70E-01
	810.45	0.32	4.68E+00		1.34E+01
	867.37	4.26	2.02E-01		8.12E-01
	919.33	0.43	-7.32E+00		8.95E+00
	964.08	14.65	4.39E-02		3.80E-01
	1085.87	10.24	-1.06E-01		4.32E-01
	1089.74	1.73	7.30E-01		2.69E+00
	1112.07	13.69	-3.99E-01		3.56E-01
	1212.95	1.43	2.62E-01		3.82E+00
	1249.94	0.19	5.06E+00		2.32E+01
	1299.14	1.63	-1.65E-01		2.94E+00
	1408.01	21.07	1.39E-02		1.93E-01
	1457.64	0.50	-5.51E+00		3.54E+01
	1528.10	0.28	1.84E+00		9.19E+00
Eu-154	123.07	40.40	3.95E-02	8.32E-02	8.32E-02
	247.93	6.89	-1.05E-01		4.01E-01
	591.76	4.95	1.80E-02		6.43E-01
	692.42	1.78	1.41E+00		2.13E+00
	723.30	20.06	-1.03E-02		2.07E-01
	756.80	4.52	3.65E-02		8.40E-01
	873.18	12.08	-4.99E-02		2.68E-01

Analysis Report for 18-Jun-19-10047  
L1-10221D-FJGS-002SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	1.43E-02	8.32E-02	3.70E-01
	1004.76	18.01	9.05E-02		2.16E-01
	1274.43	34.80	-1.06E-01		1.36E-01
	1596.48	1.80	-1.69E+00		1.63E+00
Eu-155	45.30	1.31	2.73E+00	1.75E-01	1.18E+01
	60.01	1.22	-2.68E+00		1.14E+01
	86.55	30.70	9.23E-02		1.75E-01
	105.31	21.10	4.11E-03		1.77E-01
Ra-226	186.21	3.64	9.48E-01	1.02E+00	1.02E+00
Pa-231	27.36	10.30	7.72E-01	1.09E+00	1.09E+00
	283.69	1.70	4.07E-02		1.88E+00
	300.07	2.47	-5.17E-03		1.27E+00
	302.65	2.20	-1.42E-01		1.41E+00
	330.06	1.40	-5.93E-03		2.46E+00
U-235	143.76	10.96	-6.49E-02	6.44E-02	2.62E-01
	163.33	5.08	-1.46E-03		6.74E-01
	185.71	57.20	5.02E-02		6.44E-02
	202.11	1.08	-9.86E-01		3.07E+00
	205.31	5.01	1.27E-01		6.84E-01
Am-241	59.54	35.90	-1.92E-01	3.88E-01	3.88E-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-Jun-19-10048  
L1-10221D-FJGS-003SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 18-Jun-19-10048  
Sample Description : L1-10221D-FJGS-003SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.634E+03 grams  
Facility : Default  
  
Sample Taken On : 6/17/2019 8:04:00AM  
Acquisition Started : 6/18/2019 1:30:28PM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P40818B  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.9 seconds  
  
Dead Time : 0.10 %  
  
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 : 6/18/2019  
Efficiency Calibration Description :  
  
Sample Number : 77481  
Fill Height : 1634.26 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/30/2012 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 6/18/2019 1:45:31PM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 8192

*J. Mark*  
Data Validated  
1130 6/20/19 [230]

Analysis Report for 18-Jun-19-10048  
L1-10221D-FJGS-003SS

<b>Peak No.</b>	<b>Energy (keV)</b>	<b>ROI start</b>	<b>ROI end</b>	<b>Peak Centroid</b>	<b>Net Peak Area</b>	<b>Net Area Uncertainty</b>	<b>Continuum Counts</b>	<b>FWHM (keV)</b>
1	238.57	946 -	962	954.37	6.63E+01	14.17	4.27E+01	0.83
2	351.75	1398 -	1412	1406.74	4.57E+01	9.19	1.33E+01	1.02
3	582.91	2326 -	2336	2330.85	2.33E+01	5.46	2.75E+00	0.56
4	1459.65	5828 -	5848	5838.45	8.08E+01	9.99	5.25E+00	1.60

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

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Tl-208	0.98	583.19 *	85.00	3.82E-02	9.26E-03
Bi-211	0.92	351.07 *	13.02	3.45E-01	7.48E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	1.17E-01	2.68E-02
		300.09	3.30		
Pb-214	0.99	241.99	7.25		
		295.22	18.42		
		351.93 *	35.60	1.26E-01	2.73E-02
		785.96	1.06		

Analysis Report for 18-Jun-19-10048  
L1-10221D-FJGS-003SS

\* = 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

<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
Tl-208	0.988	3.82E-02	9.26E-03	
? Bi-211	0.928	3.45E-01	7.48E-02	
Pb-212	0.999	1.17E-01	2.68E-02	
? Pb-214	0.997	1.26E-01	2.73E-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-Jun-19-10048  
L1-10221D-FJGS-003SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/18/2019 1:45:31PM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
4	1459.65	8.97222E-02	12.37		

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	4.11E-02	5.11E-02	5.11E-02
BE-7	477.60	10.44	1.60E-01	3.51E-01	3.51E-01
K-40	1460.82	10.66	1.93E+00	1.20E+00	1.20E+00
Mn-54	834.85	99.98	-1.29E-02	3.72E-02	3.72E-02
Co-60	1173.23	99.85	-2.17E-02	4.00E-02	4.04E-02
	1332.49	99.98	1.95E-02		4.00E-02
Nb-94	702.65	99.81	9.13E-03	3.51E-02	3.51E-02
	871.09	99.89	2.50E-02		4.15E-02
Ag-108m	79.13	6.60	-1.88E-01	3.26E-02	1.43E+00
	433.94	90.50	-1.11E-02		3.26E-02
	614.28	89.80	-5.63E-02		4.01E-02
	722.94	90.80	1.91E-02		4.42E-02
Sb-125	176.31	6.84	2.25E-03	1.21E-01	4.95E-01
	380.45	1.52	3.91E-01		1.91E+00
	427.87	29.60	5.51E-02		1.21E-01
	463.36	10.49	1.76E-01		3.99E-01
	600.60	17.65	3.14E-03		1.88E-01
	606.71	4.98	7.08E-02		9.36E-01

[233]

Analysis Report for 18-Jun-19-10048  
L1-10221D-FJGS-003SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	635.95	11.22	2.92E-02	1.21E-01	3.00E-01
	671.44	1.79	-6.47E-01		1.61E+00
Ba-133	79.61	2.65	-1.92E+00	6.04E-02	3.38E+00
	81.00	32.90	-1.78E-01		2.41E-01
	276.40	7.16	-1.71E-01		4.42E-01
	302.85	18.34	7.95E-02		1.81E-01
	356.01	62.05	-1.62E-02		6.04E-02
	383.85	8.94	-9.29E-02		3.15E-01
Cs-134	475.36	1.48	-9.70E-01	4.57E-02	2.60E+00
	563.25	8.34	-9.59E-02		3.71E-01
	569.33	15.37	-7.49E-02		2.13E-01
	604.72	97.62	2.85E-02		4.77E-02
	795.86	85.46	-1.78E-02		4.57E-02
	801.95	8.69	-2.63E-02		3.75E-01
	1038.61	0.99	1.17E+00		3.92E+00
	1167.97	1.79	4.13E-01		2.43E+00
	1365.19	3.02	-1.97E-01		1.12E+00
	Cs-137	661.66	85.10		-1.30E-02
Eu-152	121.78	28.67	-5.86E-03	1.18E-01	1.36E-01
	244.70	7.61	7.22E-02		4.65E-01
	295.94	0.45	1.26E+00		9.07E+00
	344.28	26.60	-1.26E-02		1.18E-01
	367.79	0.86	1.51E+00		3.91E+00
	411.12	2.24	6.97E-01		1.45E+00
	443.96	2.83	-5.63E-02		1.19E+00
	488.68	0.42	-2.90E+00		8.59E+00
	563.99	0.49	9.27E-01		6.46E+00
	586.26	0.46	-9.76E-01		9.66E+00
	678.62	0.47	1.20E-01		7.04E+00
	688.67	0.86	1.50E+00		4.23E+00
	719.35	0.28	-1.91E+00		1.37E+01
	778.90	12.96	-2.14E-01		2.64E-01
	810.45	0.32	-3.55E+00		9.38E+00
	867.37	4.26	-1.39E-01		7.05E-01
	919.33	0.43	6.22E+00		9.26E+00
	964.08	14.65	-1.91E-01		3.40E-01
	1085.87	10.24	2.04E-01		4.70E-01
	1089.74	1.73	5.23E-01		2.72E+00
	1112.07	13.69	-7.99E-02		2.96E-01
	1212.95	1.43	1.60E+00		2.89E+00
	1249.94	0.19	-8.33E+00		1.80E+01
1299.14	1.63	-2.30E-01	2.42E+00		
1408.01	21.07	9.49E-02	2.43E-01		
1457.64	0.50	4.52E+01	2.53E+01		
1528.10	0.28	4.79E+00	1.30E+01		
Eu-154	123.07	40.40	3.13E-02	9.99E-02	9.99E-02
	247.93	6.89	1.15E-02		4.86E-01
	591.76	4.95	-1.28E-01		6.12E-01
	692.42	1.78	-3.98E-01		1.95E+00
	723.30	20.06	9.47E-02		2.05E-01
	756.80	4.52	4.61E-02		8.14E-01

Analysis Report for 18-Jun-19-10048  
L1-10221D-FJGS-003SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	873.18	12.08	1.95E-01	9.99E-02	3.53E-01
	996.29	10.48	1.46E-01		3.87E-01
	1004.76	18.01	6.36E-02		2.19E-01
	1274.43	34.80	1.31E-02		1.37E-01
	1596.48	1.80	4.67E-01		1.74E+00
Eu-155	45.30	1.31	2.12E+01	2.19E-01	2.87E+01
	60.01	1.22	2.84E+00		2.60E+01
	86.55	30.70	-2.11E-03		2.19E-01
	105.31	21.10	4.11E-02		2.20E-01
Ra-226	186.21	3.64	8.92E-01	9.25E-01	9.25E-01
Pa-231	27.36	10.30	2.62E+00	1.46E+00	3.18E+00
	283.69	1.70	1.16E+00		1.89E+00
	300.07	2.47	2.49E-01		1.46E+00
	302.65	2.20	1.38E-01		1.51E+00
	330.06	1.40	-1.01E-01		2.37E+00
	U-235	143.76	10.96		1.49E-01
U-235	163.33	5.08	1.43E-01	5.79E-02	6.95E-01
	185.71	57.20	2.81E-02		5.79E-02
	202.11	1.08	-1.24E+00		2.99E+00
	205.31	5.01	-3.65E-01		6.50E-01
Am-241	59.54	35.90	-7.11E-02	9.22E-01	9.22E-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-Jun-19-10049  
L1-10221D-FJGS-004SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 18-Jun-19-10049  
Sample Description : L1-10221D-FJGS-004SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.623E+03 grams  
Facility : Default  
  
Sample Taken On : 6/17/2019 8:06:00AM  
Acquisition Started : 6/18/2019 1:30:35PM  
  
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 : 6/18/2019  
Efficiency Calibration Description :  
  
Sample Number : 77482  
Fill Height : 1623.06 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/7/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 6/18/2019 1:45:48PM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 8192

  
Data Validated  
1130 6 [236] 79

Analysis Report for 18-Jun-19-10049  
L1-10221D-FJGS-004SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.55	948 -	961	954.65	1.10E+02	17.74	7.17E+01	0.98
2	295.07	1174 -	1185	1180.50	3.90E+01	11.04	3.30E+01	1.26
3	338.43	1349 -	1359	1353.76	3.73E+01	8.50	1.47E+01	0.74
4	351.78	1402 -	1414	1407.10	8.11E+01	12.63	2.99E+01	0.44
5	583.02	2325 -	2339	2331.38	5.23E+01	9.10	1.07E+01	1.20
6	609.20	2427 -	2444	2436.06	9.12E+01	10.65	6.80E+00	1.11
7	968.42	3866 -	3878	3872.77	1.71E+01	6.21	7.93E+00	0.46
8	1460.34	5831 -	5853	5841.73	2.86E+02	17.21	2.67E+00	1.80

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.96	1460.82 *	10.66	5.90E+00	4.37E-01
Tl-208	0.99	583.19 *	85.00	7.39E-02	1.36E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	1.71E-01	3.08E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	2.48E-01	3.25E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		

[237]

Analysis Report for 18-Jun-19-10049  
L1-10221D-FJGS-004SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
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	0.99	241.99	7.25
295.22 *	18.42			1.61E-01	4.72E-02
351.93 *	35.60			1.95E-01	3.42E-02
Ac-228	0.56	785.96	1.06		
		129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32 *	11.27	2.76E-01	6.68E-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	1.81E-01	6.63E-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 18-Jun-19-10049  
L1-10221D-FJGS-004SS

<i><b>Nuclide Name</b></i>	<i><b>Nuclide Id Confidence</b></i>	<i><b>Wt mean Activity (pCi/grams)</b></i>	<i><b>Wt mean Activity Uncertainty</b></i>	<i><b>Comments</b></i>
	0.964	5.90E+00	4.37E-01	
	0.995	7.39E-02	1.36E-02	
X	0.923			
	0.999	1.71E-01	3.08E-02	
	0.999	2.48E-01	3.25E-02	
	0.997	1.83E-01	2.77E-02	
	0.562	2.28E-01	4.71E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 18-Jun-19-10049  
L1-10221D-FJGS-004SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/18/2019 1:45:48PM  
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	5.70E-02	4.84E-02	4.84E-02
	BE-7	477.60	10.44	7.97E-02	3.87E-01	3.87E-01
+	K-40	1460.82	* 10.66	5.90E+00	2.78E-01	2.78E-01
	Mn-54	834.85	99.98	1.88E-02	4.37E-02	4.37E-02
	Co-60	1173.23	99.85	2.36E-02	4.53E-02	5.76E-02
		1332.49	99.98	-1.51E-02		4.53E-02
	Nb-94	702.65	99.81	1.93E-02	4.35E-02	4.35E-02
		871.09	99.89	2.46E-02		4.41E-02
	Ag-108m	79.13	6.60	4.98E-02	3.45E-02	1.52E+00
		433.94	90.50	-1.39E-02		3.45E-02
		614.28	89.80	-1.91E-02		6.83E-02
		722.94	90.80	4.69E-03		4.63E-02
	Sb-125	176.31	6.84	-2.98E-01	1.24E-01	4.80E-01
		380.45	1.52	5.62E-01		2.20E+00
		427.87	29.60	6.02E-02		1.24E-01
		463.36	10.49	1.13E-01		3.65E-01
		600.60	17.65	1.29E-01		2.38E-01
		606.71	4.98	1.29E+00		1.36E+00
		635.95	11.22	2.59E-02		3.35E-01



Analysis Report for 18-Jun-19-10049  
L1-10221D-FJGS-004SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-2.06E+00	1.24E-01	2.24E+00
Ba-133	79.61	2.65	4.33E-01	7.37E-02	3.65E+00
	81.00	32.90	-3.00E-01		2.62E-01
	276.40	7.16	1.67E-01		4.95E-01
	302.85	18.34	3.97E-03		2.02E-01
	356.01	62.05	-2.91E-02		7.37E-02
	383.85	8.94	1.40E-01		3.78E-01
Cs-134	475.36	1.48	6.61E-01	5.45E-02	2.69E+00
	563.25	8.34	-3.28E-01		4.63E-01
	569.33	15.37	1.32E-01		2.61E-01
	604.72	97.62	-6.43E-03		6.71E-02
	795.86	85.46	1.01E-02		5.45E-02
	801.95	8.69	-6.31E-01		4.96E-01
	1038.61	0.99	1.46E+00		4.40E+00
	1167.97	1.79	-2.42E+00		3.16E+00
	1365.19	3.02	3.68E-01		1.35E+00
Cs-137	661.66	85.10	4.52E-02	5.74E-02	5.74E-02
Eu-152	121.78	28.67	8.16E-03	1.11E-01	1.21E-01
	244.70	7.61	2.52E-01		5.07E-01
	295.94	0.45	2.53E+00		9.73E+00
	344.28	26.60	-7.53E-02		1.11E-01
	367.79	0.86	1.35E+00		4.23E+00
	411.12	2.24	2.13E-02		1.69E+00
	443.96	2.83	-1.33E-01		1.24E+00
	488.68	0.42	-6.01E-01		7.74E+00
	563.99	0.49	3.59E+00		8.04E+00
	586.26	0.46	1.60E+01		1.20E+01
	678.62	0.47	3.83E+00		8.31E+00
	688.67	0.86	-2.03E+00		4.61E+00
	719.35	0.28	-1.44E+01		1.20E+01
	778.90	12.96	3.05E-02		3.31E-01
	810.45	0.32	6.23E+00		1.31E+01
	867.37	4.26	-1.36E+00		9.62E-01
	919.33	0.43	-1.54E+01		1.20E+01
	964.08	14.65	4.93E-01		4.52E-01
	1085.87	10.24	2.23E-01		5.12E-01
	1089.74	1.73	-2.11E+00		2.95E+00
	1112.07	13.69	-3.32E-01		3.39E-01
	1212.95	1.43	-5.96E-01		4.70E+00
	1249.94	0.19	-7.27E+00		2.90E+01
	1299.14	1.63	-5.59E-01		2.74E+00
	1408.01	21.07	1.07E-01		2.30E-01
	1457.64	0.50	1.31E+02		3.75E+01
	1528.10	0.28	8.06E+00		1.45E+01
Eu-154	123.07	40.40	-1.93E-02	8.66E-02	8.66E-02
	247.93	6.89	1.36E-01		4.56E-01
	591.76	4.95	2.57E-01		7.25E-01
	692.42	1.78	-2.19E+00		2.33E+00
	723.30	20.06	9.35E-02		2.15E-01
	756.80	4.52	-1.02E-01		9.45E-01
	873.18	12.08	2.55E-01		3.88E-01

Analysis Report for 18-Jun-19-10049  
L1-10221D-FJGS-004SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	-5.00E-02	8.66E-02	4.21E-01
	1004.76	18.01	-8.21E-02		2.46E-01
	1274.43	34.80	1.54E-02		1.48E-01
	1596.48	1.80	-2.45E+00		1.91E+00
Eu-155	45.30	1.31	1.24E+01	2.12E-01	2.03E+01
	60.01	1.22	-2.26E+00		2.01E+01
	86.55	30.70	1.50E-02		2.27E-01
	105.31	21.10	1.89E-02		2.12E-01
Ra-226	186.21	3.64	9.17E-01	1.07E+00	1.07E+00
Pa-231	27.36	10.30	1.44E+00	1.55E+00	2.21E+00
	283.69	1.70	-5.47E-01		1.89E+00
	300.07	2.47	-1.55E+00		1.55E+00
	302.65	2.20	6.05E-01		1.71E+00
	330.06	1.40	1.72E-01		2.32E+00
	U-235	143.76	10.96		7.13E-02
U-235	163.33	5.08	2.53E-03	6.80E-02	7.13E-01
	185.71	57.20	6.27E-02		6.80E-02
	202.11	1.08	5.95E-01		3.34E+00
	205.31	5.01	-1.02E+00		6.94E-01
Am-241	59.54	35.90	-5.65E-02	6.97E-01	6.97E-01

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

Analysis Report for 18-Jun-19-10050  
L1-10221D-FJGS-005SS

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## GAMMA SPECTRUM ANALYSIS

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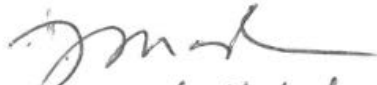
Sample Identification : 18-Jun-19-10050  
Sample Description : L1-10221D-FJGS-005SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.616E+03 grams  
Facility : Default  
  
Sample Taken On : 6/17/2019 8:08:00AM  
Acquisition Started : 6/18/2019 1:51:55PM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : 324  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.3 seconds  
  
Dead Time : 0.03 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 4096  
Peak Area Range (in channels) : 120 - 4096  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 9/29/2018  
Efficiency Calibration Used Done On : 6/18/2019  
Efficiency Calibration Description :  
  
Sample Number : 77483  
Fill Height : 1615.71 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/30/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 6/18/2019 2:06:57PM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 4096

  
Data Validated  
1130 6-18-19 [243]

Analysis Report for 18-Jun-19-10050  
L1-10221D-FJGS-005SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.71	473 -	482	477.61	6.07E+01	14.10	6.13E+01	1.02
2	1460.90	2914 -	2928	2921.85	8.25E+01	10.20	7.50E+00	2.06

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82 *	10.66	1.53E+00	2.00E-01
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	8.43E-02	2.07E-02
		300.09	3.30		

\* = 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-Jun-19-10050  
L1-10221D-FJGS-005SS

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## INTERFERENCE CORRECTED REPORT

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<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	0.999	1.53E+00	2.00E-01	
Pb-212	0.999	8.43E-02	2.07E-02	

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

Errors quoted at 1.000sigma

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Analysis Report for 18-Jun-19-10050  
L1-10221D-FJGS-005SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/18/2019 2:06:57PM  
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	3.74E-02	4.31E-02	4.31E-02
	BE-7	477.60	10.44	1.15E-01	2.57E-01	2.57E-01
+	K-40	1460.82	* 10.66	1.53E+00	3.45E-01	3.45E-01
	Mn-54	834.85	99.98	4.09E-03	2.86E-02	2.86E-02
	Co-60	1173.23	99.85	1.84E-03	3.04E-02	3.76E-02
		1332.49	99.98	-1.67E-03		3.04E-02
	Nb-94	702.65	99.81	-9.33E-03	2.12E-02	2.12E-02
		871.09	99.89	-9.09E-03		2.93E-02
	Ag-108m	79.13	6.60	4.65E-01	2.74E-02	8.40E-01
		433.94	90.50	-3.59E-03		2.74E-02
		614.28	89.80	-1.01E-02		3.69E-02
		722.94	90.80	9.78E-03		3.26E-02
	Sb-125	176.31	6.84	-2.29E-01	7.26E-02	3.47E-01
		380.45	1.52	3.25E-01		1.68E+00
		427.87	29.60	-2.83E-02		7.26E-02
		463.36	10.49	-1.33E-02		2.47E-01
		600.60	17.65	3.19E-02		1.74E-01
		606.71	4.98	8.36E-01		8.59E-01
		635.95	11.22	1.15E-01		2.59E-01

Analysis Report for 18-Jun-19-10050  
L1-10221D-FJGS-005SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-1.08E+00	7.26E-02	1.50E+00
Ba-133	79.61	2.65	2.78E-01	4.82E-02	1.93E+00
	81.00	32.90	-6.44E-02		1.35E-01
	276.40	7.16	-6.10E-02		3.18E-01
	302.85	18.34	5.60E-02		1.46E-01
	356.01	62.05	2.86E-02		4.82E-02
	383.85	8.94	-1.01E-01		2.59E-01
Cs-134	475.36	1.48	4.14E-02	3.13E-02	1.84E+00
	563.25	8.34	-1.16E-02		2.95E-01
	569.33	15.37	6.13E-02		1.65E-01
	604.72	97.62	-5.79E-03		3.69E-02
	795.86	85.46	-1.00E-02		3.13E-02
	801.95	8.69	-1.80E-01		2.99E-01
	1038.61	0.99	-1.26E+00		3.11E+00
	1167.97	1.79	5.74E-01		2.15E+00
	1365.19	3.02	1.28E-01		1.12E+00
Cs-137	661.66	85.10	1.73E-02	3.91E-02	3.91E-02
Eu-152	121.78	28.67	-4.92E-02	8.82E-02	8.82E-02
	244.70	7.61	-2.75E-02		3.38E-01
	295.94	0.45	-1.57E+00		5.53E+00
	344.28	26.60	-4.43E-02		9.94E-02
	367.79	0.86	-3.85E-02		2.57E+00
	411.12	2.24	-2.11E-01		1.09E+00
	443.96	2.83	-1.51E-01		8.27E-01
	488.68	0.42	1.20E+00		5.33E+00
	563.99	0.49	-6.27E-01		4.76E+00
	586.26	0.46	6.22E+00		8.78E+00
	678.62	0.47	1.15E+00		6.68E+00
	688.67	0.86	1.34E-01		3.42E+00
	719.35	0.28	-2.78E+00		9.55E+00
	778.90	12.96	2.86E-02		1.97E-01
	810.45	0.32	1.31E+00		1.06E+01
	867.37	4.26	-7.51E-01		6.41E-01
	919.33	0.43	-7.67E+00		5.88E+00
	964.08	14.65	-2.01E-02		2.50E-01
	1085.87	10.24	2.18E-02		2.86E-01
	1089.74	1.73	5.48E-02		1.83E+00
	1112.07	13.69	-2.71E-01		1.98E-01
	1212.95	1.43	-1.47E+00		2.54E+00
	1249.94	0.19	7.75E+00		1.83E+01
	1299.14	1.63	-4.22E-01		1.93E+00
	1408.01	21.07	-3.16E-02		1.33E-01
	1457.64	0.50	-9.80E-01		1.94E+01
	1528.10	0.28	5.43E-01		1.13E+01
Eu-154	123.07	40.40	-3.13E-02	6.30E-02	6.30E-02
	247.93	6.89	-2.05E-01		3.22E-01
	591.76	4.95	-1.51E-01		6.04E-01
	692.42	1.78	6.48E-01		1.62E+00
	723.30	20.06	2.95E-02		1.48E-01
	756.80	4.52	-3.07E-01		6.27E-01
	873.18	12.08	9.91E-02		2.71E-01

Analysis Report for 18-Jun-19-10050  
L1-10221D-FJGS-005SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	-2.17E-01	6.30E-02	2.75E-01
	1004.76	18.01	1.98E-02		2.04E-01
	1274.43	34.80	2.82E-02		8.90E-02
	1596.48	1.80	2.20E-01		1.72E+00
Eu-155	45.30	1.31	-2.86E+00	1.25E-01	6.87E+00
	60.01	1.22	3.72E-02		8.42E+00
	86.55	30.70	-1.01E-03		1.25E-01
Ra-226	105.31	21.10	6.27E-02		1.53E-01
Ra-226	186.21	3.64	4.54E-01	8.19E-01	8.19E-01
Pa-231	27.36	10.30	4.96E-01	8.99E-01	8.99E-01
	283.69	1.70	5.99E-01		1.50E+00
	300.07	2.47	-7.50E-01		9.72E-01
	302.65	2.20	4.66E-01		1.22E+00
	330.06	1.40	-9.89E-02		1.93E+00
U-235	143.76	10.96	1.20E-01	5.23E-02	2.39E-01
	163.33	5.08	2.16E-01		5.53E-01
	185.71	57.20	2.69E-02		5.23E-02
	202.11	1.08	-3.42E-01		2.48E+00
	205.31	5.01	-5.56E-02		5.39E-01
Am-241	59.54	35.90	-1.78E-02	2.97E-01	2.97E-01

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



Analysis Report for 18-Jun-19-10051  
L1-10221D-FJGS-006SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 18-Jun-19-10051  
Sample Description : L1-10221D-FJGS-006SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.696E+03 grams  
Facility : Default  
  
Sample Taken On : 6/17/2019 8:10:00AM  
Acquisition Started : 6/18/2019 1:52:01PM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P40818B  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 901.0 seconds  
  
Dead Time : 0.11 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/29/2019  
Efficiency Calibration Used Done On : 6/18/2019  
Efficiency Calibration Description :  
  
Sample Number : 77484  
Fill Height : 1696.01 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/30/2012 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 6/18/2019 2:07:05PM

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

*J. Mark*  
Data Validated  
1130 6-18-19 [249]

Analysis Report for 18-Jun-19-10051  
L1-10221D-FJGS-006SS

<b>Peak No.</b>	<b>Energy (keV)</b>	<b>ROI start</b>	<b>ROI end</b>	<b>Peak Centroid</b>	<b>Net Peak Area</b>	<b>Net Area Uncertainty</b>	<b>Continuum Counts</b>	<b>FWHM (keV)</b>
1	238.45	948 -	960	953.91	6.56E+01	13.13	4.04E+01	0.63
2	351.67	1400 -	1411	1406.41	5.05E+01	9.60	1.65E+01	0.78
3	1459.59	5829 -	5847	5838.19	1.10E+02	11.59	7.18E+00	1.92

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

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Bi-211	0.94	351.07 *	13.02	3.79E-01	7.82E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	1.15E-01	2.49E-02
		300.09	3.30		
Pb-214	0.99	241.99	7.25		
		295.22	18.42		
		351.93 *	35.60	1.39E-01	2.86E-02
		785.96	1.06		

Analysis Report for 18-Jun-19-10051  
L1-10221D-FJGS-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

	<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
?	Bi-211	0.944	3.79E-01	7.82E-02	
	Pb-212	0.995	1.15E-01	2.49E-02	
?	Pb-214	0.994	1.39E-01	2.86E-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 18-Jun-19-10051  
L1-10221D-FJGS-006SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/18/2019 2:07:05PM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
3	1459.59	1.22028E-01	10.55		

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	3.42E-02	4.82E-02	4.82E-02
BE-7	477.60	10.44	2.43E-01	3.68E-01	3.68E-01
K-40	1460.82	10.66	2.98E+00	1.36E+00	1.36E+00
Mn-54	834.85	99.98	1.43E-02	3.91E-02	3.91E-02
Co-60	1173.23	99.85	-1.28E-02	3.75E-02	4.33E-02
	1332.49	99.98	-4.46E-02		3.75E-02
Nb-94	702.65	99.81	1.62E-02	3.48E-02	3.48E-02
	871.09	99.89	-1.72E-02		3.78E-02
Ag-108m	79.13	6.60	2.87E-01	3.30E-02	1.48E+00
	433.94	90.50	-1.31E-02		3.30E-02
	614.28	89.80	-1.28E-01		3.81E-02
	722.94	90.80	2.15E-02		5.15E-02
Sb-125	176.31	6.84	2.40E-02	1.09E-01	5.07E-01
	380.45	1.52	-1.75E+00		2.16E+00
	427.87	29.60	-1.62E-02		1.09E-01
	463.36	10.49	6.50E-02		3.39E-01
	600.60	17.65	6.26E-02		2.19E-01
	606.71	4.98	6.92E-01		9.51E-01

[252]

Analysis Report for 18-Jun-19-10051  
L1-10221D-FJGS-006SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>	
Sb-125	635.95	11.22	-1.90E-01	1.09E-01	2.82E-01	
	671.44	1.79	5.44E-01		1.98E+00	
Ba-133	79.61	2.65	-8.79E-01	6.51E-02	3.44E+00	
	81.00	32.90	-1.20E-01		2.40E-01	
	276.40	7.16	2.44E-01		4.59E-01	
	302.85	18.34	-1.67E-02		1.67E-01	
	356.01	62.05	-2.25E-02		6.51E-02	
	383.85	8.94	2.33E-02		3.78E-01	
	475.36	1.48	2.62E+00		4.54E-02	2.74E+00
Cs-134	563.25	8.34	9.11E-02	4.54E-02	4.29E-01	
	569.33	15.37	9.76E-02		2.59E-01	
	604.72	97.62	-3.23E-03		4.90E-02	
	795.86	85.46	2.54E-02		4.54E-02	
	801.95	8.69	-4.45E-02		3.26E-01	
	1038.61	0.99	-9.96E-01		3.40E+00	
	1167.97	1.79	9.58E-01		3.01E+00	
	1365.19	3.02	-1.18E-01		1.11E+00	
	661.66	85.10	4.70E-02		5.97E-02	5.97E-02
	Cs-137					
Eu-152	121.78	28.67	-8.11E-04	1.38E-01	1.38E-01	
	244.70	7.61	1.35E-01		4.82E-01	
	295.94	0.45	5.02E+00		9.42E+00	
	344.28	26.60	6.16E-02		1.38E-01	
	367.79	0.86	-2.88E+00		3.56E+00	
	411.12	2.24	1.29E+00		1.66E+00	
	443.96	2.83	-8.73E-02		1.30E+00	
	488.68	0.42	3.53E+00		9.02E+00	
	563.99	0.49	-4.14E+00		7.01E+00	
	586.26	0.46	1.12E+01		1.01E+01	
	678.62	0.47	-3.75E-01		6.99E+00	
	688.67	0.86	-9.04E-02		4.30E+00	
	719.35	0.28	-1.72E+01		1.30E+01	
	778.90	12.96	-9.38E-02		2.62E-01	
	810.45	0.32	-5.84E+00		1.05E+01	
	867.37	4.26	1.17E-01		8.85E-01	
	919.33	0.43	5.61E+00		1.02E+01	
	964.08	14.65	2.13E-01		2.93E-01	
	1085.87	10.24	-7.52E-02		4.15E-01	
	1089.74	1.73	8.68E-01		2.84E+00	
	1112.07	13.69	1.90E-01		3.72E-01	
	1212.95	1.43	1.80E-01		3.95E+00	
	1249.94	0.19	-1.28E+01		2.11E+01	
1299.14	1.63	-2.92E-01	1.82E+00			
1408.01	21.07	-5.99E-02	2.41E-01			
1457.64	0.50	6.02E+01	2.87E+01			
1528.10	0.28	-1.51E+01	1.39E+01			
Eu-154	123.07	40.40	7.49E-03	1.01E-01	1.01E-01	
	247.93	6.89	1.76E-01		5.22E-01	
	591.76	4.95	-2.50E-02		6.73E-01	
	692.42	1.78	-5.11E-01		2.09E+00	
	723.30	20.06	1.92E-01		2.40E-01	
	756.80	4.52	-1.83E-02		8.90E-01	

Analysis Report for 18-Jun-19-10051  
L1-10221D-FJGS-006SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	873.18	12.08	-4.44E-02	1.01E-01	3.23E-01
	996.29	10.48	-1.90E-01		4.31E-01
	1004.76	18.01	3.06E-02		2.32E-01
	1274.43	34.80	2.19E-02		1.48E-01
	1596.48	1.80	4.62E-01		1.72E+00
Eu-155	45.30	1.31	-6.50E+00	2.25E-01	2.50E+01
	60.01	1.22	-2.20E+00		2.68E+01
	86.55	30.70	4.06E-02		2.27E-01
	105.31	21.10	5.92E-02		2.25E-01
Ra-226	186.21	3.64	1.98E-01	9.48E-01	9.48E-01
Pa-231	27.36	10.30	2.60E-01	1.33E+00	2.57E+00
	283.69	1.70	-5.73E-01		1.72E+00
	300.07	2.47	-1.43E+00		1.33E+00
	302.65	2.20	-6.06E-01		1.39E+00
	330.06	1.40	-1.68E-01		2.33E+00
U-235	143.76	10.96	1.86E-01	6.14E-02	3.63E-01
	163.33	5.08	-3.78E-01		6.72E-01
	185.71	57.20	2.72E-02		6.14E-02
	202.11	1.08	-2.13E-01		3.10E+00
	205.31	5.01	1.46E-01		7.06E-01
Am-241	59.54	35.90	4.87E-02	9.95E-01	9.95E-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 20-Jun-19-10010  
L1-10221D-FJGS-007SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 20-Jun-19-10010  
Sample Description : L1-10221D-FJGS-007SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.133E+03 grams  
Facility : Default  
  
Sample Taken On : 6/18/2019 12:30:00PM  
Acquisition Started : 6/20/2019 7:20:06AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : 352  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.7 seconds  
  
Dead Time : 0.08 %  
  
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 : 6/20/2019  
Efficiency Calibration Description :  
  
Sample Number : 77539  
Fill Height : 1133.09 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/7/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 6/20/2019 7:35:09AM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 8192

*JM-L*  
Data Validated  
1445 (255) 6/20/19

Analysis Report for 20-Jun-19-10010  
L1-10221D-FJGS-007SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.64	949 -	961	955.01	2.05E+02	28.85	2.35E+02	0.86
2	295.04	1174 -	1187	1180.39	9.31E+01	21.83	1.39E+02	0.48
3	338.27	1343 -	1359	1353.13	6.58E+01	23.61	1.57E+02	0.41
4	351.77	1400 -	1417	1407.08	1.86E+02	27.78	1.77E+02	1.41
5	477.45	1904 -	1917	1909.36	6.74E+01	18.22	9.56E+01	1.05
6	583.01	2325 -	2343	2331.36	8.93E+01	17.43	6.18E+01	1.27
7	609.12	2427 -	2446	2435.77	1.27E+02	17.95	5.50E+01	1.44
8	661.51	2634 -	2657	2645.24	3.30E+03	59.92	7.16E+01	1.45
9	911.20	3633 -	3652	3643.85	9.46E+01	14.43	3.24E+01	1.14
10	1173.03	4680 -	4703	4691.51	5.46E+02	25.67	2.88E+01	1.94
11	1332.20	5316 -	5341	5328.67	4.31E+02	23.27	2.60E+01	1.98
12	1460.51	5829 -	5854	5842.42	4.48E+02	22.15	9.83E+00	1.89
13	1764.10	7052 -	7065	7058.46	1.60E+01	6.23	8.03E+00	0.47

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
BE-7	0.99	477.60 *	10.44	7.70E-01	2.15E-01
K-40	0.98	1460.82 *	10.66	1.04E+01	6.86E-01
Co-60	0.99	1173.23 *	99.85	1.16E+00	7.18E-02
		1332.49 *	99.98	9.98E-01	6.70E-02 <sup>[256]</sup>



Analysis Report for 20-Jun-19-10010  
L1-10221D-FJGS-007SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>		<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Cs-137	0.99	661.66	*	85.10	5.62E+00	3.53E-01
Tl-208	0.99	583.19	*	85.00	1.40E-01	2.85E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	3.46E-01	5.61E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	3.82E-01	5.87E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
1764.49		15.30	*	2.99E-01	1.17E-01	
1847.43		2.03				
2118.51		1.16				
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	4.19E-01	1.04E-01
		351.93	*	35.60	4.91E-01	8.32E-02
Ac-228	1.00	785.96		1.06		
		129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	5.34E-01	1.96E-01
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	6.59E-01	1.04E-01
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 20-Jun-19-10010  
L1-10221D-FJGS-007SS

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## INTERFERENCE CORRECTED REPORT

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<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
BE-7	0.996	7.70E-01	2.15E-01	
K-40	0.985	1.04E+01	6.86E-01	
Co-60	0.990	1.07E+00	4.90E-02	
Cs-137	0.997	5.62E+00	3.53E-01	
Tl-208	0.995	1.40E-01	2.85E-02	
X Bi-211	0.924			
Pb-212	1.000	3.46E-01	5.61E-02	
Bi-214	0.994	3.66E-01	5.25E-02	
Pb-214	0.996	4.62E-01	6.49E-02	
Ac-228	1.000	6.31E-01	9.22E-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

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Analysis Report for 20-Jun-19-10010  
L1-10221D-FJGS-007SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/20/2019 7:35:09AM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

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

## NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	1.38E-01	1.05E-01	1.05E-01
+	BE-7	477.60	* 10.44	7.70E-01	6.63E-01	6.63E-01
+	K-40	1460.82	* 10.66	1.04E+01	5.80E-01	5.80E-01
	Mn-54	834.85	99.98	3.31E-02	9.19E-02	9.19E-02
+	Co-60	1173.23	* 99.85	1.16E+00	8.28E-02	8.28E-02
		1332.49	* 99.98	9.98E-01		8.93E-02
	Nb-94	702.65	99.81	2.47E-02	8.14E-02	8.14E-02
		871.09	99.89	5.57E-02		9.31E-02
	Ag-108m	79.13	6.60	5.79E-01	1.01E-01	2.66E+00
		433.94	90.50	-2.84E-02		1.12E-01
		614.28	89.80	4.24E-03		1.17E-01
		722.94	90.80	7.47E-02		1.01E-01
	Sb-125	176.31	6.84	-1.14E-01	3.41E-01	9.64E-01
		380.45	1.52	-1.33E-01		5.71E+00
		427.87	29.60	5.46E-04		3.41E-01
		463.36	10.49	-8.16E-03		1.02E+00
		600.60	17.65	2.36E-02		4.79E-01
		606.71	4.98	3.17E+00		2.24E+00
		635.95	11.22	2.32E-01		7.48E-01

Analysis Report for 20-Jun-19-10010  
L1-10221D-FJGS-007SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-5.05E-01	3.41E-01	3.96E+00
Ba-133	79.61	2.65	1.71E+00	1.58E-01	6.43E+00
	81.00	32.90	-6.82E-01		4.58E-01
	276.40	7.16	-1.04E-01		1.07E+00
	302.85	18.34	3.41E-02		4.05E-01
	356.01	62.05	-1.81E-02		1.58E-01
	383.85	8.94	8.86E-01		1.00E+00
Cs-134	475.36	1.48	4.74E+00	1.08E-01	7.22E+00
	563.25	8.34	-6.23E-01		9.47E-01
	569.33	15.37	-1.62E-01		5.17E-01
	604.72	97.62	-2.86E-02		1.10E-01
	795.86	85.46	1.32E-01		1.08E-01
	801.95	8.69	-1.62E+00		9.28E-01
	1038.61	0.99	-6.28E+00		9.14E+00
	1167.97	1.79	-2.13E+00		1.45E+01
	1365.19	3.02	-8.93E-01		1.82E+00
+ Cs-137	661.66	* 85.10	5.62E+00	1.03E-01	1.03E-01
Eu-152	121.78	28.67	1.29E-01	2.64E-01	2.64E-01
	244.70	7.61	5.61E-01		1.07E+00
	295.94	0.45	1.75E+01		1.88E+01
	344.28	26.60	3.43E-02		3.08E-01
	367.79	0.86	-3.61E+00		9.52E+00
	411.12	2.24	-1.25E+00		4.22E+00
	443.96	2.83	4.16E-02		3.64E+00
	488.68	0.42	1.21E+01		2.21E+01
	563.99	0.49	3.59E+00		1.64E+01
	586.26	0.46	4.14E+01		2.15E+01
	678.62	0.47	6.98E-01		1.57E+01
	688.67	0.86	-3.98E+00		8.30E+00
	719.35	0.28	8.32E+00		2.78E+01
	778.90	12.96	-5.08E-01		5.77E-01
	810.45	0.32	-1.92E+01		2.45E+01
	867.37	4.26	-1.21E+00		2.19E+00
	919.33	0.43	5.27E+00		2.08E+01
	964.08	14.65	-1.65E-01		8.05E-01
	1085.87	10.24	3.19E-01		9.98E-01
	1089.74	1.73	2.80E-01		6.01E+00
	1112.07	13.69	-6.02E-01		7.36E-01
	1212.95	1.43	-4.44E+00		5.76E+00
	1249.94	0.19	-2.32E+01		4.73E+01
	1299.14	1.63	-9.45E-01		4.43E+00
	1408.01	21.07	3.18E-04		3.18E-01
	1457.64	0.50	2.28E+02		5.28E+01
	1528.10	0.28	-1.59E+00		1.78E+01
Eu-154	123.07	40.40	1.04E-01	1.88E-01	1.88E-01
	247.93	6.89	-5.29E-02		1.06E+00
	591.76	4.95	1.60E+00		1.67E+00
	692.42	1.78	2.69E+00		4.27E+00
	723.30	20.06	4.10E-01		4.62E-01
	756.80	4.52	5.34E-02		1.84E+00
	873.18	12.08	-1.05E-01		7.44E-01

Analysis Report for 20-Jun-19-10010  
L1-10221D-FJGS-007SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	2.68E-01	1.88E-01	8.81E-01
	1004.76	18.01	7.83E-02		4.79E-01
	1274.43	34.80	4.47E-03		2.42E-01
	1596.48	1.80	-3.34E+00		3.08E+00
Eu-155	45.30	1.31	-2.84E+01	3.97E-01	3.51E+01
	60.01	1.22	4.60E+00		3.86E+01
	86.55	30.70	-2.98E-03		4.10E-01
	105.31	21.10	2.84E-01		3.97E-01
Ra-226	186.21	3.64	1.39E+00	2.16E+00	2.16E+00
Pa-231	27.36	10.30	6.19E+00	3.08E+00	4.51E+00
	283.69	1.70	-1.57E+00		4.44E+00
	300.07	2.47	1.49E-01		3.08E+00
	302.65	2.20	6.91E-01		3.39E+00
	330.06	1.40	3.45E+00		6.00E+00
U-235	143.76	10.96	2.03E-01	1.37E-01	6.52E-01
	163.33	5.08	-4.77E-01		1.28E+00
	185.71	57.20	5.56E-02		1.37E-01
	202.11	1.08	1.21E+00		6.90E+00
	205.31	5.01	-3.95E-01		1.49E+00
Am-241	59.54	35.90	3.10E-01	1.38E+00	1.38E+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 01-Jul-19-10008  
L1-10221D-FIGS-001SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 01-Jul-19-10008  
Sample Description : L1-10221D-FIGS-001SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.154E+03 grams  
Facility : Default  
  
Sample Taken On : 6/27/2019 9:30:00AM  
Acquisition Started : 7/1/2019 9:28:04AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P40818B  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 904.9 seconds  
  
Dead Time : 0.54 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/29/2019  
Efficiency Calibration Used Done On : 7/1/2019  
Efficiency Calibration Description :  
  
Sample Number : 77680  
Fill Height : 1154.32 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/30/2012 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/1/2019 9:43:12AM

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

DATA VALIDATED 7/1/19 - 1600  
J. Graham / [Signature] [262]

Analysis Report for 01-Jul-19-10008

L1-10221D-FIGS-001SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.15	307	315	309.31	5.77E+01	20.83	1.74E+02	0.62
2	238.54	946	962	954.25	3.26E+02	35.59	2.99E+02	1.04
3	295.00	1173	1186	1179.92	9.79E+01	23.83	1.70E+02	0.77
4	351.81	1397	1416	1406.98	2.23E+02	31.24	2.14E+02	0.68
5	582.92	2325	2337	2330.90	1.00E+02	16.05	6.00E+01	0.66
6	608.90	2426	2444	2434.77	1.64E+02	19.17	5.98E+01	1.05
7	661.28	2633	2655	2644.23	3.53E+03	62.24	8.89E+01	1.29
8	726.75	2902	2911	2906.01	2.75E+01	8.89	2.25E+01	0.33
9	910.61	3634	3648	3641.40	6.79E+01	13.85	4.31E+01	0.89
10	1119.30	4471	4484	4476.32	2.73E+01	10.20	2.77E+01	1.41
11	1172.59	4679	4700	4689.54	6.20E+02	29.15	6.18E+01	1.63
12	1331.75	5314	5337	5326.46	5.82E+02	25.33	1.49E+01	1.75
13	1459.90	5828	5852	5839.43	4.34E+02	21.44	6.25E+00	1.69
14	1763.40	7048	7061	7054.61	2.59E+01	6.38	5.10E+00	1.47

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	0.87	1460.82	* 10.66	1.20E+01	7.90E-01
Co-60	0.92	1173.23	* 99.85	1.57E+00	9.69E-02
		1332.49	* 99.98	1.60E+00	9.45E-02 <sup>[263]</sup>

Analysis Report for 01-Jul-19-10008

L1-10221D-FIGS-001SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>		<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Cs-137	0.97	661.66	*	85.10	7.03E+00	4.40E-01
Tl-208	0.98	583.19	*	85.00	1.83E-01	3.13E-02
Bi-212	0.96	39.86		1.06		
		727.33	*	6.67	7.46E-01	2.45E-01
		785.37		1.10		
		1620.50		1.47		
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	6.29E-01	8.54E-02
		300.09		3.30		
Pb212-XR	1.00	74.82		10.28		
		77.11	*	17.10	7.37E-01	2.77E-01
		87.35		3.97		
		89.78		1.46		
Bi-214	0.96	609.32	*	45.49	5.78E-01	7.59E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	4.47E-01	1.68E-01
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	5.04E-01	1.29E-01
		351.93	*	35.60	6.79E-01	1.09E-01
		785.96		1.06		
Pb214-XR	1.00	74.82		5.80		
		77.11	*	9.70	1.30E+00	4.91E-01
		87.35		2.24		
		89.78		0.82		
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	5.57E-01	1.16E-01
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		



Analysis Report for 01-Jul-19-10008

L1-10221D-FIGS-001SS

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

## INTERFERENCE CORRECTED REPORT

<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	0.873	1.20E+01	7.90E-01	
Co-60	0.926	1.58E+00	6.76E-02	
Cs-137	0.978	7.03E+00	4.40E-01	
Tl-208	0.989	1.83E-01	3.13E-02	
X Bi-211	0.916			
Bi-212	0.965	7.46E-01	2.45E-01	
Pb-212	0.999	6.29E-01	8.54E-02	
? Pb212-XR	1.000	7.37E-01	2.77E-01	
Bi-214	0.968	5.56E-01	6.91E-02	
Pb-214	0.996	6.06E-01	8.35E-02	
? Pb214-XR	1.000	1.30E+00	4.91E-01	
Ac-228	0.983	5.57E-01	1.16E-01	

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

Errors quoted at 1.000sigma

Analysis Report for 01-Jul-19-10008  
L1-10221D-FIGS-001SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/1/2019 9:43:12AM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
14	1763.40	2.87724E-02	24.65		

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	1.77E-01	1.22E-01	1.22E-01
	BE-7	477.60	10.44	3.09E-01	1.29E+00	1.29E+00
+	K-40	1460.82	* 10.66	1.20E+01	5.58E-01	5.58E-01
	Mn-54	834.85	99.98	-1.01E-01	1.00E-01	1.00E-01
+	Co-60	1173.23	* 99.85	1.57E+00	7.98E-02	1.37E-01
		1332.49	* 99.98	1.60E+00		7.98E-02
	Nb-94	702.65	99.81	-9.87E-03	9.62E-02	9.62E-02
		871.09	99.89	3.08E-03		1.11E-01
	Ag-108m	79.13	6.60	-5.59E-01	1.13E-01	3.17E+00
		433.94	90.50	9.55E-02		1.31E-01
		614.28	89.80	-2.04E-03		1.21E-01
		722.94	90.80	-7.25E-02		1.13E-01
	Sb-125	176.31	6.84	3.03E-01	3.87E-01	1.18E+00
		380.45	1.52	-4.15E+00		6.56E+00
		427.87	29.60	-6.46E-02		3.87E-01
		463.36	10.49	1.02E+00		1.27E+00
		600.60	17.65	3.04E-01		5.64E-01
		606.71	4.98	5.16E+00		2.77E+00

Analysis Report for 01-Jul-19-10008

L1-10221D-FIGS-001SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>		
Sb-125	635.95	11.22	3.23E-02	3.87E-01	8.82E-01		
	671.44	1.79	2.83E+00		4.71E+00		
Ba-133	79.61	2.65	-1.20E-01	1.73E-01	7.67E+00		
	81.00	32.90	-3.29E-01		5.39E-01		
	276.40	7.16	-4.19E-02		1.25E+00		
	302.85	18.34	-4.53E-02		4.89E-01		
	356.01	62.05	4.82E-02		1.73E-01		
	383.85	8.94	3.06E-01		1.12E+00		
	475.36	1.48	-1.18E-01		1.18E-01	8.72E+00	
Cs-134	563.25	8.34	-1.37E-01	1.18E-01	1.18E+00		
	569.33	15.37	2.64E-01		6.26E-01		
	604.72	97.62	8.75E-03		1.34E-01		
	795.86	85.46	4.79E-02		1.18E-01		
	801.95	8.69	1.48E-01		1.10E+00		
	1038.61	0.99	-6.99E-01		1.11E+01		
	1167.97	1.79	-3.03E+00		1.87E+01		
	1365.19	3.02	-2.03E-01		2.11E+00		
	+ Cs-137	661.66	* 85.10		7.03E+00	1.31E-01	1.31E-01
	Eu-152	121.78	28.67		-2.01E-01	2.99E-01	2.99E-01
		244.70	7.61		-3.27E-01		1.22E+00
295.94		0.45	1.68E+01	2.23E+01			
344.28		26.60	-1.93E-01	3.42E-01			
367.79		0.86	-4.98E-01	1.19E+01			
411.12		2.24	2.13E+00	4.87E+00			
443.96		2.83	-4.16E+00	4.35E+00			
488.68		0.42	3.34E+01	2.66E+01			
563.99		0.49	-8.00E+00	1.99E+01			
586.26		0.46	-2.76E+01	2.67E+01			
678.62		0.47	-6.55E-01	1.82E+01			
688.67		0.86	-3.47E+00	9.02E+00			
719.35		0.28	-1.12E+00	3.28E+01			
778.90		12.96	-2.12E-01	7.45E-01			
810.45		0.32	-1.47E+01	2.83E+01			
867.37		4.26	2.42E-01	2.57E+00			
919.33		0.43	-1.37E+01	2.50E+01			
964.08		14.65	1.31E+00	1.00E+00			
1085.87		10.24	-2.36E-02	1.19E+00			
1089.74		1.73	-3.76E+00	7.02E+00			
1112.07		13.69	-6.64E-02	9.57E-01			
1212.95		1.43	-2.35E+00	7.93E+00			
1249.94		0.19	1.87E+01	5.74E+01			
1299.14	1.63	3.47E+00	5.52E+00				
1408.01	21.07	-1.62E-01	3.24E-01				
1457.64	0.50	2.52E+02	6.09E+01				
1528.10	0.28	-1.43E+00	1.69E+01				
Eu-154	123.07	40.40	1.49E-01	2.18E-01	2.18E-01		
	247.93	6.89	4.26E-01		1.29E+00		
	591.76	4.95	7.47E-01		1.99E+00		
	692.42	1.78	-1.76E+00		4.57E+00		
	723.30	20.06	4.14E-01		5.11E-01		
	756.80	4.52	1.14E+00		2.02E+00		

Analysis Report for 01-Jul-19-10008

L1-10221D-FIGS-001SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	873.18	12.08	3.62E-01	2.18E-01	9.31E-01
	996.29	10.48	4.47E-01		1.20E+00
	1004.76	18.01	3.04E-01		6.93E-01
	1274.43	34.80	2.86E-02		2.79E-01
	1596.48	1.80	-1.55E+00		3.56E+00
Eu-155	45.30	1.31	-1.76E+01	5.17E-01	6.13E+01
	60.01	1.22	-1.57E+01		5.67E+01
	86.55	30.70	6.06E-02		5.17E-01
	105.31	21.10	-2.07E-01		5.23E-01
Ra-226	186.21	3.64	2.53E+00	2.50E+00	2.50E+00
Pa-231	27.36	10.30	1.42E+01	3.68E+00	7.36E+00
	283.69	1.70	-1.86E+00		5.06E+00
	300.07	2.47	-1.48E-01		3.68E+00
	302.65	2.20	-8.56E-02		4.08E+00
	330.06	1.40	1.30E+00		6.56E+00
U-235	143.76	10.96	1.03E-01	1.59E-01	7.76E-01
	163.33	5.08	-6.26E-02		1.66E+00
	185.71	57.20	1.48E-01		1.59E-01
	202.11	1.08	3.52E+00		7.75E+00
	205.31	5.01	8.58E-02		1.70E+00
Am-241	59.54	35.90	-2.72E-01	2.03E+00	2.03E+00

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

Analysis Report for 01-Jul-19-10009  
L1-10221D-FIGS-002SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 01-Jul-19-10009  
Sample Description : L1-10221D-FIGS-002SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.123E+03 grams  
Facility : Default  
  
Sample Taken On : 6/27/2019 9:32:00AM  
Acquisition Started : 7/1/2019 9:28:11AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P11314  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.7 seconds  
  
Dead Time : 0.07 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/24/2019  
Efficiency Calibration Used Done On : 7/1/2019  
Efficiency Calibration Description :  
  
Sample Number : 77681  
Fill Height : 1122.95 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 12/22/2008 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/1/2019 9:43:14AM

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

DATA VALIDATED 7/1/19 - 1600  
J. Graham / [Signature] [269]

Analysis Report for 01-Jul-19-10009

L1-10221D-FIGS-002SS

	<b>Peak No.</b>	<b>Energy (keV)</b>	<b>ROI start</b>	<b>ROI end</b>	<b>Peak Centroid</b>	<b>Net Peak Area</b>	<b>Net Area Uncertainty</b>	<b>Continuum Counts</b>	<b>FWHM (keV)</b>
M	1	75.09	295 -	314	300.91	6.19E+01	20.91	1.68E+02	0.66
m	2	77.29	295 -	314	309.69	1.25E+02	37.93	1.81E+02	0.67
M	3	238.84	948 -	975	954.94	2.93E+02	54.18	1.56E+02	0.99
m	4	241.99	948 -	975	967.52	7.97E+01	18.07	1.75E+02	0.99
	5	295.37	1172 -	1188	1180.76	1.44E+02	23.29	1.28E+02	1.14
	6	351.98	1398 -	1416	1406.95	2.18E+02	25.68	1.31E+02	1.01
	7	477.11	1902 -	1916	1906.93	4.43E+01	18.54	1.04E+02	0.37
	8	583.23	2323 -	2338	2331.05	7.70E+01	15.06	5.00E+01	1.07
	9	609.27	2429 -	2443	2435.11	1.21E+02	17.82	6.78E+01	0.99
	10	661.64	2634 -	2655	2644.47	3.17E+03	57.79	4.63E+01	1.43
	11	911.27	3636 -	3650	3642.54	5.92E+01	12.63	3.48E+01	0.78
	12	969.05	3866 -	3883	3873.63	6.47E+01	12.30	2.63E+01	1.40
	13	1173.02	4679 -	4701	4689.54	4.48E+02	23.66	2.88E+01	1.79
	14	1332.27	5314 -	5339	5326.75	4.25E+02	21.88	1.28E+01	1.69
	15	1460.47	5828 -	5851	5839.80	4.31E+02	22.39	1.77E+01	1.66

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
BE-7	0.96	477.60	*	10.44	5.50E-01
K-40	0.98	1460.82	*	10.66	1.09E+01
					2.33E-01
					7.36E-01 <sup>[270]</sup>

Analysis Report for 01-Jul-19-10009

L1-10221D-FIGS-002SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>		<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Co-60	0.99	1173.23	*	99.85	1.03E+00	6.83E-02
		1332.49	*	99.98	1.06E+00	6.93E-02
Cs-137	1.00	661.66	*	85.10	5.75E+00	3.61E-01
Tl-208	1.00	583.19	*	85.00	1.28E-01	2.62E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	5.06E-01	1.02E-01
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	3.89E-01	6.17E-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	8.35E-01	2.01E-01
		295.22	*	18.42	6.70E-01	1.21E-01
		351.93	*	35.60	6.02E-01	8.57E-02
		785.96		1.06		
Pb214-XR	0.99	74.82	*	5.80	1.46E+00	5.21E-01
		77.11	*	9.70	1.63E+00	5.27E-01
		87.35		2.24		
Ac-228	1.00	89.78		0.82		
		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	4.43E-01	9.65E-02
964.77		4.99				
968.97	*	15.80	8.26E-01	1.61E-01		
1588.20		3.22				

Analysis Report for 01-Jul-19-10009

L1-10221D-FIGS-002SS

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

## INTERFERENCE CORRECTED REPORT

<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
BE-7	0.962	5.50E-01	2.33E-01	
K-40	0.980	1.09E+01	7.36E-01	
Co-60	0.993	1.05E+00	4.86E-02	
Cs-137	1.000	5.75E+00	3.61E-01	
Tl-208	1.000	1.28E-01	2.62E-02	
X Bi-211	0.875			
Pb-212	0.994	5.06E-01	1.02E-01	
X Pb212-XR	0.993			
Bi-214	1.000	3.89E-01	6.17E-02	
Pb-214	0.999	6.47E-01	6.61E-02	
Pb214-XR	0.993	1.55E+00	3.71E-01	
Ac-228	1.000	5.44E-01	8.28E-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 01-Jul-19-10009  
L1-10221D-FIGS-002SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/1/2019 9:43:14AM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

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

## NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	1.70E-01	1.09E-01	1.09E-01
+	BE-7	477.60	* 10.44	5.50E-01	7.64E-01	7.64E-01
+	K-40	1460.82	* 10.66	1.09E+01	7.88E-01	7.88E-01
	Mn-54	834.85	99.98	-1.84E-02	8.43E-02	8.43E-02
+	Co-60	1173.23	* 99.85	1.03E+00	6.93E-02	8.91E-02
		1332.49	* 99.98	1.06E+00		6.93E-02
	Nb-94	702.65	99.81	8.18E-03	7.73E-02	7.73E-02
		871.09	99.89	4.28E-02		8.57E-02
	Ag-108m	79.13	6.60	-7.53E-01	9.38E-02	1.87E+00
		433.94	90.50	-9.34E-02		1.04E-01
		614.28	89.80	2.16E-02		1.13E-01
		722.94	90.80	2.81E-02		9.38E-02
	Sb-125	176.31	6.84	2.86E-01	3.17E-01	8.78E-01
		380.45	1.52	-2.04E-01		5.49E+00
		427.87	29.60	-1.54E-01		3.17E-01
		463.36	10.49	-2.55E-02		9.62E-01
		600.60	17.65	-3.93E-01		4.23E-01
		606.71	4.98	-5.54E-01		2.40E+00
		635.95	11.22	4.80E-01		7.71E-01

Analysis Report for 01-Jul-19-10009

L1-10221D-FIGS-002SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-1.57E+00	3.17E-01	3.66E+00
Ba-133	79.61	2.65	-1.87E+00	1.33E-01	4.57E+00
	81.00	32.90	-3.60E-01		3.08E-01
	276.40	7.16	3.59E-01		1.02E+00
	302.85	18.34	2.40E-01		3.95E-01
	356.01	62.05	-1.21E-02		1.33E-01
	383.85	8.94	-2.62E-01		9.40E-01
Cs-134	475.36	1.48	-1.03E+00	9.93E-02	7.26E+00
	563.25	8.34	-6.23E-01		9.78E-01
	569.33	15.37	-1.09E-01		4.85E-01
	604.72	97.62	-5.64E-02		1.06E-01
	795.86	85.46	6.18E-02		9.93E-02
	801.95	8.69	-4.54E-01		8.47E-01
	1038.61	0.99	5.44E+00		9.46E+00
	1167.97	1.79	-9.54E-01		1.33E+01
	1365.19	3.02	9.28E-01		1.97E+00
+ Cs-137	661.66	* 85.10	5.75E+00	8.63E-02	8.63E-02
Eu-152	121.78	28.67	6.59E-02	2.20E-01	2.20E-01
	244.70	7.61	-1.90E-01		1.02E+00
	295.94	0.45	1.96E+01		1.81E+01
	344.28	26.60	-1.40E-01		2.84E-01
	367.79	0.86	4.26E-02		9.04E+00
	411.12	2.24	-2.27E-01		4.03E+00
	443.96	2.83	-2.15E+00		3.56E+00
	488.68	0.42	-7.82E+00		2.18E+01
	563.99	0.49	-1.14E+01		1.60E+01
	586.26	0.46	-7.00E+00		2.14E+01
	678.62	0.47	-9.98E+00		1.38E+01
	688.67	0.86	-2.31E-01		7.80E+00
	719.35	0.28	-1.56E+01		2.77E+01
	778.90	12.96	-4.40E-02		5.47E-01
	810.45	0.32	-6.10E+00		2.38E+01
	867.37	4.26	-1.43E+00		1.94E+00
	919.33	0.43	1.52E+01		2.32E+01
	964.08	14.65	-3.62E-01		8.64E-01
	1085.87	10.24	3.72E-02		9.97E-01
	1089.74	1.73	2.86E+00		6.20E+00
	1112.07	13.69	-2.43E-01		7.62E-01
	1212.95	1.43	-8.98E-01		6.64E+00
	1249.94	0.19	-5.25E+00		4.11E+01
	1299.14	1.63	-1.25E+00		4.41E+00
	1408.01	21.07	-6.41E-02		2.88E-01
	1457.64	0.50	2.37E+02		5.67E+01
	1528.10	0.28	2.77E+00		1.78E+01
Eu-154	123.07	40.40	2.77E-02	1.57E-01	1.57E-01
	247.93	6.89	-2.00E-01		9.63E-01
	591.76	4.95	-2.71E-01		1.58E+00
	692.42	1.78	-3.82E-01		3.71E+00
	723.30	20.06	2.67E-01		4.31E-01
	756.80	4.52	8.73E-01		1.86E+00
	873.18	12.08	-5.92E-02		7.35E-01

Analysis Report for 01-Jul-19-10009

L1-10221D-FIGS-002SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	6.78E-01	1.57E-01	8.72E-01
	1004.76	18.01	8.86E-02		4.97E-01
	1274.43	34.80	-6.14E-02		2.29E-01
	1596.48	1.80	-1.33E+00		3.01E+00
Eu-155	45.30	1.31	6.92E-01	3.18E-01	1.97E+01
	60.01	1.22	4.67E+00		2.27E+01
	86.55	30.70	1.72E-01		3.18E-01
	105.31	21.10	-1.05E-01		3.29E-01
Ra-226	186.21	3.64	2.03E+00	1.87E+00	1.87E+00
Pa-231	27.36	10.30	1.79E+00	2.16E+00	2.16E+00
	283.69	1.70	-1.93E+00		3.97E+00
	300.07	2.47	-2.00E-01		2.86E+00
	302.65	2.20	1.62E+00		3.29E+00
	330.06	1.40	2.63E+00		5.51E+00
U-235	143.76	10.96	-9.25E-02	1.19E-01	5.47E-01
	163.33	5.08	2.26E-01		1.17E+00
	185.71	57.20	1.19E-01		1.19E-01
	202.11	1.08	2.67E+00		6.09E+00
	205.31	5.01	-3.80E-01		1.31E+00
Am-241	59.54	35.90	1.06E-01	7.97E-01	7.97E-01

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

Analysis Report for 01-Jul-19-10010  
L1-10221D-FIGS-003SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 01-Jul-19-10010  
Sample Description : L1-10221D-FIGS-003SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 7.785E+02 grams  
Facility : Default  
  
Sample Taken On : 6/27/2019 9:34:00AM  
Acquisition Started : 7/1/2019 9:28:18AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : 352  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.4 seconds  
  
Dead Time : 0.05 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 9/29/2018  
Efficiency Calibration Used Done On : 7/1/2019  
Efficiency Calibration Description :  
  
Sample Number : 77682  
Fill Height : 778.46 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/7/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/1/2019 9:43:41AM

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

DATA VALIDATED 7/1/19 - 1600  
J. Graham / [Signature] [276]

Analysis Report for 01-Jul-19-10010

L1-10221D-FIGS-003SS

	<b>Peak No.</b>	<b>Energy (keV)</b>	<b>ROI start</b>	<b>ROI end</b>	<b>Peak Centroid</b>	<b>Net Peak Area</b>	<b>Net Area Uncertainty</b>	<b>Continuum Counts</b>	<b>FWHM (keV)</b>
M	1	238.67	951 -	974	955.16	2.08E+02	16.10	6.73E+01	0.97
m	2	241.93	951 -	974	968.18	4.08E+01	9.03	8.10E+01	0.98
	3	295.16	1170 -	1190	1180.85	1.10E+02	19.64	7.61E+01	0.63
	4	351.89	1400 -	1417	1407.55	9.67E+01	18.83	7.93E+01	0.47
	5	583.13	2326 -	2337	2331.84	4.22E+01	10.40	2.58E+01	0.54
	6	609.15	2428 -	2443	2435.86	1.09E+02	13.93	2.81E+01	1.18
	7	661.61	2634 -	2656	2645.62	1.77E+03	43.56	3.17E+01	1.33
	8	911.11	3636 -	3650	3643.50	5.87E+01	9.24	9.32E+00	1.03
	9	968.81	3869 -	3880	3874.31	1.90E+01	8.99	2.30E+01	0.43
	10	1120.26	4475 -	4486	4480.32	2.33E+01	7.26	1.17E+01	0.33
	11	1172.90	4680 -	4703	4691.00	2.53E+02	17.29	1.16E+01	1.76
	12	1332.30	5316 -	5340	5329.06	2.65E+02	17.07	6.37E+00	1.84
	13	1460.54	5829 -	5854	5842.53	2.83E+02	18.39	1.30E+01	1.78

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

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
K-40	0.98	1460.82 *	10.66	8.17E+00	6.39E-01
Co-60	0.98	1173.23 *	99.85	6.69E-01	5.29E-02
		1332.49 *	99.98	7.60E-01	5.77E-02
Cs-137	1.00	661.66 *	85.10	3.70E+00	2.40E-01 <sup>[277]</sup>

Analysis Report for 01-Jul-19-10010

L1-10221D-FIGS-003SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>		<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Tl-208	1.00	583.19	*	85.00	8.09E-02	2.05E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	4.24E-01	4.74E-02
Bi-214	0.99	300.09		3.30		
		609.32	*	45.49	4.01E-01	5.67E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	3.98E-01	1.25E-01
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
1764.49		15.30				
1847.43		2.03				
2118.51		1.16				
Pb-214	1.00	241.99	*	7.25	5.03E-01	1.19E-01
		295.22	*	18.42	5.99E-01	1.17E-01
		351.93	*	35.60	3.10E-01	6.53E-02
Ac-228	0.99	785.96		1.06		
		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	5.03E-01	8.21E-02
		964.77		4.99		
968.97	*	15.80	2.77E-01	1.32E-01		
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 01-Jul-19-10010

L1-10221D-FIGS-003SS

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## INTERFERENCE CORRECTED REPORT

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<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	0.987	8.17E+00	6.39E-01	
Co-60	0.989	7.11E-01	3.90E-02	
Cs-137	1.000	3.70E+00	2.40E-01	
Tl-208	1.000	8.09E-02	2.05E-02	
X Bi-211	0.898			
Pb-212	1.000	4.24E-01	4.74E-02	
Bi-214	0.998	4.01E-01	5.17E-02	
Pb-214	1.000	4.02E-01	5.14E-02	
Ac-228	0.999	4.40E-01	6.97E-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

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Analysis Report for 01-Jul-19-10010  
L1-10221D-FIGS-003SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/1/2019 9:43:41AM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

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

## NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	1.09E-01	9.85E-02	9.85E-02
	BE-7	477.60	10.44	2.04E+00	1.17E+00	1.17E+00
+	K-40	1460.82	* 10.66	8.17E+00	8.11E-01	8.11E-01
	Mn-54	834.85	99.98	6.68E-02	9.55E-02	9.55E-02
+	Co-60	1173.23	* 99.85	6.69E-01	5.87E-02	6.80E-02
		1332.49	* 99.98	7.60E-01		5.87E-02
	Nb-94	702.65	99.81	1.47E-02	7.59E-02	7.59E-02
		871.09	99.89	-6.41E-02		7.88E-02
	Ag-108m	79.13	6.60	8.57E-01	8.93E-02	2.56E+00
		433.94	90.50	3.86E-02		1.03E-01
		614.28	89.80	-8.17E-02		1.28E-01
		722.94	90.80	7.53E-02		8.93E-02
	Sb-125	176.31	6.84	4.02E-02	3.12E-01	9.02E-01
		380.45	1.52	6.09E+00		5.34E+00
		427.87	29.60	7.15E-02		3.12E-01
		463.36	10.49	-8.70E-02		9.68E-01
		600.60	17.65	-1.39E-01		4.34E-01
		606.71	4.98	3.83E+00		2.33E+00
		635.95	11.22	2.48E-01		7.02E-01



Analysis Report for 01-Jul-19-10010

L1-10221D-FIGS-003SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-2.31E+00	3.12E-01	3.69E+00
Ba-133	79.61	2.65	3.59E+00	1.40E-01	6.17E+00
	81.00	32.90	-5.12E-01		4.41E-01
	276.40	7.16	9.28E-02		1.01E+00
	302.85	18.34	4.27E-01		4.14E-01
	356.01	62.05	-6.46E-03		1.40E-01
	383.85	8.94	-2.94E-01		9.13E-01
Cs-134	475.36	1.48	1.26E+01	9.17E-02	7.89E+00
	563.25	8.34	-2.15E-02		8.65E-01
	569.33	15.37	2.36E-02		4.95E-01
	604.72	97.62	-2.18E-02		1.11E-01
	795.86	85.46	8.08E-03		9.17E-02
	801.95	8.69	-3.98E-01		9.28E-01
	1038.61	0.99	-4.60E+00		8.61E+00
	1167.97	1.79	-2.27E+00		1.26E+01
	1365.19	3.02	1.70E-01		2.15E+00
+ Cs-137	661.66	* 85.10	3.70E+00	8.44E-02	8.44E-02
Eu-152	121.78	28.67	7.23E-02	2.25E-01	2.25E-01
	244.70	7.61	7.36E-02		9.27E-01
	295.94	0.45	1.80E+01		1.83E+01
	344.28	26.60	1.00E-02		2.86E-01
	367.79	0.86	5.43E-01		8.85E+00
	411.12	2.24	1.88E+00		3.83E+00
	443.96	2.83	-2.75E-01		3.32E+00
	488.68	0.42	1.43E+01		1.97E+01
	563.99	0.49	1.55E-01		1.42E+01
	586.26	0.46	2.63E+01		2.07E+01
	678.62	0.47	4.31E+00		1.34E+01
	688.67	0.86	4.08E+00		8.70E+00
	719.35	0.28	-6.52E+00		2.52E+01
	778.90	12.96	-5.35E-01		5.74E-01
	810.45	0.32	1.46E+01		2.58E+01
	867.37	4.26	-1.37E+00		1.93E+00
	919.33	0.43	-1.86E+01		2.30E+01
	964.08	14.65	2.75E-02		8.43E-01
	1085.87	10.24	6.83E-01		1.01E+00
	1089.74	1.73	1.86E-01		5.84E+00
	1112.07	13.69	-2.04E-01		7.54E-01
	1212.95	1.43	3.76E+00		7.01E+00
	1249.94	0.19	2.87E+01		4.30E+01
	1299.14	1.63	-8.67E-02		4.90E+00
	1408.01	21.07	-1.06E-01		2.87E-01
	1457.64	0.50	1.81E+02		5.31E+01
	1528.10	0.28	9.05E+00		1.86E+01
Eu-154	123.07	40.40	-8.26E-02	1.57E-01	1.57E-01
	247.93	6.89	1.37E-01		9.50E-01
	591.76	4.95	-8.89E-01		1.57E+00
	692.42	1.78	-1.79E+00		4.35E+00
	723.30	20.06	5.36E-01		4.10E-01
	756.80	4.52	-7.05E-01		1.81E+00
	873.18	12.08	1.86E-02		6.89E-01

Analysis Report for 01-Jul-19-10010

L1-10221D-FIGS-003SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	-2.29E-01	1.57E-01	8.86E-01
	1004.76	18.01	3.22E-01		5.10E-01
	1274.43	34.80	-8.96E-02		2.37E-01
	1596.48	1.80	2.76E+00		3.94E+00
Eu-155	45.30	1.31	1.26E+01	3.74E-01	3.38E+01
	60.01	1.22	-1.67E+01		3.76E+01
	86.55	30.70	1.09E-01		3.86E-01
	105.31	21.10	1.66E-01		3.74E-01
Ra-226	186.21	3.64	7.88E-01	1.88E+00	1.88E+00
Pa-231	27.36	10.30	3.13E+00	3.06E+00	3.88E+00
	283.69	1.70	-8.25E-02		4.12E+00
	300.07	2.47	1.39E+00		3.06E+00
	302.65	2.20	2.31E+00		3.42E+00
	330.06	1.40	3.62E+00		5.20E+00
U-235	143.76	10.96	-2.03E-01	1.19E-01	5.76E-01
	163.33	5.08	4.44E-01		1.20E+00
	185.71	57.20	4.00E-02		1.19E-01
	202.11	1.08	-4.21E+00		6.06E+00
	205.31	5.01	-9.18E-01		1.30E+00
Am-241	59.54	35.90	-1.21E+00	1.30E+00	1.30E+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 01-Jul-19-10011  
L1-10221D-FIGS-004SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 01-Jul-19-10011  
Sample Description : L1-10221D-FIGS-004SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 9.233E+02 grams  
Facility : Default  
  
Sample Taken On : 6/27/2019 9:36:00AM  
Acquisition Started : 7/1/2019 9:47:05AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P40818B  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 903.2 seconds  
  
Dead Time : 0.35 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/29/2019  
Efficiency Calibration Used Done On : 7/1/2019  
Efficiency Calibration Description :  
  
Sample Number : 77683  
Fill Height : 923.35 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/30/2012 12:00:00PM

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## PEAK ANALYSIS REPORT

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

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

DATA VALIDATES 7/1/19 - 1600  
J. Graham / [Signature] [283]

Analysis Report for 01-Jul-19-10011

L1-10221D-FIGS-004SS

	<b>Peak No.</b>	<b>Energy (keV)</b>	<b>ROI start</b>	<b>ROI end</b>	<b>Peak Centroid</b>	<b>Net Peak Area</b>	<b>Net Area Uncertainty</b>	<b>Continuum Counts</b>	<b>FWHM (keV)</b>
M	1	74.81	297 -	314	299.99	3.91E+01	9.71	7.86E+01	0.62
m	2	77.14	297 -	314	309.29	7.14E+01	12.00	1.11E+02	0.63
	3	238.59	948 -	960	954.46	1.94E+02	25.81	1.77E+02	0.92
	4	295.22	1175 -	1186	1180.77	9.79E+01	17.75	8.51E+01	0.70
	5	351.75	1399 -	1414	1406.71	1.74E+02	20.51	8.25E+01	1.32
	6	477.25	1899 -	1916	1908.41	8.92E+01	19.96	9.48E+01	1.05
	7	582.90	2322 -	2341	2330.83	1.17E+02	15.01	3.10E+01	1.16
	8	608.87	2427 -	2442	2434.65	1.10E+02	14.78	3.61E+01	1.06
	9	661.26	2634 -	2652	2644.12	1.91E+03	45.52	4.61E+01	1.38
	10	910.46	3633 -	3650	3640.82	7.21E+01	12.40	2.49E+01	1.83
	11	968.48	3865 -	3880	3872.88	3.19E+01	10.23	2.41E+01	1.31
	12	1172.49	4677 -	4701	4689.13	2.94E+02	18.21	9.22E+00	1.42
	13	1331.61	5315 -	5338	5325.94	2.76E+02	17.71	9.24E+00	1.59
	14	1460.01	5828 -	5852	5839.88	3.33E+02	19.60	1.25E+01	2.03

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
BE-7	0.98	477.60	*	10.44	1.36E+00
K-40	0.90	1460.82	*	10.66	1.04E+01
Co-60	0.90	1173.23	*	99.85	8.37E-01
					3.19E-01
					7.61E-01
					6.17E-02 <sup>[284]</sup>

Analysis Report for 01-Jul-19-10011

L1-10221D-FIGS-004SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>		<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Co-60	0.90	1332.49	*	99.98	8.56E-01	6.47E-02
Cs-137	0.97	661.66	*	85.10	4.26E+00	2.75E-01
Tl-208	0.98	583.19	*	85.00	2.39E-01	3.39E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	4.14E-01	6.44E-02
		300.09		3.30		
Pb212-XR	1.00	74.82	*	10.28	1.02E+00	2.74E-01
		77.11	*	17.10	9.86E-01	1.94E-01
		87.35		3.97		
		89.78		1.46		
Bi-214	0.98	609.32	*	45.49	4.33E-01	6.37E-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	5.60E-01	1.11E-01
		351.93	*	35.60	5.87E-01	8.37E-02
		785.96		1.06		
Ac-228	0.96	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	6.65E-01	1.18E-01
		964.77		4.99		
		968.97	*	15.80	5.02E-01	1.62E-01
		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 01-Jul-19-10011  
L1-10221D-FIGS-004SS

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## INTERFERENCE CORRECTED REPORT

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<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
BE-7	0.980	1.36E+00	3.19E-01	
K-40	0.900	1.04E+01	7.61E-01	
Co-60	0.900	8.46E-01	4.47E-02	
Cs-137	0.975	4.26E+00	2.75E-01	
Tl-208	0.987	2.39E-01	3.39E-02	
X Bi-211	0.930			
Pb-212	1.000	4.14E-01	6.44E-02	
Pb212-XR	1.000	9.97E-01	1.58E-01	
Bi-214	0.987	4.33E-01	6.37E-02	
Pb-214	0.997	5.77E-01	6.68E-02	
X Pb214-XR	1.000			
Ac-228	0.967	6.08E-01	9.54E-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

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Analysis Report for 01-Jul-19-10011  
L1-10221D-FIGS-004SS

## UNIDENTIFIED PEAKS

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

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

## NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	6.95E-02	1.14E-01	1.14E-01
+	BE-7	477.60	* 10.44	1.36E+00	9.52E-01	9.52E-01
+	K-40	1460.82	* 10.66	1.04E+01	8.52E-01	8.52E-01
	Mn-54	834.85	99.98	1.41E-02	8.81E-02	8.81E-02
+	Co-60	1173.23	* 99.85	8.37E-01	6.77E-02	6.77E-02
		1332.49	* 99.98	8.56E-01		7.37E-02
	Nb-94	702.65	99.81	3.48E-02	8.31E-02	8.31E-02
		871.09	99.89	-5.84E-02		9.84E-02
	Ag-108m	79.13	6.60	-5.97E-01	9.89E-02	2.85E+00
		433.94	90.50	7.36E-02		1.14E-01
		614.28	89.80	-5.38E-02		1.08E-01
		722.94	90.80	8.68E-04		9.89E-02
	Sb-125	176.31	6.84	8.01E-02	3.41E-01	1.03E+00
		380.45	1.52	1.17E+00		5.82E+00
		427.87	29.60	-4.01E-02		3.41E-01
		463.36	10.49	2.65E-01		1.09E+00
		600.60	17.65	2.52E-02		5.12E-01
		606.71	4.98	4.02E+00		2.59E+00
		635.95	11.22	-2.86E-01		7.98E-01

Analysis Report for 01-Jul-19-10011

L1-10221D-FIGS-004SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	1.35E+00	3.41E-01	4.50E+00
Ba-133	79.61	2.65	-9.29E-01	1.52E-01	6.81E+00
	81.00	32.90	-5.07E-01		4.65E-01
	276.40	7.16	7.67E-01		1.06E+00
	302.85	18.34	1.33E-01		4.37E-01
	356.01	62.05	6.40E-03		1.52E-01
	383.85	8.94	-6.45E-01		9.95E-01
Cs-134	475.36	1.48	6.05E+00	9.84E-02	8.50E+00
	563.25	8.34	-4.39E-01		1.07E+00
	569.33	15.37	-2.09E-01		5.59E-01
	604.72	97.62	1.41E-02		1.27E-01
	795.86	85.46	3.52E-02		9.84E-02
	801.95	8.69	9.41E-02		9.65E-01
	1038.61	0.99	-7.41E+00		1.11E+01
	1167.97	1.79	-3.63E+00		1.38E+01
	1365.19	3.02	5.52E-01		2.44E+00
+ Cs-137	661.66	* 85.10	4.26E+00	1.02E-01	1.02E-01
Eu-152	121.78	28.67	4.61E-02	2.76E-01	2.76E-01
	244.70	7.61	-4.18E-01		1.05E+00
	295.94	0.45	9.32E+00		2.07E+01
	344.28	26.60	1.80E-01		3.08E-01
	367.79	0.86	2.16E+00		1.03E+01
	411.12	2.24	2.26E+00		4.64E+00
	443.96	2.83	-1.21E+00		3.83E+00
	488.68	0.42	6.42E+00		2.41E+01
	563.99	0.49	1.05E+01		1.82E+01
	586.26	0.46	1.65E+00		2.59E+01
	678.62	0.47	-8.10E+00		1.74E+01
	688.67	0.86	-7.87E+00		8.22E+00
	719.35	0.28	-9.92E+00		2.89E+01
	778.90	12.96	7.86E-02		6.68E-01
	810.45	0.32	3.28E+00		2.56E+01
	867.37	4.26	3.03E-01		2.27E+00
	919.33	0.43	1.03E+01		2.39E+01
	964.08	14.65	3.07E-01		8.96E-01
	1085.87	10.24	1.25E-01		1.12E+00
	1089.74	1.73	-2.33E+00		6.30E+00
	1112.07	13.69	-2.70E-01		8.89E-01
	1212.95	1.43	-1.01E+00		7.97E+00
	1249.94	0.19	1.40E+01		4.91E+01
	1299.14	1.63	3.21E+00		5.94E+00
	1408.01	21.07	2.16E-01		3.82E-01
	1457.64	0.50	2.17E+02		6.20E+01
	1528.10	0.28	6.13E+00		1.67E+01
Eu-154	123.07	40.40	8.63E-03	1.90E-01	1.90E-01
	247.93	6.89	-5.04E-01		1.09E+00
	591.76	4.95	1.57E+00		1.86E+00
	692.42	1.78	-3.38E+00		4.17E+00
	723.30	20.06	2.15E-01		4.48E-01
	756.80	4.52	-4.71E-01		1.81E+00
	873.18	12.08	3.52E-01		8.05E-01



Analysis Report for 01-Jul-19-10011

L1-10221D-FIGS-004SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	-8.71E-02	1.90E-01	9.77E-01
	1004.76	18.01	-4.74E-01		5.72E-01
	1274.43	34.80	1.21E-01		2.36E-01
	1596.48	1.80	1.99E+00		3.60E+00
Eu-155	45.30	1.31	-1.21E+01	4.52E-01	5.27E+01
	60.01	1.22	2.33E+01		5.23E+01
	86.55	30.70	1.47E-01		4.60E-01
	105.31	21.10	6.62E-02		4.52E-01
Ra-226	186.21	3.64	-4.78E-01	2.19E+00	2.19E+00
Pa-231	27.36	10.30	5.35E+00	3.36E+00	5.95E+00
	283.69	1.70	1.06E+00		4.34E+00
	300.07	2.47	-4.26E-01		3.36E+00
	302.65	2.20	1.10E-01		3.62E+00
	330.06	1.40	3.25E+00		6.12E+00
U-235	143.76	10.96	3.92E-01	1.39E-01	7.03E-01
	163.33	5.08	3.40E-01		1.42E+00
	185.71	57.20	1.56E-02		1.39E-01
	202.11	1.08	-1.25E-01		7.05E+00
	205.31	5.01	-1.19E+00		1.47E+00
Am-241	59.54	35.90	1.52E-01	1.84E+00	1.84E+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 09-Jul-19-10016  
L1-10221D-FIGS-005SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 09-Jul-19-10016  
Sample Description : L1-10221D-FIGS-005SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.301E+03 grams  
Facility : Default  
  
Sample Taken On : 7/8/2019 12:30:00PM  
Acquisition Started : 7/9/2019 9:10:08AM  
  
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 : 7/9/2019  
Efficiency Calibration Description :  
  
Sample Number : 77824  
Fill Height : 1300.66 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 12/22/2008 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/9/2019 9:25:31AM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 8192

*gmm*  
Data Validated  
1500 7-[290]9

Analysis Report for 09-Jul-19-10016

L1-10221D-FIGS-005SS

	<b>Peak No.</b>	<b>Energy (keV)</b>	<b>ROI start</b>	<b>ROI end</b>	<b>Peak Centroid</b>	<b>Net Peak Area</b>	<b>Net Area Uncertainty</b>	<b>Continuum Counts</b>	<b>FWHM (keV)</b>
M	1	75.15	296 -	316	301.16	6.52E+01	10.40	8.10E+01	1.00
m	2	77.35	296 -	316	309.95	9.13E+01	11.65	9.98E+01	1.00
	3	238.92	946 -	962	955.25	1.51E+02	23.32	1.24E+02	1.24
	4	295.54	1175 -	1186	1181.45	6.28E+01	13.57	4.82E+01	0.91
	5	338.35	1347 -	1359	1352.49	3.88E+01	11.39	3.42E+01	0.77
	6	351.92	1399 -	1414	1406.70	1.32E+02	15.69	3.80E+01	0.87
	7	477.49	1901 -	1915	1908.45	7.39E+01	14.07	4.31E+01	1.08
	8	583.21	2325 -	2337	2330.96	4.38E+01	9.31	1.63E+01	0.64
	9	609.31	2428 -	2442	2435.29	7.99E+01	13.16	3.21E+01	0.39
	10	661.63	2637 -	2654	2644.43	5.58E+02	26.23	3.98E+01	1.05
	11	910.81	3635 -	3647	3640.70	2.93E+01	9.04	1.97E+01	0.58
	12	1119.99	4472 -	4484	4477.35	2.37E+01	6.80	8.33E+00	0.65
	13	1172.99	4680 -	4700	4689.42	1.19E+02	13.13	1.39E+01	0.61
	14	1331.90	5317 -	5336	5325.23	1.08E+02	11.52	7.24E+00	1.24
	15	1460.37	5829 -	5850	5839.42	3.18E+02	17.83	0.00E+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

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
BE-7	0.99	477.60	*	10.44	8.36E-01
K-40	0.96	1460.82	*	10.66	7.53E+00
					1.70E-01
					5.34E-01 <sup>[291]</sup>

Analysis Report for 09-Jul-19-10016

L1-10221D-FIGS-005SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>		<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Co-60	0.96	1173.23	*	99.85	2.57E-01	3.02E-02
		1332.49	*	99.98	2.53E-01	2.89E-02
Cs-137	1.00	661.66	*	85.10	9.59E-01	7.31E-02
Tl-208	1.00	583.19	*	85.00	6.89E-02	1.52E-02
Pb-212	0.98	115.18		0.60		
		238.63	*	43.60	2.48E-01	4.34E-02
		300.09		3.30		
Pb212-XR	0.98	74.82	*	10.28	8.42E-01	1.60E-01
		77.11	*	17.10	6.52E-01	1.07E-01
		87.35		3.97		
Bi-214	0.99	89.78		1.46		
		609.32	*	45.49	2.42E-01	4.25E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	3.33E-01	9.64E-02
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
1764.49		15.30				
1847.43		2.03				
2118.51		1.16				
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	2.79E-01	6.44E-02
		351.93	*	35.60	3.46E-01	4.96E-02
Ac-228	0.99	785.96		1.06		
		129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	3.12E-01	9.51E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.07E-01	6.45E-02
964.77		4.99				
968.97		15.80				
1588.20		3.22				

Analysis Report for 09-Jul-19-10016

L1-10221D-FIGS-005SS

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

## INTERFERENCE CORRECTED REPORT

	<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
	BE-7	0.998	8.36E-01	1.70E-01	
	K-40	0.968	7.53E+00	5.34E-01	
	Co-60	0.968	2.55E-01	2.09E-02	
	Cs-137	1.000	9.59E-01	7.31E-02	
	Tl-208	1.000	6.89E-02	1.52E-02	
X	Bi-211	0.890			
	Pb-212	0.988	2.48E-01	4.34E-02	
	Pb212-XR	0.989	7.11E-01	8.88E-02	
	Bi-214	0.998	2.57E-01	3.89E-02	
	Pb-214	0.995	3.21E-01	3.93E-02	
X	Pb214-XR	0.989			
	Ac-228	0.992	2.40E-01	5.34E-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 09-Jul-19-10016  
L1-10221D-FIGS-005SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/9/2019 9:25:31AM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

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

## NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	8.13E-02	6.80E-02	6.80E-02
+	BE-7	477.60	* 10.44	8.36E-01	4.59E-01	4.59E-01
+	K-40	1460.82	* 10.66	7.53E+00	6.81E-02	6.81E-02
	Mn-54	834.85	99.98	-1.20E-02	6.08E-02	6.08E-02
+	Co-60	1173.23	* 99.85	2.57E-01	4.66E-02	5.98E-02
		1332.49	* 99.98	2.53E-01		4.66E-02
	Nb-94	702.65	99.81	1.98E-02	5.45E-02	5.72E-02
		871.09	99.89	4.91E-03		5.45E-02
	Ag-108m	79.13	6.60	-4.41E-02	5.44E-02	1.41E+00
		433.94	90.50	-1.76E-02		5.44E-02
		614.28	89.80	-1.54E-02		7.82E-02
		722.94	90.80	7.42E-02		6.46E-02
	Sb-125	176.31	6.84	-1.62E-01	1.85E-01	5.63E-01
		380.45	1.52	1.29E-01		3.14E+00
		427.87	29.60	-5.55E-02		1.85E-01
		463.36	10.49	2.67E-01		5.38E-01
		600.60	17.65	-6.65E-02		2.74E-01
		606.71	4.98	2.47E+00		1.65E+00
		635.95	11.22	-2.84E-02		4.31E-01

Analysis Report for 09-Jul-19-10016

L1-10221D-FIGS-005SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-4.81E-01	1.85E-01	2.51E+00
Ba-133	79.61	2.65	-4.81E-01	8.96E-02	3.39E+00
	81.00	32.90	-7.35E-02		2.22E-01
	276.40	7.16	-1.10E-01		5.99E-01
	302.85	18.34	7.68E-02		2.44E-01
	356.01	62.05	-1.47E-02		8.96E-02
	383.85	8.94	-6.06E-02		5.16E-01
Cs-134	475.36	1.48	5.27E+00	6.22E-02	5.04E+00
	563.25	8.34	-4.01E-01		6.08E-01
	569.33	15.37	-3.48E-02		3.21E-01
	604.72	97.62	-1.89E-02		7.09E-02
	795.86	85.46	-6.63E-02		6.22E-02
	801.95	8.69	1.38E-02		7.19E-01
	1038.61	0.99	-3.04E-01		5.51E+00
	1167.97	1.79	4.28E-01		7.22E+00
	1365.19	3.02	9.94E-02		1.66E+00
+ Cs-137	661.66	* 85.10	9.59E-01	7.14E-02	7.14E-02
Eu-152	121.78	28.67	1.74E-02	1.48E-01	1.48E-01
	244.70	7.61	-1.15E-02		6.43E-01
	295.94	0.45	3.47E+00		1.19E+01
	344.28	26.60	2.01E-02		1.77E-01
	367.79	0.86	1.49E+00		5.66E+00
	411.12	2.24	1.95E-02		2.28E+00
	443.96	2.83	-2.23E+00		2.00E+00
	488.68	0.42	-9.02E-01		1.22E+01
	563.99	0.49	-2.32E+01		9.53E+00
	586.26	0.46	-9.67E-01		1.38E+01
	678.62	0.47	2.91E+00		9.72E+00
	688.67	0.86	2.60E+00		5.61E+00
	719.35	0.28	7.31E+00		1.80E+01
	778.90	12.96	-4.76E-01		4.19E-01
	810.45	0.32	1.18E+01		1.80E+01
	867.37	4.26	-5.67E-01		1.20E+00
	919.33	0.43	-3.03E+00		1.46E+01
	964.08	14.65	9.10E-02		5.89E-01
	1085.87	10.24	-2.39E-02		6.58E-01
	1089.74	1.73	1.28E+00		4.21E+00
	1112.07	13.69	-5.05E-01		4.57E-01
	1212.95	1.43	-6.85E-01		4.96E+00
	1249.94	0.19	1.46E+00		3.77E+01
	1299.14	1.63	7.88E-01		4.32E+00
	1408.01	21.07	1.28E-01		2.19E-01
	1457.64	0.50	1.50E+02		4.46E+01
	1528.10	0.28	8.35E+00		1.60E+01
Eu-154	123.07	40.40	2.49E-02	1.05E-01	1.05E-01
	247.93	6.89	-5.58E-02		6.49E-01
	591.76	4.95	-1.43E-01		9.18E-01
	692.42	1.78	-1.78E+00		2.28E+00
	723.30	20.06	3.32E-01		2.93E-01
	756.80	4.52	9.64E-02		1.06E+00
	873.18	12.08	1.59E-01		5.07E-01

Analysis Report for 09-Jul-19-10016

L1-10221D-FIGS-005SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	4.89E-02	1.05E-01	6.00E-01
	1004.76	18.01	-4.79E-02		3.68E-01
	1274.43	34.80	-5.66E-02		1.70E-01
	1596.48	1.80	-2.64E-01		2.48E+00
Eu-155	45.30	1.31	4.28E+00	2.20E-01	1.44E+01
	60.01	1.22	-1.31E+00		1.42E+01
	86.55	30.70	-1.79E-02		2.20E-01
	105.31	21.10	1.94E-02		2.36E-01
Ra-226	186.21	3.64	1.31E+00	1.19E+00	1.19E+00
Pa-231	27.36	10.30	1.43E+00	1.52E+00	1.52E+00
	283.69	1.70	1.82E+00		2.55E+00
	300.07	2.47	-1.02E+00		1.82E+00
	302.65	2.20	1.43E-01		2.02E+00
	330.06	1.40	-2.52E+00		3.38E+00
U-235	143.76	10.96	-6.65E-02	7.40E-02	3.67E-01
	163.33	5.08	6.46E-01		7.94E-01
	185.71	57.20	5.14E-02		7.40E-02
	202.11	1.08	2.51E-01		3.79E+00
	205.31	5.01	-1.00E+00		7.78E-01
Am-241	59.54	35.90	-1.23E-01	4.86E-01	4.86E-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 09-Jul-19-10017  
L1-10221D-FIGS-006SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 09-Jul-19-10017  
Sample Description : L1-10221D-FIGS-006SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.331E+03 grams  
Facility : Default  
  
Sample Taken On : 7/8/2019 12:32:00PM  
Acquisition Started : 7/9/2019 9:10:16AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : 352  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.3 seconds  
  
Dead Time : 0.03 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 9/29/2018  
Efficiency Calibration Used Done On : 7/9/2019  
Efficiency Calibration Description :  
  
Sample Number : 77825  
Fill Height : 1331.15 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/7/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/9/2019 9:25:24AM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 8192

*gmm*  
Data Validated  
1500 7/29/19

Analysis Report for 09-Jul-19-10017

L1-10221D-FIGS-006SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.67	948 -	960	955.16	2.01E+02	18.72	5.68E+01	0.55
2	295.06	1174 -	1186	1180.46	5.58E+01	12.91	4.23E+01	0.37
3	338.14	1348 -	1359	1352.59	3.55E+01	9.93	2.45E+01	0.37
4	351.99	1401 -	1414	1407.93	1.09E+02	14.17	3.23E+01	0.60
5	477.80	1903 -	1917	1910.77	5.88E+01	10.16	1.52E+01	0.95
6	583.06	2325 -	2338	2331.56	5.64E+01	10.87	2.16E+01	0.89
7	609.24	2430 -	2445	2436.24	7.88E+01	12.29	2.42E+01	0.88
8	661.66	2637 -	2655	2645.80	1.61E+02	14.58	1.55E+01	1.50
9	911.42	3635 -	3651	3644.73	5.61E+01	10.13	1.49E+01	1.06
10	1460.62	5830 -	5855	5842.84	3.03E+02	18.93	1.30E+01	1.38

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
BE-7	0.99	477.60 *	10.44	6.29E-01	1.18E-01
K-40	0.99	1460.82 *	10.66	6.62E+00	5.04E-01
Cs-137	1.00	661.66 *	85.10	2.60E-01	2.82E-02
Tl-208	0.99	583.19 *	85.00	8.36E-02	1.69E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	3.24E-01	4.00E-02
		300.09	3.30		

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Analysis Report for 09-Jul-19-10017

L1-10221D-FIGS-006SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>		<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Bi-214	1.00	609.32	*	45.49	2.25E-01	3.75E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
Pb-214	0.99	2118.51		1.16	2.39E-01	5.85E-02
		241.99		7.25		
		295.22	*	18.42		
Ac-228	0.99	351.93	*	35.60	2.74E-01	7.98E-02
		785.96		1.06		
		129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	3.69E-01	6.85E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

\* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

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**INTERFERENCE CORRECTED REPORT**

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Analysis Report for 09-Jul-19-10017

L1-10221D-FIGS-006SS

<i><b>Nuclide Name</b></i>	<i><b>Nuclide Id Confidence</b></i>	<i><b>Wt mean Activity (pCi/grams)</b></i>	<i><b>Wt mean Activity Uncertainty</b></i>	<i><b>Comments</b></i>
BE-7	0.994	6.29E-01	1.18E-01	
K-40	0.993	6.62E+00	5.04E-01	
Cs-137	1.000	2.60E-01	2.82E-02	
Tl-208	0.997	8.36E-02	1.69E-02	
X Bi-211	0.875			
Pb-212	1.000	3.24E-01	4.00E-02	
Bi-214	1.000	2.25E-01	3.75E-02	
Pb-214	0.998	2.62E-01	3.40E-02	
Ac-228	0.997	3.29E-01	5.20E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 1.000sigma

Analysis Report for 09-Jul-19-10017  
L1-10221D-FIGS-006SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/9/2019 9:25:24AM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

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

## NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	9.16E-02	5.91E-02	5.91E-02
+	BE-7	477.60	* 10.44	6.29E-01	2.73E-01	2.73E-01
+	K-40	1460.82	* 10.66	6.62E+00	6.14E-01	6.14E-01
	Mn-54	834.85	99.98	1.83E-02	4.94E-02	4.94E-02
	Co-60	1173.23	99.85	3.70E-02	6.89E-02	7.64E-02
		1332.49	99.98	2.16E-02		6.89E-02
	Nb-94	702.65	99.81	1.16E-02	4.00E-02	5.30E-02
		871.09	99.89	1.01E-03		4.00E-02
	Ag-108m	79.13	6.60	8.18E-01	5.00E-02	1.74E+00
		433.94	90.50	-1.55E-02		5.05E-02
		614.28	89.80	-4.23E-03		7.92E-02
		722.94	90.80	4.00E-02		5.00E-02
	Sb-125	176.31	6.84	3.16E-01	1.51E-01	5.46E-01
		380.45	1.52	-5.73E-01		2.51E+00
		427.87	29.60	1.20E-02		1.51E-01
		463.36	10.49	1.28E-01		4.32E-01
		600.60	17.65	-6.01E-02		2.50E-01
		606.71	4.98	2.39E+00		1.51E+00
		635.95	11.22	-5.71E-01		3.36E-01

Analysis Report for 09-Jul-19-10017

L1-10221D-FIGS-006SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	1.85E+00	1.51E-01	2.60E+00
Ba-133	79.61	2.65	4.47E+00	8.90E-02	4.23E+00
	81.00	32.90	-4.84E-01		2.75E-01
	276.40	7.16	1.22E-01		5.85E-01
	302.85	18.34	-7.44E-02		2.18E-01
	356.01	62.05	-4.78E-02		8.90E-02
	383.85	8.94	8.94E-02		4.39E-01
Cs-134	475.36	1.48	3.56E+00	6.02E-02	3.83E+00
	563.25	8.34	-7.89E-03		5.13E-01
	569.33	15.37	5.09E-02		2.80E-01
	604.72	97.62	-3.42E-02		7.16E-02
	795.86	85.46	8.65E-03		6.02E-02
	801.95	8.69	-7.48E-01		5.45E-01
	1038.61	0.99	-2.34E+00		4.64E+00
	1167.97	1.79	3.19E+00		4.21E+00
	1365.19	3.02	-1.67E+00		1.43E+00
+ Cs-137	661.66	* 85.10	2.60E-01	4.37E-02	4.37E-02
Eu-152	121.78	28.67	1.42E-02	1.54E-01	1.54E-01
	244.70	7.61	4.35E-01		5.58E-01
	295.94	0.45	5.50E+00		1.15E+01
	344.28	26.60	-2.07E-02		1.60E-01
	367.79	0.86	3.19E-01		4.75E+00
	411.12	2.24	4.89E-01		1.95E+00
	443.96	2.83	-1.04E+00		1.52E+00
	488.68	0.42	3.75E+00		9.74E+00
	563.99	0.49	-3.57E+00		8.43E+00
	586.26	0.46	1.13E+01		1.48E+01
	678.62	0.47	-1.20E-01		9.58E+00
	688.67	0.86	-2.92E+00		5.68E+00
	719.35	0.28	9.47E+00		1.49E+01
	778.90	12.96	-8.01E-01		3.38E-01
	810.45	0.32	1.93E+00		1.38E+01
	867.37	4.26	-6.34E-01		9.76E-01
	919.33	0.43	-7.62E+00		1.25E+01
	964.08	14.65	2.56E-01		4.62E-01
	1085.87	10.24	1.21E-01		5.57E-01
	1089.74	1.73	1.64E+00		3.44E+00
	1112.07	13.69	-5.26E-01		4.41E-01
	1212.95	1.43	3.91E+00		4.81E+00
	1249.94	0.19	1.22E+01		3.40E+01
	1299.14	1.63	2.07E+00		3.84E+00
	1408.01	21.07	-1.79E-01		1.77E-01
	1457.64	0.50	1.42E+02		4.14E+01
	1528.10	0.28	4.27E+00		1.16E+01
Eu-154	123.07	40.40	6.70E-03	1.08E-01	1.08E-01
	247.93	6.89	-2.15E-01		5.27E-01
	591.76	4.95	1.59E-02		9.80E-01
	692.42	1.78	6.42E-01		2.70E+00
	723.30	20.06	1.43E-01		2.29E-01
	756.80	4.52	5.23E-01		1.10E+00
	873.18	12.08	-1.80E-01		3.53E-01

Analysis Report for 09-Jul-19-10017

L1-10221D-FIGS-006SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	2.91E-01	1.08E-01	5.43E-01
	1004.76	18.01	1.83E-01		2.97E-01
	1274.43	34.80	-7.69E-02		1.74E-01
	1596.48	1.80	-9.02E-01		2.50E+00
Eu-155	45.30	1.31	1.33E+01	2.47E-01	2.35E+01
	60.01	1.22	1.03E+01		2.60E+01
	86.55	30.70	2.08E-01		2.60E-01
	105.31	21.10	-5.60E-02		2.47E-01
Ra-226	186.21	3.64	1.44E+00	1.21E+00	1.21E+00
Pa-231	27.36	10.30	3.01E+00	1.71E+00	2.67E+00
	283.69	1.70	8.39E-01		2.32E+00
	300.07	2.47	-1.34E+00		1.71E+00
	302.65	2.20	-8.53E-01		1.83E+00
	330.06	1.40	5.25E-01		2.87E+00
U-235	143.76	10.96	-1.22E-02	7.69E-02	3.78E-01
	163.33	5.08	6.60E-01		8.04E-01
	185.71	57.20	1.23E-01		7.69E-02
	202.11	1.08	7.07E-02		3.75E+00
	205.31	5.01	-4.37E-01		8.15E-01
Am-241	59.54	35.90	1.93E-01	9.06E-01	9.06E-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 09-Jul-19-10018  
L1-10221D-FIGS-007SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 09-Jul-19-10018  
Sample Description : L1-10221D-FIGS-007SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.105E+03 grams  
Facility : Default  
  
Sample Taken On : 7/8/2019 12:34:00PM  
Acquisition Started : 7/9/2019 9:30:07AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : 324  
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 - 4096  
Peak Area Range (in channels) : 120 - 4096  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 9/29/2018  
Efficiency Calibration Used Done On : 7/9/2019  
Efficiency Calibration Description :  
  
Sample Number : 77826  
Fill Height : 1105.12 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/30/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/9/2019 9:45:09AM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 4096

*gmk*  
Data Validated  
1500 7/30/19



Analysis Report for 09-Jul-19-10018

L1-10221D-FIGS-007SS

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	477.50	1.89E+02	22.31	1.44E+02	1.12
2	295.16	585 -	595	590.38	8.46E+01	17.69	9.54E+01	1.29
3	351.92	700 -	708	703.79	1.48E+02	15.12	3.78E+01	1.49
4	477.64	949 -	960	955.01	1.47E+02	15.96	4.31E+01	1.00
5	609.22	1214 -	1223	1218.03	9.35E+01	12.49	2.75E+01	1.55
6	661.68	1317 -	1328	1322.90	4.21E+02	21.76	2.10E+01	1.79
7	911.39	1815 -	1826	1822.22	5.49E+01	10.24	2.01E+01	1.80
8	1173.24	2340 -	2352	2346.08	3.76E+01	10.14	2.44E+01	1.00
9	1332.48	2657 -	2670	2664.77	6.38E+01	9.87	1.22E+01	2.13
10	1460.82	2914 -	2928	2921.69	3.59E+02	19.23	3.66E+00	2.16

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
BE-7	1.00	477.60 *	10.44	1.51E+00	1.96E-01
K-40	1.00	1460.82 *	10.66	7.60E+00	5.24E-01
Co-60	1.00	1173.23 *	99.85	7.28E-02	1.98E-02
		1332.49 *	99.98	1.34E-01	2.14E-02
Cs-137	1.00	661.66 *	85.10	6.53E-01	5.17E-02
Pb-212	1.00	115.18 *	0.60		
		238.63 *	43.60	2.88E-01	4.12E-02 <sup>[305]</sup>

Analysis Report for 09-Jul-19-10018

L1-10221D-FIGS-007SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Pb-212	1.00	300.09	3.30		
Bi-214	0.99	609.32 *	45.49	2.57E-01	3.76E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	1.00	241.99	7.25		
		295.22 *	18.42	3.46E-01	7.75E-02
		351.93 *	35.60	3.56E-01	4.62E-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	3.48E-01	6.67E-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

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**INTERFERENCE CORRECTED REPORT**

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Analysis Report for 09-Jul-19-10018

L1-10221D-FIGS-007SS

<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
BE-7	1.000	1.51E+00	1.96E-01	
K-40	1.000	7.60E+00	5.24E-01	
Co-60	1.000	1.01E-01	1.46E-02	
Cs-137	1.000	6.53E-01	5.17E-02	
X Bi-211	0.890			
Pb-212	1.000	2.88E-01	4.12E-02	
Bi-214	0.999	2.57E-01	3.76E-02	
Pb-214	1.000	3.53E-01	3.97E-02	
Ac-228	0.998	3.48E-01	6.67E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 1.000sigma

Analysis Report for 09-Jul-19-10018  
L1-10221D-FIGS-007SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/9/2019 9:45:09AM  
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	9.93E-02	6.58E-02	6.58E-02
+	BE-7	477.60	* 10.44	1.51E+00	3.92E-01	3.92E-01
+	K-40	1460.82	* 10.66	7.60E+00	2.92E-01	2.92E-01
	Mn-54	834.85	99.98	3.36E-02	5.30E-02	5.30E-02
+	Co-60	1173.23	* 99.85	7.28E-02	4.74E-02	5.86E-02
		1332.49	* 99.98	1.34E-01		4.74E-02
	Nb-94	702.65	99.81	-9.81E-03	4.36E-02	4.36E-02
		871.09	99.89	-4.25E-03		4.69E-02
	Ag-108m	79.13	6.60	8.64E-01	4.96E-02	1.39E+00
		433.94	90.50	1.03E-02		4.96E-02
		614.28	89.80	-3.21E-02		6.69E-02
		722.94	90.80	1.76E-02		5.83E-02
	Sb-125	176.31	6.84	2.27E-01	1.44E-01	6.26E-01
		380.45	1.52	3.72E-01		2.83E+00
		427.87	29.60	-3.27E-04		1.44E-01
		463.36	10.49	2.13E-01		4.77E-01
		600.60	17.65	-1.16E-01		2.27E-01
		606.71	4.98	-8.06E-01		1.50E+00
		635.95	11.22	4.30E-02		4.44E-01

Analysis Report for 09-Jul-19-10018

L1-10221D-FIGS-007SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	1.30E-01	1.44E-01	2.33E+00
Ba-133	79.61	2.65	6.56E-02	8.73E-02	3.18E+00
	81.00	32.90	-3.54E-01		2.11E-01
	276.40	7.16	7.51E-02		5.59E-01
	302.85	18.34	5.01E-02		2.24E-01
	356.01	62.05	-5.87E-02		8.73E-02
	383.85	8.94	-2.44E-01		4.63E-01
Cs-134	475.36	1.48	-3.62E-01	6.31E-02	5.09E+00
	563.25	8.34	1.05E-01		5.33E-01
	569.33	15.37	5.31E-03		2.83E-01
	604.72	97.62	-5.95E-02		6.47E-02
	795.86	85.46	4.32E-02		6.31E-02
	801.95	8.69	-2.76E-01		5.04E-01
	1038.61	0.99	-1.85E+00		5.41E+00
	1167.97	1.79	-8.59E-02		4.14E+00
	1365.19	3.02	3.08E-01		1.69E+00
+ Cs-137	661.66	* 85.10	6.53E-01	4.26E-02	4.26E-02
Eu-152	121.78	28.67	3.29E-02	1.37E-01	1.37E-01
	244.70	7.61	-2.10E-01		5.50E-01
	295.94	0.45	-1.05E+00		1.18E+01
	344.28	26.60	-1.21E-01		1.49E-01
	367.79	0.86	-1.65E+00		4.66E+00
	411.12	2.24	-1.96E+00		1.68E+00
	443.96	2.83	-6.76E-01		1.43E+00
	488.68	0.42	-3.10E+00		1.11E+01
	563.99	0.49	9.64E-01		9.13E+00
	586.26	0.46	1.62E+01		1.42E+01
	678.62	0.47	5.61E-01		9.00E+00
	688.67	0.86	-1.41E+00		5.00E+00
	719.35	0.28	1.88E+00		1.86E+01
	778.90	12.96	1.21E-01		3.81E-01
	810.45	0.32	2.69E+00		1.31E+01
	867.37	4.26	-4.04E-01		1.13E+00
	919.33	0.43	1.99E-01		1.32E+01
	964.08	14.65	-3.54E-01		4.31E-01
	1085.87	10.24	2.90E-02		5.89E-01
	1089.74	1.73	2.34E-01		3.41E+00
	1112.07	13.69	1.79E-01		4.53E-01
	1212.95	1.43	-1.52E+00		4.33E+00
	1249.94	0.19	9.95E+00		3.38E+01
	1299.14	1.63	1.24E+00		3.23E+00
	1408.01	21.07	1.15E-01		2.89E-01
	1457.64	0.50	-3.36E+00		4.24E+01
	1528.10	0.28	-6.21E-01		1.43E+01
Eu-154	123.07	40.40	2.57E-02	9.74E-02	9.74E-02
	247.93	6.89	1.55E-01		5.71E-01
	591.76	4.95	-1.98E-01		9.02E-01
	692.42	1.78	7.56E-01		2.63E+00
	723.30	20.06	5.18E-02		2.68E-01
	756.80	4.52	-6.05E-02		8.42E-01
	873.18	12.08	-2.95E-02		3.89E-01

Analysis Report for 09-Jul-19-10018

L1-10221D-FIGS-007SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	2.74E-01	9.74E-02	4.61E-01
	1004.76	18.01	-1.41E-01		2.25E-01
	1274.43	34.80	1.30E-01		1.90E-01
	1596.48	1.80	-8.35E-01		2.09E+00
Eu-155	45.30	1.31	-3.00E+00	2.10E-01	1.24E+01
	60.01	1.22	-1.96E-01		1.43E+01
	86.55	30.70	-2.84E-02		2.10E-01
	105.31	21.10	-1.69E-02		2.11E-01
Ra-226	186.21	3.64	7.17E-01	1.24E+00	1.24E+00
Pa-231	27.36	10.30	1.03E+00	1.30E+00	1.30E+00
	283.69	1.70	-1.11E+00		2.10E+00
	300.07	2.47	5.77E-01		1.72E+00
	302.65	2.20	4.17E-01		1.87E+00
	330.06	1.40	5.32E-01		3.13E+00
U-235	143.76	10.96	5.09E-02	7.81E-02	3.41E-01
	163.33	5.08	4.54E-01		8.54E-01
	185.71	57.20	3.44E-02		7.81E-02
	202.11	1.08	-1.47E+00		3.84E+00
	205.31	5.01	-1.96E-01		8.54E-01
Am-241	59.54	35.90	1.27E-02	5.00E-01	5.00E-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 09-Jul-19-10019  
L1-10221D-FIGS-008SS

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## GAMMA SPECTRUM ANALYSIS

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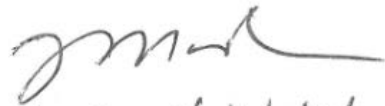
Sample Identification : 09-Jul-19-10019  
Sample Description : L1-10221D-FIGS-008SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.118E+03 grams  
Facility : Default  
  
Sample Taken On : 7/8/2019 12:36:00PM  
Acquisition Started : 7/9/2019 9:30:13AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P40818B  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 901.6 seconds  
  
Dead Time : 0.18 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/29/2019  
Efficiency Calibration Used Done On : 7/9/2019  
Efficiency Calibration Description :  
  
Sample Number : 77827  
Fill Height : 1118.31 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/30/2012 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/9/2019 9:45:17AM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 8192

  
Data Validated  
1500 7/31/19

Analysis Report for 09-Jul-19-10019

L1-10221D-FIGS-008SS

	<b>Peak No.</b>	<b>Energy (keV)</b>	<b>ROI start</b>	<b>ROI end</b>	<b>Peak Centroid</b>	<b>Net Peak Area</b>	<b>Net Area Uncertainty</b>	<b>Continuum Counts</b>	<b>FWHM (keV)</b>
	1	186.18	741 -	749	744.99	2.02E+01	12.73	6.58E+01	0.76
M	2	238.57	947 -	974	954.38	1.92E+02	15.01	6.54E+01	0.97
m	3	241.76	947 -	974	967.13	6.05E+01	9.60	5.91E+01	0.97
	4	295.12	1171 -	1186	1180.38	6.82E+01	14.95	5.18E+01	0.65
	5	351.79	1400 -	1416	1406.90	1.04E+02	14.36	3.29E+01	0.46
	6	477.33	1904 -	1916	1908.75	1.38E+02	13.71	1.88E+01	1.23
	7	582.86	2323 -	2338	2330.64	6.98E+01	11.45	2.02E+01	1.30
	8	608.96	2427 -	2441	2435.03	1.07E+02	11.32	7.46E+00	1.36
	9	661.31	2636 -	2652	2644.34	1.93E+02	15.87	1.89E+01	1.32
	10	910.62	3634 -	3649	3641.43	5.50E+01	8.54	5.98E+00	0.94
	11	1460.09	5829 -	5851	5840.19	2.59E+02	16.71	5.47E+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

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
BE-7	0.98	477.60 *	10.44	1.83E+00	2.24E-01
K-40	0.91	1460.82 *	10.66	7.26E+00	5.66E-01
Cs-137	0.98	661.66 *	85.10	3.90E-01	3.97E-02
Tl-208	0.98	583.19 *	85.00	1.29E-01	2.26E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	3.74E-01	4.21E-02 <sup>[312]</sup>



Analysis Report for 09-Jul-19-10019

L1-10221D-FIGS-008SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Pb-212	0.99	300.09	3.30		
Bi-214	0.99	609.32 *	45.49	3.80E-01	4.64E-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	7.14E-01	1.27E-01
		295.22 *	18.42	3.56E-01	8.31E-02
		351.93 *	35.60	3.20E-01	5.11E-02
		785.96	1.06		
Ra-226	1.00	186.21 *	3.64	4.20E-01	2.67E-01
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	4.58E-01	7.39E-02
		964.77	4.99		
		968.97	15.80		
		1588.20	3.22		
U-235	0.97	143.76	10.96		
		163.33	5.08		
		185.71 *	57.20	2.67E-02	1.70E-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 09-Jul-19-10019

L1-10221D-FIGS-008SS

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## INTERFERENCE CORRECTED REPORT

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<i><b>Nuclide Name</b></i>	<i><b>Nuclide Id Confidence</b></i>	<i><b>Wt mean Activity (pCi/grams)</b></i>	<i><b>Wt mean Activity Uncertainty</b></i>	<i><b>Comments</b></i>	
	BE-7	0.988	1.83E+00	2.24E-01	
	K-40	0.918	7.26E+00	5.66E-01	
	Cs-137	0.981	3.90E-01	3.97E-02	
	Tl-208	0.983	1.29E-01	2.26E-02	
X	Bi-211	0.920			
	Pb-212	0.999	3.74E-01	4.21E-02	
	Bi-214	0.992	3.80E-01	4.64E-02	
	Pb-214	0.997	3.70E-01	4.12E-02	
?	Ra-226	1.000	4.20E-01	2.67E-01	
	Ac-228	0.983	4.58E-01	7.39E-02	
?	U-235	0.976	2.67E-02	1.70E-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

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Analysis Report for 09-Jul-19-10019  
L1-10221D-FIGS-008SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/9/2019 9:45:17AM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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	8.43E-02	7.59E-02	7.59E-02
+	BE-7	477.60	* 10.44	1.83E+00	3.56E-01	3.56E-01
+	K-40	1460.82	* 10.66	7.26E+00	5.13E-01	5.13E-01
	Mn-54	834.85	99.98	1.15E-03	6.40E-02	6.40E-02
	Co-60	1173.23	99.85	-2.53E-02	9.68E-02	9.68E-02
		1332.49	99.98	1.28E-01		1.05E-01
	Nb-94	702.65	99.81	4.80E-02	5.76E-02	5.76E-02
		871.09	99.89	5.65E-03		6.06E-02
	Ag-108m	79.13	6.60	8.08E-01	5.83E-02	2.39E+00
		433.94	90.50	2.02E-02		5.83E-02
		614.28	89.80	-1.13E-01		7.16E-02
		722.94	90.80	5.23E-04		7.41E-02
	Sb-125	176.31	6.84	-4.91E-01	1.78E-01	6.91E-01
		380.45	1.52	-1.27E+00		3.29E+00
		427.87	29.60	3.45E-02		1.78E-01
		463.36	10.49	3.47E-01		6.02E-01
		600.60	17.65	1.19E-01		3.26E-01
		606.71	4.98	2.98E+00		1.90E+00
		635.95	11.22	-9.65E-02		4.41E-01

Analysis Report for 09-Jul-19-10019

L1-10221D-FIGS-008SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	5.93E-01	1.78E-01	3.22E+00
Ba-133	79.61	2.65	1.57E+00	9.10E-02	5.69E+00
	81.00	32.90	-6.38E-01		3.85E-01
	276.40	7.16	-2.01E-01		6.57E-01
	302.85	18.34	-1.96E-01		2.53E-01
	356.01	62.05	-3.39E-02		9.10E-02
	383.85	8.94	-5.25E-02		6.13E-01
Cs-134	475.36	1.48	1.61E+01	6.77E-02	6.51E+00
	563.25	8.34	7.86E-02		6.53E-01
	569.33	15.37	-4.80E-02		3.57E-01
	604.72	97.62	-3.97E-02		9.28E-02
	795.86	85.46	4.86E-02		6.77E-02
	801.95	8.69	-2.45E-01		5.97E-01
	1038.61	0.99	-1.24E+00		6.72E+00
	1167.97	1.79	3.31E+00		5.70E+00
	1365.19	3.02	2.76E-01		1.47E+00
+ Cs-137	661.66	* 85.10	3.90E-01	5.83E-02	5.83E-02
Eu-152	121.78	28.67	-2.72E-02	1.82E-01	1.94E-01
	244.70	7.61	-1.74E-01		7.70E-01
	295.94	0.45	3.41E+00		1.39E+01
	344.28	26.60	-1.28E-01		1.82E-01
	367.79	0.86	-1.22E+00		5.42E+00
	411.12	2.24	-7.15E-01		2.41E+00
	443.96	2.83	-1.43E-01		1.80E+00
	488.68	0.42	2.47E+00		1.19E+01
	563.99	0.49	2.66E+00		1.11E+01
	586.26	0.46	1.98E+00		1.87E+01
	678.62	0.47	4.72E+00		1.23E+01
	688.67	0.86	-8.23E-01		6.43E+00
	719.35	0.28	8.54E+00		2.14E+01
	778.90	12.96	-2.38E-01		4.33E-01
	810.45	0.32	-2.26E+00		1.68E+01
	867.37	4.26	-8.33E-01		1.31E+00
	919.33	0.43	8.13E+00		1.43E+01
	964.08	14.65	4.29E-01		6.52E-01
	1085.87	10.24	2.47E-01		7.78E-01
	1089.74	1.73	1.08E+00		4.50E+00
	1112.07	13.69	-3.24E-01		5.17E-01
	1212.95	1.43	-7.00E-01		5.73E+00
	1249.94	0.19	-1.31E+01		4.06E+01
	1299.14	1.63	3.37E+00		4.10E+00
	1408.01	21.07	-3.07E-02		3.05E-01
	1457.64	0.50	1.46E+02		4.84E+01
	1528.10	0.28	5.38E+00		1.90E+01
Eu-154	123.07	40.40	7.67E-02	1.41E-01	1.41E-01
	247.93	6.89	-3.51E-01		6.47E-01
	591.76	4.95	3.32E-01		1.16E+00
	692.42	1.78	2.35E+00		3.47E+00
	723.30	20.06	2.12E-01		3.48E-01
	756.80	4.52	9.75E-01		1.37E+00
	873.18	12.08	8.01E-02		5.17E-01

Analysis Report for 09-Jul-19-10019

L1-10221D-FIGS-008SS

	<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
	Eu-154	996.29	10.48	5.67E-01	1.41E-01	7.00E-01
		1004.76	18.01	2.37E-01		4.04E-01
		1274.43	34.80	-6.81E-02		2.13E-01
		1596.48	1.80	-2.52E+00		3.36E+00
	Eu-155	45.30	1.31	7.66E+00	3.34E-01	3.71E+01
		60.01	1.22	-2.63E+01		3.61E+01
		86.55	30.70	-2.64E-02		3.58E-01
		105.31	21.10	1.71E-03		3.34E-01
+	Ra-226	186.21	*	3.64	4.20E-01	8.99E-01
	Pa-231	27.36	10.30	1.61E+00	2.01E+00	4.17E+00
		283.69	1.70	-5.66E-02		3.00E+00
		300.07	2.47	5.49E-01		2.01E+00
		302.65	2.20	-7.62E-01		2.18E+00
		330.06	1.40	1.68E+00		4.04E+00
+	U-235	143.76	10.96	-3.15E-01	5.72E-02	4.80E-01
		163.33	5.08	-3.33E-01		9.68E-01
		185.71	*	57.20	2.67E-02	5.72E-02
		202.11	1.08	9.30E-01		4.53E+00
		205.31	5.01	-1.94E+00		9.23E-01
	Am-241	59.54	35.90	1.92E-01	1.30E+00	1.30E+00

+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = 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 09-Jul-19-10020  
L1-10221D-FIGS-009SS

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## GAMMA SPECTRUM ANALYSIS

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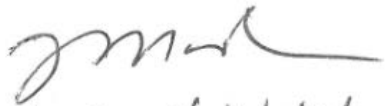
Sample Identification : 09-Jul-19-10020  
Sample Description : L1-10221D-FIGS-009SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.502E+03 grams  
Facility : Default  
  
Sample Taken On : 7/8/2019 12:38:00PM  
Acquisition Started : 7/9/2019 9:30:19AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P11314  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.3 seconds  
  
Dead Time : 0.03 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/24/2019  
Efficiency Calibration Used Done On : 7/9/2019  
Efficiency Calibration Description :  
  
Sample Number : 77828  
Fill Height : 1502.23 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 12/22/2008 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/9/2019 9:45:38AM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 8192

  
Data Validated  
1500 7/31/19

Analysis Report for 09-Jul-19-10020

L1-10221D-FIGS-009SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.50	306 -	315	310.54	5.45E+01	14.27	6.55E+01	0.63
2	238.79	948 -	961	954.73	1.37E+02	19.38	8.38E+01	1.34
3	295.27	1175 -	1189	1180.38	6.61E+01	12.33	2.89E+01	0.86
4	338.49	1347 -	1358	1353.02	2.46E+01	8.98	2.24E+01	0.50
5	351.90	1399 -	1414	1406.60	1.01E+02	14.05	3.20E+01	0.41
6	609.20	2427 -	2443	2434.85	6.30E+01	10.78	1.70E+01	1.66
7	661.72	2639 -	2653	2644.79	7.29E+01	12.29	2.71E+01	1.03
8	910.97	3634 -	3649	3641.33	3.29E+01	7.98	1.01E+01	0.33
9	968.80	3867 -	3877	3872.62	1.78E+01	6.12	8.25E+00	0.77
10	1460.28	5830 -	5852	5839.05	3.15E+02	18.41	7.07E+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	0.95	1460.82 *	10.66	7.10E+00	5.17E-01
Cs-137	0.99	661.66 *	85.10	1.20E-01	2.15E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	2.19E-01	3.56E-02
		300.09	3.30		
Pb212-XR	0.98	74.82	10.28		
		77.11 *	17.10	3.81E-01	1.07E-01 <sup>[319]</sup>

Analysis Report for 09-Jul-19-10020

L1-10221D-FIGS-009SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Pb212-XR	0.98	87.35	3.97		
		89.78	1.46		
Bi-214	0.99	609.32 *	45.49	1.83E-01	3.33E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	1.00	241.99	7.25		
		295.22 *	18.42	2.84E-01	5.75E-02
		351.93 *	35.60	2.55E-01	4.10E-02
		785.96	1.06		
Pb214-XR	0.98	74.82	5.80		
		77.11 *	9.70	6.71E-01	1.91E-01
		87.35	2.24		
		89.78	0.82		
Ac-228	0.99	129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32 *	11.27	1.90E-01	7.14E-02
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	2.22E-01	5.47E-02
		964.77	4.99		
		968.97 *	15.80	2.04E-01	7.09E-02
		1588.20	3.22		

\* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma



Analysis Report for 09-Jul-19-10020

L1-10221D-FIGS-009SS

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## INTERFERENCE CORRECTED REPORT

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	<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
	K-40	0.954	7.10E+00	5.17E-01	
	Cs-137	0.999	1.20E-01	2.15E-02	
X	Bi-211	0.896			
	Pb-212	0.996	2.19E-01	3.56E-02	
?	Pb212-XR	0.987	3.81E-01	1.07E-01	
	Bi-214	0.999	1.83E-01	3.33E-02	
	Pb-214	1.000	2.65E-01	3.34E-02	
?	Pb214-XR	0.987	6.71E-01	1.91E-01	
	Ac-228	0.996	2.09E-01	3.70E-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

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Analysis Report for 09-Jul-19-10020  
L1-10221D-FIGS-009SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/9/2019 9:45:38AM  
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	7.52E-02	5.85E-02	5.85E-02
	BE-7	477.60	10.44	1.84E-01	4.50E-01	4.50E-01
+	K-40	1460.82	* 10.66	7.10E+00	4.40E-01	4.40E-01
	Mn-54	834.85	99.98	1.74E-02	5.20E-02	5.20E-02
	Co-60	1173.23	99.85	2.15E-03	6.62E-02	6.62E-02
		1332.49	99.98	3.10E-02		6.82E-02
	Nb-94	702.65	99.81	-3.13E-03	4.13E-02	4.13E-02
		871.09	99.89	3.00E-02		4.77E-02
	Ag-108m	79.13	6.60	-2.53E-01	3.92E-02	1.15E+00
		433.94	90.50	-2.33E-02		3.92E-02
		614.28	89.80	-4.58E-03		5.98E-02
		722.94	90.80	-6.62E-03		5.50E-02
	Sb-125	176.31	6.84	1.40E-01	1.15E-01	4.57E-01
		380.45	1.52	8.95E-01		2.31E+00
		427.87	29.60	-2.20E-02		1.15E-01
		463.36	10.49	2.83E-02		4.05E-01
		600.60	17.65	-1.68E-01		2.38E-01
		606.71	4.98	-2.98E-01		1.35E+00
		635.95	11.22	2.63E-02		3.85E-01

Analysis Report for 09-Jul-19-10020

L1-10221D-FIGS-009SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-2.35E+00	1.15E-01	1.54E+00
Ba-133	79.61	2.65	-5.32E-01	7.00E-02	2.80E+00
	81.00	32.90	-2.01E-01		1.70E-01
	276.40	7.16	1.05E-01		4.50E-01
	302.85	18.34	-9.49E-02		1.97E-01
	356.01	62.05	-3.74E-02		7.00E-02
	383.85	8.94	1.16E-01		3.87E-01
Cs-134	475.36	1.48	1.09E+00	5.42E-02	3.18E+00
	563.25	8.34	-2.33E-01		4.83E-01
	569.33	15.37	-1.68E-02		2.73E-01
	604.72	97.62	-1.03E-02		6.00E-02
	795.86	85.46	2.02E-02		5.42E-02
	801.95	8.69	4.02E-02		4.47E-01
	1038.61	0.99	-7.38E-01		4.98E+00
	1167.97	1.79	8.46E-02		3.73E+00
	1365.19	3.02	-1.68E-01		1.72E+00
+ Cs-137	661.66	* 85.10	1.20E-01	5.41E-02	5.41E-02
Eu-152	121.78	28.67	-2.18E-02	1.18E-01	1.25E-01
	244.70	7.61	4.06E-01		5.47E-01
	295.94	0.45	1.16E+01		9.98E+00
	344.28	26.60	-1.07E-01		1.18E-01
	367.79	0.86	-1.54E+00		3.58E+00
	411.12	2.24	-5.43E-01		1.58E+00
	443.96	2.83	-7.07E-01		1.38E+00
	488.68	0.42	3.26E-01		9.08E+00
	563.99	0.49	-9.59E+00		7.56E+00
	586.26	0.46	1.76E+01		1.34E+01
	678.62	0.47	2.43E+00		7.18E+00
	688.67	0.86	-3.91E-01		4.17E+00
	719.35	0.28	-4.38E+00		1.48E+01
	778.90	12.96	-1.06E-01		3.06E-01
	810.45	0.32	3.25E+00		1.24E+01
	867.37	4.26	2.57E-01		1.10E+00
	919.33	0.43	-7.68E+00		8.79E+00
	964.08	14.65	-4.94E-02		4.91E-01
	1085.87	10.24	4.78E-02		5.23E-01
	1089.74	1.73	-5.22E-01		3.05E+00
	1112.07	13.69	5.31E-02		3.97E-01
	1212.95	1.43	-1.64E-01		4.24E+00
	1249.94	0.19	-1.12E+01		2.88E+01
	1299.14	1.63	1.72E+00		3.23E+00
	1408.01	21.07	-3.70E-02		2.16E-01
	1457.64	0.50	1.52E+02		4.28E+01
	1528.10	0.28	3.53E+00		1.10E+01
Eu-154	123.07	40.40	3.55E-02	9.04E-02	9.04E-02
	247.93	6.89	-3.38E-01		4.52E-01
	591.76	4.95	-4.44E-01		8.41E-01
	692.42	1.78	6.29E-01		2.26E+00
	723.30	20.06	1.52E-01		2.55E-01
	756.80	4.52	3.50E-02		8.78E-01
	873.18	12.08	2.20E-01		4.26E-01

Analysis Report for 09-Jul-19-10020

L1-10221D-FIGS-009SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	-1.60E-01	9.04E-02	4.91E-01
	1004.76	18.01	1.59E-01		3.10E-01
	1274.43	34.80	-1.52E-01		1.52E-01
	1596.48	1.80	5.74E-01		1.79E+00
Eu-155	45.30	1.31	-2.08E+00	1.83E-01	1.17E+01
	60.01	1.22	5.33E-01		1.29E+01
	86.55	30.70	6.32E-02		1.83E-01
Ra-226	105.31	21.10	6.35E-02		2.06E-01
Ra-226	186.21	3.64	7.35E-01	1.01E+00	1.01E+00
Pa-231	27.36	10.30	-3.07E-01	1.13E+00	1.13E+00
	283.69	1.70	-1.22E+00		1.74E+00
	300.07	2.47	-7.48E-02		1.47E+00
	302.65	2.20	5.37E-01		1.68E+00
	330.06	1.40	-1.47E+00		2.62E+00
U-235	143.76	10.96	2.09E-02	6.30E-02	3.02E-01
	163.33	5.08	9.61E-02		6.39E-01
	185.71	57.20	5.04E-02		6.30E-02
	202.11	1.08	7.74E-01		2.70E+00
	205.31	5.01	-6.46E-01		5.43E-01
Am-241	59.54	35.90	-6.92E-02	4.43E-01	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 10-Jul-19-10012  
L1-10221D-FIGS-010SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 10-Jul-19-10012  
Sample Description : L1-10221D-FIGS-010SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.178E+03 grams  
Facility : Default  
  
Sample Taken On : 7/9/2019 8:45:00AM  
Acquisition Started : 7/10/2019 1:27:53PM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P11314  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.5 seconds  
  
Dead Time : 0.06 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/24/2019  
Efficiency Calibration Used Done On : 7/10/2019  
Efficiency Calibration Description :  
  
Sample Number : 77864  
Fill Height : 1178.39 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 12/22/2008 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/10/2019 1:43:08PM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 8192

*J. Mad*  
Data Validated  
1530 7/30/19

Analysis Report for 10-Jul-19-10012

L1-10221D-FIGS-010SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.33	306 -	315	309.84	7.47E+01	21.43	1.69E+02	0.79
2	238.83	949 -	960	954.88	2.32E+02	24.67	1.50E+02	1.05
3	295.42	1175 -	1187	1180.97	8.85E+01	18.57	9.75E+01	0.60
4	352.08	1398 -	1413	1407.32	1.68E+02	21.88	1.03E+02	1.57
5	583.21	2324 -	2340	2330.96	8.90E+01	16.82	6.20E+01	1.48
6	609.24	2427 -	2442	2435.01	9.73E+01	15.51	4.77E+01	0.82
7	661.62	2633 -	2655	2644.36	2.23E+03	48.57	3.43E+01	1.29
8	910.98	3634 -	3647	3641.38	5.25E+01	11.80	3.15E+01	1.18
9	1173.01	4679 -	4701	4689.49	5.48E+02	26.41	3.91E+01	1.74
10	1332.12	5313 -	5338	5326.13	5.04E+02	23.36	9.75E+00	1.74
11	1460.33	5826 -	5852	5839.25	4.36E+02	21.90	1.01E+01	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	0.96	1460.82	*	10.66	1.07E+01	7.14E-01
Co-60	0.98	1173.23	*	99.85	1.23E+00	7.71E-02
		1332.49	*	99.98	1.23E+00	7.54E-02
Cs-137	1.00	661.66	*	85.10	3.97E+00	2.53E-01
Tl-208	1.00	583.19	*	85.00	1.45E-01	2.88E-02
Pb-212	0.99	115.18		0.60		

[326]

Analysis Report for 10-Jul-19-10012

L1-10221D-FIGS-010SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Pb-212	0.99	238.63 *	43.60	3.94E-01	5.26E-02
		300.09	3.30		
Pb212-XR	0.99	74.82	10.28		
		77.11 *	17.10	5.45E-01	1.66E-01
		87.35	3.97		
		89.78	1.46		
Bi-214	1.00	609.32 *	45.49	3.06E-01	5.21E-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	4.06E-01	9.12E-02
		351.93 *	35.60	4.55E-01	6.96E-02
		785.96	1.06		
Pb214-XR	0.99	74.82	5.80		
		77.11 *	9.70	9.61E-01	2.96E-01
		87.35	2.24		
		89.78	0.82		
Ac-228	0.99	129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32	11.27		
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	3.85E-01	8.82E-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

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Analysis Report for 10-Jul-19-10012  
L1-10221D-FIGS-010SS

## INTERFERENCE CORRECTED REPORT

<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	0.962	1.07E+01	7.14E-01	
Co-60	0.985	1.23E+00	5.39E-02	
Cs-137	1.000	3.97E+00	2.53E-01	
Tl-208	1.000	1.45E-01	2.88E-02	
Pb-212	0.994	3.94E-01	5.26E-02	
? Pb212-XR	0.996	5.45E-01	1.66E-01	
Bi-214	1.000	3.06E-01	5.21E-02	
Pb-214	0.996	4.37E-01	5.53E-02	
? Pb214-XR	0.996	9.61E-01	2.96E-01	
Ac-228	0.998	3.85E-01	8.82E-02	

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

Errors quoted at 1.000sigma



Analysis Report for 10-Jul-19-10012  
L1-10221D-FIGS-010SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/10/2019 1:43:08PM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

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

## NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	1.36E-01	9.50E-02	9.50E-02
	BE-7	477.60	10.44	1.12E+00	1.01E+00	1.01E+00
+	K-40	1460.82	* 10.66	1.07E+01	6.25E-01	6.25E-01
	Mn-54	834.85	99.98	-2.19E-02	7.92E-02	7.92E-02
+	Co-60	1173.23	* 99.85	1.23E+00	6.04E-02	9.97E-02
		1332.49	* 99.98	1.23E+00		6.04E-02
	Nb-94	702.65	99.81	6.38E-02	7.62E-02	7.62E-02
		871.09	99.89	2.61E-02		9.01E-02
	Ag-108m	79.13	6.60	2.04E-02	8.93E-02	1.79E+00
		433.94	90.50	-1.56E-01		9.35E-02
		614.28	89.80	-1.90E-02		9.96E-02
		722.94	90.80	3.50E-02		8.93E-02
	Sb-125	176.31	6.84	-4.70E-01	2.90E-01	7.81E-01
		380.45	1.52	4.16E+00		5.02E+00
		427.87	29.60	8.92E-02		2.90E-01
		463.36	10.49	8.01E-01		9.08E-01
		600.60	17.65	-1.63E-01		4.25E-01
		606.71	4.98	2.70E+00		2.11E+00
		635.95	11.22	1.90E-01		7.20E-01

Analysis Report for 10-Jul-19-10012

L1-10221D-FIGS-010SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-2.13E+00	2.90E-01	4.16E+00
Ba-133	79.61	2.65	-8.77E-01	1.36E-01	4.37E+00
	81.00	32.90	-1.92E-01		2.99E-01
	276.40	7.16	2.40E-01		8.95E-01
	302.85	18.34	2.29E-01		3.89E-01
	356.01	62.05	-5.72E-02		1.36E-01
	383.85	8.94	-9.07E-01		7.89E-01
Cs-134	475.36	1.48	2.81E+00	9.49E-02	6.94E+00
	563.25	8.34	-2.43E-01		9.42E-01
	569.33	15.37	-2.62E-01		4.92E-01
	604.72	97.62	1.91E-03		9.99E-02
	795.86	85.46	-1.60E-02		9.49E-02
	801.95	8.69	6.40E-02		9.39E-01
	1038.61	0.99	-4.99E-02		1.00E+01
	1167.97	1.79	-6.65E+00		1.42E+01
	1365.19	3.02	-5.49E-01		1.92E+00
+ Cs-137	661.66	* 85.10	3.97E+00	7.46E-02	7.46E-02
Eu-152	121.78	28.67	-5.05E-03	1.99E-01	1.99E-01
	244.70	7.61	-1.36E-01		9.27E-01
	295.94	0.45	9.45E+00		1.66E+01
	344.28	26.60	1.68E-01		2.61E-01
	367.79	0.86	-4.43E+00		8.12E+00
	411.12	2.24	1.98E+00		3.78E+00
	443.96	2.83	-3.25E+00		3.12E+00
	488.68	0.42	6.77E+00		1.92E+01
	563.99	0.49	-2.89E+00		1.57E+01
	586.26	0.46	6.10E+00		2.24E+01
	678.62	0.47	1.19E+01		1.64E+01
	688.67	0.86	-3.45E+00		7.43E+00
	719.35	0.28	-2.42E+01		2.67E+01
	778.90	12.96	3.05E-01		6.33E-01
	810.45	0.32	-5.89E+00		2.56E+01
	867.37	4.26	-1.33E+00		2.04E+00
	919.33	0.43	-1.05E+01		2.14E+01
	964.08	14.65	-3.98E-01		7.53E-01
	1085.87	10.24	-6.37E-01		9.86E-01
	1089.74	1.73	-2.82E-01		6.04E+00
	1112.07	13.69	3.99E-01		7.29E-01
	1212.95	1.43	-2.04E+00		6.79E+00
	1249.94	0.19	5.23E+00		4.43E+01
	1299.14	1.63	-3.04E+00		4.37E+00
	1408.01	21.07	1.65E-01		3.31E-01
	1457.64	0.50	2.23E+02		5.50E+01
	1528.10	0.28	4.29E+00		1.67E+01
Eu-154	123.07	40.40	-5.20E-02	1.38E-01	1.38E-01
	247.93	6.89	9.65E-02		9.34E-01
	591.76	4.95	1.33E-02		1.58E+00
	692.42	1.78	-3.85E+00		3.68E+00
	723.30	20.06	2.99E-01		4.07E-01
	756.80	4.52	-7.30E-01		1.54E+00
	873.18	12.08	-3.17E-01		8.08E-01

Analysis Report for 10-Jul-19-10012

L1-10221D-FIGS-010SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	-6.79E-01	1.38E-01	9.49E-01
	1004.76	18.01	7.44E-01		6.01E-01
	1274.43	34.80	-6.72E-02		2.34E-01
	1596.48	1.80	5.10E-01		3.55E+00
Eu-155	45.30	1.31	1.26E+01	2.88E-01	1.91E+01
	60.01	1.22	2.24E+00		2.02E+01
	86.55	30.70	-1.71E-01		2.88E-01
Ra-226	105.31	21.10	3.21E-03		3.17E-01
Ra-226	186.21	3.64	1.78E-01	1.67E+00	1.67E+00
Pa-231	27.36	10.30	2.63E+00	2.11E+00	2.11E+00
	283.69	1.70	2.11E+00		3.96E+00
	300.07	2.47	-1.09E+00		2.81E+00
	302.65	2.20	2.66E+00		3.26E+00
	330.06	1.40	-1.36E+00		5.26E+00
U-235	143.76	10.96	-1.88E-01	1.05E-01	5.23E-01
	163.33	5.08	4.48E-01		1.04E+00
	185.71	57.20	5.70E-03		1.05E-01
	202.11	1.08	3.92E+00		5.78E+00
	205.31	5.01	1.63E-01		1.23E+00
Am-241	59.54	35.90	2.37E-01	7.13E-01	7.13E-01

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

Analysis Report for 10-Jul-19-10013  
L1-10221D-FIGS-011SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 10-Jul-19-10013  
Sample Description : L1-10221D-FIGS-011SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.282E+03 grams  
Facility : Default  
  
Sample Taken On : 7/9/2019 8:47:00AM  
Acquisition Started : 7/10/2019 1:28:01PM  
  
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 : 7/10/2019  
Efficiency Calibration Description :  
  
Sample Number : 77865  
Fill Height : 1282.35 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/7/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/10/2019 1:43:08PM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 8192

*Jmad*  
Data Validated  
1530 7-10-19 [332]

Analysis Report for 10-Jul-19-10013

L1-10221D-FIGS-011SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.60	949 -	961	954.89	9.94E+01	14.82	4.56E+01	0.95
2	295.22	1177 -	1186	1181.09	2.49E+01	8.67	2.21E+01	0.59
3	351.81	1402 -	1416	1407.22	8.41E+01	11.23	1.49E+01	1.08
4	583.05	2325 -	2338	2331.53	3.32E+01	7.59	8.81E+00	0.81
5	609.31	2428 -	2442	2436.50	6.53E+01	8.72	3.75E+00	1.40
6	661.78	2640 -	2652	2646.30	2.34E+01	7.85	1.46E+01	0.74
7	910.97	3637 -	3649	3642.93	2.90E+01	5.39	0.00E+00	1.22
8	1460.70	5832 -	5852	5843.18	2.24E+02	17.03	1.83E+01	1.48

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	4.95E+00	4.34E-01
Cs-137	0.99	661.66 *	85.10	3.82E-02	1.30E-02
Tl-208	0.99	583.19 *	85.00	4.98E-02	1.18E-02
Bi-211	0.91	351.07 *	13.02	5.83E-01	9.09E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.62E-01	2.74E-02
		300.09	3.30		
Bi-214	1.00	609.32 *	45.49	1.88E-01	2.76E-02
		768.36	4.89		

[333]

Analysis Report for 10-Jul-19-10013

L1-10221D-FIGS-011SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Bi-214	1.00	806.18	1.26		
		934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
		Pb-214	0.99	241.99	7.25
295.22 *	18.42			1.08E-01	3.85E-02
351.93 *	35.60			2.13E-01	3.32E-02
Ac-228	0.99	785.96	1.06		
		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	1.93E-01	3.68E-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

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**INTERFERENCE CORRECTED REPORT**

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Analysis Report for 10-Jul-19-10013

L1-10221D-FIGS-011SS

<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	0.998	4.95E+00	4.34E-01	
Cs-137	0.998	3.82E-02	1.30E-02	
Tl-208	0.997	4.98E-02	1.18E-02	
Bi-211	0.917	2.88E-01	1.39E-01	
Pb-212	1.000	1.62E-01	2.74E-02	
Bi-214	1.000	1.88E-01	2.76E-02	
Pb-214	0.999	1.08E-01	3.85E-02	
Ac-228	0.997	1.93E-01	3.68E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 1.000sigma

Analysis Report for 10-Jul-19-10013  
L1-10221D-FIGS-011SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/10/2019 1:43:08PM  
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	6.30E-02	5.39E-02	5.39E-02
	BE-7	477.60	10.44	5.16E-01	4.44E-01	4.44E-01
+	K-40	1460.82	* 10.66	4.95E+00	6.75E-01	6.75E-01
	Mn-54	834.85	99.98	3.61E-02	5.00E-02	5.00E-02
	Co-60	1173.23	99.85	-4.11E-02	4.59E-02	5.04E-02
		1332.49	99.98	3.39E-03		4.59E-02
	Nb-94	702.65	99.81	1.08E-02	4.21E-02	4.21E-02
		871.09	99.89	-3.48E-02		4.55E-02
	Ag-108m	79.13	6.60	-3.53E-01	4.17E-02	1.42E+00
		433.94	90.50	1.11E-02		4.17E-02
		614.28	89.80	-4.54E-02		6.88E-02
		722.94	90.80	3.16E-02		5.50E-02
	Sb-125	176.31	6.84	-4.09E-01	1.20E-01	4.20E-01
		380.45	1.52	-2.00E+00		1.94E+00
		427.87	29.60	1.65E-02		1.20E-01
		463.36	10.49	2.89E-02		3.34E-01
		600.60	17.65	1.22E-01		2.36E-01
		606.71	4.98	1.75E+00		1.28E+00
		635.95	11.22	-1.86E-01		3.18E-01



Analysis Report for 10-Jul-19-10013

L1-10221D-FIGS-011SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-3.31E-01	1.20E-01	2.06E+00
Ba-133	79.61	2.65	-7.82E-02	6.88E-02	3.42E+00
	81.00	32.90	-7.06E-02		2.42E-01
	276.40	7.16	6.65E-02		4.65E-01
	302.85	18.34	5.28E-02		1.83E-01
	356.01	62.05	-9.32E-03		6.88E-02
	383.85	8.94	1.51E-01		3.57E-01
Cs-134	475.36	1.48	2.77E+00	4.84E-02	3.01E+00
	563.25	8.34	1.88E-01		4.91E-01
	569.33	15.37	-3.27E-02		2.62E-01
	604.72	97.62	5.62E-03		6.06E-02
	795.86	85.46	2.48E-02		4.84E-02
	801.95	8.69	-1.47E-01		5.21E-01
	1038.61	0.99	1.43E+00		4.50E+00
	1167.97	1.79	1.13E-01		2.92E+00
	1365.19	3.02	-3.16E-01		1.34E+00
+ Cs-137	661.66	* 85.10	3.82E-02	3.88E-02	3.88E-02
Eu-152	121.78	28.67	3.14E-02	1.15E-01	1.31E-01
	244.70	7.61	2.36E-02		4.98E-01
	295.94	0.45	5.78E+00		8.77E+00
	344.28	26.60	-1.07E-01		1.15E-01
	367.79	0.86	7.72E-03		3.67E+00
	411.12	2.24	-9.15E-01		1.56E+00
	443.96	2.83	-1.22E-01		1.17E+00
	488.68	0.42	4.21E+00		8.53E+00
	563.99	0.49	1.84E+00		8.24E+00
	586.26	0.46	8.69E+00		1.13E+01
	678.62	0.47	2.06E+00		7.73E+00
	688.67	0.86	1.18E+00		4.45E+00
	719.35	0.28	-6.74E+00		1.46E+01
	778.90	12.96	-2.26E-01		3.37E-01
	810.45	0.32	6.62E+00		1.44E+01
	867.37	4.26	-4.00E-01		1.06E+00
	919.33	0.43	-1.99E+00		9.14E+00
	964.08	14.65	1.97E-01		3.99E-01
	1085.87	10.24	-3.81E-01		4.37E-01
	1089.74	1.73	6.14E-01		2.94E+00
	1112.07	13.69	-3.78E-01		3.40E-01
	1212.95	1.43	-8.46E-01		4.93E+00
	1249.94	0.19	5.10E+00		2.89E+01
	1299.14	1.63	-3.18E+00		3.17E+00
	1408.01	21.07	-1.16E-01		1.97E-01
	1457.64	0.50	1.19E+02		3.72E+01
	1528.10	0.28	3.47E+00		1.08E+01
Eu-154	123.07	40.40	-9.34E-03	8.89E-02	8.89E-02
	247.93	6.89	-3.65E-02		4.79E-01
	591.76	4.95	-3.42E-01		8.33E-01
	692.42	1.78	-3.88E-02		2.31E+00
	723.30	20.06	2.28E-01		2.52E-01
	756.80	4.52	7.40E-01		1.10E+00
	873.18	12.08	2.45E-01		4.02E-01

Analysis Report for 10-Jul-19-10013  
L1-10221D-FIGS-011SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	1.82E-01	8.89E-02	4.59E-01
	1004.76	18.01	-4.95E-02		2.30E-01
	1274.43	34.80	4.73E-02		1.77E-01
	1596.48	1.80	3.48E-01		2.64E+00
Eu-155	45.30	1.31	-4.30E+00	1.93E-01	1.71E+01
	60.01	1.22	-7.06E+00		1.85E+01
	86.55	30.70	-7.73E-02		2.12E-01
	105.31	21.10	2.31E-03		1.93E-01
Ra-226	186.21	3.64	1.02E+00	1.02E+00	1.02E+00
Pa-231	27.36	10.30	1.05E+00	1.41E+00	2.20E+00
	283.69	1.70	-5.52E-01		1.88E+00
	300.07	2.47	-6.22E-01		1.41E+00
	302.65	2.20	7.62E-01		1.52E+00
	330.06	1.40	1.66E+00		2.58E+00
U-235	143.76	10.96	1.27E-01	6.41E-02	3.33E-01
	163.33	5.08	3.84E-01		6.23E-01
	185.71	57.20	2.65E-02		6.41E-02
	202.11	1.08	1.51E-01		3.24E+00
	205.31	5.01	-2.95E-01		6.29E-01
Am-241	59.54	35.90	-1.48E-01	6.44E-01	6.44E-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 10-Jul-19-10014  
L1-10221D-FIGS-012SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 10-Jul-19-10014  
Sample Description : L1-10221D-FIGS-012SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.427E+03 grams  
Facility : Default  
  
Sample Taken On : 7/9/2019 8:49:00AM  
Acquisition Started : 7/10/2019 1:51:01PM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P11314  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.3 seconds  
  
Dead Time : 0.03 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/24/2019  
Efficiency Calibration Used Done On : 7/10/2019  
Efficiency Calibration Description :  
  
Sample Number : 77867  
Fill Height : 1426.77 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 12/22/2008 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/10/2019 2:06:08PM

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

*J. Mad*  
Data Validated  
1530 7-10-19 [339]

Analysis Report for 10-Jul-19-10014

L1-10221D-FIGS-012SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.49	305 -	316	310.49	4.24E+01	17.05	9.66E+01	0.66
2	238.82	948 -	960	954.87	1.53E+02	17.11	5.34E+01	1.09
3	351.98	1403 -	1416	1406.93	1.07E+02	13.55	2.70E+01	0.89
4	609.33	2428 -	2442	2435.35	8.29E+01	10.71	1.11E+01	1.77
5	661.68	2635 -	2652	2644.60	7.59E+01	11.62	1.81E+01	0.95
6	911.21	3636 -	3649	3642.30	2.99E+01	6.62	5.07E+00	0.88
7	1460.40	5827 -	5851	5839.54	2.85E+02	17.64	6.30E+00	1.89

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.97	1460.82 *	10.66	6.53E+00	4.94E-01
Cs-137	1.00	661.66 *	85.10	1.27E-01	2.08E-02
Bi-211	0.87	351.07 *	13.02	7.48E-01	1.12E-01
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	2.46E-01	3.40E-02
		300.09	3.30		
Pb212-XR	0.98	74.82	10.28		
		77.11 *	17.10	2.98E-01	1.24E-01
		87.35	3.97		
		89.78	1.46		

[340]

Analysis Report for 10-Jul-19-10014

L1-10221D-FIGS-012SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>		<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Bi-214	1.00	609.32	*	45.49	2.45E-01	3.49E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
Pb-214	0.51	241.99		7.25	2.74E-01	4.10E-02
		295.22		18.42		
		351.93	*	35.60		
Pb214-XR	0.98	785.96		1.06	5.25E-01	2.19E-01
		74.82		5.80		
Ac-228	1.00	77.11	*	9.70	2.05E-01	4.62E-02
		87.35		2.24		
		89.78		0.82		
		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		
		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 10-Jul-19-10014

L1-10221D-FIGS-012SS

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## INTERFERENCE CORRECTED REPORT

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<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	0.972	6.53E+00	4.94E-01	
Cs-137	1.000	1.27E-01	2.08E-02	
? Bi-211	0.876	7.48E-01	1.12E-01	
Pb-212	0.995	2.46E-01	3.40E-02	
? Pb212-XR	0.988	2.98E-01	1.24E-01	
Bi-214	1.000	2.45E-01	3.49E-02	
? Pb-214	0.513	2.74E-01	4.10E-02	
? Pb214-XR	0.988	5.25E-01	2.19E-01	
Ac-228	1.000	2.05E-01	4.62E-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

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Analysis Report for 10-Jul-19-10014  
L1-10221D-FIGS-012SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/10/2019 2:06:08PM  
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	7.35E-02	5.74E-02	5.74E-02
	BE-7	477.60	10.44	7.35E-01	5.04E-01	5.04E-01
+	K-40	1460.82	* 10.66	6.53E+00	4.65E-01	4.65E-01
	Mn-54	834.85	99.98	9.05E-03	4.56E-02	4.56E-02
	Co-60	1173.23	99.85	5.20E-02	5.90E-02	6.72E-02
		1332.49	99.98	3.47E-02		5.90E-02
	Nb-94	702.65	99.81	-1.76E-03	3.68E-02	3.84E-02
		871.09	99.89	-7.09E-02		3.68E-02
	Ag-108m	79.13	6.60	-2.39E-01	4.02E-02	1.19E+00
		433.94	90.50	-2.13E-02		4.02E-02
		614.28	89.80	-5.22E-02		6.16E-02
		722.94	90.80	4.66E-02		5.76E-02
	Sb-125	176.31	6.84	-1.08E-01	1.24E-01	4.27E-01
		380.45	1.52	-2.37E-01		2.04E+00
		427.87	29.60	3.41E-02		1.24E-01
		463.36	10.49	1.27E-01		3.78E-01
		600.60	17.65	-2.81E-01		2.29E-01
		606.71	4.98	2.09E+00		1.49E+00
		635.95	11.22	1.27E-02		3.65E-01

Analysis Report for 10-Jul-19-10014

L1-10221D-FIGS-012SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-7.49E-01	1.24E-01	2.27E+00
Ba-133	79.61	2.65	-6.94E-01	7.49E-02	2.92E+00
	81.00	32.90	-3.81E-02		1.87E-01
	276.40	7.16	-1.45E-01		4.62E-01
	302.85	18.34	1.15E-01		2.14E-01
	356.01	62.05	-4.72E-02		7.49E-02
	383.85	8.94	-1.82E-01		3.69E-01
Cs-134	475.36	1.48	1.78E+00	6.12E-02	3.40E+00
	563.25	8.34	-6.16E-01		5.18E-01
	569.33	15.37	-3.60E-02		2.74E-01
	604.72	97.62	-1.40E-02		6.56E-02
	795.86	85.46	3.13E-02		6.12E-02
	801.95	8.69	-6.04E-01		4.92E-01
	1038.61	0.99	-7.65E-01		4.54E+00
	1167.97	1.79	-8.61E-01		3.60E+00
	1365.19	3.02	4.60E-01		1.45E+00
+ Cs-137	661.66	* 85.10	1.27E-01	4.83E-02	4.83E-02
Eu-152	121.78	28.67	-3.74E-02	1.10E-01	1.10E-01
	244.70	7.61	1.86E-01		5.10E-01
	295.94	0.45	4.11E+00		9.67E+00
	344.28	26.60	3.28E-02		1.31E-01
	367.79	0.86	-1.24E+00		3.71E+00
	411.12	2.24	-1.05E+00		1.63E+00
	443.96	2.83	-5.89E-01		1.22E+00
	488.68	0.42	-1.28E+00		8.56E+00
	563.99	0.49	-1.16E+01		8.10E+00
	586.26	0.46	1.40E+01		1.31E+01
	678.62	0.47	2.50E-01		8.37E+00
	688.67	0.86	-1.05E+00		4.40E+00
	719.35	0.28	-8.10E+00		1.59E+01
	778.90	12.96	-3.31E-01		3.35E-01
	810.45	0.32	9.49E-01		1.26E+01
	867.37	4.26	7.78E-02		9.96E-01
	919.33	0.43	-1.85E+00		1.21E+01
	964.08	14.65	1.53E-01		4.62E-01
	1085.87	10.24	5.27E-02		4.62E-01
	1089.74	1.73	1.42E+00		3.31E+00
	1112.07	13.69	-1.45E-01		4.03E-01
	1212.95	1.43	1.01E+00		4.03E+00
	1249.94	0.19	-8.33E+00		3.05E+01
	1299.14	1.63	3.32E-01		3.50E+00
	1408.01	21.07	1.06E-01		2.42E-01
	1457.64	0.50	1.38E+02		4.15E+01
	1528.10	0.28	5.08E+00		1.69E+01
Eu-154	123.07	40.40	2.63E-02	7.83E-02	7.83E-02
	247.93	6.89	4.82E-01		4.87E-01
	591.76	4.95	4.31E-01		8.42E-01
	692.42	1.78	3.71E-01		2.18E+00
	723.30	20.06	2.13E-01		2.61E-01
	756.80	4.52	9.99E-01		9.89E-01
	873.18	12.08	5.77E-02		3.60E-01



Analysis Report for 10-Jul-19-10014

L1-10221D-FIGS-012SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	7.08E-02	7.83E-02	5.07E-01
	1004.76	18.01	2.12E-01		3.11E-01
	1274.43	34.80	-1.20E-01		1.55E-01
	1596.48	1.80	1.56E-02		2.27E+00
Eu-155	45.30	1.31	-3.02E+00	1.80E-01	1.21E+01
	60.01	1.22	-1.01E+01		1.17E+01
	86.55	30.70	5.40E-02		1.96E-01
	105.31	21.10	-4.93E-02		1.80E-01
Ra-226	186.21	3.64	9.03E-01	9.95E-01	9.95E-01
Pa-231	27.36	10.30	2.84E-01	1.15E+00	1.15E+00
	283.69	1.70	7.38E-01		1.99E+00
	300.07	2.47	-1.18E+00		1.59E+00
	302.65	2.20	7.02E-01		1.79E+00
	330.06	1.40	1.29E+00		2.59E+00
U-235	143.76	10.96	8.77E-02	6.26E-02	3.20E-01
	163.33	5.08	-4.66E-01		5.84E-01
	185.71	57.20	4.11E-02		6.26E-02
	202.11	1.08	-3.17E+00		2.93E+00
	205.31	5.01	-4.06E-01		6.39E-01
Am-241	59.54	35.90	-3.13E-01	4.08E-01	4.08E-01

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

Analysis Report for 10-Jul-19-10015  
L1-10221D-FIGS-013SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 10-Jul-19-10015  
Sample Description : L1-10221D-FIGS-013SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.211E+03 grams  
Facility : Default  
  
Sample Taken On : 7/9/2019 8:51:00AM  
Acquisition Started : 7/10/2019 1:51:09PM  
  
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 : 7/10/2019  
Efficiency Calibration Description :  
  
Sample Number : 77868  
Fill Height : 1210.97 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/7/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/10/2019 2:06:11PM

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

*Jmad*  
Data Validated  
1530-19-19 [346]

Analysis Report for 10-Jul-19-10015

L1-10221D-FIGS-013SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	107.56	428 -	435	431.38	2.38E+01	10.26	4.03E+01	0.34
2	185.90	736 -	749	744.32	5.79E+01	15.04	6.11E+01	0.81
3	238.61	947 -	960	954.93	1.33E+02	19.06	8.37E+01	1.03
4	295.10	1176 -	1186	1180.61	6.32E+01	12.01	3.18E+01	0.76
5	351.84	1400 -	1414	1407.34	7.61E+01	12.99	3.19E+01	0.89
6	477.48	1902 -	1918	1909.48	9.91E+01	14.21	3.29E+01	1.52
7	583.23	2326 -	2339	2332.25	4.80E+01	9.00	1.21E+01	1.15
8	609.32	2427 -	2445	2436.54	7.41E+01	10.69	1.19E+01	0.61
9	653.53	2609 -	2618	2613.32	1.25E+01	5.27	6.49E+00	0.36
10	661.68	2636 -	2656	2645.88	3.46E+02	20.96	2.58E+01	1.57
11	727.31	2903 -	2915	2908.33	2.24E+01	7.21	1.06E+01	1.16
12	911.12	3637 -	3650	3643.51	4.00E+01	7.70	7.00E+00	1.10
13	1120.25	4474 -	4486	4480.27	2.62E+01	6.22	4.77E+00	0.70
14	1460.70	5832 -	5854	5843.15	2.79E+02	17.33	5.51E+00	2.31

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
BE-7	0.99	477.60 *	10.44	1.10E+00	1.75E-01
K-40	0.99	1460.82 *	10.66	6.32E+00	4.79E-01
Cs-137	1.00	661.66 *	85.10	5.75E-01	4.90E-02 <sup>[347]</sup>

Analysis Report for 10-Jul-19-10015

L1-10221D-FIGS-013SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>		<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Tl-208	1.00	583.19	*	85.00	7.32E-02	1.44E-02
Bi-212	1.00	39.86		1.06		
		727.33	*	6.67	5.05E-01	1.65E-01
		785.37		1.10		
		1620.50		1.47		
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.20E-01	3.62E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	2.18E-01	3.40E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	3.53E-01	8.50E-02
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
2118.51		1.16				
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	2.78E-01	5.74E-02
		351.93	*	35.60	1.96E-01	3.70E-02
		785.96		1.06		
Ra-226	0.98	186.21	*	3.64	1.02E+00	2.78E-01
Ac-228	1.00	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.72E-01	5.36E-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	6.50E-02	1.77E-02
202.11				1.08		
205.31				5.01		

Analysis Report for 10-Jul-19-10015  
L1-10221D-FIGS-013SS

\* = 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

	<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
	BE-7	0.997	1.10E+00	1.75E-01	
	K-40	0.997	6.32E+00	4.79E-01	
	Cs-137	1.000	5.75E-01	4.90E-02	
	Tl-208	1.000	7.32E-02	1.44E-02	
X	Bi-211	0.910			
	Bi-212	1.000	5.05E-01	1.65E-01	
	Pb-212	1.000	2.20E-01	3.62E-02	
	Bi-214	1.000	2.37E-01	3.16E-02	
	Pb-214	0.998	2.20E-01	3.11E-02	
?	Ra-226	0.985	1.02E+00	2.78E-01	
	Ac-228	1.000	2.72E-01	5.36E-02	
?	U-235	0.996	6.50E-02	1.77E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 10-Jul-19-10015  
L1-10221D-FIGS-013SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/10/2019 2:06:11PM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
1	107.56	2.63889E-02	43.19		
9	653.53	1.39035E-02	42.15		

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

## NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	6.82E-02	5.82E-02	5.82E-02
+	BE-7	477.60	* 10.44	1.10E+00	4.12E-01	4.12E-01
+	K-40	1460.82	* 10.66	6.32E+00	4.15E-01	4.15E-01
	Mn-54	834.85	99.98	4.70E-03	5.37E-02	5.37E-02
	Co-60	1173.23	99.85	6.20E-02	8.10E-02	8.10E-02
		1332.49	99.98	5.96E-02		8.13E-02
	Nb-94	702.65	99.81	-2.45E-02	4.48E-02	4.48E-02
		871.09	99.89	-2.49E-02		5.24E-02
	Ag-108m	79.13	6.60	1.44E+00	5.19E-02	1.81E+00
		433.94	90.50	1.31E-02		5.19E-02
		614.28	89.80	2.43E-02		8.10E-02
		722.94	90.80	-7.60E-03		6.96E-02
	Sb-125	176.31	6.84	3.70E-01	1.54E-01	5.87E-01
		380.45	1.52	4.42E-01		2.70E+00
		427.87	29.60	6.64E-02		1.54E-01
		463.36	10.49	7.86E-02		5.27E-01
		600.60	17.65	-9.50E-02		2.76E-01

[350]

Analysis Report for 10-Jul-19-10015

L1-10221D-FIGS-013SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>			
Sb-125	606.71	4.98	2.21E+00	1.54E-01	1.44E+00			
	635.95	11.22	8.66E-02		3.93E-01			
	671.44	1.79	-1.25E+00		2.46E+00			
Ba-133	79.61	2.65	3.97E+00	8.57E-02	4.34E+00			
	81.00	32.90	-7.25E-01		2.71E-01			
	276.40	7.16	-4.46E-01		5.71E-01			
	302.85	18.34	-1.38E-01		2.18E-01			
	356.01	62.05	-2.47E-02		8.57E-02			
	383.85	8.94	-4.41E-02		4.70E-01			
	475.36	1.48	8.10E+00		5.70E-02	5.03E+00		
Cs-134	563.25	8.34	5.71E-01	5.70E-02	6.00E-01			
	569.33	15.37	-6.75E-02		3.01E-01			
	604.72	97.62	1.98E-02		6.80E-02			
	795.86	85.46	6.18E-02		5.70E-02			
	801.95	8.69	-9.09E-01		5.55E-01			
	1038.61	0.99	3.33E+00		5.63E+00			
	1167.97	1.79	4.49E+00		4.72E+00			
	1365.19	3.02	1.22E+00		1.68E+00			
	+ Cs-137	661.66	*		85.10	5.75E-01	5.91E-02	5.91E-02
	Eu-152	121.78	28.67		-5.56E-02	1.51E-01	1.51E-01	
244.70		7.61	3.63E-01	5.95E-01				
295.94		0.45	1.11E+01	1.22E+01				
344.28		26.60	-3.92E-02	1.53E-01				
367.79		0.86	-1.73E+00	4.64E+00				
411.12		2.24	-4.98E-01	2.01E+00				
443.96		2.83	6.83E-01	1.81E+00				
488.68		0.42	5.04E+00	1.01E+01				
563.99		0.49	7.11E-01	9.86E+00				
586.26		0.46	1.29E+01	1.35E+01				
678.62		0.47	5.58E-01	1.03E+01				
688.67		0.86	1.51E+00	5.48E+00				
719.35		0.28	-1.31E+01	1.84E+01				
778.90		12.96	2.12E-01	3.80E-01				
810.45		0.32	1.07E+01	1.67E+01				
867.37		4.26	-2.15E+00	1.22E+00				
919.33		0.43	-2.53E+00	1.24E+01				
964.08		14.65	2.82E-01	5.01E-01				
1085.87		10.24	-3.76E-02	4.88E-01				
1089.74		1.73	2.61E-01	3.01E+00				
1112.07		13.69	-5.62E-01	3.85E-01				
1212.95	1.43	2.90E+00	4.57E+00					
1249.94	0.19	1.95E+00	3.66E+01					
1299.14	1.63	3.92E-01	3.59E+00					
1408.01	21.07	5.96E-02	2.71E-01					
1457.64	0.50	1.38E+02	4.06E+01					
1528.10	0.28	7.97E+00	1.53E+01					
Eu-154	123.07	40.40	5.76E-02	1.07E-01	1.07E-01			
	247.93	6.89	-5.73E-01		5.56E-01			
	591.76	4.95	-3.32E-01		1.00E+00			
	692.42	1.78	4.16E-01		2.56E+00			
	723.30	20.06	-6.23E-02		3.17E-01			

Analysis Report for 10-Jul-19-10015

L1-10221D-FIGS-013SS

	<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
	Eu-154	756.80	4.52	-1.68E-01	1.07E-01	9.97E-01
		873.18	12.08	2.04E-01		4.62E-01
		996.29	10.48	2.94E-02		5.40E-01
		1004.76	18.01	-2.40E-01		2.84E-01
		1274.43	34.80	-1.79E-01		1.59E-01
		1596.48	1.80	-1.93E+00		2.70E+00
	Eu-155	45.30	1.31	1.45E+01	2.53E-01	2.49E+01
		60.01	1.22	-5.94E+00		2.48E+01
		86.55	30.70	5.41E-03		2.72E-01
		105.31	21.10	-3.45E-02		2.53E-01
+	Ra-226	186.21	* 3.64	1.02E+00	8.27E-01	8.27E-01
	Pa-231	27.36	10.30	3.17E+00	1.84E+00	2.74E+00
		283.69	1.70	-1.16E+00		2.52E+00
		300.07	2.47	-2.65E-01		1.86E+00
		302.65	2.20	-1.13E+00		1.84E+00
		330.06	1.40	1.45E+00		3.14E+00
+	U-235	143.76	10.96	-2.40E-01	5.27E-02	3.90E-01
		163.33	5.08	-2.83E-01		7.40E-01
		185.71	* 57.20	6.50E-02		5.27E-02
		202.11	1.08	1.66E+00		4.06E+00
		205.31	5.01	-2.68E-01		8.68E-01
	Am-241	59.54	35.90	-1.14E-01	8.63E-01	8.63E-01

+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = 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 10-Jul-19-10016  
L1-10221D-QIGS-013SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 10-Jul-19-10016  
Sample Description : L1-10221D-QIGS-013SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.376E+03 grams  
Facility : Default  
  
Sample Taken On : 7/9/2019 8:51:00AM  
Acquisition Started : 7/10/2019 2:08:47PM  
  
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 : 7/10/2019  
Efficiency Calibration Description :  
  
Sample Number : 77870  
Fill Height : 1375.59 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/7/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/10/2019 2:23:50PM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 8192

*J. Mad*  
Data Validated  
1530-7353-19

Analysis Report for 10-Jul-19-10016

L1-10221D-QIGS-013SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.65	947 -	961	955.08	1.50E+02	19.92	8.59E+01	1.21
2	295.38	1172 -	1187	1181.74	5.81E+01	13.78	4.39E+01	1.25
3	338.38	1345 -	1359	1353.59	4.17E+01	12.22	3.73E+01	0.34
4	351.88	1401 -	1416	1407.51	9.15E+01	14.08	3.55E+01	0.62
5	477.59	1904 -	1917	1909.96	7.08E+01	10.86	1.72E+01	0.82
6	583.27	2324 -	2338	2332.40	4.58E+01	9.20	1.32E+01	1.70
7	609.21	2429 -	2444	2436.09	8.65E+01	10.83	1.05E+01	1.51
8	661.74	2636 -	2655	2646.14	2.02E+02	15.71	1.26E+01	1.35
9	1460.75	5830 -	5855	5843.36	2.81E+02	17.16	3.21E+00	1.68

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
BE-7	1.00	477.60 *	10.44	7.55E-01	1.28E-01
K-40	0.99	1460.82 *	10.66	6.07E+00	4.55E-01
Cs-137	0.99	661.66 *	85.10	3.23E-01	3.17E-02
Tl-208	0.99	583.19 *	85.00	6.72E-02	1.41E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	2.40E-01	3.73E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	2.44E-01	3.39E-02 <sup>[354]</sup>

Analysis Report for 10-Jul-19-10016

L1-10221D-QIGS-013SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
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	0.99	241.99	7.25		
		295.22 *	18.42	2.47E-01	6.19E-02
		351.93 *	35.60	2.28E-01	3.95E-02
Ac-228	0.57	785.96	1.06		
		129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32 *	11.27	3.19E-01	9.71E-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

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**INTERFERENCE CORRECTED REPORT**

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Analysis Report for 10-Jul-19-10016

L1-10221D-QIGS-013SS

	<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
	BE-7	1.000	7.55E-01	1.28E-01	
	K-40	0.999	6.07E+00	4.55E-01	
	Cs-137	0.999	3.23E-01	3.17E-02	
	Tl-208	0.999	6.72E-02	1.41E-02	
X	Bi-211	0.901			
	Pb-212	1.000	2.40E-01	3.73E-02	
	Bi-214	0.999	2.44E-01	3.39E-02	
	Pb-214	0.999	2.34E-01	3.33E-02	
	Ac-228	0.572	3.19E-01	9.71E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 1.000sigma

Analysis Report for 10-Jul-19-10016  
L1-10221D-QIGS-013SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/10/2019 2:23:50PM  
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	5.48E-02	5.42E-02	5.42E-02
+	BE-7	477.60	* 10.44	7.55E-01	2.79E-01	2.79E-01
+	K-40	1460.82	* 10.66	6.07E+00	3.32E-01	3.32E-01
	Mn-54	834.85	99.98	2.30E-02	5.15E-02	5.15E-02
	Co-60	1173.23	99.85	2.61E-02	7.22E-02	7.22E-02
		1332.49	99.98	9.04E-02		7.31E-02
	Nb-94	702.65	99.81	-1.58E-02	4.05E-02	4.64E-02
		871.09	99.89	6.28E-03		4.05E-02
	Ag-108m	79.13	6.60	-1.11E+00	4.13E-02	1.59E+00
		433.94	90.50	-1.62E-04		4.13E-02
		614.28	89.80	1.35E-02		7.62E-02
		722.94	90.80	5.33E-03		5.38E-02
	Sb-125	176.31	6.84	9.13E-02	1.36E-01	5.50E-01
		380.45	1.52	1.24E+00		2.76E+00
		427.87	29.60	3.67E-02		1.36E-01
		463.36	10.49	2.05E-01		4.22E-01
		600.60	17.65	-4.80E-03		2.73E-01
		606.71	4.98	2.50E+00		1.45E+00
		635.95	11.22	-7.19E-02		3.59E-01

Analysis Report for 10-Jul-19-10016

L1-10221D-QIGS-013SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-1.48E+00	1.36E-01	2.30E+00
Ba-133	79.61	2.65	-2.46E+00	8.20E-02	3.80E+00
	81.00	32.90	-1.19E-01		2.70E-01
	276.40	7.16	2.43E-01		5.76E-01
	302.85	18.34	2.36E-02		2.25E-01
	356.01	62.05	-3.57E-02		8.20E-02
	383.85	8.94	2.74E-01		4.57E-01
Cs-134	475.36	1.48	7.78E+00	5.68E-02	4.34E+00
	563.25	8.34	1.49E-01		4.92E-01
	569.33	15.37	6.29E-02		2.60E-01
	604.72	97.62	-7.93E-03		7.00E-02
	795.86	85.46	2.20E-02		5.68E-02
	801.95	8.69	-7.53E-01		5.76E-01
	1038.61	0.99	3.15E+00		5.85E+00
	1167.97	1.79	2.65E+00		4.02E+00
	1365.19	3.02	3.68E-01		1.37E+00
+ Cs-137	661.66	* 85.10	3.23E-01	4.06E-02	4.06E-02
Eu-152	121.78	28.67	-2.78E-02	1.33E-01	1.51E-01
	244.70	7.61	-4.86E-01		5.05E-01
	295.94	0.45	5.27E+00		1.11E+01
	344.28	26.60	-1.28E-01		1.33E-01
	367.79	0.86	2.13E+00		4.59E+00
	411.12	2.24	-6.36E-01		1.87E+00
	443.96	2.83	-8.34E-01		1.47E+00
	488.68	0.42	3.18E+00		9.56E+00
	563.99	0.49	2.16E+00		8.17E+00
	586.26	0.46	-8.65E+00		1.26E+01
	678.62	0.47	5.39E+00		9.26E+00
	688.67	0.86	4.05E-01		4.36E+00
	719.35	0.28	7.97E+00		1.67E+01
	778.90	12.96	-3.28E-01		3.13E-01
	810.45	0.32	1.03E+01		1.74E+01
	867.37	4.26	1.10E-01		1.04E+00
	919.33	0.43	-3.00E+01		1.06E+01
	964.08	14.65	2.43E-01		4.30E-01
	1085.87	10.24	-8.27E-02		4.57E-01
	1089.74	1.73	-2.40E+00		2.93E+00
	1112.07	13.69	-2.93E-01		4.07E-01
	1212.95	1.43	2.69E-01		4.55E+00
	1249.94	0.19	-1.72E+01		3.13E+01
	1299.14	1.63	-1.50E+00		2.95E+00
	1408.01	21.07	-2.66E-03		2.22E-01
	1457.64	0.50	1.24E+02		3.87E+01
	1528.10	0.28	7.61E+00		1.46E+01
Eu-154	123.07	40.40	1.25E-02	1.08E-01	1.08E-01
	247.93	6.89	-7.08E-03		4.87E-01
	591.76	4.95	3.57E-01		9.79E-01
	692.42	1.78	1.63E+00		2.36E+00
	723.30	20.06	1.33E-01		2.51E-01
	756.80	4.52	4.12E-01		1.05E+00
	873.18	12.08	-1.87E-01		3.13E-01

Analysis Report for 10-Jul-19-10016

L1-10221D-QIGS-013SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	-2.28E-01	1.08E-01	5.03E-01
	1004.76	18.01	-2.63E-01		2.62E-01
	1274.43	34.80	-6.08E-02		1.52E-01
	1596.48	1.80	-6.05E-01		2.58E+00
Eu-155	45.30	1.31	-1.99E+00	2.34E-01	2.01E+01
	60.01	1.22	-3.40E+00		2.34E+01
	86.55	30.70	2.75E-02		2.34E-01
	105.31	21.10	1.11E-01		2.46E-01
Ra-226	186.21	3.64	4.04E-01	1.14E+00	1.14E+00
Pa-231	27.36	10.30	1.33E+00	1.75E+00	2.46E+00
	283.69	1.70	-9.68E-01		2.29E+00
	300.07	2.47	-1.27E+00		1.75E+00
	302.65	2.20	2.08E-01		1.86E+00
	330.06	1.40	6.20E-01		2.91E+00
U-235	143.76	10.96	4.34E-02	7.22E-02	3.93E-01
	163.33	5.08	1.95E-02		7.45E-01
	185.71	57.20	3.09E-02		7.22E-02
	202.11	1.08	2.13E+00		3.76E+00
	205.31	5.01	-7.13E-01		7.57E-01
Am-241	59.54	35.90	-3.22E-02	8.16E-01	8.16E-01

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

Analysis Report for 10-Jul-19-10017  
L1-10221D-FIGS-014SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 10-Jul-19-10017  
Sample Description : L1-10221D-FIGS-014SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.337E+03 grams  
Facility : Default  
  
Sample Taken On : 7/9/2019 8:53:00AM  
Acquisition Started : 7/10/2019 2:08:54PM  
  
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 : 0.16 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/29/2019  
Efficiency Calibration Used Done On : 7/10/2019  
Efficiency Calibration Description :  
  
Sample Number : 77871  
Fill Height : 1337.32 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/30/2012 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/10/2019 2:24:15PM

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

*J. Mad*  
Data Validated  
1530 7/30/19



Analysis Report for 10-Jul-19-10017

L1-10221D-FIGS-014SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.51	947 -	961	954.13	1.43E+02	20.25	9.18E+01	1.02
2	295.01	1173 -	1186	1179.94	4.34E+01	13.53	5.06E+01	0.70
3	351.74	1401 -	1413	1406.71	1.07E+02	12.57	1.95E+01	1.22
4	477.36	1902 -	1916	1908.84	6.90E+01	10.89	1.70E+01	0.78
5	582.93	2325 -	2338	2330.91	6.65E+01	9.89	1.15E+01	0.66
6	608.87	2427 -	2443	2434.66	8.25E+01	10.45	8.50E+00	1.29
7	661.21	2637 -	2651	2643.93	1.70E+02	14.98	1.88E+01	1.28
8	910.66	3634 -	3649	3641.60	3.22E+01	9.89	2.18E+01	0.81
9	1459.89	5829 -	5850	5839.40	2.54E+02	15.94	0.00E+00	2.13

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
BE-7	0.99	477.60 *	10.44	8.62E-01	1.49E-01
K-40	0.87	1460.82 *	10.66	6.62E+00	5.05E-01
Cs-137	0.96	661.66 *	85.10	3.21E-01	3.42E-02
Tl-208	0.98	583.19 *	85.00	1.15E-01	1.85E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	2.64E-01	4.30E-02
		300.09	3.30		
Bi-214	0.98	609.32 *	45.49	2.75E-01	3.86E-02 <sup>[361]</sup>

Analysis Report for 10-Jul-19-10017

L1-10221D-FIGS-014SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Bi-214	0.98	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	2.14E-01	6.87E-02
		351.93 *	35.60	3.08E-01	4.40E-02
Ac-228	0.98	785.96	1.06		
		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	2.50E-01	7.75E-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

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**INTERFERENCE CORRECTED REPORT**

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Analysis Report for 10-Jul-19-10017

L1-10221D-FIGS-014SS

<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
BE-7	0.990	8.62E-01	1.49E-01	
K-40	0.871	6.62E+00	5.05E-01	
Cs-137	0.968	3.21E-01	3.42E-02	
Tl-208	0.989	1.15E-01	1.85E-02	
X Bi-211	0.930			
Pb-212	0.998	2.64E-01	4.30E-02	
Bi-214	0.987	2.75E-01	3.86E-02	
Pb-214	0.995	2.81E-01	3.70E-02	
Ac-228	0.986	2.50E-01	7.75E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 1.000sigma

Analysis Report for 10-Jul-19-10017  
L1-10221D-FIGS-014SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/10/2019 2:24:15PM  
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	3.32E-02	6.78E-02	6.78E-02
+	BE-7	477.60	* 10.44	8.62E-01	3.34E-01	3.34E-01
+	K-40	1460.82	* 10.66	6.62E+00	7.49E-02	7.49E-02
	Mn-54	834.85	99.98	2.83E-04	5.50E-02	5.50E-02
	Co-60	1173.23	99.85	6.89E-02	7.32E-02	7.44E-02
		1332.49	99.98	8.83E-03		7.32E-02
	Nb-94	702.65	99.81	1.76E-02	4.96E-02	4.96E-02
		871.09	99.89	2.42E-03		5.02E-02
	Ag-108m	79.13	6.60	4.19E-01	5.47E-02	1.92E+00
		433.94	90.50	-1.90E-02		5.47E-02
		614.28	89.80	4.00E-03		7.06E-02
		722.94	90.80	1.23E-02		6.32E-02
	Sb-125	176.31	6.84	2.95E-01	1.61E-01	6.41E-01
		380.45	1.52	1.05E+00		2.95E+00
		427.87	29.60	-2.31E-03		1.61E-01
		463.36	10.49	-9.17E-02		5.05E-01
		600.60	17.65	7.49E-03		2.66E-01
		606.71	4.98	1.82E+00		1.60E+00
		635.95	11.22	-2.37E-01		3.68E-01

Analysis Report for 10-Jul-19-10017

L1-10221D-FIGS-014SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-3.15E+00	1.61E-01	2.06E+00
Ba-133	79.61	2.65	3.88E-01	8.83E-02	4.54E+00
	81.00	32.90	-4.60E-01		3.04E-01
	276.40	7.16	4.48E-02		6.08E-01
	302.85	18.34	1.09E-01		2.36E-01
	356.01	62.05	-3.01E-02		8.83E-02
	383.85	8.94	-1.65E-01		4.72E-01
Cs-134	475.36	1.48	5.28E+00	6.22E-02	4.63E+00
	563.25	8.34	2.29E-01		5.80E-01
	569.33	15.37	1.61E-02		3.10E-01
	604.72	97.62	6.73E-03		7.84E-02
	795.86	85.46	4.22E-02		6.22E-02
	801.95	8.69	-1.68E-01		5.46E-01
	1038.61	0.99	6.22E-01		6.05E+00
	1167.97	1.79	-9.64E-01		4.19E+00
	1365.19	3.02	9.62E-01		1.64E+00
+ Cs-137	661.66	* 85.10	3.21E-01	5.24E-02	5.24E-02
Eu-152	121.78	28.67	-1.32E-02	1.63E-01	1.79E-01
	244.70	7.61	3.03E-01		6.39E-01
	295.94	0.45	-5.80E+00		1.22E+01
	344.28	26.60	2.67E-02		1.63E-01
	367.79	0.86	3.27E+00		5.13E+00
	411.12	2.24	5.10E-01		2.00E+00
	443.96	2.83	-2.04E-01		1.61E+00
	488.68	0.42	3.10E+00		1.17E+01
	563.99	0.49	2.88E+00		1.01E+01
	586.26	0.46	6.85E-01		1.67E+01
	678.62	0.47	5.78E-02		1.01E+01
	688.67	0.86	8.25E-01		5.07E+00
	719.35	0.28	1.15E+00		1.58E+01
	778.90	12.96	-9.65E-02		3.92E-01
	810.45	0.32	7.18E-01		1.73E+01
	867.37	4.26	-1.54E+00		1.26E+00
	919.33	0.43	-5.28E+00		1.29E+01
	964.08	14.65	5.61E-01		5.78E-01
	1085.87	10.24	4.02E-01		6.42E-01
	1089.74	1.73	1.11E+00		3.92E+00
	1112.07	13.69	-1.84E-01		5.30E-01
	1212.95	1.43	1.33E+00		5.39E+00
	1249.94	0.19	-6.56E-01		3.52E+01
	1299.14	1.63	8.22E-01		3.64E+00
	1408.01	21.07	1.10E-01		2.75E-01
	1457.64	0.50	1.39E+02		4.43E+01
	1528.10	0.28	3.06E+00		1.14E+01
Eu-154	123.07	40.40	5.36E-04	1.27E-01	1.27E-01
	247.93	6.89	-4.54E-01		5.97E-01
	591.76	4.95	-6.50E-01		9.15E-01
	692.42	1.78	-1.26E+00		2.51E+00
	723.30	20.06	1.54E-01		2.89E-01
	756.80	4.52	-1.07E-01		1.10E+00
	873.18	12.08	-1.20E-01		3.99E-01

Analysis Report for 10-Jul-19-10017

L1-10221D-FIGS-014SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	-1.02E-01	1.27E-01	4.83E-01
	1004.76	18.01	1.07E-01		3.19E-01
	1274.43	34.80	1.25E-01		2.10E-01
	1596.48	1.80	1.49E+00		2.86E+00
Eu-155	45.30	1.31	3.43E+00	2.86E-01	3.47E+01
	60.01	1.22	-2.04E+01		3.12E+01
	86.55	30.70	-6.91E-02		2.98E-01
	105.31	21.10	1.13E-01		2.86E-01
Ra-226	186.21	3.64	5.54E-01	1.31E+00	1.31E+00
Pa-231	27.36	10.30	4.01E+00	1.76E+00	4.00E+00
	283.69	1.70	-3.07E-01		2.51E+00
	300.07	2.47	5.49E-01		1.76E+00
	302.65	2.20	-2.20E-02		1.93E+00
	330.06	1.40	1.39E+00		3.42E+00
U-235	143.76	10.96	-8.94E-02	8.47E-02	4.01E-01
	163.33	5.08	-3.81E-01		8.87E-01
	185.71	57.20	6.48E-02		8.47E-02
	202.11	1.08	-3.76E+00		3.77E+00
	205.31	5.01	-6.35E-01		8.42E-01
Am-241	59.54	35.90	-4.54E-02	1.17E+00	1.17E+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-Jul-19-10018  
L1-10221D-FIGS-015SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 12-Jul-19-10018  
Sample Description : L1-10221D-FIGS-015SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.472E+03 grams  
Facility : Default  
  
Sample Taken On : 7/11/2019 7:15:00AM  
Acquisition Started : 7/12/2019 9:32:54AM  
  
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 : 7/12/2019  
Efficiency Calibration Description :  
  
Sample Number : 77938  
Fill Height : 1472.17 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/7/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/12/2019 9:47:57AM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 8192

*zmak*  
Data Validated  
1430 7/12/19 [367]

Analysis Report for 12-Jul-19-10018

L1-10221D-FIGS-015SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.64	948 -	960	955.01	1.12E+02	16.45	5.98E+01	0.65
2	295.38	1176 -	1188	1181.73	3.68E+01	9.97	2.32E+01	0.41
3	351.83	1400 -	1413	1407.30	7.80E+01	12.45	2.80E+01	0.90
4	510.35	2034 -	2046	2040.88	3.11E+01	9.01	1.79E+01	0.85
5	583.23	2326 -	2338	2332.23	5.21E+01	8.23	5.91E+00	1.17
6	609.28	2429 -	2444	2436.39	6.36E+01	10.68	1.64E+01	1.13
7	911.16	3637 -	3652	3643.69	4.63E+01	7.95	5.71E+00	0.48
8	1460.57	5832 -	5855	5842.64	2.86E+02	17.79	8.13E+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
An Pk	0.93	511.00 *	100.00	3.55E-02	1.06E-02
K-40	0.99	1460.82 *	10.66	6.05E+00	4.59E-01
Tl-208	1.00	583.19 *	85.00	7.52E-02	1.27E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.77E-01	2.96E-02
		300.09	3.30		
Bi-214	1.00	609.32 *	45.49	1.77E-01	3.15E-02
		768.36	4.89		
		806.18	1.26		

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Analysis Report for 12-Jul-19-10018

L1-10221D-FIGS-015SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
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	1.54E-01	4.36E-02
		351.93 *	35.60	1.91E-01	3.41E-02
Ac-228	1.00	785.96	1.06		
		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	2.95E-01	5.23E-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

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## INTERFERENCE CORRECTED REPORT

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Analysis Report for 12-Jul-19-10018  
L1-10221D-FIGS-015SS

<i><b>Nuclide Name</b></i>	<i><b>Nuclide Id Confidence</b></i>	<i><b>Wt mean Activity (pCi/grams)</b></i>	<i><b>Wt mean Activity Uncertainty</b></i>	<i><b>Comments</b></i>
An Pk	0.934	3.55E-02	1.06E-02	
K-40	0.990	6.05E+00	4.59E-01	
Tl-208	1.000	7.52E-02	1.27E-02	
X Bi-211	0.912			
Pb-212	1.000	1.77E-01	2.96E-02	
Bi-214	1.000	1.77E-01	3.15E-02	
Pb-214	0.998	1.77E-01	2.69E-02	
Ac-228	1.000	2.95E-01	5.23E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 12-Jul-19-10018  
L1-10221D-FIGS-015SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/12/2019 9:47:57AM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

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

## NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	* 100.00	3.55E-02	3.07E-02	3.07E-02
	BE-7	477.60	10.44	2.46E-01	3.63E-01	3.63E-01
+	K-40	1460.82	* 10.66	6.05E+00	4.57E-01	4.57E-01
	Mn-54	834.85	99.98	-1.46E-02	4.33E-02	4.33E-02
	Co-60	1173.23	99.85	4.90E-02	5.01E-02	6.38E-02
		1332.49	99.98	1.00E-02		5.01E-02
	Nb-94	702.65	99.81	1.74E-02	3.99E-02	3.99E-02
		871.09	99.89	1.44E-03		4.37E-02
	Ag-108m	79.13	6.60	1.41E-01	3.70E-02	1.37E+00
		433.94	90.50	-7.91E-03		3.70E-02
		614.28	89.80	-1.70E-02		6.87E-02
		722.94	90.80	1.93E-03		4.74E-02
	Sb-125	176.31	6.84	-5.52E-02	1.12E-01	4.71E-01
		380.45	1.52	-3.90E-01		2.20E+00
		427.87	29.60	3.38E-03		1.12E-01
		463.36	10.49	-1.72E-01		3.30E-01
		600.60	17.65	-4.56E-02		2.16E-01
		606.71	4.98	2.14E+00		1.30E+00
		635.95	11.22	-6.56E-02		3.22E-01

Analysis Report for 12-Jul-19-10018

L1-10221D-FIGS-015SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	2.67E-01	1.12E-01	2.26E+00
Ba-133	79.61	2.65	6.98E-01	7.28E-02	3.27E+00
	81.00	32.90	-1.64E-01		2.36E-01
	276.40	7.16	-4.98E-02		4.73E-01
	302.85	18.34	5.46E-02		1.89E-01
	356.01	62.05	-2.99E-02		7.28E-02
	383.85	8.94	-3.48E-01		3.49E-01
Cs-134	475.36	1.48	4.63E-01	4.90E-02	2.41E+00
	563.25	8.34	2.59E-01		4.38E-01
	569.33	15.37	-9.37E-02		2.22E-01
	604.72	97.62	-2.27E-02		6.26E-02
	795.86	85.46	-1.45E-02		4.90E-02
	801.95	8.69	1.25E-01		5.08E-01
	1038.61	0.99	-1.27E+00		5.36E+00
	1167.97	1.79	3.54E+00		3.55E+00
	1365.19	3.02	-6.29E-01		1.04E+00
Cs-137	661.66	85.10	1.31E-02	5.02E-02	5.02E-02
Eu-152	121.78	28.67	2.86E-02	1.21E-01	1.32E-01
	244.70	7.61	-1.63E-01		4.48E-01
	295.94	0.45	2.08E+00		8.61E+00
	344.28	26.60	-1.57E-01		1.21E-01
	367.79	0.86	7.55E-01		3.98E+00
	411.12	2.24	-1.50E+00		1.70E+00
	443.96	2.83	-2.01E-01		1.29E+00
	488.68	0.42	-2.06E+00		7.70E+00
	563.99	0.49	7.50E+00		7.74E+00
	586.26	0.46	1.34E+01		1.20E+01
	678.62	0.47	-7.26E+00		7.72E+00
	688.67	0.86	1.08E+00		4.98E+00
	719.35	0.28	-2.02E+00		1.33E+01
	778.90	12.96	1.26E-01		3.29E-01
	810.45	0.32	2.37E-01		1.25E+01
	867.37	4.26	-5.85E-01		1.07E+00
	919.33	0.43	-1.88E+00		1.08E+01
	964.08	14.65	3.10E-01		4.56E-01
	1085.87	10.24	2.33E-01		4.29E-01
	1089.74	1.73	1.26E+00		2.87E+00
	1112.07	13.69	-1.06E-01		4.11E-01
	1212.95	1.43	-2.27E+00		4.17E+00
	1249.94	0.19	8.82E+00		2.71E+01
	1299.14	1.63	-1.40E+00		3.03E+00
	1408.01	21.07	1.25E-01		2.03E-01
	1457.64	0.50	1.24E+02		3.86E+01
	1528.10	0.28	-6.00E+00		1.36E+01
Eu-154	123.07	40.40	-1.86E-02	9.08E-02	9.08E-02
	247.93	6.89	-2.31E-01		4.08E-01
	591.76	4.95	7.37E-01		8.22E-01
	692.42	1.78	-1.35E-01		2.32E+00
	723.30	20.06	5.05E-02		2.17E-01
	756.80	4.52	-1.25E+00		8.65E-01
	873.18	12.08	-6.73E-02		3.68E-01

Analysis Report for 12-Jul-19-10018

L1-10221D-FIGS-015SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	-2.08E-01	9.08E-02	4.63E-01
	1004.76	18.01	5.87E-02		2.88E-01
	1274.43	34.80	-5.58E-02		1.46E-01
	1596.48	1.80	-1.62E+00		2.32E+00
Eu-155	45.30	1.31	-9.81E-01	2.04E-01	1.67E+01
	60.01	1.22	-1.69E+01		1.89E+01
	86.55	30.70	1.39E-01		2.31E-01
	105.31	21.10	-1.24E-02		2.04E-01
Ra-226	186.21	3.64	1.01E+00	1.05E+00	1.05E+00
Pa-231	27.36	10.30	1.76E+00	1.44E+00	2.16E+00
	283.69	1.70	-1.08E+00		1.92E+00
	300.07	2.47	2.39E-01		1.44E+00
	302.65	2.20	2.98E-01		1.58E+00
	330.06	1.40	1.11E+00		2.66E+00
U-235	143.76	10.96	-2.90E-01	6.62E-02	3.24E-01
	163.33	5.08	-2.31E-01		5.82E-01
	185.71	57.20	6.12E-02		6.62E-02
	202.11	1.08	-5.81E-01		3.10E+00
	205.31	5.01	-7.97E-01		6.52E-01
Am-241	59.54	35.90	-4.69E-01	6.58E-01	6.58E-01

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

Analysis Report for 12-Jul-19-10019  
L1-10221D-FIGS-016SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 12-Jul-19-10019  
Sample Description : L1-10221D-FIGS-016SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.494E+03 grams  
Facility : Default  
  
Sample Taken On : 7/11/2019 7:17:00AM  
Acquisition Started : 7/12/2019 9:49:08AM  
  
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 : 7/12/2019  
Efficiency Calibration Description :  
  
Sample Number : 77942  
Fill Height : 1494.48 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/7/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/12/2019 10:04:10AM

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

*zmad*  
Data Validated  
1430 7/12/19

[374]

Analysis Report for 12-Jul-19-10019

L1-10221D-FIGS-016SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	185.62	738 -	749	743.23	3.02E+01	12.24	4.58E+01	1.27
2	238.71	950 -	962	955.30	1.18E+02	17.74	7.02E+01	0.80
3	295.42	1177 -	1186	1181.91	4.61E+01	9.78	2.19E+01	0.88
4	351.91	1401 -	1416	1407.63	9.47E+01	12.76	2.23E+01	1.09
5	583.03	2326 -	2338	2331.42	4.93E+01	8.66	9.75E+00	1.13
6	609.23	2428 -	2443	2436.20	7.71E+01	11.18	1.59E+01	0.74
7	910.79	3636 -	3648	3642.19	3.00E+01	8.03	1.30E+01	1.12
8	1120.16	4474 -	4485	4479.92	2.38E+01	5.90	4.18E+00	0.40
9	1460.65	5831 -	5854	5842.95	2.64E+02	16.59	2.87E+00	1.70

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82 *	10.66	5.57E+00	4.25E-01
Tl-208	0.99	583.19 *	85.00	7.08E-02	1.32E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	1.85E-01	3.17E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	2.13E-01	3.35E-02
		768.36	4.89		
		806.18	1.26		

[375]

Analysis Report for 12-Jul-19-10019

L1-10221D-FIGS-016SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Bi-214	0.99	934.06	3.11	3.00E-01	7.51E-02
		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	1.93E-01	4.37E-02
		295.22 *	18.42		
		351.93 *	35.60		
		785.96	1.06	2.32E-01	3.63E-02
Ra-226	0.94	186.21 *	3.64	5.09E-01	2.10E-01
Ac-228	0.99	129.07	2.42	1.91E-01	5.17E-02
		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		
		964.77	4.99		
		968.97	15.80		
		1588.20	3.22		
		U-235	0.99		
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



Analysis Report for 12-Jul-19-10019

L1-10221D-FIGS-016SS

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## INTERFERENCE CORRECTED REPORT

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<i><b>Nuclide Name</b></i>	<i><b>Nuclide Id Confidence</b></i>	<i><b>Wt mean Activity (pCi/grams)</b></i>	<i><b>Wt mean Activity Uncertainty</b></i>	<i><b>Comments</b></i>
	0.995	5.57E+00	4.25E-01	
	0.996	7.08E-02	1.32E-02	
X	0.893			
	0.999	1.85E-01	3.17E-02	
	0.999	2.27E-01	3.06E-02	
	0.998	2.16E-01	2.79E-02	
?	0.947	5.09E-01	2.10E-01	
	0.992	1.91E-01	5.17E-02	
?	0.999	3.24E-02	1.34E-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

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Analysis Report for 12-Jul-19-10019  
L1-10221D-FIGS-016SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/12/2019 10:04:10AM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

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

## NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	4.27E-02	5.61E-02	5.61E-02
	BE-7	477.60	10.44	2.80E-01	3.68E-01	3.68E-01
+	K-40	1460.82	* 10.66	5.57E+00	2.99E-01	2.99E-01
	Mn-54	834.85	99.98	2.32E-02	4.72E-02	4.72E-02
	Co-60	1173.23	99.85	-4.08E-02	4.09E-02	5.89E-02
		1332.49	99.98	4.11E-03		4.09E-02
	Nb-94	702.65	99.81	1.51E-02	4.27E-02	4.27E-02
		871.09	99.89	2.22E-02		4.78E-02
	Ag-108m	79.13	6.60	-8.54E-02	3.97E-02	1.51E+00
		433.94	90.50	1.41E-02		3.97E-02
		614.28	89.80	-1.96E-02		7.23E-02
		722.94	90.80	1.14E-03		4.91E-02
	Sb-125	176.31	6.84	4.48E-03	1.21E-01	5.17E-01
		380.45	1.52	-1.32E+00		2.10E+00
		427.87	29.60	-4.34E-03		1.21E-01
		463.36	10.49	1.23E-02		3.68E-01
		600.60	17.65	9.30E-02		2.35E-01
		606.71	4.98	2.31E+00		1.37E+00
		635.95	11.22	-2.74E-01		3.31E-01

Analysis Report for 12-Jul-19-10019

L1-10221D-FIGS-016SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-1.75E+00	1.21E-01	1.94E+00
Ba-133	79.61	2.65	1.82E+00	7.68E-02	3.60E+00
	81.00	32.90	-4.22E-01		2.29E-01
	276.40	7.16	3.18E-01		4.81E-01
	302.85	18.34	-2.65E-02		1.86E-01
	356.01	62.05	1.25E-02		7.68E-02
	383.85	8.94	-8.83E-02		3.84E-01
Cs-134	475.36	1.48	3.01E-03	5.04E-02	2.61E+00
	563.25	8.34	3.30E-02		4.65E-01
	569.33	15.37	0.00E+00		2.63E-01
	604.72	97.62	-2.64E-02		6.53E-02
	795.86	85.46	3.24E-02		5.04E-02
	801.95	8.69	-3.87E-01		4.74E-01
	1038.61	0.99	-2.80E+00		4.68E+00
	1167.97	1.79	2.04E+00		3.53E+00
	1365.19	3.02	1.84E-01		1.28E+00
Cs-137	661.66	85.10	2.63E-02	5.47E-02	5.47E-02
Eu-152	121.78	28.67	-1.08E-01	1.25E-01	1.37E-01
	244.70	7.61	2.20E-01		5.24E-01
	295.94	0.45	7.48E+00		9.84E+00
	344.28	26.60	-4.15E-02		1.25E-01
	367.79	0.86	2.64E+00		4.14E+00
	411.12	2.24	-7.71E-01		1.56E+00
	443.96	2.83	8.11E-01		1.22E+00
	488.68	0.42	5.43E+00		8.79E+00
	563.99	0.49	-3.88E+00		7.61E+00
	586.26	0.46	8.37E+00		1.24E+01
	678.62	0.47	1.75E+00		7.96E+00
	688.67	0.86	1.20E+00		4.19E+00
	719.35	0.28	4.70E+00		1.49E+01
	778.90	12.96	-6.01E-01		3.32E-01
	810.45	0.32	-9.19E+00		1.34E+01
	867.37	4.26	-6.53E-01		1.13E+00
	919.33	0.43	-1.57E+01		1.14E+01
	964.08	14.65	1.50E-01		4.43E-01
	1085.87	10.24	1.61E-01		5.16E-01
	1089.74	1.73	-1.30E+00		3.15E+00
	1112.07	13.69	-2.28E-01		3.67E-01
	1212.95	1.43	1.82E+00		4.60E+00
	1249.94	0.19	-1.22E+01		3.06E+01
	1299.14	1.63	5.47E-01		3.22E+00
	1408.01	21.07	9.61E-02		2.29E-01
	1457.64	0.50	1.22E+02		3.66E+01
	1528.10	0.28	-1.71E+00		1.28E+01
Eu-154	123.07	40.40	1.05E-02	1.00E-01	1.00E-01
	247.93	6.89	-3.33E-02		4.87E-01
	591.76	4.95	-1.54E-01		8.19E-01
	692.42	1.78	1.21E+00		2.14E+00
	723.30	20.06	-1.97E-02		2.22E-01
	756.80	4.52	2.90E-01		8.62E-01
	873.18	12.08	-1.86E-01		4.07E-01

Analysis Report for 12-Jul-19-10019

L1-10221D-FIGS-016SS

	<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
	Eu-154	996.29	10.48	9.68E-03	1.00E-01	4.38E-01
		1004.76	18.01	2.46E-01		2.92E-01
		1274.43	34.80	2.77E-02		1.60E-01
		1596.48	1.80	-2.47E-01		2.70E+00
	Eu-155	45.30	1.31	-6.24E+00	2.05E-01	1.69E+01
		60.01	1.22	3.42E+00		2.23E+01
		86.55	30.70	6.43E-02		2.18E-01
		105.31	21.10	-6.08E-02		2.05E-01
+	Ra-226	186.21	* 3.64	5.09E-01	6.73E-01	6.73E-01
	Pa-231	27.36	10.30	1.39E+00	1.50E+00	2.17E+00
		283.69	1.70	1.12E-01		1.97E+00
		300.07	2.47	-2.13E+00		1.50E+00
		302.65	2.20	6.30E-01		1.58E+00
		330.06	1.40	5.54E-01		2.40E+00
+	U-235	143.76	10.96	2.93E-01	4.28E-02	3.46E-01
		163.33	5.08	-4.73E-02		6.44E-01
		185.71	* 57.20	3.24E-02		4.28E-02
		202.11	1.08	-3.20E-01		3.27E+00
		205.31	5.01	-2.73E-01		6.95E-01
	Am-241	59.54	35.90	3.25E-01	8.03E-01	8.03E-01

+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = 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-Jul-19-10020  
L1-10221D-FIGS-017SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 12-Jul-19-10020  
Sample Description : L1-10221D-FIGS-017SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.561E+03 grams  
Facility : Default  
  
Sample Taken On : 7/11/2019 7:19:00AM  
Acquisition Started : 7/12/2019 10:05:36AM  
  
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 : 7/12/2019  
Efficiency Calibration Description :  
  
Sample Number : 77943  
Fill Height : 1561.27 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/7/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/12/2019 10:20:39AM

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

*zmad*  
Data Validated  
1430 7-12-19 [381]

Analysis Report for 12-Jul-19-10020

L1-10221D-FIGS-017SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.72	948 -	960	955.35	1.28E+02	15.96	4.85E+01	1.04
2	295.29	1174 -	1186	1181.38	5.47E+01	10.88	2.43E+01	0.41
3	351.97	1402 -	1413	1407.86	8.02E+01	11.77	2.28E+01	1.18
4	477.48	1905 -	1915	1909.48	1.82E+01	7.09	1.28E+01	0.81
5	511.04	2039 -	2052	2043.64	2.89E+01	10.62	3.01E+01	0.37
6	583.19	2325 -	2339	2332.06	5.38E+01	9.29	1.13E+01	1.11
7	609.33	2429 -	2446	2436.60	5.61E+01	12.29	2.89E+01	0.36
8	661.70	2638 -	2652	2645.98	6.16E+01	9.41	9.38E+00	1.31
9	911.04	3636 -	3650	3643.18	3.82E+01	7.44	5.80E+00	0.92
10	1460.59	5832 -	5853	5842.75	2.69E+02	17.07	5.71E+00	1.87

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	1.00	511.00 *	100.00	3.26E-02	1.22E-02
BE-7	0.99	477.60 *	10.44	1.88E-01	7.45E-02
K-40	0.99	1460.82 *	10.66	5.60E+00	4.31E-01
Cs-137	1.00	661.66 *	85.10	9.52E-02	1.56E-02
Tl-208	1.00	583.19 *	85.00	7.65E-02	1.40E-02
Pb-212	0.99	115.18 *	0.60		
		238.63 *	43.60	1.99E-01	2.96E-02 <sup>[382]</sup>

Analysis Report for 12-Jul-19-10020

L1-10221D-FIGS-017SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Pb-212	0.99	300.09	3.30		
Bi-214	1.00	609.32 *	45.49	1.54E-01	3.49E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	1.00	241.99	7.25		
		295.22 *	18.42	2.27E-01	4.86E-02
		351.93 *	35.60	1.94E-01	3.25E-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	2.40E-01	4.79E-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

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**INTERFERENCE CORRECTED REPORT**

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Analysis Report for 12-Jul-19-10020  
L1-10221D-FIGS-017SS

<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
An Pk	1.000	3.26E-02	1.22E-02	
BE-7	0.997	1.88E-01	7.45E-02	
K-40	0.992	5.60E+00	4.31E-01	
Cs-137	1.000	9.52E-02	1.56E-02	
Tl-208	1.000	7.65E-02	1.40E-02	
X Bi-211	0.879			
Pb-212	0.999	1.99E-01	2.96E-02	
Bi-214	1.000	1.54E-01	3.49E-02	
Pb-214	1.000	2.04E-01	2.70E-02	
Ac-228	0.999	2.40E-01	4.79E-02	

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

Errors quoted at 1.000sigma



Analysis Report for 12-Jul-19-10020  
L1-10221D-FIGS-017SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/12/2019 10:20:39AM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

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

## NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	* 100.00	3.26E-02	3.83E-02	3.83E-02
+	BE-7	477.60	* 10.44	1.88E-01	2.28E-01	2.28E-01
+	K-40	1460.82	* 10.66	5.60E+00	3.92E-01	3.92E-01
	Mn-54	834.85	99.98	2.10E-03	4.12E-02	4.12E-02
	Co-60	1173.23	99.85	-2.87E-02	4.58E-02	5.82E-02
		1332.49	99.98	3.32E-02		4.58E-02
	Nb-94	702.65	99.81	-2.89E-02	3.61E-02	3.61E-02
		871.09	99.89	2.66E-02		4.45E-02
	Ag-108m	79.13	6.60	-9.03E-01	4.16E-02	1.52E+00
		433.94	90.50	1.17E-02		4.16E-02
		614.28	89.80	2.99E-02		7.29E-02
		722.94	90.80	3.83E-04		4.73E-02
	Sb-125	176.31	6.84	1.11E-01	1.29E-01	5.08E-01
		380.45	1.52	1.05E+00		2.19E+00
		427.87	29.60	5.01E-02		1.29E-01
		463.36	10.49	1.32E-01		3.88E-01
		600.60	17.65	8.74E-04		2.10E-01
		606.71	4.98	1.50E+00		1.34E+00
		635.95	11.22	9.18E-02		3.62E-01

Analysis Report for 12-Jul-19-10020

L1-10221D-FIGS-017SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	4.57E-01	1.29E-01	2.29E+00
Ba-133	79.61	2.65	1.59E+00	8.07E-02	3.75E+00
	81.00	32.90	-3.81E-01		2.53E-01
	276.40	7.16	2.35E-01		5.57E-01
	302.85	18.34	8.62E-02		1.91E-01
	356.01	62.05	-5.11E-02		8.07E-02
	383.85	8.94	-1.70E-01		3.70E-01
Cs-134	475.36	1.48	3.14E+00	5.57E-02	2.85E+00
	563.25	8.34	9.95E-02		4.55E-01
	569.33	15.37	1.35E-01		2.49E-01
	604.72	97.62	2.64E-03		6.18E-02
	795.86	85.46	4.14E-03		5.57E-02
	801.95	8.69	-7.14E-01		4.61E-01
	1038.61	0.99	4.11E-01		5.13E+00
	1167.97	1.79	-7.71E-01		3.28E+00
	1365.19	3.02	-1.06E+00		1.41E+00
+ Cs-137	661.66	* 85.10	9.52E-02	3.17E-02	3.17E-02
Eu-152	121.78	28.67	1.22E-02	1.38E-01	1.39E-01
	244.70	7.61	6.37E-01		5.46E-01
	295.94	0.45	1.64E+00		9.42E+00
	344.28	26.60	7.40E-02		1.38E-01
	367.79	0.86	3.38E-01		4.10E+00
	411.12	2.24	-8.61E-02		1.68E+00
	443.96	2.83	-9.00E-01		1.16E+00
	488.68	0.42	3.60E+00		9.46E+00
	563.99	0.49	2.42E+00		7.64E+00
	586.26	0.46	1.67E+01		1.20E+01
	678.62	0.47	3.25E-01		8.13E+00
	688.67	0.86	-1.52E+00		4.58E+00
	719.35	0.28	3.96E+00		1.34E+01
	778.90	12.96	-1.10E-01		3.08E-01
	810.45	0.32	-8.88E+00		1.32E+01
	867.37	4.26	-5.72E-01		1.06E+00
	919.33	0.43	-2.06E+00		1.18E+01
	964.08	14.65	1.03E-01		4.15E-01
	1085.87	10.24	-2.35E-01		4.77E-01
	1089.74	1.73	-7.92E-01		2.93E+00
	1112.07	13.69	-1.47E-01		3.42E-01
	1212.95	1.43	2.63E+00		4.16E+00
	1249.94	0.19	1.29E+01		2.88E+01
	1299.14	1.63	-1.11E+00		3.49E+00
	1408.01	21.07	-4.29E-02		2.00E-01
	1457.64	0.50	1.23E+02		3.66E+01
	1528.10	0.28	-3.76E+00		1.19E+01
Eu-154	123.07	40.40	3.12E-02	9.81E-02	9.81E-02
	247.93	6.89	4.25E-02		4.88E-01
	591.76	4.95	2.39E-01		6.98E-01
	692.42	1.78	1.35E+00		2.15E+00
	723.30	20.06	4.40E-02		2.20E-01
	756.80	4.52	-1.20E+00		8.37E-01
	873.18	12.08	1.26E-01		3.62E-01

Analysis Report for 12-Jul-19-10020

L1-10221D-FIGS-017SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	7.95E-02	9.81E-02	4.33E-01
	1004.76	18.01	6.96E-02		2.34E-01
	1274.43	34.80	-2.08E-01		1.38E-01
	1596.48	1.80	1.19E+00		2.28E+00
Eu-155	45.30	1.31	1.79E+00	2.11E-01	2.07E+01
	60.01	1.22	2.33E+00		2.35E+01
	86.55	30.70	-4.58E-02		2.27E-01
	105.31	21.10	1.06E-01		2.11E-01
Ra-226	186.21	3.64	-4.72E-02	1.04E+00	1.04E+00
Pa-231	27.36	10.30	1.90E+00	1.50E+00	2.47E+00
	283.69	1.70	4.25E-01		2.06E+00
	300.07	2.47	-1.72E+00		1.50E+00
	302.65	2.20	5.71E-01		1.59E+00
	330.06	1.40	1.23E-01		2.68E+00
U-235	143.76	10.96	-2.01E-01	6.62E-02	3.47E-01
	163.33	5.08	4.19E-01		7.14E-01
	185.71	57.20	1.40E-02		6.62E-02
	202.11	1.08	-3.57E-01		3.23E+00
	205.31	5.01	-7.17E-01		6.64E-01
Am-241	59.54	35.90	-1.64E-01	8.16E-01	8.16E-01

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

Analysis Report for 16-Jul-19-10008  
L1-10221D-FIGS-018SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 16-Jul-19-10008  
Sample Description : L1-10221D-FIGS-018SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.201E+03 grams  
Facility : Default  
  
Sample Taken On : 7/15/2019 1:45:00PM  
Acquisition Started : 7/16/2019 9:10:12AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P40818B  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 901.3 seconds  
  
Dead Time : 0.14 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/29/2019  
Efficiency Calibration Used Done On : 7/16/2019  
Efficiency Calibration Description :  
  
Sample Number : 77982  
Fill Height : 1201.39 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/30/2012 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/16/2019 9:25:16AM

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

*JMK*  
Data Validated  
1530 7/16/19 [388]

Analysis Report for 16-Jul-19-10008

L1-10221D-FIGS-018SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.58	946 -	960	954.41	1.38E+02	17.65	6.05E+01	1.02
2	295.21	1175 -	1188	1180.72	5.00E+01	11.91	3.30E+01	1.33
3	338.22	1347 -	1356	1352.67	1.96E+01	7.71	1.74E+01	0.46
4	351.83	1402 -	1413	1407.07	5.47E+01	11.23	2.83E+01	0.85
5	609.02	2429 -	2441	2435.27	4.54E+01	9.48	1.66E+01	1.22
6	661.20	2637 -	2650	2643.88	5.84E+01	9.39	1.06E+01	0.86
7	910.95	3638 -	3648	3642.78	2.54E+01	6.85	8.63E+00	0.63
8	968.42	3867 -	3878	3872.65	1.74E+01	5.40	4.59E+00	1.44
9	1459.84	5828 -	5851	5839.19	2.44E+02	16.03	3.16E+00	1.48

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	0.85	1460.82 *	10.66	6.63E+00	5.22E-01
Cs-137	0.96	661.66 *	85.10	1.14E-01	1.96E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	2.61E-01	3.96E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.57E-01	3.42E-02
		768.36	4.89		
		806.18	1.26		

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Analysis Report for 16-Jul-19-10008

L1-10221D-FIGS-018SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Bi-214	0.99	934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	0.99	241.99	7.25		
		295.22 *	18.42	2.54E-01	6.39E-02
		351.93 *	35.60	1.64E-01	3.61E-02
Ac-228	0.98	785.96	1.06		
		129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32 *	11.27	1.80E-01	7.24E-02
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	2.05E-01	5.60E-02
		964.77	4.99		
		968.97 *	15.80	2.39E-01	7.51E-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

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## INTERFERENCE CORRECTED REPORT

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Analysis Report for 16-Jul-19-10008

L1-10221D-FIGS-018SS

<i><b>Nuclide Name</b></i>	<i><b>Nuclide Id Confidence</b></i>	<i><b>Wt mean Activity (pCi/grams)</b></i>	<i><b>Wt mean Activity Uncertainty</b></i>	<i><b>Comments</b></i>
	0.857	6.63E+00	5.22E-01	
	0.967	1.14E-01	1.96E-02	
X	0.911			
	1.000	2.61E-01	3.96E-02	
	0.994	1.57E-01	3.42E-02	
	0.999	1.86E-01	3.14E-02	
	0.988	2.07E-01	3.81E-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 16-Jul-19-10008  
L1-10221D-FIGS-018SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/16/2019 9:25:16AM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

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

## NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	8.43E-02	6.56E-02	6.56E-02
	BE-7	477.60	10.44	3.48E-01	4.90E-01	4.90E-01
+	K-40	1460.82	* 10.66	6.63E+00	4.13E-01	4.13E-01
	Mn-54	834.85	99.98	1.61E-02	4.67E-02	4.67E-02
	Co-60	1173.23	99.85	1.78E-02	7.51E-02	8.14E-02
		1332.49	99.98	7.29E-02		7.51E-02
	Nb-94	702.65	99.81	3.27E-02	5.00E-02	5.00E-02
		871.09	99.89	2.79E-03		5.70E-02
	Ag-108m	79.13	6.60	6.57E-01	4.39E-02	1.84E+00
		433.94	90.50	-2.11E-02		4.39E-02
		614.28	89.80	-6.89E-03		5.86E-02
		722.94	90.80	-2.33E-02		6.03E-02
	Sb-125	176.31	6.84	2.23E-01	1.43E-01	6.29E-01
		380.45	1.52	-1.34E+00		2.77E+00
		427.87	29.60	-3.55E-02		1.43E-01
		463.36	10.49	3.39E-01		4.69E-01
		600.60	17.65	-5.06E-02		2.62E-01
		606.71	4.98	1.63E+00		1.45E+00
		635.95	11.22	2.28E-01		4.22E-01



Analysis Report for 16-Jul-19-10008

L1-10221D-FIGS-018SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-3.06E-01	1.43E-01	2.58E+00
Ba-133	79.61	2.65	-1.57E+00	6.89E-02	4.18E+00
	81.00	32.90	-3.52E-01		2.86E-01
	276.40	7.16	-2.25E-01		5.42E-01
	302.85	18.34	8.06E-02		2.41E-01
	356.01	62.05	-3.70E-02		6.89E-02
	383.85	8.94	3.21E-01		4.68E-01
Cs-134	475.36	1.48	-1.19E+00	6.47E-02	3.24E+00
	563.25	8.34	-3.72E-02		5.22E-01
	569.33	15.37	1.79E-01		3.10E-01
	604.72	97.62	-3.52E-02		7.36E-02
	795.86	85.46	3.34E-02		6.47E-02
	801.95	8.69	-1.70E-01		5.68E-01
	1038.61	0.99	3.61E+00		5.85E+00
	1167.97	1.79	2.46E+00		4.74E+00
	1365.19	3.02	1.10E+00		1.78E+00
+ Cs-137	661.66	* 85.10	1.14E-01	4.19E-02	4.19E-02
Eu-152	121.78	28.67	-4.68E-02	1.37E-01	1.53E-01
	244.70	7.61	1.18E-01		6.10E-01
	295.94	0.45	-2.72E+00		1.17E+01
	344.28	26.60	-2.01E-02		1.37E-01
	367.79	0.86	-7.28E-01		4.20E+00
	411.12	2.24	5.32E-01		2.10E+00
	443.96	2.83	-6.77E-01		1.43E+00
	488.68	0.42	-2.25E+00		9.08E+00
	563.99	0.49	7.86E+00		9.51E+00
	586.26	0.46	9.43E+00		1.29E+01
	678.62	0.47	-2.06E+00		9.50E+00
	688.67	0.86	1.24E+00		5.91E+00
	719.35	0.28	4.27E+00		1.79E+01
	778.90	12.96	1.18E-01		4.44E-01
	810.45	0.32	7.22E-01		1.39E+01
	867.37	4.26	4.39E-01		1.51E+00
	919.33	0.43	-3.18E+00		1.05E+01
	964.08	14.65	-6.52E-02		5.08E-01
	1085.87	10.24	-7.76E-01		6.79E-01
	1089.74	1.73	2.30E+00		4.20E+00
	1112.07	13.69	-1.87E-01		4.51E-01
	1212.95	1.43	-1.20E+00		5.18E+00
	1249.94	0.19	-1.81E+01		3.67E+01
	1299.14	1.63	1.98E+00		3.70E+00
	1408.01	21.07	3.34E-03		2.70E-01
	1457.64	0.50	1.38E+02		4.52E+01
	1528.10	0.28	5.33E+00		1.45E+01
Eu-154	123.07	40.40	3.40E-02	1.07E-01	1.07E-01
	247.93	6.89	-5.06E-01		5.33E-01
	591.76	4.95	-2.55E-01		9.23E-01
	692.42	1.78	1.00E-02		2.78E+00
	723.30	20.06	1.99E-01		2.77E-01
	756.80	4.52	-8.13E-01		1.11E+00
	873.18	12.08	1.41E-01		4.65E-01

Analysis Report for 16-Jul-19-10008

L1-10221D-FIGS-018SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	1.80E-01	1.07E-01	5.78E-01
	1004.76	18.01	-7.02E-02		3.38E-01
	1274.43	34.80	9.96E-02		1.79E-01
	1596.48	1.80	-3.35E-01		2.16E+00
Eu-155	45.30	1.31	2.01E+00	2.83E-01	3.18E+01
	60.01	1.22	-4.50E-01		2.87E+01
	86.55	30.70	1.17E-01		2.94E-01
Ra-226	105.31	21.10	3.01E-02		2.83E-01
Ra-226	186.21	3.64	1.90E-01	1.19E+00	1.19E+00
Pa-231	27.36	10.30	8.92E-01	1.62E+00	3.28E+00
	283.69	1.70	-2.80E+00		2.24E+00
	300.07	2.47	-3.37E-01		1.62E+00
	302.65	2.20	3.21E-01		1.99E+00
	330.06	1.40	5.46E-01		3.12E+00
U-235	143.76	10.96	6.45E-02	7.50E-02	4.01E-01
	163.33	5.08	-1.25E-01		8.67E-01
	185.71	57.20	-1.38E-02		7.50E-02
	202.11	1.08	2.84E-02		3.61E+00
	205.31	5.01	-1.44E-01		8.23E-01
Am-241	59.54	35.90	1.60E-01	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 16-Jul-19-10009  
L1-10221D-FIGS-019SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 16-Jul-19-10009  
Sample Description : L1-10221D-FIGS-019SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.616E+03 grams  
Facility : Default  
  
Sample Taken On : 7/15/2019 1:47:00PM  
Acquisition Started : 7/16/2019 9:10:18AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P11314  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.3 seconds  
  
Dead Time : 0.04 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/24/2019  
Efficiency Calibration Used Done On : 7/16/2019  
Efficiency Calibration Description :  
  
Sample Number : 77983  
Fill Height : 1615.95 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 12/22/2008 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/16/2019 9:25:21AM

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

*JMK*  
Data Validated  
1530 7-16-19  
[395]

Analysis Report for 16-Jul-19-10009

L1-10221D-FIGS-019SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.85	950 -	960	954.96	8.69E+01	15.30	6.01E+01	1.37
2	338.51	1348 -	1359	1353.14	3.08E+01	8.40	1.42E+01	1.16
3	352.07	1400 -	1414	1407.28	7.66E+01	11.12	1.64E+01	1.19
4	531.67	2120 -	2129	2124.98	9.50E+00	4.65	4.50E+00	0.72
5	910.79	3633 -	3647	3640.63	3.59E+01	8.24	1.11E+01	1.04
6	1460.45	5829 -	5849	5839.73	2.30E+02	16.08	7.82E+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	0.97	1460.82 *	10.66	5.09E+00	4.18E-01
Bi-211	0.85	351.07 *	13.02	5.21E-01	8.66E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	1.37E-01	2.65E-02
		300.09	3.30		
Pb-214	0.99	241.99	7.25		
		295.22	18.42		
		351.93 *	35.60	1.91E-01	3.16E-02
		785.96	1.06		
Ac-228	0.99	129.07	2.42		
		209.25	3.89		

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Analysis Report for 16-Jul-19-10009

L1-10221D-FIGS-019SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Ac-228	0.99	270.24	3.46		
		328.00	2.95		
		338.32 *	11.27	2.36E-01	6.70E-02
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	2.38E-01	5.56E-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

<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	0.978	5.09E+00	4.18E-01	
? Bi-211	0.853	5.21E-01	8.66E-02	
Pb-212	0.993	1.37E-01	2.65E-02	
? Pb-214	0.998	1.91E-01	3.16E-02	
Ac-228	0.991	2.37E-01	4.28E-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 16-Jul-19-10009  
L1-10221D-FIGS-019SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/16/2019 9:25:21AM  
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	531.67	1.05556E-02	48.94		

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	6.82E-02	5.22E-02	5.22E-02
	BE-7	477.60	10.44	-4.50E-02	3.33E-01	3.33E-01
+	K-40	1460.82	* 10.66	5.09E+00	4.62E-01	4.62E-01
	Mn-54	834.85	99.98	-1.62E-02	4.48E-02	4.48E-02
	Co-60	1173.23	99.85	-6.47E-03	4.28E-02	4.81E-02
		1332.49	99.98	-2.42E-02		4.28E-02
	Nb-94	702.65	99.81	-2.17E-02	3.57E-02	3.57E-02
		871.09	99.89	6.55E-03		4.03E-02
	Ag-108m	79.13	6.60	1.29E+00	3.32E-02	1.17E+00
		433.94	90.50	-3.46E-02		3.32E-02
		614.28	89.80	-4.34E-02		4.95E-02
		722.94	90.80	-2.79E-02		4.47E-02
	Sb-125	176.31	6.84	-1.33E-01	1.26E-01	4.04E-01
		380.45	1.52	-2.72E-01		2.08E+00
		427.87	29.60	7.84E-02		1.26E-01
		463.36	10.49	-1.88E-01		3.34E-01
		600.60	17.65	-1.04E-01		1.85E-01
		606.71	4.98	1.29E+00		1.09E+00

[398]

Analysis Report for 16-Jul-19-10009

L1-10221D-FIGS-019SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>	
Sb-125	635.95	11.22	1.41E-01	1.26E-01	3.83E-01	
	671.44	1.79	5.12E-01		2.16E+00	
Ba-133	79.61	2.65	2.19E+00	6.24E-02	2.78E+00	
	81.00	32.90	-3.56E-01		1.75E-01	
	276.40	7.16	3.42E-02		4.38E-01	
	302.85	18.34	4.15E-02		1.71E-01	
	356.01	62.05	-1.44E-02		6.24E-02	
	383.85	8.94	4.16E-02		3.55E-01	
	475.36	1.48	6.44E-01		4.61E-02	2.44E+00
Cs-134	563.25	8.34	-1.21E-01	4.61E-02	4.51E-01	
	569.33	15.37	1.43E-01		2.05E-01	
	604.72	97.62	-3.66E-02		4.61E-02	
	795.86	85.46	3.00E-02		4.72E-02	
	801.95	8.69	-7.33E-02		3.98E-01	
	1038.61	0.99	-2.07E-01		4.05E+00	
	1167.97	1.79	9.28E-01		3.02E+00	
	1365.19	3.02	5.60E-01		1.39E+00	
	661.66	85.10	3.23E-02		5.06E-02	5.06E-02
	Cs-137					
Eu-152	121.78	28.67	-6.46E-02	1.04E-01	1.04E-01	
	244.70	7.61	-3.50E-02		4.81E-01	
	295.94	0.45	3.68E+00		8.02E+00	
	344.28	26.60	-1.53E-02		1.18E-01	
	367.79	0.86	-4.43E+00		3.40E+00	
	411.12	2.24	-9.75E-01		1.54E+00	
	443.96	2.83	-1.87E-01		1.13E+00	
	488.68	0.42	-8.86E+00		7.53E+00	
	563.99	0.49	-8.34E+00		7.00E+00	
	586.26	0.46	1.22E+01		1.10E+01	
	678.62	0.47	3.84E+00		9.51E+00	
	688.67	0.86	-1.83E+00		3.63E+00	
	719.35	0.28	-4.01E+00		1.45E+01	
	778.90	12.96	-1.11E-01		3.30E-01	
	810.45	0.32	8.23E+00		1.37E+01	
	867.37	4.26	-1.48E-01		9.84E-01	
	919.33	0.43	-8.44E+00		1.06E+01	
	964.08	14.65	-2.92E-02		3.43E-01	
	1085.87	10.24	1.92E-01		4.76E-01	
	1089.74	1.73	-5.16E+00		2.65E+00	
	1112.07	13.69	-2.88E-02		2.97E-01	
	1212.95	1.43	3.30E-01		4.35E+00	
	1249.94	0.19	1.31E+01		2.94E+01	
1299.14	1.63	4.40E-01	3.23E+00			
1408.01	21.07	-3.64E-01	1.22E-01			
1457.64	0.50	1.12E+02	3.64E+01			
1528.10	0.28	1.73E+00	8.36E+00			
Eu-154	123.07	40.40	-2.30E-03	7.51E-02	7.51E-02	
	247.93	6.89	-3.02E-01		3.99E-01	
	591.76	4.95	-3.87E-01		6.54E-01	
	692.42	1.78	-1.70E-01		1.76E+00	
	723.30	20.06	-1.53E-01		2.03E-01	
	756.80	4.52	3.03E-01		8.96E-01	

Analysis Report for 16-Jul-19-10009

L1-10221D-FIGS-019SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	873.18	12.08	-9.78E-02	7.51E-02	3.41E-01
	996.29	10.48	1.22E-01		4.66E-01
	1004.76	18.01	9.04E-02		2.18E-01
	1274.43	34.80	-7.43E-02		1.15E-01
	1596.48	1.80	-9.48E-01		2.19E+00
Eu-155	45.30	1.31	1.35E+00	1.70E-01	1.05E+01
	60.01	1.22	1.96E+00		1.13E+01
	86.55	30.70	1.97E-02		1.70E-01
	105.31	21.10	-1.63E-02		1.73E-01
Ra-226	186.21	3.64	4.58E-01	8.65E-01	8.65E-01
Pa-231	27.36	10.30	9.09E-01	1.16E+00	1.16E+00
	283.69	1.70	1.87E-01		1.78E+00
	300.07	2.47	-1.36E+00		1.23E+00
	302.65	2.20	7.69E-01		1.43E+00
	330.06	1.40	9.54E-01		2.25E+00
	U-235	143.76	10.96	4.06E-02	5.64E-02
U-235	163.33	5.08	-7.06E-02		5.42E-01
	185.71	57.20	6.52E-02		5.64E-02
	202.11	1.08	-1.94E+00		2.70E+00
	205.31	5.01	-1.64E-02		6.18E-01
Am-241	59.54	35.90	-1.16E-01	3.86E-01	3.86E-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 17-Jul-19-10023  
L1-10221D-FIGS-020SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 17-Jul-19-10023  
Sample Description : L1-10221D-FIGS-020SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.556E+03 grams  
Facility : Default  
  
Sample Taken On : 7/17/2019 8:30:00AM  
Acquisition Started : 7/17/2019 3:50:29PM  
  
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 : 0.03 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 4096  
Peak Area Range (in channels) : 120 - 4096  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 9/29/2018  
Efficiency Calibration Used Done On : 7/17/2019  
Efficiency Calibration Description :  
  
Sample Number : 78024  
Fill Height : 1555.84 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/30/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/17/2019 4:05:32PM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 4096

*Handwritten signature*  
Data Validated  
1630 7/17/19

Analysis Report for 17-Jul-19-10023

L1-10221D-FIGS-020SS

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	477.50	1.28E+02	18.49	9.79E+01	1.17
2	338.59	672 -	681	677.14	5.77E+01	11.33	3.13E+01	1.02
3	351.97	698 -	708	703.89	8.17E+01	14.47	5.33E+01	1.43
4	583.44	1163 -	1171	1166.49	5.10E+01	9.49	1.80E+01	1.32
5	609.45	1212 -	1223	1218.49	5.76E+01	9.56	1.34E+01	1.69
6	911.27	1816 -	1828	1822.00	4.78E+01	9.52	1.63E+01	1.91
7	1460.87	2915 -	2929	2921.80	3.07E+02	17.66	1.69E+00	1.74
8	1764.68	3526 -	3536	3530.22	1.84E+01	4.78	1.64E+00	1.37

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty	
K-40	1.00	1460.82	*	10.66	5.75E+00	4.14E-01
Tl-208	0.98	583.19	*	85.00	6.55E-02	1.28E-02
Bi-211	0.87	351.07	*	13.02	4.88E-01	9.49E-02
Pb-212	1.00	115.18	*	0.60		
		238.63	*	43.60	1.79E-01	2.96E-02
		300.09	*	3.30		
Bi-214	0.99	609.32	*	45.49	1.42E-01	2.51E-02
		768.36	*	4.89		
		806.18	*	1.26		

[402]

Analysis Report for 17-Jul-19-10023

L1-10221D-FIGS-020SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Bi-214	0.99	934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49 *	15.30	2.76E-01	7.26E-02
		1847.43	2.03		
		2118.51	1.16		
Pb-214	1.00	241.99	7.25		
		295.22	18.42		
		351.93 *	35.60	1.78E-01	3.47E-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	3.87E-01	8.24E-02
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	2.71E-01	5.52E-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

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## INTERFERENCE CORRECTED REPORT

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Analysis Report for 17-Jul-19-10023

L1-10221D-FIGS-020SS

<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	1.000	5.75E+00	4.14E-01	
Tl-208	0.989	6.55E-02	1.28E-02	
? Bi-211	0.878	4.88E-01	9.49E-02	
Pb-212	1.000	1.79E-01	2.96E-02	
Bi-214	0.998	1.56E-01	2.37E-02	
? Pb-214	1.000	1.78E-01	3.47E-02	
Ac-228	0.998	3.07E-01	4.59E-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 17-Jul-19-10023  
L1-10221D-FIGS-020SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/17/2019 4:05:32PM  
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	6.10E-02	5.08E-02	5.08E-02
	BE-7	477.60	10.44	2.09E-02	2.98E-01	2.98E-01
+	K-40	1460.82	* 10.66	5.75E+00	1.89E-01	1.89E-01
	Mn-54	834.85	99.98	-2.51E-02	3.36E-02	3.36E-02
	Co-60	1173.23	99.85	5.26E-03	4.11E-02	4.94E-02
		1332.49	99.98	2.44E-02		4.11E-02
	Nb-94	702.65	99.81	-8.72E-03	3.38E-02	3.38E-02
		871.09	99.89	8.52E-03		3.81E-02
	Ag-108m	79.13	6.60	6.42E-01	3.18E-02	1.11E+00
		433.94	90.50	1.47E-04		3.18E-02
		614.28	89.80	6.44E-03		5.26E-02
		722.94	90.80	-2.01E-02		4.03E-02
	Sb-125	176.31	6.84	-1.27E-01	8.06E-02	4.39E-01
		380.45	1.52	9.71E-02		2.01E+00
		427.87	29.60	-7.32E-02		8.06E-02
		463.36	10.49	1.03E-01		3.26E-01
		600.60	17.65	1.35E-01		2.00E-01
		606.71	4.98	-1.46E-01		1.01E+00
		635.95	11.22	-2.25E-01		2.45E-01

Analysis Report for 17-Jul-19-10023

L1-10221D-FIGS-020SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-7.27E-01	8.06E-02	1.70E+00
Ba-133	79.61	2.65	9.53E-01	6.51E-02	2.57E+00
	81.00	32.90	-2.08E-01		1.69E-01
	276.40	7.16	1.78E-01		4.65E-01
	302.85	18.34	2.46E-03		1.66E-01
	356.01	62.05	-3.25E-02		6.51E-02
	383.85	8.94	5.82E-02		3.46E-01
Cs-134	475.36	1.48	-6.64E-01	4.33E-02	1.88E+00
	563.25	8.34	6.17E-03		3.62E-01
	569.33	15.37	1.70E-02		2.10E-01
	604.72	97.62	-1.01E-02		4.33E-02
	795.86	85.46	2.11E-02		4.56E-02
	801.95	8.69	-3.95E-01		3.93E-01
	1038.61	0.99	2.78E-01		4.08E+00
	1167.97	1.79	-1.03E+00		2.22E+00
	1365.19	3.02	7.55E-01		1.23E+00
Cs-137	661.66	85.10	4.24E-02	4.73E-02	4.73E-02
Eu-152	121.78	28.67	2.98E-02	1.07E-01	1.11E-01
	244.70	7.61	-2.61E-01		4.49E-01
	295.94	0.45	4.13E+00		7.75E+00
	344.28	26.60	-1.30E-01		1.07E-01
	367.79	0.86	-1.53E+00		3.16E+00
	411.12	2.24	4.25E-01		1.50E+00
	443.96	2.83	-3.55E-01		1.10E+00
	488.68	0.42	6.98E-01		7.41E+00
	563.99	0.49	-1.07E+00		6.15E+00
	586.26	0.46	-2.68E+00		1.11E+01
	678.62	0.47	1.79E+00		6.98E+00
	688.67	0.86	1.35E+00		4.25E+00
	719.35	0.28	1.40E+00		1.27E+01
	778.90	12.96	-6.02E-03		2.42E-01
	810.45	0.32	2.68E+00		1.17E+01
	867.37	4.26	-5.78E-01		8.59E-01
	919.33	0.43	-1.40E+00		9.07E+00
	964.08	14.65	-1.52E-01		3.48E-01
	1085.87	10.24	1.28E-01		4.05E-01
	1089.74	1.73	-6.23E-01		2.25E+00
	1112.07	13.69	-4.69E-02		3.43E-01
	1212.95	1.43	1.13E-01		3.48E+00
	1249.94	0.19	9.22E+00		2.63E+01
	1299.14	1.63	2.46E-01		3.24E+00
	1408.01	21.07	2.30E-02		1.98E-01
	1457.64	0.50	-4.06E+00		3.47E+01
	1528.10	0.28	-3.61E+00		1.37E+01
Eu-154	123.07	40.40	4.70E-02	8.10E-02	8.10E-02
	247.93	6.89	-1.68E-01		4.41E-01
	591.76	4.95	-2.01E-01		6.59E-01
	692.42	1.78	1.04E-01		2.00E+00
	723.30	20.06	-1.42E-02		1.88E-01
	756.80	4.52	-5.94E-02		7.41E-01
	873.18	12.08	1.38E-01		3.21E-01

Analysis Report for 17-Jul-19-10023

L1-10221D-FIGS-020SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	1.95E-01	8.10E-02	4.04E-01
	1004.76	18.01	-6.74E-02		2.28E-01
	1274.43	34.80	-2.12E-02		1.18E-01
	1596.48	1.80	-6.78E-01		1.85E+00
Eu-155	45.30	1.31	-2.56E+00	1.61E-01	1.01E+01
	60.01	1.22	-3.59E+00		1.22E+01
	86.55	30.70	-2.17E-02		1.61E-01
	105.31	21.10	-9.96E-03		1.70E-01
Ra-226	186.21	3.64	5.44E-01	9.83E-01	9.83E-01
Pa-231	27.36	10.30	1.49E-01	1.05E+00	1.05E+00
	283.69	1.70	-5.79E-03		1.62E+00
	300.07	2.47	-1.03E+00		1.23E+00
	302.65	2.20	2.05E-02		1.38E+00
	330.06	1.40	1.15E+00		2.32E+00
U-235	143.76	10.96	2.14E-01	6.20E-02	2.89E-01
	163.33	5.08	1.09E-01		6.49E-01
	185.71	57.20	2.85E-02		6.20E-02
	202.11	1.08	-1.64E+00		2.53E+00
	205.31	5.01	1.74E-01		5.86E-01
Am-241	59.54	35.90	1.39E-03	4.40E-01	4.40E-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 17-Jul-19-10024  
L1-10221D-FIGS-021SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 17-Jul-19-10024  
Sample Description : L1-10221D-FIGS-021SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.005E+03 grams  
Facility : Default  
  
Sample Taken On : 7/17/2019 8:32:00AM  
Acquisition Started : 7/17/2019 3:50:36PM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P40818B  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 901.6 seconds  
  
Dead Time : 0.17 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/29/2019  
Efficiency Calibration Used Done On : 7/17/2019  
Efficiency Calibration Description :  
  
Sample Number : 78025  
Fill Height : 1004.51 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/30/2012 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/17/2019 4:05:39PM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 8192

*Handwritten signature*  
Data Validated  
1630 [408] 7/17/19



Analysis Report for 17-Jul-19-10024

L1-10221D-FIGS-021SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.60	948 -	960	954.48	1.06E+02	17.49	7.45E+01	0.95
2	351.64	1400 -	1412	1406.28	6.13E+01	13.25	4.27E+01	1.02
3	583.06	2325 -	2337	2331.44	3.93E+01	9.59	1.98E+01	0.90
4	608.88	2428 -	2441	2434.68	5.35E+01	10.09	1.75E+01	1.41
5	661.26	2634 -	2654	2644.15	6.32E+02	26.79	2.36E+01	1.42
6	1172.52	4681 -	4699	4689.26	8.15E+01	10.67	9.50E+00	1.29
7	1331.95	5321 -	5334	5327.28	4.54E+01	7.60	4.56E+00	1.14
8	1460.06	5829 -	5849	5840.05	1.73E+02	13.15	0.00E+00	1.63
9	1763.50	7049 -	7062	7055.01	1.40E+01	3.74	0.00E+00	0.63

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	0.91	1460.82 *	10.66	5.14E+00	4.50E-01
Co-60	0.93	1173.23 *	99.85	2.21E-01	3.02E-02
		1332.49 *	99.98	1.34E-01	2.30E-02
Cs-137	0.97	661.66 *	85.10	1.34E+00	9.87E-02
Tl-208	0.99	583.19 *	85.00	7.65E-02	1.92E-02
Bi-211	0.95	351.07 *	13.02	5.41E-01	1.25E-01
Pb-212	1.00	115.18 *	0.60		
		238.63 *	43.60	2.17E-01	3.98E-02 <sup>[409]</sup>

Analysis Report for 17-Jul-19-10024

L1-10221D-FIGS-021SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Pb-212	1.00	300.09	3.30		
Bi-214	0.96	609.32 *	45.49	2.01E-01	3.97E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49 *	15.30	3.37E-01	9.10E-02
		1847.43	2.03		
		2118.51	1.16		
Pb-214	0.99	241.99	7.25		
		295.22	18.42		
		351.93 *	35.60	1.98E-01	4.56E-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

<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	0.910	5.14E+00	4.50E-01	
Co-60	0.939	1.66E-01	1.83E-02	
Cs-137	0.976	1.34E+00	9.87E-02	
Tl-208	0.997	7.65E-02	1.92E-02	[410]

Analysis Report for 17-Jul-19-10024

L1-10221D-FIGS-021SS

	<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
?	Bi-211	0.950	5.41E-01	1.25E-01	
	Pb-212	1.000	2.17E-01	3.98E-02	
	Bi-214	0.966	2.23E-01	3.64E-02	
?	Pb-214	0.992	1.98E-01	4.56E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 1.000sigma

Analysis Report for 17-Jul-19-10024  
L1-10221D-FIGS-021SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/17/2019 4:05:39PM  
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	7.59E-02	7.01E-02	7.01E-02
	BE-7	477.60	10.44	2.06E-01	6.82E-01	6.82E-01
+	K-40	1460.82	* 10.66	5.14E+00	8.55E-02	8.55E-02
	Mn-54	834.85	99.98	-4.62E-02	5.72E-02	5.72E-02
+	Co-60	1173.23	* 99.85	2.21E-01	4.35E-02	6.00E-02
		1332.49	* 99.98	1.34E-01		4.35E-02
	Nb-94	702.65	99.81	-7.09E-03	5.26E-02	5.26E-02
		871.09	99.89	-6.26E-02		6.20E-02
	Ag-108m	79.13	6.60	2.34E+00	6.74E-02	2.42E+00
		433.94	90.50	3.93E-02		6.74E-02
		614.28	89.80	8.36E-03		7.10E-02
		722.94	90.80	3.25E-02		7.04E-02
	Sb-125	176.31	6.84	-2.51E-01	1.84E-01	7.03E-01
		380.45	1.52	-7.84E-01		3.57E+00
		427.87	29.60	-2.06E-01		1.84E-01
		463.36	10.49	2.44E-01		6.68E-01
		600.60	17.65	-7.97E-02		3.03E-01
		606.71	4.98	1.79E+00		1.71E+00
		635.95	11.22	-2.62E-01		5.03E-01

Analysis Report for 17-Jul-19-10024

L1-10221D-FIGS-021SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-5.11E-02	1.84E-01	2.43E+00
Ba-133	79.61	2.65	7.48E-01	1.02E-01	5.66E+00
	81.00	32.90	-2.22E-01		3.86E-01
	276.40	7.16	2.46E-01		7.25E-01
	302.85	18.34	8.84E-02		2.91E-01
	356.01	62.05	-6.65E-02		1.02E-01
	383.85	8.94	6.32E-02		6.10E-01
Cs-134	475.36	1.48	2.58E+00	6.11E-02	4.95E+00
	563.25	8.34	6.47E-02		6.73E-01
	569.33	15.37	1.19E-01		3.48E-01
	604.72	97.62	-2.36E-02		8.42E-02
	795.86	85.46	1.10E-03		6.11E-02
	801.95	8.69	1.48E-02		6.40E-01
	1038.61	0.99	5.24E-01		6.50E+00
	1167.97	1.79	-3.95E+00		7.80E+00
	1365.19	3.02	9.41E-01		2.26E+00
+ Cs-137	661.66	* 85.10	1.34E+00	7.26E-02	7.26E-02
Eu-152	121.78	28.67	-5.01E-02	1.85E-01	1.85E-01
	244.70	7.61	-2.06E-01		7.12E-01
	295.94	0.45	6.89E+00		1.31E+01
	344.28	26.60	1.94E-01		2.08E-01
	367.79	0.86	-1.23E+00		5.97E+00
	411.12	2.24	-1.73E+00		2.59E+00
	443.96	2.83	-2.65E-01		2.23E+00
	488.68	0.42	2.00E+00		1.46E+01
	563.99	0.49	-7.51E-01		1.13E+01
	586.26	0.46	-2.05E+00		1.72E+01
	678.62	0.47	-2.02E+00		1.05E+01
	688.67	0.86	1.84E+00		6.13E+00
	719.35	0.28	-1.96E+00		2.12E+01
	778.90	12.96	1.29E-02		4.35E-01
	810.45	0.32	-1.09E+01		1.89E+01
	867.37	4.26	-6.63E-03		1.47E+00
	919.33	0.43	-6.81E+00		1.46E+01
	964.08	14.65	1.59E-01		5.81E-01
	1085.87	10.24	-6.45E-01		4.88E-01
	1089.74	1.73	-2.37E+00		3.36E+00
	1112.07	13.69	-3.66E-01		4.20E-01
	1212.95	1.43	-5.07E+00		4.50E+00
	1249.94	0.19	5.03E+00		3.93E+01
	1299.14	1.63	1.89E+00		4.03E+00
	1408.01	21.07	5.11E-02		2.75E-01
	1457.64	0.50	9.61E+01		4.17E+01
	1528.10	0.28	1.05E+01		2.01E+01
Eu-154	123.07	40.40	-8.17E-03	1.29E-01	1.29E-01
	247.93	6.89	2.06E-01		7.26E-01
	591.76	4.95	9.94E-02		1.15E+00
	692.42	1.78	-6.46E-01		3.11E+00
	723.30	20.06	2.62E-01		3.26E-01
	756.80	4.52	2.87E-01		1.14E+00
	873.18	12.08	4.50E-01		5.30E-01

Analysis Report for 17-Jul-19-10024

L1-10221D-FIGS-021SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	2.47E-01	1.29E-01	5.96E-01
	1004.76	18.01	8.83E-03		3.35E-01
	1274.43	34.80	-2.39E-02		1.95E-01
	1596.48	1.80	4.55E-01		3.11E+00
Eu-155	45.30	1.31	-5.65E+00	3.15E-01	3.53E+01
	60.01	1.22	1.79E+01		3.92E+01
	86.55	30.70	7.22E-03		3.15E-01
	105.31	21.10	1.08E-01		3.33E-01
Ra-226	186.21	3.64	3.95E-02	1.46E+00	1.46E+00
Pa-231	27.36	10.30	3.84E+00	2.15E+00	4.04E+00
	283.69	1.70	3.23E-01		3.04E+00
	300.07	2.47	-7.67E-01		2.15E+00
	302.65	2.20	7.04E-01		2.44E+00
	330.06	1.40	2.07E+00		4.21E+00
U-235	143.76	10.96	6.33E-03	9.40E-02	4.74E-01
	163.33	5.08	6.15E-01		1.01E+00
	185.71	57.20	2.78E-02		9.40E-02
	202.11	1.08	-3.73E+00		4.36E+00
	205.31	5.01	-5.65E-02		9.48E-01
Am-241	59.54	35.90	9.04E-01	1.41E+00	1.41E+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 17-Jul-19-10025  
L1-10221D-FIGS-022SS

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 17-Jul-19-10025  
Sample Description : L1-10221D-FIGS-022SS  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.085E+03 grams  
Facility : Default  
  
Sample Taken On : 7/17/2019 8:34:00AM  
Acquisition Started : 7/17/2019 3:50:46PM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P11314  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.3 seconds  
  
Dead Time : 0.03 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/24/2019  
Efficiency Calibration Used Done On : 7/17/2019  
Efficiency Calibration Description :  
  
Sample Number : 78026  
Fill Height : 1084.95 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 12/22/2008 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/17/2019 4:05:57PM  
Peak Analysis From Channel : 120  
Peak Analysis To Channel : 8192

*JMD*  
Data Validated  
1630 7/17/19

Analysis Report for 17-Jul-19-10025

L1-10221D-FIGS-022SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.34	306 -	316	309.88	4.82E+01	16.12	8.68E+01	0.59
2	238.89	948 -	961	955.15	1.20E+02	19.60	9.60E+01	0.77
3	352.05	1400 -	1416	1407.21	1.17E+02	14.71	3.20E+01	0.99
4	583.20	2324 -	2338	2330.93	5.10E+01	10.01	1.70E+01	1.31
5	609.26	2428 -	2441	2435.09	4.16E+01	9.76	1.94E+01	0.42
6	661.62	2634 -	2655	2644.40	7.16E+02	28.95	3.26E+01	1.34
7	911.09	3632 -	3649	3641.82	4.84E+01	9.65	1.36E+01	1.01
8	1172.88	4680 -	4699	4688.96	1.27E+02	13.30	1.45E+01	1.50
9	1331.93	5317 -	5335	5325.37	1.28E+02	12.37	7.33E+00	1.71
10	1460.54	5828 -	5851	5840.10	2.57E+02	16.74	5.85E+00	1.79

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.82 *	10.66	6.59E+00	5.15E-01
Co-60	0.96	1173.23 *	99.85	2.96E-01	3.33E-02
		1332.49 *	99.98	3.25E-01	3.40E-02
Cs-137	1.00	661.66 *	85.10	1.32E+00	9.56E-02
Tl-208	1.00	583.19 *	85.00	8.62E-02	1.77E-02
Bi-211	0.85	351.07 *	13.02	8.96E-01	1.34E-01
Pb-212	0.99	115.18	0.60		

[416]



Analysis Report for 17-Jul-19-10025

L1-10221D-FIGS-022SS

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Pb-212	0.99	238.63 *	43.60	2.10E-01	3.83E-02
		300.09	3.30		
Pb212-XR	0.99	74.82	10.28		
		77.11 *	17.10	3.59E-01	1.26E-01
		87.35	3.97		
		89.78	1.46		
Bi-214	1.00	609.32 *	45.49	1.36E-01	3.28E-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	3.28E-01	4.88E-02
		785.96	1.06		
Pb214-XR	0.99	74.82	5.80		
		77.11 *	9.70	6.33E-01	2.23E-01
		87.35	2.24		
		89.78	0.82		
Ac-228	0.99	129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32	11.27		
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	3.68E-01	7.51E-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 17-Jul-19-10025  
L1-10221D-FIGS-022SS

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## INTERFERENCE CORRECTED REPORT

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<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	0.987	6.59E+00	5.15E-01	
Co-60	0.966	3.10E-01	2.38E-02	
Cs-137	1.000	1.32E+00	9.56E-02	
Tl-208	1.000	8.62E-02	1.77E-02	
? Bi-211	0.857	8.96E-01	1.34E-01	
Pb-212	0.990	2.10E-01	3.83E-02	
? Pb212-XR	0.996	3.59E-01	1.26E-01	
Bi-214	1.000	1.36E-01	3.28E-02	
? Pb-214	0.511	3.28E-01	4.88E-02	
? Pb214-XR	0.996	6.33E-01	2.23E-01	
Ac-228	0.999	3.68E-01	7.51E-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 17-Jul-19-10025  
L1-10221D-FIGS-022SS

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/17/2019 4:05:57PM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

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

## NUCLIDE MDA REPORT

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

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
An Pk	511.00	100.00	7.37E-02	6.95E-02	6.95E-02
BE-7	477.60	10.44	3.86E-01	6.48E-01	6.48E-01
+ K-40	1460.82	* 10.66	6.59E+00	4.91E-01	4.91E-01
Mn-54	834.85	99.98	-9.24E-03	5.77E-02	5.77E-02
+ Co-60	1173.23	* 99.85	2.96E-01	5.08E-02	6.30E-02
	1332.49	* 99.98	3.25E-01		5.08E-02
Nb-94	702.65	99.81	1.64E-03	5.45E-02	5.45E-02
	871.09	99.89	4.17E-02		6.38E-02
Ag-108m	79.13	6.60	-1.65E-01	5.74E-02	1.28E+00
	433.94	90.50	1.26E-03		6.47E-02
	614.28	89.80	3.46E-03		6.94E-02
	722.94	90.80	9.19E-05		5.74E-02
Sb-125	176.31	6.84	3.73E-01	1.90E-01	6.09E-01
	380.45	1.52	-1.24E-01		3.37E+00
	427.87	29.60	5.11E-03		1.90E-01
	463.36	10.49	2.64E-01		6.07E-01
	600.60	17.65	-3.93E-02		3.14E-01
	606.71	4.98	4.84E-01		1.42E+00
	635.95	11.22	2.48E-02		4.82E-01

Analysis Report for 17-Jul-19-10025

L1-10221D-FIGS-022SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	1.96E+00	1.90E-01	2.84E+00
Ba-133	79.61	2.65	-5.96E-01	9.26E-02	3.11E+00
	81.00	32.90	-1.73E-01		2.06E-01
	276.40	7.16	-2.22E-01		5.91E-01
	302.85	18.34	2.98E-02		2.53E-01
	356.01	62.05	-6.39E-05		9.26E-02
	383.85	8.94	-1.21E-01		5.93E-01
Cs-134	475.36	1.48	4.04E+00	6.91E-02	4.66E+00
	563.25	8.34	-1.08E+00		5.65E-01
	569.33	15.37	2.22E-01		3.41E-01
	604.72	97.62	-3.09E-02		6.91E-02
	795.86	85.46	5.83E-02		7.24E-02
	801.95	8.69	8.71E-02		6.37E-01
	1038.61	0.99	4.09E+00		6.87E+00
	1167.97	1.79	8.43E-01		7.65E+00
	1365.19	3.02	-7.03E-01		1.67E+00
+ Cs-137	661.66	* 85.10	1.32E+00	7.44E-02	7.44E-02
Eu-152	121.78	28.67	5.01E-02	1.44E-01	1.44E-01
	244.70	7.61	-8.38E-02		6.29E-01
	295.94	0.45	5.78E+00		1.32E+01
	344.28	26.60	2.49E-02		1.88E-01
	367.79	0.86	-3.98E+00		5.31E+00
	411.12	2.24	-2.17E+00		2.18E+00
	443.96	2.83	8.16E-01		2.15E+00
	488.68	0.42	1.23E+01		1.38E+01
	563.99	0.49	-2.33E+01		9.15E+00
	586.26	0.46	-3.35E+00		1.55E+01
	678.62	0.47	1.78E+00		1.17E+01
	688.67	0.86	-4.06E+00		5.95E+00
	719.35	0.28	-3.42E+00		1.66E+01
	778.90	12.96	1.69E-01		4.13E-01
	810.45	0.32	8.26E+00		1.85E+01
	867.37	4.26	-1.22E-01		1.26E+00
	919.33	0.43	-1.15E+00		1.48E+01
	964.08	14.65	1.71E-01		5.49E-01
	1085.87	10.24	-6.19E-01		6.31E-01
	1089.74	1.73	4.32E+00		4.45E+00
	1112.07	13.69	-2.79E-01		5.21E-01
	1212.95	1.43	-2.54E+00		5.16E+00
	1249.94	0.19	6.92E+00		3.40E+01
	1299.14	1.63	1.01E+00		4.20E+00
	1408.01	21.07	3.15E-03		2.54E-01
	1457.64	0.50	1.35E+02		4.41E+01
	1528.10	0.28	4.01E+00		1.25E+01
Eu-154	123.07	40.40	1.43E-02	9.86E-02	9.86E-02
	247.93	6.89	3.11E-01		6.25E-01
	591.76	4.95	2.31E-01		1.08E+00
	692.42	1.78	-8.72E-01		2.96E+00
	723.30	20.06	4.37E-02		2.63E-01
	756.80	4.52	4.33E-01		1.22E+00
	873.18	12.08	1.65E-01		5.95E-01

Analysis Report for 17-Jul-19-10025

L1-10221D-FIGS-022SS

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	4.61E-01	9.86E-02	5.72E-01
	1004.76	18.01	2.20E-02		3.40E-01
	1274.43	34.80	-1.25E-01		1.69E-01
	1596.48	1.80	1.96E+00		3.18E+00
Eu-155	45.30	1.31	4.69E+00	2.21E-01	1.48E+01
	60.01	1.22	4.50E+00		1.38E+01
	86.55	30.70	1.27E-01		2.21E-01
	105.31	21.10	-9.82E-02		2.24E-01
Ra-226	186.21	3.64	1.31E+00	1.25E+00	1.25E+00
Pa-231	27.36	10.30	1.78E+00	1.50E+00	1.50E+00
	283.69	1.70	-2.14E+00		2.38E+00
	300.07	2.47	-3.97E+00		1.96E+00
	302.65	2.20	-1.01E+00		2.09E+00
	330.06	1.40	-2.70E+00		3.40E+00
	U-235	143.76	10.96		-8.20E-02
U-235	163.33	5.08	-7.68E-01	8.03E-02	7.58E-01
	185.71	57.20	8.30E-02		8.03E-02
	202.11	1.08	-3.60E-02		3.91E+00
	205.31	5.01	-6.12E-01		8.05E-01
Am-241	59.54	35.90	1.51E-01	4.83E-01	4.83E-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 31-Jul-19-10019  
L1-10221D-FIGS-005SB

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 31-Jul-19-10019  
Sample Description : L1-10221D-FIGS-005SB  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.399E+03 grams  
Facility : Default  
  
Sample Taken On : 7/30/2019 7:32:00AM  
Acquisition Started : 7/31/2019 10:23:25AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : P11314  
Geometry : 130G\_SOIL\_1  
Live Time : 900.0 seconds  
Real Time : 900.3 seconds  
  
Dead Time : 0.03 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 1/24/2019  
Efficiency Calibration Used Done On : 7/31/2019  
Efficiency Calibration Description :  
  
Sample Number : 78349  
Fill Height : 1399.13 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 12/22/2008 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/31/2019 10:38:30AM

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

*JM*  
Data Validated  
0830 [422]-19

Analysis Report for 31-Jul-19-10019

L1-10221D-FIGS-005SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.22	305 -	315	309.40	6.57E+01	14.68	6.03E+01	0.69
2	238.91	946 -	959	955.23	1.32E+02	16.00	4.59E+01	0.91
3	295.42	1176 -	1187	1180.98	3.04E+01	11.10	3.56E+01	0.83
4	352.03	1399 -	1414	1407.11	9.50E+01	11.45	1.20E+01	1.35
5	583.10	2326 -	2337	2330.53	3.47E+01	7.78	1.03E+01	0.78
6	609.35	2427 -	2441	2435.44	5.05E+01	10.46	2.05E+01	1.27
7	1460.46	5826 -	5850	5839.77	2.67E+02	16.34	0.00E+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	0.97	1460.82 *	10.66	6.16E+00	4.62E-01
Tl-208	0.99	583.19 *	85.00	5.34E-02	1.24E-02
Bi-211	0.86	351.07 *	13.02	6.68E-01	9.68E-02
Pb-212	0.98	115.18	0.60		
		238.63 *	43.60	2.14E-01	3.11E-02
		300.09	3.30		
Pb212-XR	0.99	74.82	10.28		
		77.11 *	17.10	4.67E-01	1.15E-01
		87.35	3.97		
		89.78	1.46		

[423]

Analysis Report for 31-Jul-19-10019

L1-10221D-FIGS-005SB

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Bi-214	1.00	609.32 *	45.49	1.50E-01	3.23E-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	1.32E-01	4.95E-02
		295.22 *	18.42		
		351.93 *	35.60		
Pb214-XR	0.99	785.96	1.06	8.24E-01	2.06E-01
		74.82	5.80		
		77.11 *	9.70		
		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

<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	0.979	6.16E+00	4.62E-01	[424]



Analysis Report for 31-Jul-19-10019

L1-10221D-FIGS-005SB

<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
Tl-208	0.999	5.34E-02	1.24E-02	
Bi-211	0.864	3.06E-01	1.66E-01	
Pb-212	0.988	2.14E-01	3.11E-02	
? Pb212-XR	0.999	4.67E-01	1.15E-01	
Bi-214	1.000	1.50E-01	3.23E-02	
Pb-214	0.997	1.32E-01	4.95E-02	
? Pb214-XR	0.999	8.24E-01	2.06E-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 31-Jul-19-10019  
L1-10221D-FIGS-005SB

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/31/2019 10:38:30AM  
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	4.67E-02	5.48E-02	5.48E-02
	BE-7	477.60	10.44	-1.77E-01	2.86E-01	2.86E-01
+	K-40	1460.82	* 10.66	6.16E+00	6.64E-02	6.64E-02
	Mn-54	834.85	99.98	3.82E-02	5.11E-02	5.11E-02
	Co-60	1173.23	99.85	1.69E-02	5.20E-02	6.68E-02
		1332.49	99.98	2.20E-02		5.20E-02
	Nb-94	702.65	99.81	-2.42E-02	2.91E-02	2.91E-02
		871.09	99.89	2.90E-02		4.37E-02
	Ag-108m	79.13	6.60	-3.81E-01	3.38E-02	1.16E+00
		433.94	90.50	-8.00E-03		3.38E-02
		614.28	89.80	-4.41E-02		5.61E-02
		722.94	90.80	-2.42E-02		5.02E-02
	Sb-125	176.31	6.84	8.85E-02	1.11E-01	4.33E-01
		380.45	1.52	1.15E+00		2.29E+00
		427.87	29.60	5.83E-03		1.11E-01
		463.36	10.49	-7.97E-03		3.69E-01
		600.60	17.65	5.33E-02		2.11E-01
		606.71	4.98	1.48E+00		1.31E+00
		635.95	11.22	2.06E-01		3.08E-01

Analysis Report for 31-Jul-19-10019

L1-10221D-FIGS-005SB

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	671.44	1.79	-2.03E+00	1.11E-01	1.83E+00
Ba-133	79.61	2.65	-1.08E+00	6.52E-02	2.85E+00
	81.00	32.90	-1.39E-01		1.75E-01
	276.40	7.16	1.37E-01		4.63E-01
	302.85	18.34	-2.23E-03		1.94E-01
	356.01	62.05	5.17E-03		6.52E-02
	383.85	8.94	-3.03E-01		3.46E-01
Cs-134	475.36	1.48	8.36E-01	5.68E-02	2.24E+00
	563.25	8.34	-2.64E-01		4.67E-01
	569.33	15.37	1.25E-01		2.41E-01
	604.72	97.62	2.58E-03		5.68E-02
	795.86	85.46	1.63E-02		5.93E-02
	801.95	8.69	2.01E-01		5.13E-01
	1038.61	0.99	9.82E-02		5.09E+00
	1167.97	1.79	-2.80E-01		3.62E+00
	1365.19	3.02	9.30E-01		1.51E+00
Cs-137	661.66	85.10	5.10E-02	5.89E-02	5.89E-02
Eu-152	121.78	28.67	4.38E-02	1.02E-01	1.08E-01
	244.70	7.61	1.44E-01		4.98E-01
	295.94	0.45	5.44E+00		9.59E+00
	344.28	26.60	-5.17E-02		1.02E-01
	367.79	0.86	2.32E+00		3.47E+00
	411.12	2.24	3.53E-02		1.67E+00
	443.96	2.83	-2.59E-01		1.11E+00
	488.68	0.42	2.61E+00		8.72E+00
	563.99	0.49	-3.00E+00		7.82E+00
	586.26	0.46	1.29E+01		1.14E+01
	678.62	0.47	3.07E+00		8.28E+00
	688.67	0.86	-1.53E+00		4.25E+00
	719.35	0.28	7.41E+00		1.43E+01
	778.90	12.96	3.21E-02		2.79E-01
	810.45	0.32	-1.82E-01		1.06E+01
	867.37	4.26	4.44E-01		1.04E+00
	919.33	0.43	7.50E+00		1.18E+01
	964.08	14.65	1.40E-01		4.19E-01
	1085.87	10.24	1.35E-01		4.54E-01
	1089.74	1.73	1.07E+00		2.88E+00
	1112.07	13.69	-4.73E-02		3.28E-01
	1212.95	1.43	-3.96E+00		4.06E+00
	1249.94	0.19	-2.42E+01		2.89E+01
	1299.14	1.63	-9.15E-01		3.37E+00
	1408.01	21.07	4.26E-02		2.05E-01
	1457.64	0.50	1.24E+02		4.00E+01
	1528.10	0.28	-1.24E+00		1.13E+01
Eu-154	123.07	40.40	-6.12E-02	7.23E-02	7.23E-02
	247.93	6.89	1.86E-01		4.45E-01
	591.76	4.95	-1.54E-03		5.39E-01
	692.42	1.78	-6.74E-01		2.06E+00
	723.30	20.06	7.49E-02		2.43E-01
	756.80	4.52	3.97E-01		1.02E+00
	873.18	12.08	-2.00E-01		3.55E-01

Analysis Report for 31-Jul-19-10019

L1-10221D-FIGS-005SB

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	996.29	10.48	-1.35E-01	7.23E-02	4.49E-01
	1004.76	18.01	5.28E-03		2.73E-01
	1274.43	34.80	-4.65E-02		1.69E-01
	1596.48	1.80	-1.56E-01		1.83E+00
Eu-155	45.30	1.31	1.25E+00	1.72E-01	1.02E+01
	60.01	1.22	-5.72E+00		1.11E+01
	86.55	30.70	1.78E-02		1.72E-01
Ra-226	105.31	21.10	-3.21E-02		1.75E-01
Ra-226	186.21	3.64	7.60E-01	9.23E-01	9.23E-01
Pa-231	27.36	10.30	6.05E-01	1.18E+00	1.18E+00
	283.69	1.70	5.42E-01		1.86E+00
	300.07	2.47	1.09E+00		1.43E+00
	302.65	2.20	6.28E-01		1.66E+00
	330.06	1.40	1.18E+00		2.66E+00
U-235	143.76	10.96	-7.54E-02	5.91E-02	2.67E-01
	163.33	5.08	1.24E-01		5.89E-01
	185.71	57.20	6.24E-02		5.91E-02
	202.11	1.08	-5.38E-01		2.80E+00
	205.31	5.01	-2.28E-01		5.95E-01
Am-241	59.54	35.90	-1.45E-01	3.96E-01	3.96E-01

+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = 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 31-Jul-19-10020  
L1-10221D-FIGS-010SB

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## GAMMA SPECTRUM ANALYSIS

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Sample Identification : 31-Jul-19-10020  
Sample Description : L1-10221D-FIGS-010SB  
Sample Type : Soil  
Unit :  
Sample Point :  
  
Sample Size : 1.357E+03 grams  
Facility : Default  
  
Sample Taken On : 7/30/2019 9:06:00AM  
Acquisition Started : 7/31/2019 10:23:40AM  
  
Procedure : 130G\_SOIL\_1  
Operator : Administrator  
Detector Name : 352  
Geometry : 130G\_SOIL\_1  
Live Time : 1800.0 seconds  
Real Time : 1800.5 seconds  
  
Dead Time : 0.03 %  
  
Peak Locate Threshold : 3.00  
Peak Locate Range (in channels) : 120 - 8192  
Peak Area Range (in channels) : 120 - 8192  
Identification Energy Tolerance : 1.000 keV  
  
Energy Calibration Used Done On : 9/29/2018  
Efficiency Calibration Used Done On : 7/31/2019  
Efficiency Calibration Description :  
  
Sample Number : 78350  
Fill Height : 1357.46 gram  
Certificate Name : Eu155-Na22  
Certificate Date : 1/7/2013 12:00:00PM

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## PEAK ANALYSIS REPORT

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Peak Analysis Performed on : 7/31/2019 10:57:14AM

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

*JM*  
Data Validated  
0830 [429]-19

Analysis Report for 31-Jul-19-10020

L1-10221D-FIGS-010SB

	<b>Peak No.</b>	<b>Energy (keV)</b>	<b>ROI start</b>	<b>ROI end</b>	<b>Peak Centroid</b>	<b>Net Peak Area</b>	<b>Net Area Uncertainty</b>	<b>Continuum Counts</b>	<b>FWHM (keV)</b>
M	1	75.03	297 -	316	301.44	3.59E+01	418.60	7.46E+01	0.76
m	2	77.18	297 -	316	310.05	6.28E+01	648.77	1.14E+02	0.77
	3	185.78	737 -	749	743.83	4.22E+01	16.13	8.28E+01	0.43
	4	238.66	949 -	961	955.11	1.65E+02	20.06	8.89E+01	0.84
	5	295.22	1176 -	1187	1181.11	5.56E+01	12.01	3.54E+01	0.54
	6	351.84	1400 -	1415	1407.36	1.05E+02	14.60	3.60E+01	0.81
	7	583.28	2327 -	2339	2332.45	6.67E+01	10.96	2.03E+01	1.33
	8	609.35	2428 -	2443	2436.65	9.10E+01	11.53	1.40E+01	0.48
	9	661.62	2635 -	2656	2645.64	2.52E+02	18.59	2.48E+01	1.82
	10	911.34	3639 -	3651	3644.38	3.72E+01	8.82	1.48E+01	0.57
	11	1173.16	4686 -	4698	4692.03	3.01E+01	9.86	2.49E+01	1.19
	12	1332.76	5322 -	5338	5330.91	5.46E+01	8.64	6.39E+00	1.10
	13	1460.64	5830 -	5854	5842.94	3.19E+02	19.23	1.25E+01	1.96

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

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
K-40	0.99	1460.82 *	10.66	3.46E+00	2.57E-01
Co-60	0.99	1173.23 *	99.85	3.00E-02	9.89E-03
		1332.49 *	99.98	5.91E-02	9.64E-03
Cs-137	1.00	661.66 *	85.10	2.02E-01	1.92E-02 <sup>[430]</sup>

Analysis Report for 31-Jul-19-10020

L1-10221D-FIGS-010SB

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>		<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
Tl-208	0.99	583.19	*	85.00	4.91E-02	8.60E-03
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.32E-01	1.93E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	1.29E-01	1.81E-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	1.19E-01	2.73E-02
		351.93	*	35.60	1.31E-01	2.10E-02
		785.96		1.06		
Ra-226	0.97	186.21	*	3.64	3.63E-01	1.41E-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	1.21E-01	2.93E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		
U-235	1.00	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	2.31E-02	9.01E-03
		202.11		1.08		
		205.31		5.01		

\* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

Analysis Report for 31-Jul-19-10020  
L1-10221D-FIGS-010SB

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## INTERFERENCE CORRECTED REPORT

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<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	0.995	3.46E+00	2.57E-01	
Co-60	0.994	4.49E-02	6.91E-03	
Cs-137	1.000	2.02E-01	1.92E-02	
Tl-208	0.999	4.91E-02	8.60E-03	
X Bi-211	0.909			
Pb-212	1.000	1.32E-01	1.93E-02	
X Pb212-XR	0.997			
Bi-214	1.000	1.29E-01	1.81E-02	
Pb-214	0.999	1.27E-01	1.67E-02	
X Pb214-XR	0.997			
? Ra-226	0.970	3.63E-01	1.41E-01	
Ac-228	0.999	1.21E-01	2.93E-02	
? U-235	1.000	2.31E-02	9.01E-03	

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

Errors quoted at 1.000sigma



Analysis Report for 31-Jul-19-10020  
L1-10221D-FIGS-010SB

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/31/2019 10:57:14AM  
Peak Locate From Channel : 120  
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
M 1	75.03	1.99645E-02	1164.85	Tol.	Pb212-XR Pb214-XR
m 2	77.18	3.49134E-02	1032.34	Tol.	Pb212-XR Pb214-XR

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	5.67E-02	3.63E-02	3.63E-02
	BE-7	477.60	10.44	-2.72E-01	2.53E-01	2.53E-01
+	K-40	1460.82	* 10.66	3.46E+00	2.95E-01	2.95E-01
	Mn-54	834.85	99.98	-1.84E-02	3.01E-02	3.01E-02
+	Co-60	1173.23	* 99.85	3.00E-02	1.95E-02	3.05E-02
	Nb-94	1332.49	* 99.98	5.91E-02		1.95E-02
		702.65	99.81	-2.30E-02	2.56E-02	2.56E-02
		871.09	99.89	1.02E-03		2.65E-02
	Ag-108m	79.13	6.60	-2.80E-01	2.41E-02	8.22E-01
		433.94	90.50	5.78E-03		2.41E-02
		614.28	89.80	-4.02E-02		4.13E-02
		722.94	90.80	2.52E-03		2.84E-02
	Sb-125	176.31	6.84	2.22E-01	6.99E-02	3.09E-01
		380.45	1.52	-5.81E-01		1.48E+00

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Analysis Report for 31-Jul-19-10020

L1-10221D-FIGS-010SB

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Sb-125	427.87	29.60	7.35E-03	6.99E-02	6.99E-02
	463.36	10.49	8.63E-02		2.54E-01
	600.60	17.65	1.01E-01		1.68E-01
	606.71	4.98	8.10E-01		7.86E-01
	635.95	11.22	1.44E-01		2.31E-01
	671.44	1.79	1.67E-01		1.33E+00
Ba-133	79.61	2.65	-2.32E-01	4.44E-02	2.03E+00
	81.00	32.90	1.38E-03		1.39E-01
	276.40	7.16	-2.64E-01		2.95E-01
	302.85	18.34	8.77E-02		1.27E-01
	356.01	62.05	-2.02E-02		4.44E-02
	383.85	8.94	5.89E-02		2.61E-01
	475.36	1.48	8.28E-01		3.38E-02
Cs-134	563.25	8.34	9.18E-03	3.38E-02	3.01E-01
	569.33	15.37	4.27E-02		1.67E-01
	604.72	97.62	-6.42E-03		3.79E-02
	795.86	85.46	-1.85E-02		3.38E-02
	801.95	8.69	-1.64E-01		3.45E-01
	1038.61	0.99	2.81E+00		3.19E+00
	1167.97	1.79	-5.87E-01		2.76E+00
	1365.19	3.02	4.75E-01		7.37E-01
+ Cs-137	661.66	* 85.10	2.02E-01	2.86E-02	2.86E-02
Eu-152	121.78	28.67	-3.01E-02	7.86E-02	7.86E-02
	244.70	7.61	-3.25E-02		2.96E-01
	295.94	0.45	-1.12E+00		5.78E+00
	344.28	26.60	3.22E-02		8.72E-02
	367.79	0.86	6.69E-01		2.49E+00
	411.12	2.24	1.00E+00		1.09E+00
	443.96	2.83	-3.35E-01		8.44E-01
	488.68	0.42	2.81E+00		5.96E+00
	563.99	0.49	-3.29E-01		5.15E+00
	586.26	0.46	1.16E+01		7.72E+00
	678.62	0.47	2.82E+00		5.50E+00
	688.67	0.86	7.94E-01		2.88E+00
	719.35	0.28	-3.35E+00		7.74E+00
	778.90	12.96	-2.28E-01		2.07E-01
	810.45	0.32	-2.96E+00		7.68E+00
	867.37	4.26	-4.37E-01		6.97E-01
	919.33	0.43	-3.47E+00		6.94E+00
	964.08	14.65	-5.63E-02		2.28E-01
	1085.87	10.24	1.05E-01		3.72E-01
	1089.74	1.73	7.26E-01		2.29E+00
	1112.07	13.69	3.68E-02		2.46E-01
	1212.95	1.43	8.33E-01		2.67E+00
	1249.94	0.19	2.74E-01		1.55E+01
1299.14	1.63	-1.28E+00	1.91E+00		
1408.01	21.07	1.82E-02	1.18E-01		
1457.64	0.50	6.85E+01	2.10E+01		
1528.10	0.28	4.78E-01	6.98E+00		
Eu-154	123.07	40.40	7.75E-03	5.61E-02	5.61E-02
	247.93	6.89	-1.65E-01		2.97E-01

Analysis Report for 31-Jul-19-10020

L1-10221D-FIGS-010SB

<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
Eu-154	591.76	4.95	6.07E-01	5.61E-02	5.50E-01
	692.42	1.78	6.07E-01		1.44E+00
	723.30	20.06	-1.12E-02		1.33E-01
	756.80	4.52	-5.18E-01		5.77E-01
	873.18	12.08	1.32E-01		2.35E-01
	996.29	10.48	-3.35E-01		2.96E-01
	1004.76	18.01	-1.20E-01		1.77E-01
	1274.43	34.80	-1.80E-01		8.66E-02
	1596.48	1.80	-4.99E-01		1.13E+00
	Eu-155	45.30	1.31		-3.73E-01
60.01		1.22	-1.38E+00	1.24E+01	
86.55		30.70	-2.40E-02	1.39E-01	
105.31		21.10	-1.37E-01	1.22E-01	
+ Ra-226	186.21	* 3.64	3.63E-01	4.54E-01	4.54E-01
Pa-231	27.36	10.30	8.11E-01	9.60E-01	1.32E+00
	283.69	1.70	3.16E-01		1.29E+00
	300.07	2.47	-3.42E-01		9.60E-01
	302.65	2.20	7.18E-01		1.06E+00
	330.06	1.40	-4.59E-01		1.51E+00
+ U-235	143.76	10.96	6.23E-02	2.89E-02	2.14E-01
163.33	5.08	-1.04E-01	4.25E-01		
185.71	* 57.20	2.31E-02	2.89E-02		
202.11	1.08	-4.33E-02	2.12E+00		
205.31	5.01	-7.28E-01	4.34E-01		
Am-241	59.54	35.90	-2.74E-01	4.24E-01	4.24E-01

+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = 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 CORPORATION  
601 SCARBORO ROAD  
OAK RIDGE, TENNESSEE 37830  
PHONE (865) 481-0683  
FAX (865) 483-4621

EBS-OR-46231

October 22, 2019

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

CASE NARRATIVE  
Work Order # 19-09012-OR

SAMPLE RECEIPT

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

<u>CLIENT ID</u>	<u>LAB ID</u>	<u>CLIENT ID</u>	<u>LAB ID</u>
L1-10221A-FJGS-002-SS-A	19-09012-04	L1-10221C-FIGS-103-SS-A	19-09012-12
L1-10221A-FJGS-001-SS-A	19-09012-05	L1-10221B-FIGS-102-SS-A	19-09012-13
L1-10221A-FIGS-005-SS-A	19-09012-06	L1-10221B-FIGS-103-SS-A	19-09012-14
L1-10221A-FIGS-006-SS-A	19-09012-07	L1-10221B-FIGS-104-SS-A	19-09012-15
L1-10221A-FIGS-007-SS-A	19-09012-08	L1-10221B-FIGS-105-SS-A	19-09012-16
L1-10221A-FIGS-008-SS-A	19-09012-09	L1-10221D-FIGS-005-SS-A	19-09012-17
L1-10221A-FIGS-009-SS-A	19-09012-10	L1-10221D-FIGS-006-SS-A	19-09012-18
L1-10221B-FIGS-100-SS-A	19-09012-11	L1-10221D-FIGS-007-SS-A	19-09012-19

ANALYTICAL METHODS

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

Laboratory qualifiers are as follows:

U - Result is less than the MDA.

ANALYTICAL RESULTS

Combined Standard Uncertainty is reported at 1-sigma value.

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

## ANALYTICAL RESULTS CONTINUED

### TOTAL STRONTIUM

Samples were prepared by acid digestion as appropriate for the matrix. Digested samples were acidified and selectively extracted and precipitated. Precipitates were 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 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 an acceptable relative percent difference and normalized difference. 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.

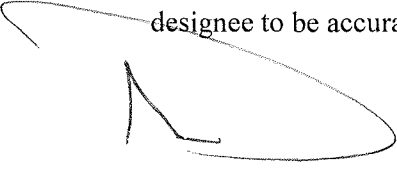
ANALYTICAL RESULTS CONTINUED

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: 10/22/2019



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<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:							
			Patricia Giza					SDG:	19-09012						
			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	
19-09012-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	10/1/2019	19-09012	Tritium	LANL ER-210 Modified	2.08E+02	7.48E+00				pCi/g	
19-09012-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	10/1/2019	19-09012	Tritium	LANL ER-210 Modified	2.04E+02	7.87E+00	1.39E+01	5.89E+00		pCi/g	
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	10/1/2019	19-09012	Tritium	LANL ER-210 Modified	1.33E+00	3.38E+00	3.38E+00	5.79E+00	U	pCi/g	
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	10/1/2019	19-09012	Tritium	LANL ER-210 Modified	3.24E+00	3.47E+00	3.48E+00	5.82E+00	U	pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	10/1/2019	19-09012	Tritium	LANL ER-210 Modified	5.14E+00	3.53E+00	3.54E+00	5.81E+00	U	pCi/g	
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	10/1/2019	19-09012	Tritium	LANL ER-210 Modified	2.69E+00	3.47E+00	3.48E+00	5.86E+00	U	pCi/g	
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	10/1/2019	19-09012	Tritium	LANL ER-210 Modified	3.03E+00	3.44E+00	3.44E+00	5.78E+00	U	pCi/g	
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	10/1/2019	19-09012	Tritium	LANL ER-210 Modified	4.00E+00	3.50E+00	3.50E+00	5.82E+00	U	pCi/g	
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	10/1/2019	19-09012	Tritium	LANL ER-210 Modified	3.06E+00	3.48E+00	3.48E+00	5.85E+00	U	pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	10/1/2019	19-09012	Tritium	LANL ER-210 Modified	-1.88E-01	3.30E+00	3.30E+00	5.73E+00	U	pCi/g	
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	10/1/2019	19-09012	Tritium	LANL ER-210 Modified	4.53E+00	3.48E+00	3.49E+00	5.76E+00	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	10/1/2019	19-09012	Tritium	LANL ER-210 Modified	2.99E+00	3.40E+00	3.40E+00	5.71E+00	U	pCi/g	
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	10/1/2019	19-09012	Tritium	LANL ER-210 Modified	1.86E-01	3.28E+00	3.28E+00	5.68E+00	U	pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	10/1/2019	19-09012	Tritium	LANL ER-210 Modified	2.03E+00	3.32E+00	3.32E+00	5.62E+00	U	pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	10/1/2019	19-09012	Tritium	LANL ER-210 Modified	2.21E+00	3.32E+00	3.32E+00	5.61E+00	U	pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	10/1/2019	19-09012	Tritium	LANL ER-210 Modified	2.18E+00	3.28E+00	3.28E+00	5.55E+00	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	10/1/2019	19-09012	Tritium	LANL ER-210 Modified	-1.25E+00	3.11E+00	3.11E+00	5.47E+00	U	pCi/g	
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	10/1/2019	19-09012	Tritium	LANL ER-210 Modified	2.00E+00	3.28E+00	3.28E+00	5.56E+00	U	pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	10/2/2019	19-09012	Tritium	LANL ER-210 Modified	0.00E+00	3.21E+00	3.21E+00	5.57E+00	U	pCi/g	
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	10/2/2019	19-09012	Tritium	LANL ER-210 Modified	-3.04E+00	3.03E+00	3.04E+00	5.45E+00	U	pCi/g	

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



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<h1 style="margin: 0;">Eberline Analytical</h1> <h2 style="margin: 0;">Final Report of Analysis</h2>			Report To:					Work Order Details:						
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG:	19-09012					
								Purchase Order:	677118					
								Analysis Category:	ENVIRONMENTAL					
					Sample Matrix:		SO							
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09012-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	10/1/2019	19-09012	Nickel-63	ASTM 3500-Ni Modified	1.49E+03	4.47E+01				pCi/g
19-09012-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	10/1/2019	19-09012	Nickel-63	ASTM 3500-Ni Modified	1.52E+03	1.34E+01	9.03E+01	3.29E+00		pCi/g
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	10/1/2019	19-09012	Nickel-63	ASTM 3500-Ni Modified	6.96E-01	1.86E+00	1.86E+00	3.17E+00	U	pCi/g
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	10/1/2019	19-09012	Nickel-63	ASTM 3500-Ni Modified	1.85E+00	2.01E+00	2.01E+00	3.37E+00	U	pCi/g
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	10/1/2019	19-09012	Nickel-63	ASTM 3500-Ni Modified	2.14E+00	2.03E+00	2.03E+00	3.39E+00	U	pCi/g
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	10/1/2019	19-09012	Nickel-63	ASTM 3500-Ni Modified	1.18E+00	1.95E+00	1.95E+00	3.30E+00	U	pCi/g
19-09012-06	TRG	L1-10221A-FJGS-005-SS-A	06/13/19 07:45	9/3/2019	10/1/2019	19-09012	Nickel-63	ASTM 3500-Ni Modified	0.00E+00	1.84E+00	1.84E+00	3.17E+00	U	pCi/g
19-09012-07	TRG	L1-10221A-FJGS-006-SS-A	06/13/19 07:47	9/3/2019	10/1/2019	19-09012	Nickel-63	ASTM 3500-Ni Modified	7.77E-01	1.85E+00	1.85E+00	3.14E+00	U	pCi/g
19-09012-08	TRG	L1-10221A-FJGS-007-SS-A	06/13/19 07:49	9/3/2019	10/1/2019	19-09012	Nickel-63	ASTM 3500-Ni Modified	3.63E-01	1.93E+00	1.93E+00	3.30E+00	U	pCi/g
19-09012-09	TRG	L1-10221A-FJGS-008-SS-A	06/13/19 07:51	9/3/2019	10/1/2019	19-09012	Nickel-63	ASTM 3500-Ni Modified	1.12E+00	2.01E+00	2.01E+00	3.40E+00	U	pCi/g
19-09012-10	TRG	L1-10221A-FJGS-009-SS-A	06/13/19 07:53	9/3/2019	10/1/2019	19-09012	Nickel-63	ASTM 3500-Ni Modified	2.51E+00	1.97E+00	1.98E+00	3.27E+00	U	pCi/g
19-09012-11	TRG	L1-10221B-FJGS-100-SS-A	06/20/19 09:55	9/3/2019	10/1/2019	19-09012	Nickel-63	ASTM 3500-Ni Modified	-3.27E-01	2.29E+00	2.29E+00	3.97E+00	U	pCi/g
19-09012-12	TRG	L1-10221C-FJGS-103-SS-A	07/08/19 12:47	9/3/2019	10/1/2019	19-09012	Nickel-63	ASTM 3500-Ni Modified	2.41E+00	1.96E+00	1.96E+00	3.26E+00	U	pCi/g
19-09012-13	TRG	L1-10221B-FJGS-102-SS-A	07/08/19 13:10	9/3/2019	10/1/2019	19-09012	Nickel-63	ASTM 3500-Ni Modified	1.49E+00	2.14E+00	2.14E+00	3.61E+00	U	pCi/g
19-09012-14	TRG	L1-10221B-FJGS-103-SS-A	07/08/19 13:12	9/3/2019	10/1/2019	19-09012	Nickel-63	ASTM 3500-Ni Modified	1.31E+00	1.88E+00	1.88E+00	3.18E+00	U	pCi/g
19-09012-15	TRG	L1-10221B-FJGS-104-SS-A	07/08/19 13:14	9/3/2019	10/1/2019	19-09012	Nickel-63	ASTM 3500-Ni Modified	-1.84E-01	1.93E+00	1.93E+00	3.34E+00	U	pCi/g
19-09012-16	TRG	L1-10221B-FJGS-105-SS-A	07/08/19 13:16	9/3/2019	10/1/2019	19-09012	Nickel-63	ASTM 3500-Ni Modified	2.68E-01	1.89E+00	1.89E+00	3.25E+00	U	pCi/g
19-09012-17	TRG	L1-10221D-FJGS-005-SS-A	07/08/19 12:30	9/3/2019	10/1/2019	19-09012	Nickel-63	ASTM 3500-Ni Modified	2.33E+00	2.04E+00	2.05E+00	3.40E+00	U	pCi/g
19-09012-18	TRG	L1-10221D-FJGS-006-SS-A	07/08/19 12:32	9/3/2019	10/1/2019	19-09012	Nickel-63	ASTM 3500-Ni Modified	7.33E-01	1.96E+00	1.96E+00	3.34E+00	U	pCi/g
19-09012-19	TRG	L1-10221D-FJGS-007-SS-A	07/08/19 12:34	9/3/2019	10/1/2019	19-09012	Nickel-63	ASTM 3500-Ni Modified	1.82E+00	2.08E+00	2.08E+00	3.49E+00	U	pCi/g

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



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<h1 style="margin: 0;">Eberline Analytical</h1> <h2 style="margin: 0;">Final Report of Analysis</h2>			Report To:					Work Order Details:							
			<b>Patricia Giza</b> <b>Zion Solutions</b> <b>2701 Deborah Ave</b> <b>Zion, IL 60099</b>					SDG: <b>19-09012</b>		Purchase Order: <b>677118</b>		Analysis Category: <b>ENVIRONMENTAL</b>			
								Sample Matrix: <b>SO</b>							
			Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA
19-09012-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	10/2/2019	19-09012	Strontium-90	EiChroM SRW01 Modified	5.03E+01	2.82E-01				pCi/g	
19-09012-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	10/2/2019	19-09012	Strontium-90	EiChroM SRW01 Modified	5.11E+01	1.43E+00	1.78E+01	7.98E-01		pCi/g	
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	10/2/2019	19-09012	Strontium-90	EiChroM SRW01 Modified	5.10E-01	3.02E-01	3.50E-01	5.89E-01	U	pCi/g	
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	10/2/2019	19-09012	Strontium-90	EiChroM SRW01 Modified	2.61E-01	3.30E-01	3.42E-01	6.77E-01	U	pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	10/2/2019	19-09012	Strontium-90	EiChroM SRW01 Modified	-8.57E-02	3.21E-01	3.23E-01	6.96E-01	U	pCi/g	
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	10/2/2019	19-09012	Strontium-90	EiChroM SRW01 Modified	1.84E-01	3.14E-01	3.21E-01	6.52E-01	U	pCi/g	
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	10/2/2019	19-09012	Strontium-90	EiChroM SRW01 Modified	3.72E-01	2.98E-01	3.25E-01	5.95E-01	U	pCi/g	
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	10/2/2019	19-09012	Strontium-90	EiChroM SRW01 Modified	2.98E-01	3.21E-01	3.37E-01	6.52E-01	U	pCi/g	
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	10/2/2019	19-09012	Strontium-90	EiChroM SRW01 Modified	2.59E-02	3.45E-01	3.45E-01	7.33E-01	U	pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	10/2/2019	19-09012	Strontium-90	EiChroM SRW01 Modified	2.55E-01	3.46E-01	3.57E-01	7.11E-01	U	pCi/g	
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	10/2/2019	19-09012	Strontium-90	EiChroM SRW01 Modified	3.39E-01	4.09E-01	4.26E-01	8.38E-01	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	10/2/2019	19-09012	Strontium-90	EiChroM SRW01 Modified	1.42E-01	3.82E-01	3.85E-01	8.01E-01	U	pCi/g	
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	10/2/2019	19-09012	Strontium-90	EiChroM SRW01 Modified	3.73E-01	3.20E-01	3.45E-01	6.40E-01	U	pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	10/2/2019	19-09012	Strontium-90	EiChroM SRW01 Modified	3.64E-01	3.67E-01	3.88E-01	7.44E-01	U	pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	10/2/2019	19-09012	Strontium-90	EiChroM SRW01 Modified	1.69E-01	3.58E-01	3.63E-01	7.47E-01	U	pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	10/2/2019	19-09012	Strontium-90	EiChroM SRW01 Modified	3.40E-02	2.86E-01	2.87E-01	6.10E-01	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	10/2/2019	19-09012	Strontium-90	EiChroM SRW01 Modified	1.59E-01	3.12E-01	3.17E-01	6.50E-01	U	pCi/g	
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	10/2/2019	19-09012	Strontium-90	EiChroM SRW01 Modified	1.84E-01	3.61E-01	3.67E-01	7.52E-01	U	pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	10/2/2019	19-09012	Strontium-90	EiChroM SRW01 Modified	1.68E-01	2.90E-01	2.96E-01	6.01E-01	U	pCi/g	
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	10/2/2019	19-09012	Strontium-90	EiChroM SRW01 Modified	4.47E-01	2.81E-01	3.22E-01	5.52E-01	U	pCi/g	
19-09012-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Cobalt-60	EPA 901.1 Modified	1.31E+02	5.10E+00				pCi/g	
19-09012-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Cesium-137	EPA 901.1 Modified	8.26E+01	3.39E+00				pCi/g	
19-09012-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Cobalt-60	EPA 901.1 Modified	1.40E+02	1.02E+01	1.25E+01	9.61E-01		pCi/g	
19-09012-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Cesium-137	EPA 901.1 Modified	8.28E+01	9.07E+00	1.00E+01	1.09E+00		pCi/g	

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



**EBERLINE ANALYTICAL CORPORATION**

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

<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:									
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG: <b>19-09012</b> Purchase Order: 677118 Analysis Category: ENVIRONMENTAL Sample Matrix: SO									
			Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Actinium-228	EPA 901.1 Modified	2.49E-02	7.21E-02	7.21E-02	1.34E-01	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Silver-108m	EPA 901.1 Modified	-7.92E-04	2.06E-02	2.06E-02	3.31E-02	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Americium-241	EPA 901.1 Modified	-5.66E-02	4.02E-02	4.03E-02	5.25E-02	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Barium-133	EPA 901.1 Modified	-1.05E-02	3.04E-02	3.04E-02	3.97E-02	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Bismuth-214	EPA 901.1 Modified	3.81E-02	4.31E-02	4.32E-02	7.73E-02	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Cobalt-60	EPA 901.1 Modified	-1.24E-02	2.13E-02	2.13E-02	3.07E-02	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Cesium-134	EPA 901.1 Modified	3.48E-03	2.40E-02	2.40E-02	2.93E-02	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Cesium-137	EPA 901.1 Modified	2.99E-03	1.81E-02	1.81E-02	3.91E-02	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Europium-152	EPA 901.1 Modified	1.79E-02	8.29E-02	8.29E-02	5.86E-02	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Europium-154	EPA 901.1 Modified	4.69E-02	7.07E-02	7.08E-02	2.94E-02	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Europium-155	EPA 901.1 Modified	-1.52E-02	2.90E-02	2.91E-02	4.09E-02	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Holmium-166m	EPA 901.1 Modified	-1.47E-02	4.09E-02	4.09E-02	3.16E-02	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Iodine-129	EPA 901.1 Modified	6.46E-02	1.09E-01	1.10E-01	1.65E-01	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Potassium-40	EPA 901.1 Modified	4.95E-01	3.12E-01	3.13E-01	7.81E-01	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Manganese-54	EPA 901.1 Modified	3.56E-03	2.02E-02	2.02E-02	4.09E-02	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Molybdenum-93	EPA 901.1 Modified	-1.02E-03	1.01E-02	1.01E-02	2.99E-02	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Niobium-94	EPA 901.1 Modified	-8.82E-03	2.08E-02	2.08E-02	3.25E-02	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Lead-210	EPA 901.1 Modified	3.70E-01	4.21E-01	4.21E-01	6.60E-01	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Lead-212	EPA 901.1 Modified	3.27E-02	2.93E-02	2.94E-02	5.17E-02	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Lead-214	EPA 901.1 Modified	1.06E-02	4.68E-02	4.68E-02	7.51E-02	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Promethium-145	EPA 901.1 Modified	-4.08E-02	7.12E-02	7.12E-02	1.01E-01	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Radium-226	EPA 901.1 Modified	3.81E-02	4.31E-02	4.32E-02	7.73E-02	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Antimony-125	EPA 901.1 Modified	1.21E-02	2.75E-02	2.75E-02	9.58E-02	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Thorium-234	EPA 901.1 Modified	4.09E-01	3.05E-01	3.06E-01	4.96E-01	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Thallium-208	EPA 901.1 Modified	1.70E-02	7.84E-02	7.85E-02	1.18E-01	U	pCi/g			
19-09012-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/10/2019	19-09012	Uranium-235	EPA 901.1 Modified	-3.29E-02	9.91E-02	9.91E-02	1.44E-01	U	pCi/g			

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



EBERLINE ANALYTICAL CORPORATION

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

<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:								
			Patricia Giza					SDG:	19-09012							
			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		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Actinium-228	EPA 901.1 Modified	5.38E-01	1.61E-01	1.64E-01	2.71E-01		pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Silver-108m	EPA 901.1 Modified	-1.92E-02	4.82E-02	4.83E-02	5.20E-02	U	pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Americium-241	EPA 901.1 Modified	3.73E-02	9.39E-02	9.39E-02	1.26E-01	U	pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Barium-133	EPA 901.1 Modified	0.00E+00	3.09E-02	3.09E-02	8.53E-02	U	pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Bismuth-214	EPA 901.1 Modified	4.08E-01	1.06E-01	1.08E-01	1.75E-01		pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Cobalt-60	EPA 901.1 Modified	1.07E-01	4.63E-02	4.66E-02	8.72E-02		pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Cesium-134	EPA 901.1 Modified	-2.29E-03	2.29E-02	2.29E-02	5.49E-02	U	pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Cesium-137	EPA 901.1 Modified	6.79E-01	1.11E-01	1.16E-01	7.96E-02		pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Europium-152	EPA 901.1 Modified	3.53E-02	1.31E-01	1.31E-01	1.63E-01	U	pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Europium-154	EPA 901.1 Modified	8.96E-03	1.35E-01	1.35E-01	8.31E-02	U	pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Europium-155	EPA 901.1 Modified	4.04E-03	9.38E-02	9.38E-02	1.22E-01	U	pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Holmium-166m	EPA 901.1 Modified	3.05E-02	6.58E-02	6.58E-02	6.40E-02	U	pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Iodine-129	EPA 901.1 Modified	1.36E+00	6.44E+00	6.44E+00	3.02E+00	U	pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Potassium-40	EPA 901.1 Modified	1.21E+01	1.71E+00	1.82E+00	7.40E-01		pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Manganese-54	EPA 901.1 Modified	-8.31E-03	5.01E-02	5.01E-02	7.40E-02	U	pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Molybdenum-93	EPA 901.1 Modified	2.45E-02	2.90E-02	2.90E-02	3.97E-02	U	pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Niobium-94	EPA 901.1 Modified	3.89E-02	3.07E-02	3.08E-02	5.34E-02	U	pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Lead-210	EPA 901.1 Modified	5.35E-01	1.21E+00	1.21E+00	1.92E+00	U	pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Lead-212	EPA 901.1 Modified	2.44E-01	7.42E-02	7.52E-02	1.69E-01		pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Lead-214	EPA 901.1 Modified	4.96E-01	1.23E-01	1.25E-01	2.06E-01		pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Promethium-145	EPA 901.1 Modified	3.81E-02	6.06E-01	6.06E-01	8.94E-01	U	pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Radium-226	EPA 901.1 Modified	4.08E-01	1.06E-01	1.08E-01	1.75E-01		pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Antimony-125	EPA 901.1 Modified	6.35E-02	9.42E-02	9.42E-02	1.70E-01	U	pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Thorium-234	EPA 901.1 Modified	-2.14E-02	8.85E-01	8.85E-01	1.14E+00	U	pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Thallium-208	EPA 901.1 Modified	2.41E-01	8.33E-02	8.42E-02	9.03E-02		pCi/g		
19-09012-03	DUP	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Uranium-235	EPA 901.1 Modified	-9.46E-02	2.94E-01	2.94E-01	3.68E-01	U	pCi/g		

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



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<h1>Eberline Analytical</h1> <h2>Final Report of Analysis</h2>			Report To:					Work Order Details:							
			Patricia Giza					SDG:	19-09012						
			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	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Actinium-228	EPA 901.1 Modified	4.25E-01	1.78E-01	1.80E-01	3.45E-01		pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Silver-108m	EPA 901.1 Modified	-2.10E-02	4.17E-02	4.18E-02	5.01E-02	U	pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Americium-241	EPA 901.1 Modified	-1.28E-02	9.44E-02	9.44E-02	1.21E-01	U	pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Barium-133	EPA 901.1 Modified	1.48E-03	2.96E-02	2.96E-02	7.55E-02	U	pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Bismuth-214	EPA 901.1 Modified	4.34E-01	1.19E-01	1.21E-01	1.75E-01		pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Cobalt-60	EPA 901.1 Modified	1.25E-01	4.98E-02	5.02E-02	9.17E-02		pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Cesium-134	EPA 901.1 Modified	-1.51E-02	2.39E-02	2.40E-02	5.72E-02	U	pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Cesium-137	EPA 901.1 Modified	6.28E-01	1.04E-01	1.09E-01	7.49E-02		pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Europium-152	EPA 901.1 Modified	-2.94E-02	1.77E-01	1.77E-01	1.55E-01	U	pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Europium-154	EPA 901.1 Modified	-1.70E-02	1.28E-01	1.28E-01	8.06E-02	U	pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Europium-155	EPA 901.1 Modified	1.10E-01	9.01E-02	9.02E-02	1.23E-01	U	pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Holmium-166m	EPA 901.1 Modified	-8.47E-04	6.76E-02	6.76E-02	6.37E-02	U	pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Iodine-129	EPA 901.1 Modified	2.20E+00	9.51E+00	9.51E+00	3.02E+00	U	pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Potassium-40	EPA 901.1 Modified	1.29E+01	1.84E+00	1.96E+00	1.02E+00		pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Manganese-54	EPA 901.1 Modified	7.78E-03	4.16E-02	4.16E-02	6.67E-02	U	pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Molybdenum-93	EPA 901.1 Modified	-9.58E-03	3.50E-02	3.50E-02	5.14E-02	U	pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Niobium-94	EPA 901.1 Modified	3.13E-03	3.07E-02	3.07E-02	5.57E-02	U	pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Lead-210	EPA 901.1 Modified	3.64E-01	1.14E+00	1.14E+00	1.78E+00	U	pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Lead-212	EPA 901.1 Modified	3.70E-01	8.22E-02	8.44E-02	1.47E-01		pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Lead-214	EPA 901.1 Modified	4.50E-01	1.25E-01	1.27E-01	1.98E-01		pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Promethium-145	EPA 901.1 Modified	8.62E-01	7.49E-01	7.51E-01	9.33E-01	U	pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Radium-226	EPA 901.1 Modified	4.34E-01	1.19E-01	1.21E-01	1.75E-01		pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Antimony-125	EPA 901.1 Modified	-8.35E-02	1.05E-01	1.05E-01	1.53E-01	U	pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Thorium-234	EPA 901.1 Modified	3.60E-01	9.21E-01	9.22E-01	1.24E+00	U	pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Thallium-208	EPA 901.1 Modified	1.43E-01	6.15E-02	6.19E-02	9.03E-02		pCi/g	
19-09012-04	DO	L1-10221A-FJGS-002-SS-A	06/17/19 08:46	9/3/2019	9/10/2019	19-09012	Uranium-235	EPA 901.1 Modified	-1.06E-02	2.88E-01	2.88E-01	3.74E-01	U	pCi/g	

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



EBERLINE ANALYTICAL CORPORATION

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

<h1>Eberline Analytical</h1> <h2>Final Report of Analysis</h2>			Report To:						Work Order Details:								
			<b>Patricia Giza</b> <b>Zion Solutions</b> <b>2701 Deborah Ave</b> <b>Zion, IL 60099</b>						<b>SDG: 19-09012</b> <b>Purchase Order: 677118</b> <b>Analysis Category: ENVIRONMENTAL</b> <b>Sample Matrix: SO</b>								
			Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Actinium-228	EPA 901.1 Modified	6.97E-01	3.07E-01	3.09E-01	5.98E-01		pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Silver-108m	EPA 901.1 Modified	-6.69E-02	8.26E-02	8.26E-02	9.82E-02	U	pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Americium-241	EPA 901.1 Modified	-8.15E-02	1.06E-01	1.06E-01	1.47E-01	U	pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Barium-133	EPA 901.1 Modified	-2.96E-02	2.85E-02	2.86E-02	1.63E-01	U	pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Bismuth-214	EPA 901.1 Modified	3.39E-01	1.59E-01	1.60E-01	4.10E-01	U	pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Cobalt-60	EPA 901.1 Modified	1.39E-01	6.65E-02	6.69E-02	2.10E-01	U	pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Cesium-134	EPA 901.1 Modified	2.27E-02	4.58E-02	4.58E-02	1.30E-01	U	pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Cesium-137	EPA 901.1 Modified	3.14E-01	1.35E-01	1.36E-01	2.01E-01		pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Europium-152	EPA 901.1 Modified	8.36E-02	1.28E-01	1.29E-01	2.29E-01	U	pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Europium-154	EPA 901.1 Modified	-8.13E-02	2.12E-01	2.12E-01	1.16E-01	U	pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Europium-155	EPA 901.1 Modified	9.43E-03	1.26E-01	1.26E-01	1.85E-01	U	pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Holmium-166m	EPA 901.1 Modified	1.36E-01	1.29E-01	1.29E-01	8.26E-02	U	pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Iodine-129	EPA 901.1 Modified	-2.12E-02	8.05E-02	8.05E-02	1.16E-01	U	pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Potassium-40	EPA 901.1 Modified	1.36E+01	2.20E+00	2.31E+00	1.20E+00		pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Manganese-54	EPA 901.1 Modified	-9.68E-03	9.13E-02	9.13E-02	1.43E-01	U	pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Molybdenum-93	EPA 901.1 Modified	1.29E-02	7.31E-02	7.31E-02	7.37E-02	U	pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Niobium-94	EPA 901.1 Modified	-7.32E-02	6.09E-02	6.11E-02	7.84E-02	U	pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Lead-210	EPA 901.1 Modified	1.28E+00	8.24E-01	8.26E-01	1.30E+00	U	pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Lead-212	EPA 901.1 Modified	5.51E-01	1.25E-01	1.28E-01	2.73E-01		pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Lead-214	EPA 901.1 Modified	3.48E-01	1.86E-01	1.87E-01	2.94E-01		pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Promethium-145	EPA 901.1 Modified	4.25E-02	9.06E-02	9.06E-02	1.38E-01	U	pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Radium-226	EPA 901.1 Modified	3.39E-01	1.59E-01	1.60E-01	4.10E-01	U	pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Antimony-125	EPA 901.1 Modified	1.82E-02	2.35E-01	2.35E-01	3.30E-01	U	pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Thorium-234	EPA 901.1 Modified	1.34E+00	1.41E+00	1.41E+00	2.35E+00	U	pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Thallium-208	EPA 901.1 Modified	3.98E-01	1.58E-01	1.59E-01	1.72E-01		pCi/g			
19-09012-05	TRG	L1-10221A-FJGS-001-SS-A	06/17/19 08:44	9/3/2019	9/10/2019	19-09012	Uranium-235	EPA 901.1 Modified	-3.29E-02	3.31E-01	3.31E-01	4.87E-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

<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:								
			Patricia Giza					SDG:	19-09012							
			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		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Actinium-228	EPA 901.1 Modified	5.92E-01	2.11E-01	2.13E-01	3.07E-01		pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Silver-108m	EPA 901.1 Modified	-2.27E-02	5.66E-02	5.66E-02	6.62E-02	U	pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Americium-241	EPA 901.1 Modified	2.79E-03	2.97E-02	2.97E-02	1.09E-01	U	pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Barium-133	EPA 901.1 Modified	1.99E-02	3.05E-02	3.05E-02	1.17E-01	U	pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Bismuth-214	EPA 901.1 Modified	4.07E-01	1.32E-01	1.34E-01	1.83E-01		pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Cobalt-60	EPA 901.1 Modified	8.58E-02	6.59E-02	6.61E-02	1.29E-01	U	pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Cesium-134	EPA 901.1 Modified	-1.17E-02	3.52E-02	3.53E-02	9.32E-02	U	pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Cesium-137	EPA 901.1 Modified	1.50E-01	7.32E-02	7.36E-02	1.10E-01		pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Europium-152	EPA 901.1 Modified	-8.47E-02	1.74E-01	1.74E-01	1.64E-01	U	pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Europium-154	EPA 901.1 Modified	-1.42E-01	1.93E-01	1.94E-01	8.27E-02	U	pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Europium-155	EPA 901.1 Modified	5.63E-02	6.93E-02	6.94E-02	1.17E-01	U	pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Holmium-166m	EPA 901.1 Modified	-5.87E-02	9.24E-02	9.25E-02	6.79E-02	U	pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Iodine-129	EPA 901.1 Modified	-6.27E-02	2.00E-01	2.00E-01	2.87E-01	U	pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Potassium-40	EPA 901.1 Modified	1.40E+01	2.94E+00	3.02E+00	1.83E+00		pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Manganese-54	EPA 901.1 Modified	1.47E-02	5.26E-02	5.27E-02	9.03E-02	U	pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Molybdenum-93	EPA 901.1 Modified	3.56E-02	4.41E-02	4.41E-02	7.84E-02	U	pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Niobium-94	EPA 901.1 Modified	2.62E-02	4.31E-02	4.31E-02	7.75E-02	U	pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Lead-210	EPA 901.1 Modified	9.10E-01	8.20E-01	8.21E-01	1.36E+00	U	pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Lead-212	EPA 901.1 Modified	3.99E-01	9.17E-02	9.40E-02	1.88E-01		pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Lead-214	EPA 901.1 Modified	5.22E-01	1.13E-01	1.17E-01	1.76E-01		pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Promethium-145	EPA 901.1 Modified	2.96E-03	1.28E-01	1.28E-01	1.89E-01	U	pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Radium-226	EPA 901.1 Modified	4.07E-01	1.32E-01	1.34E-01	1.83E-01		pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Antimony-125	EPA 901.1 Modified	-5.58E-02	1.70E-01	1.70E-01	2.26E-01	U	pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Thorium-234	EPA 901.1 Modified	8.34E-01	9.46E-01	9.47E-01	1.58E+00	U	pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Thallium-208	EPA 901.1 Modified	4.01E-01	2.16E-01	2.17E-01	3.59E-01		pCi/g		
19-09012-06	TRG	L1-10221A-FIGS-005-SS-A	06/13/19 07:45	9/3/2019	9/10/2019	19-09012	Uranium-235	EPA 901.1 Modified	1.05E-01	2.29E-01	2.29E-01	3.47E-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:

Patricia Giza  
Zion Solutions  
2701 Deborah Ave  
Zion, IL 60099

Work Order Details:

SDG: **19-09012**  
Purchase Order: 677118  
Analysis Category: ENVIRONMENTAL  
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Actinium-228	EPA 901.1 Modified	-8.65E-02	2.87E-01	2.87E-01	4.48E-01	U	pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Silver-108m	EPA 901.1 Modified	-1.82E-02	6.96E-02	6.96E-02	9.45E-02	U	pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Americium-241	EPA 901.1 Modified	-4.67E-02	9.91E-02	9.92E-02	1.38E-01	U	pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Barium-133	EPA 901.1 Modified	2.14E-01	1.09E-01	1.09E-01	1.66E-01	U	pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Bismuth-214	EPA 901.1 Modified	4.52E-01	1.52E-01	1.54E-01	2.73E-01		pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Cobalt-60	EPA 901.1 Modified	2.92E-01	8.31E-02	8.44E-02	1.24E-01		pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Cesium-134	EPA 901.1 Modified	-7.13E-03	2.50E-02	2.50E-02	1.12E-01	U	pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Cesium-137	EPA 901.1 Modified	9.35E-01	1.62E-01	1.69E-01	1.75E-01		pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Europium-152	EPA 901.1 Modified	1.21E-01	1.90E-01	1.90E-01	2.35E-01	U	pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Europium-154	EPA 901.1 Modified	-1.28E-01	2.02E-01	2.03E-01	1.23E-01	U	pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Europium-155	EPA 901.1 Modified	2.50E-02	1.16E-01	1.16E-01	1.72E-01	U	pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Holmium-166m	EPA 901.1 Modified	-4.86E-02	1.31E-01	1.31E-01	8.13E-02	U	pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Iodine-129	EPA 901.1 Modified	4.09E-03	7.72E-02	7.72E-02	1.14E-01	U	pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Potassium-40	EPA 901.1 Modified	8.63E+00	1.81E+00	1.86E+00	1.79E+00		pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Manganese-54	EPA 901.1 Modified	3.02E-02	8.64E-02	8.64E-02	1.46E-01	U	pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Molybdenum-93	EPA 901.1 Modified	2.85E-02	5.29E-02	5.29E-02	8.51E-02	U	pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Niobium-94	EPA 901.1 Modified	3.27E-03	7.25E-02	7.25E-02	1.05E-01	U	pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Lead-210	EPA 901.1 Modified	9.95E-02	8.04E-01	8.04E-01	1.18E+00	U	pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Lead-212	EPA 901.1 Modified	5.03E-01	1.46E-01	1.48E-01	2.46E-01		pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Lead-214	EPA 901.1 Modified	5.22E-01	1.53E-01	1.56E-01	2.49E-01		pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Promethium-145	EPA 901.1 Modified	-5.09E-02	9.38E-02	9.38E-02	1.32E-01	U	pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Radium-226	EPA 901.1 Modified	4.52E-01	1.52E-01	1.54E-01	2.73E-01		pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Antimony-125	EPA 901.1 Modified	-1.56E-01	2.30E-01	2.30E-01	2.93E-01	U	pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Thonium-234	EPA 901.1 Modified	2.90E-01	8.99E-01	8.99E-01	1.34E+00	U	pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Thallium-208	EPA 901.1 Modified	4.49E-01	1.42E-01	1.44E-01	1.58E-01		pCi/g
19-09012-07	TRG	L1-10221A-FIGS-006-SS-A	06/13/19 07:47	9/3/2019	9/10/2019	19-09012	Uranium-235	EPA 901.1 Modified	3.80E-01	2.98E-01	2.98E-01	4.75E-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

[448]



<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:						
			<b>Patricia Giza</b> <b>Zion Solutions</b> <b>2701 Deborah Ave</b> <b>Zion, IL 60099</b>					SDG:	<b>19-09012</b>					
								Purchase Order:	<b>677118</b>					
								Analysis Category:	<b>ENVIRONMENTAL</b>					
					Sample Matrix:		<b>SO</b>							
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Actinium-228	EPA 901.1 Modified	3.78E-01	1.65E-01	1.66E-01	3.42E-01		pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Silver-108m	EPA 901.1 Modified	2.07E-02	3.41E-02	3.41E-02	5.44E-02	U	pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Americium-241	EPA 901.1 Modified	1.14E-01	9.95E-02	9.96E-02	1.42E-01	U	pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Barium-133	EPA 901.1 Modified	1.47E-02	3.84E-02	3.84E-02	7.25E-02	U	pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Bismuth-214	EPA 901.1 Modified	4.77E-01	1.08E-01	1.11E-01	1.67E-01		pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Cobalt-60	EPA 901.1 Modified	5.65E-02	5.93E-02	5.93E-02	1.07E-01	U	pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Cesium-134	EPA 901.1 Modified	-8.23E-03	2.37E-02	2.37E-02	5.50E-02	U	pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Cesium-137	EPA 901.1 Modified	2.87E-01	8.26E-02	8.39E-02	1.04E-01		pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Europium-152	EPA 901.1 Modified	-2.92E-02	2.07E-01	2.07E-01	1.90E-01	U	pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Europium-154	EPA 901.1 Modified	3.25E-02	1.16E-01	1.16E-01	9.49E-02	U	pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Europium-155	EPA 901.1 Modified	5.71E-02	1.03E-01	1.03E-01	1.38E-01	U	pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Holmium-166m	EPA 901.1 Modified	-4.26E-02	8.31E-02	8.31E-02	7.34E-02	U	pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Iodine-129	EPA 901.1 Modified	4.39E+00	1.84E+01	1.84E+01	3.41E+00	U	pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Potassium-40	EPA 901.1 Modified	9.29E+00	1.51E+00	1.58E+00	8.40E-01		pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Manganese-54	EPA 901.1 Modified	-1.83E-03	4.74E-02	4.74E-02	7.38E-02	U	pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Molybdenum-93	EPA 901.1 Modified	1.60E-03	4.05E-02	4.05E-02	6.32E-02	U	pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Niobium-94	EPA 901.1 Modified	2.35E-02	4.04E-02	4.04E-02	6.33E-02	U	pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Lead-210	EPA 901.1 Modified	1.99E+00	1.08E+00	1.09E+00	2.29E+00	U	pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Lead-212	EPA 901.1 Modified	3.67E-01	9.14E-02	9.34E-02	1.97E-01		pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Lead-214	EPA 901.1 Modified	4.60E-01	1.22E-01	1.25E-01	1.93E-01		pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Promethium-145	EPA 901.1 Modified	8.78E-01	8.32E-01	8.33E-01	9.63E-01	U	pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Radium-226	EPA 901.1 Modified	4.77E-01	1.08E-01	1.11E-01	1.67E-01		pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Antimony-125	EPA 901.1 Modified	5.54E-02	1.00E-01	1.00E-01	1.77E-01	U	pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Thonium-234	EPA 901.1 Modified	1.19E+00	9.84E-01	9.86E-01	1.40E+00	U	pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Thallium-208	EPA 901.1 Modified	3.37E-01	1.00E-01	1.02E-01	1.41E-01		pCi/g
19-09012-08	TRG	L1-10221A-FIGS-007-SS-A	06/13/19 07:49	9/3/2019	9/11/2019	19-09012	Uranium-235	EPA 901.1 Modified	-1.24E-02	2.89E-01	2.89E-01	3.80E-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

<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:							
			Patricia Giza					SDG:	19-09012						
			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	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Actinium-228	EPA 901.1 Modified	6.08E-01	2.83E-01	2.85E-01	5.19E-01		pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Silver-108m	EPA 901.1 Modified	3.92E-02	6.72E-02	6.72E-02	8.93E-02	U	pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Americium-241	EPA 901.1 Modified	-5.79E-02	9.74E-02	9.74E-02	1.36E-01	U	pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Barium-133	EPA 901.1 Modified	-2.25E-03	3.53E-02	3.53E-02	1.50E-01	U	pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Bismuth-214	EPA 901.1 Modified	4.29E-01	1.29E-01	1.31E-01	2.02E-01		pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Cobalt-60	EPA 901.1 Modified	5.09E-02	9.40E-02	9.40E-02	1.59E-01	U	pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Cesium-134	EPA 901.1 Modified	7.34E-03	3.64E-02	3.64E-02	1.07E-01	U	pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Cesium-137	EPA 901.1 Modified	3.48E-01	1.22E-01	1.23E-01	1.72E-01		pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Europium-152	EPA 901.1 Modified	-7.16E-02	1.90E-01	1.90E-01	2.23E-01	U	pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Europium-154	EPA 901.1 Modified	7.57E-02	2.02E-01	2.02E-01	1.13E-01	U	pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Europium-155	EPA 901.1 Modified	1.25E-01	1.10E-01	1.10E-01	1.82E-01	U	pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Holmium-166m	EPA 901.1 Modified	3.24E-02	1.29E-01	1.29E-01	7.96E-02	U	pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Iodine-129	EPA 901.1 Modified	-3.70E-02	7.48E-02	7.49E-02	1.07E-01	U	pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Potassium-40	EPA 901.1 Modified	1.32E+01	2.11E+00	2.21E+00	1.39E+00		pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Manganese-54	EPA 901.1 Modified	5.41E-03	8.14E-02	8.14E-02	1.33E-01	U	pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Molybdenum-93	EPA 901.1 Modified	6.11E-03	6.58E-02	6.58E-02	7.93E-02	U	pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Niobium-94	EPA 901.1 Modified	1.60E-03	6.14E-02	6.14E-02	9.53E-02	U	pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Lead-210	EPA 901.1 Modified	6.16E-01	7.56E-01	7.57E-01	1.16E+00	U	pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Lead-212	EPA 901.1 Modified	5.52E-01	1.43E-01	1.45E-01	2.06E-01		pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Lead-214	EPA 901.1 Modified	4.65E-01	1.42E-01	1.44E-01	2.34E-01		pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Promethium-145	EPA 901.1 Modified	-4.91E-02	8.70E-02	8.70E-02	1.23E-01	U	pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Radium-226	EPA 901.1 Modified	4.29E-01	1.29E-01	1.31E-01	2.02E-01		pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Antimony-125	EPA 901.1 Modified	3.36E-02	2.11E-01	2.11E-01	2.98E-01	U	pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Thorium-234	EPA 901.1 Modified	3.80E-01	9.06E-01	9.06E-01	1.35E+00	U	pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Thallium-208	EPA 901.1 Modified	4.68E-01	1.61E-01	1.63E-01	1.48E-01		pCi/g	
19-09012-09	TRG	L1-10221A-FIGS-008-SS-A	06/13/19 07:51	9/3/2019	9/11/2019	19-09012	Uranium-235	EPA 901.1 Modified	-8.34E-02	3.09E-01	3.09E-01	4.49E-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

<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:						Work Order Details:							
			Patricia Giza						SDG:	19-09012						
			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		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Actinium-228	EPA 901.1 Modified	6.87E-01	1.91E-01	1.95E-01	2.91E-01		pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Silver-108m	EPA 901.1 Modified	5.28E-03	2.16E-02	2.16E-02	7.48E-02	U	pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Americium-241	EPA 901.1 Modified	2.41E-02	4.32E-02	4.32E-02	1.03E-01	U	pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Barium-133	EPA 901.1 Modified	-9.57E-03	4.20E-02	4.20E-02	1.11E-01	U	pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Bismuth-214	EPA 901.1 Modified	4.58E-01	1.43E-01	1.45E-01	1.59E-01		pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Cobalt-60	EPA 901.1 Modified	1.20E-01	5.91E-02	5.94E-02	1.05E-01		pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Cesium-134	EPA 901.1 Modified	-1.45E-02	1.80E-02	1.80E-02	8.67E-02	U	pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Cesium-137	EPA 901.1 Modified	5.42E-01	1.20E-01	1.23E-01	1.43E-01		pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Europium-152	EPA 901.1 Modified	3.93E-02	1.78E-01	1.78E-01	1.58E-01	U	pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Europium-154	EPA 901.1 Modified	2.43E-02	2.06E-01	2.06E-01	8.30E-02	U	pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Europium-155	EPA 901.1 Modified	4.18E-02	8.19E-02	8.19E-02	1.23E-01	U	pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Holmium-166m	EPA 901.1 Modified	-4.02E-02	7.00E-02	7.00E-02	7.33E-02	U	pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Iodine-129	EPA 901.1 Modified	2.44E-01	2.17E-01	2.17E-01	3.14E-01	U	pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Potassium-40	EPA 901.1 Modified	9.01E+00	2.02E+00	2.07E+00	7.16E-01		pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Manganese-54	EPA 901.1 Modified	5.02E-02	6.55E-02	6.55E-02	1.18E-01	U	pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Molybdenum-93	EPA 901.1 Modified	-1.65E-02	4.50E-02	4.50E-02	6.98E-02	U	pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Niobium-94	EPA 901.1 Modified	5.78E-03	4.51E-02	4.51E-02	6.65E-02	U	pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Lead-210	EPA 901.1 Modified	1.20E+00	8.25E-01	8.28E-01	1.29E+00	U	pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Lead-212	EPA 901.1 Modified	3.06E-01	9.00E-02	9.14E-02	2.19E-01		pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Lead-214	EPA 901.1 Modified	4.18E-01	1.18E-01	1.19E-01	1.82E-01		pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Promethium-145	EPA 901.1 Modified	1.58E-02	1.36E-01	1.36E-01	2.01E-01	U	pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Radium-226	EPA 901.1 Modified	4.58E-01	1.43E-01	1.45E-01	1.59E-01		pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Antimony-125	EPA 901.1 Modified	-9.24E-02	1.68E-01	1.68E-01	2.15E-01	U	pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Thorium-234	EPA 901.1 Modified	5.84E-01	6.28E-01	6.29E-01	1.05E+00	U	pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Thallium-208	EPA 901.1 Modified	3.03E-01	2.23E-01	2.23E-01	3.80E-01	U	pCi/g		
19-09012-10	TRG	L1-10221A-FIGS-009-SS-A	06/13/19 07:53	9/3/2019	9/11/2019	19-09012	Uranium-235	EPA 901.1 Modified	2.07E-01	2.39E-01	2.40E-01	3.74E-01	U	pCi/g		

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



EBERLINE ANALYTICAL 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:		19-09012					
			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	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Actinium-228	EPA 901.1 Modified	2.62E-01	2.16E-01	2.16E-01	3.86E-01	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Silver-108m	EPA 901.1 Modified	-3.45E-02	5.69E-02	5.70E-02	5.63E-02	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Americium-241	EPA 901.1 Modified	2.68E-02	1.18E-01	1.18E-01	1.58E-01	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Barium-133	EPA 901.1 Modified	-4.23E-03	4.60E-02	4.60E-02	9.80E-02	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Bismuth-214	EPA 901.1 Modified	4.53E-01	1.31E-01	1.33E-01	2.01E-01	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Cobalt-60	EPA 901.1 Modified	8.15E-02	4.67E-02	4.69E-02	1.02E-01	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Cesium-134	EPA 901.1 Modified	1.02E-02	2.82E-02	2.82E-02	7.01E-02	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Cesium-137	EPA 901.1 Modified	2.66E-01	9.61E-02	9.70E-02	1.35E-01	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Europium-152	EPA 901.1 Modified	5.25E-02	9.27E-02	9.27E-02	1.99E-01	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Europium-154	EPA 901.1 Modified	-1.70E-01	1.97E-01	1.97E-01	1.00E-01	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Europium-155	EPA 901.1 Modified	5.79E-03	1.13E-01	1.13E-01	1.46E-01	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Holmium-166m	EPA 901.1 Modified	0.00E+00	8.09E-02	8.09E-02	8.63E-02	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Iodine-129	EPA 901.1 Modified	2.04E+00	9.54E+00	9.54E+00	3.87E+00	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Potassium-40	EPA 901.1 Modified	1.15E+01	1.79E+00	1.89E+00	7.20E-01	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Manganese-54	EPA 901.1 Modified	-1.14E-02	6.08E-02	6.08E-02	9.10E-02	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Molybdenum-93	EPA 901.1 Modified	5.18E-02	4.12E-02	4.12E-02	6.30E-02	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Niobium-94	EPA 901.1 Modified	-3.25E-02	4.30E-02	4.30E-02	5.78E-02	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Lead-210	EPA 901.1 Modified	2.18E+00	1.60E+00	1.61E+00	2.67E+00	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Lead-212	EPA 901.1 Modified	4.67E-01	1.03E-01	1.06E-01	2.25E-01	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Lead-214	EPA 901.1 Modified	4.39E-01	1.33E-01	1.35E-01	2.23E-01	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Promethium-145	EPA 901.1 Modified	3.44E-01	8.21E-01	8.22E-01	1.12E+00	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Radium-226	EPA 901.1 Modified	4.53E-01	1.31E-01	1.33E-01	2.01E-01	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Antimony-125	EPA 901.1 Modified	2.61E-02	1.18E-01	1.18E-01	2.05E-01	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Thorium-234	EPA 901.1 Modified	5.52E-01	1.17E+00	1.17E+00	1.58E+00	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Thallium-208	EPA 901.1 Modified	3.33E-01	1.05E-01	1.07E-01	1.22E-01	U	pCi/g	
19-09012-11	TRG	L1-10221B-FIGS-100-SS-A	06/20/19 09:55	9/3/2019	9/11/2019	19-09012	Uranium-235	EPA 901.1 Modified	3.81E-01	3.07E-01	3.08E-01	4.47E-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

<h1 style="margin: 0;">Eberline Analytical</h1> <h2 style="margin: 0;">Final Report of Analysis</h2>			Report To:					Work Order Details:									
			<b>Patricia Giza</b> <b>Zion Solutions</b> <b>2701 Deborah Ave</b> <b>Zion, IL 60099</b>					<b>SDG: 19-09012</b> <b>Purchase Order: 677118</b> <b>Analysis Category: ENVIRONMENTAL</b> <b>Sample Matrix: SO</b>									
			Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Actinium-228	EPA 901.1 Modified	6.27E-01	1.88E-01	1.91E-01	3.77E-01		pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Silver-108m	EPA 901.1 Modified	3.54E-02	5.90E-02	5.91E-02	7.24E-02	U	pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Americium-241	EPA 901.1 Modified	-5.64E-02	8.37E-02	8.37E-02	1.16E-01	U	pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Barium-133	EPA 901.1 Modified	1.47E-02	3.60E-02	3.60E-02	1.33E-01	U	pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Bismuth-214	EPA 901.1 Modified	3.35E-01	1.47E-01	1.48E-01	2.80E-01		pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Cobalt-60	EPA 901.1 Modified	9.13E-02	6.23E-02	6.25E-02	1.12E-01	U	pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Cesium-134	EPA 901.1 Modified	1.66E-02	2.41E-02	2.41E-02	1.04E-01	U	pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Cesium-137	EPA 901.1 Modified	1.73E-01	8.28E-02	8.33E-02	1.26E-01		pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Europium-152	EPA 901.1 Modified	1.22E-02	7.34E-02	7.34E-02	1.87E-01	U	pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Europium-154	EPA 901.1 Modified	2.13E-02	1.53E-01	1.53E-01	9.92E-02	U	pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Europium-155	EPA 901.1 Modified	6.19E-02	9.90E-02	9.91E-02	1.49E-01	U	pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Holmium-166m	EPA 901.1 Modified	-4.38E-03	4.61E-02	4.61E-02	6.88E-02	U	pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Iodine-129	EPA 901.1 Modified	5.36E-03	6.73E-02	6.73E-02	9.90E-02	U	pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Potassium-40	EPA 901.1 Modified	6.53E+00	1.38E+00	1.42E+00	1.10E+00		pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Manganese-54	EPA 901.1 Modified	1.93E-02	6.00E-02	6.00E-02	1.04E-01	U	pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Molybdenum-93	EPA 901.1 Modified	8.00E-03	5.87E-02	5.87E-02	7.85E-02	U	pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Niobium-94	EPA 901.1 Modified	1.05E-02	4.25E-02	4.25E-02	7.54E-02	U	pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Lead-210	EPA 901.1 Modified	1.01E-01	6.70E-01	6.70E-01	9.95E-01	U	pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Lead-212	EPA 901.1 Modified	2.71E-01	9.06E-02	9.16E-02	1.89E-01		pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Lead-214	EPA 901.1 Modified	3.03E-01	1.36E-01	1.37E-01	2.64E-01		pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Promethium-145	EPA 901.1 Modified	-4.77E-02	8.05E-02	8.05E-02	1.14E-01	U	pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Radium-226	EPA 901.1 Modified	3.35E-01	1.47E-01	1.48E-01	2.80E-01		pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Antimony-125	EPA 901.1 Modified	1.15E-01	1.56E-01	1.56E-01	2.42E-01	U	pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Thorium-234	EPA 901.1 Modified	6.36E-01	7.55E-01	7.56E-01	1.16E+00	U	pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Thallium-208	EPA 901.1 Modified	3.00E-01	1.24E-01	1.25E-01	2.02E-01		pCi/g			
19-09012-12	TRG	L1-10221C-FIGS-103-SS-A	07/08/19 12:47	9/3/2019	9/11/2019	19-09012	Uranium-235	EPA 901.1 Modified	2.98E-01	2.45E-01	2.45E-01	3.96E-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

<h1 style="margin: 0;">Eberline Analytical</h1> <h2 style="margin: 0;">Final Report of Analysis</h2>			Report To:						Work Order Details:						
			<b>Patricia Giza</b> <b>Zion Solutions</b> <b>2701 Deborah Ave</b> <b>Zion, IL 60099</b>						SDG:	<b>19-09012</b>					
									Purchase Order:	677118					
									Analysis Category:	ENVIRONMENTAL					
						Sample Matrix:		SO							
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Actinium-228	EPA 901.1 Modified	3.53E-01	2.75E-01	2.75E-01	5.65E-01	U	pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Silver-108m	EPA 901.1 Modified	-3.93E-02	6.65E-02	6.66E-02	8.77E-02	U	pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Americium-241	EPA 901.1 Modified	-1.44E-01	8.57E-02	8.60E-02	1.12E-01	U	pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Barium-133	EPA 901.1 Modified	-3.11E-02	9.87E-02	9.87E-02	1.25E-01	U	pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Bismuth-214	EPA 901.1 Modified	5.30E-01	1.52E-01	1.55E-01	1.60E-01		pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Cobalt-60	EPA 901.1 Modified	5.05E-01	1.08E-01	1.11E-01	1.82E-01		pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Cesium-134	EPA 901.1 Modified	-7.22E-03	1.96E-02	1.96E-02	9.82E-02	U	pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Cesium-137	EPA 901.1 Modified	9.82E-01	1.60E-01	1.67E-01	1.56E-01		pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Europium-152	EPA 901.1 Modified	2.64E-01	1.93E-01	1.93E-01	1.96E-01	U	pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Europium-154	EPA 901.1 Modified	3.38E-02	2.10E-01	2.10E-01	1.02E-01	U	pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Europium-155	EPA 901.1 Modified	1.58E-04	8.83E-02	8.83E-02	1.29E-01	U	pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Holmium-166m	EPA 901.1 Modified	-7.40E-02	1.10E-01	1.10E-01	7.63E-02	U	pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Iodine-129	EPA 901.1 Modified	2.20E-01	2.34E-01	2.34E-01	3.41E-01	U	pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Potassium-40	EPA 901.1 Modified	1.60E+01	3.15E+00	3.26E+00	8.24E-01		pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Manganese-54	EPA 901.1 Modified	8.48E-02	8.87E-02	8.89E-02	1.47E-01	U	pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Molybdenum-93	EPA 901.1 Modified	4.85E-02	5.26E-02	5.27E-02	9.10E-02	U	pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Niobium-94	EPA 901.1 Modified	-4.31E-02	6.48E-02	6.48E-02	8.65E-02	U	pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Lead-210	EPA 901.1 Modified	6.42E-01	8.90E-01	8.91E-01	1.35E+00	U	pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Lead-212	EPA 901.1 Modified	4.56E-01	1.18E-01	1.20E-01	2.54E-01		pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Lead-214	EPA 901.1 Modified	4.20E-01	1.24E-01	1.26E-01	2.31E-01		pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Promethium-145	EPA 901.1 Modified	5.61E-02	1.52E-01	1.52E-01	2.26E-01	U	pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Radium-226	EPA 901.1 Modified	5.30E-01	1.52E-01	1.55E-01	1.60E-01		pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Antimony-125	EPA 901.1 Modified	1.63E-01	2.02E-01	2.02E-01	3.03E-01	U	pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Thorium-234	EPA 901.1 Modified	9.71E-01	7.36E-01	7.38E-01	1.14E+00	U	pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Thallium-208	EPA 901.1 Modified	4.02E-01	2.21E-01	2.21E-01	3.50E-01		pCi/g	
19-09012-13	TRG	L1-10221B-FIGS-102-SS-A	07/08/19 13:10	9/3/2019	9/11/2019	19-09012	Uranium-235	EPA 901.1 Modified	1.32E-01	2.60E-01	2.61E-01	3.97E-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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<h1 style="margin: 0;">Eberline Analytical</h1> <h2 style="margin: 0;">Final Report of Analysis</h2>			Report To:					Work Order Details:							
			<b>Patricia Giza</b> <b>Zion Solutions</b> <b>2701 Deborah Ave</b> <b>Zion, IL 60099</b>					SDG: <b>19-09012</b>		Purchase Order: <b>677118</b>		Analysis Category: <b>ENVIRONMENTAL</b>			
								Sample Matrix: <b>SO</b>							
			Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Actinium-228	EPA 901.1 Modified	2.23E-01	1.85E-01	1.85E-01	3.29E-01	U	pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Silver-108m	EPA 901.1 Modified	-1.18E-02	4.49E-02	4.49E-02	5.76E-02	U	pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Americium-241	EPA 901.1 Modified	-1.36E-01	1.09E-01	1.09E-01	1.26E-01	U	pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Barium-133	EPA 901.1 Modified	4.62E-03	2.80E-02	2.80E-02	7.83E-02	U	pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Bismuth-214	EPA 901.1 Modified	4.15E-01	1.20E-01	1.21E-01	2.04E-01		pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Cobalt-60	EPA 901.1 Modified	2.25E-01	5.51E-02	5.63E-02	9.50E-02		pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Cesium-134	EPA 901.1 Modified	-4.54E-02	4.08E-02	4.09E-02	5.63E-02	U	pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Cesium-137	EPA 901.1 Modified	1.08E+00	1.52E-01	1.62E-01	7.67E-02		pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Europium-152	EPA 901.1 Modified	1.47E-01	1.92E-01	1.93E-01	1.77E-01	U	pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Europium-154	EPA 901.1 Modified	-3.04E-02	1.49E-01	1.49E-01	9.42E-02	U	pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Europium-155	EPA 901.1 Modified	1.13E-01	9.62E-02	9.63E-02	1.31E-01	U	pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Holmium-166m	EPA 901.1 Modified	-6.35E-04	2.46E-02	2.46E-02	6.93E-02	U	pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Iodine-129	EPA 901.1 Modified	1.88E+00	8.55E+00	8.55E+00	3.43E+00	U	pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Potassium-40	EPA 901.1 Modified	9.57E+00	1.69E+00	1.76E+00	1.56E+00		pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Manganese-54	EPA 901.1 Modified	-1.47E-02	3.41E-02	3.41E-02	6.96E-02	U	pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Molybdenum-93	EPA 901.1 Modified	1.24E-02	3.40E-02	3.40E-02	5.59E-02	U	pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Niobium-94	EPA 901.1 Modified	-2.14E-03	3.62E-02	3.62E-02	5.55E-02	U	pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Lead-210	EPA 901.1 Modified	2.07E+00	1.38E+00	1.38E+00	2.29E+00	U	pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Lead-212	EPA 901.1 Modified	3.03E-01	8.18E-02	8.32E-02	1.83E-01		pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Lead-214	EPA 901.1 Modified	3.49E-01	1.08E-01	1.10E-01	1.98E-01		pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Promethium-145	EPA 901.1 Modified	7.15E-01	7.68E-01	7.68E-01	9.93E-01	U	pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Radium-226	EPA 901.1 Modified	4.15E-01	1.20E-01	1.21E-01	2.04E-01		pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Antimony-125	EPA 901.1 Modified	-9.09E-03	1.08E-01	1.08E-01	1.80E-01	U	pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Thorium-234	EPA 901.1 Modified	6.98E-01	9.57E-01	9.58E-01	1.30E+00	U	pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Thallium-208	EPA 901.1 Modified	2.32E-01	7.53E-02	7.63E-02	9.85E-02		pCi/g	
19-09012-14	TRG	L1-10221B-FIGS-103-SS-A	07/08/19 13:12	9/3/2019	9/11/2019	19-09012	Uranium-235	EPA 901.1 Modified	2.32E-01	2.79E-01	2.79E-01	3.92E-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:	19-09012						
			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	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Actinium-228	EPA 901.1 Modified	3.72E-01	2.22E-01	2.23E-01	3.59E-01		pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Silver-108m	EPA 901.1 Modified	2.59E-02	5.80E-02	5.80E-02	8.18E-02	U	pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Americium-241	EPA 901.1 Modified	-9.47E-02	8.90E-02	8.91E-02	1.21E-01	U	pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Barium-133	EPA 901.1 Modified	1.08E-02	2.56E-02	2.56E-02	1.35E-01	U	pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Bismuth-214	EPA 901.1 Modified	3.11E-01	1.22E-01	1.23E-01	2.56E-01		pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Cobalt-60	EPA 901.1 Modified	-1.42E-02	7.83E-02	7.83E-02	1.17E-01	U	pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Cesium-134	EPA 901.1 Modified	-1.58E-01	1.05E-01	1.06E-01	1.01E-01	U	pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Cesium-137	EPA 901.1 Modified	2.08E-01	9.07E-02	9.14E-02	1.31E-01		pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Europium-152	EPA 901.1 Modified	-7.94E-02	1.53E-01	1.53E-01	1.86E-01	U	pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Europium-154	EPA 901.1 Modified	-4.36E-03	1.06E-01	1.06E-01	9.22E-02	U	pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Europium-155	EPA 901.1 Modified	-4.19E-02	1.03E-01	1.03E-01	1.43E-01	U	pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Holmium-166m	EPA 901.1 Modified	1.98E-02	9.73E-02	9.73E-02	6.56E-02	U	pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Iodine-129	EPA 901.1 Modified	-3.32E-02	6.44E-02	6.44E-02	9.15E-02	U	pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Potassium-40	EPA 901.1 Modified	8.94E+00	1.59E+00	1.66E+00	9.19E-01		pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Manganese-54	EPA 901.1 Modified	-1.01E-02	7.16E-02	7.16E-02	1.13E-01	U	pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Molybdenum-93	EPA 901.1 Modified	-5.87E-03	6.03E-02	6.03E-02	8.24E-02	U	pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Niobium-94	EPA 901.1 Modified	2.60E-02	6.08E-02	6.09E-02	8.28E-02	U	pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Lead-210	EPA 901.1 Modified	6.35E-01	6.85E-01	6.86E-01	1.06E+00	U	pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Lead-212	EPA 901.1 Modified	3.63E-01	1.19E-01	1.21E-01	1.79E-01		pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Lead-214	EPA 901.1 Modified	3.44E-01	1.38E-01	1.39E-01	2.44E-01		pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Promethium-145	EPA 901.1 Modified	1.25E-02	7.61E-02	7.61E-02	1.14E-01	U	pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Radium-226	EPA 901.1 Modified	3.11E-01	1.22E-01	1.23E-01	2.56E-01		pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Antimony-125	EPA 901.1 Modified	-2.69E-02	1.87E-01	1.87E-01	2.54E-01	U	pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Thorium-234	EPA 901.1 Modified	9.64E-01	1.07E+00	1.07E+00	1.78E+00	U	pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Thallium-208	EPA 901.1 Modified	2.91E-01	1.20E-01	1.21E-01	2.76E-01		pCi/g	
19-09012-15	TRG	L1-10221B-FIGS-104-SS-A	07/08/19 13:14	9/3/2019	9/11/2019	19-09012	Uranium-235	EPA 901.1 Modified	1.34E-01	1.82E-01	1.82E-01	4.14E-01	U	pCi/g	

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



<h1 style="margin: 0;">Eberline Analytical</h1> <h2 style="margin: 0;">Final Report of Analysis</h2>			Report To:						Work Order Details:						
			<b>Patricia Giza</b> <b>Zion Solutions</b> <b>2701 Deborah Ave</b> <b>Zion, IL 60099</b>						SDG: <b>19-09012</b>						
									Purchase Order: <b>677118</b>						
									Analysis Category: <b>ENVIRONMENTAL</b>						
						Sample Matrix: <b>SO</b>									
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Actinium-228	EPA 901.1 Modified	3.60E-01	2.35E-01	2.36E-01	4.73E-01	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Silver-108m	EPA 901.1 Modified	-1.53E-03	3.55E-02	3.55E-02	8.25E-02	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Americium-241	EPA 901.1 Modified	-1.21E-01	8.16E-02	8.19E-02	1.05E-01	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Barium-133	EPA 901.1 Modified	2.07E-02	2.44E-02	2.44E-02	1.08E-01	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Bismuth-214	EPA 901.1 Modified	2.93E-01	1.34E-01	1.35E-01	1.62E-01	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Cobalt-60	EPA 901.1 Modified	2.64E-02	7.89E-02	7.89E-02	1.35E-01	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Cesium-134	EPA 901.1 Modified	-3.55E-03	3.00E-02	3.00E-02	8.99E-02	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Cesium-137	EPA 901.1 Modified	1.58E-01	8.22E-02	8.26E-02	1.25E-01	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Europium-152	EPA 901.1 Modified	1.96E-04	1.03E-01	1.03E-01	1.61E-01	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Europium-154	EPA 901.1 Modified	2.03E-01	2.07E-01	2.07E-01	8.50E-02	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Europium-155	EPA 901.1 Modified	1.71E-01	1.19E-01	1.19E-01	1.64E-01	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Holmium-166m	EPA 901.1 Modified	-5.62E-02	9.82E-02	9.83E-02	6.69E-02	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Iodine-129	EPA 901.1 Modified	-1.69E-03	1.99E-01	1.99E-01	2.92E-01	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Potassium-40	EPA 901.1 Modified	1.36E+01	2.76E+00	2.85E+00	3.83E-01	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Manganese-54	EPA 901.1 Modified	7.78E-02	8.30E-02	8.31E-02	1.37E-01	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Molybdenum-93	EPA 901.1 Modified	-5.95E-02	4.78E-02	4.79E-02	6.32E-02	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Niobium-94	EPA 901.1 Modified	9.12E-03	4.03E-02	4.03E-02	8.22E-02	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Lead-210	EPA 901.1 Modified	6.29E-01	8.47E-01	8.48E-01	1.28E+00	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Lead-212	EPA 901.1 Modified	4.50E-01	1.06E-01	1.08E-01	2.10E-01	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Lead-214	EPA 901.1 Modified	2.51E-01	9.59E-02	9.67E-02	2.12E-01	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Promethium-145	EPA 901.1 Modified	-1.13E-01	1.32E-01	1.33E-01	1.82E-01	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Radium-226	EPA 901.1 Modified	2.93E-01	1.34E-01	1.35E-01	1.62E-01	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Antimony-125	EPA 901.1 Modified	-2.11E-01	1.90E-01	1.90E-01	2.24E-01	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Thorium-234	EPA 901.1 Modified	4.93E-02	6.94E-01	6.94E-01	1.02E+00	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Thallium-208	EPA 901.1 Modified	5.98E-01	2.13E-01	2.15E-01	3.11E-01	U	pCi/g	
19-09012-16	TRG	L1-10221B-FIGS-105-SS-A	07/08/19 13:16	9/3/2019	9/11/2019	19-09012	Uranium-235	EPA 901.1 Modified	1.77E-01	2.43E-01	2.43E-01	3.76E-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

<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:						Work Order Details:							
			<b>Patricia Giza</b> <b>Zion Solutions</b> <b>2701 Deborah Ave</b> <b>Zion, IL 60099</b>						SDG: <b>19-09012</b>							
									Purchase Order: 677118							
									Analysis Category: ENVIRONMENTAL							
												Sample Matrix: SO				
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Actinium-228	EPA 901.1 Modified	7.04E-01	2.10E-01	2.13E-01	4.77E-01		pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Silver-108m	EPA 901.1 Modified	-7.90E-02	6.59E-02	6.60E-02	7.20E-02	U	pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Americium-241	EPA 901.1 Modified	4.43E-03	1.37E-01	1.37E-01	1.80E-01	U	pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Barium-133	EPA 901.1 Modified	2.37E-02	3.51E-02	3.51E-02	1.03E-01	U	pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Bismuth-214	EPA 901.1 Modified	6.09E-01	1.50E-01	1.54E-01	2.45E-01		pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Cobalt-60	EPA 901.1 Modified	2.58E-01	6.06E-02	6.20E-02	4.98E-02		pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Cesium-134	EPA 901.1 Modified	-8.27E-03	2.05E-02	2.05E-02	6.88E-02	U	pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Cesium-137	EPA 901.1 Modified	1.39E+00	2.09E-01	2.21E-01	1.48E-01		pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Europium-152	EPA 901.1 Modified	-7.00E-02	2.21E-01	2.21E-01	2.24E-01	U	pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Europium-154	EPA 901.1 Modified	-2.42E-02	1.90E-01	1.90E-01	1.19E-01	U	pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Europium-155	EPA 901.1 Modified	7.09E-02	6.61E-02	6.62E-02	1.88E-01	U	pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Holmium-166m	EPA 901.1 Modified	1.00E-01	8.52E-02	8.53E-02	9.56E-02	U	pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Iodine-129	EPA 901.1 Modified	3.29E+00	1.43E+01	1.43E+01	4.26E+00	U	pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Potassium-40	EPA 901.1 Modified	1.35E+01	2.00E+00	2.12E+00	5.20E-01		pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Manganese-54	EPA 901.1 Modified	5.61E-02	5.73E-02	5.74E-02	9.37E-02	U	pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Molybdenum-93	EPA 901.1 Modified	6.43E-03	4.61E-02	4.61E-02	7.16E-02	U	pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Niobium-94	EPA 901.1 Modified	3.61E-02	5.09E-02	5.09E-02	8.14E-02	U	pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Lead-210	EPA 901.1 Modified	2.87E+00	2.30E+00	2.30E+00	3.72E+00	U	pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Lead-212	EPA 901.1 Modified	6.53E-01	1.36E-01	1.40E-01	2.29E-01		pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Lead-214	EPA 901.1 Modified	7.25E-01	1.78E-01	1.82E-01	2.84E-01		pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Promethium-145	EPA 901.1 Modified	6.59E-01	9.07E-01	9.07E-01	1.30E+00	U	pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Radium-226	EPA 901.1 Modified	6.09E-01	1.50E-01	1.54E-01	2.45E-01		pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Antimony-125	EPA 901.1 Modified	4.16E-02	1.48E-01	1.48E-01	2.47E-01	U	pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Thorium-234	EPA 901.1 Modified	3.82E-01	1.28E+00	1.28E+00	1.71E+00	U	pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Thallium-208	EPA 901.1 Modified	4.04E-01	1.17E-01	1.19E-01	2.12E-01		pCi/g		
19-09012-17	TRG	L1-10221D-FIGS-005-SS-A	07/08/19 12:30	9/3/2019	9/11/2019	19-09012	Uranium-235	EPA 901.1 Modified	-8.19E-02	4.07E-01	4.07E-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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601 SCARBORO ROAD OAK RIDGE, TN 37830 865/481-0683 FAX 865/483-4621

<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:						Work Order Details:						
			<b>Patricia Giza</b> <b>Zion Solutions</b> <b>2701 Deborah Ave</b> <b>Zion, IL 60099</b>						SDG:	<b>19-09012</b>					
									Purchase Order:	677118					
									Analysis Category:	ENVIRONMENTAL					
						Sample Matrix:		SO							
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Actinium-228	EPA 901.1 Modified	6.21E-01	3.16E-01	3.17E-01	7.23E-01	U	pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Silver-108m	EPA 901.1 Modified	2.07E-02	1.00E-01	1.00E-01	1.22E-01	U	pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Americium-241	EPA 901.1 Modified	-8.27E-02	1.50E-01	1.50E-01	2.14E-01	U	pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Barium-133	EPA 901.1 Modified	-8.59E-03	6.89E-02	6.89E-02	2.51E-01	U	pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Bismuth-214	EPA 901.1 Modified	5.20E-01	2.78E-01	2.79E-01	4.89E-01		pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Cobalt-60	EPA 901.1 Modified	2.01E-01	1.39E-01	1.39E-01	2.37E-01	U	pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Cesium-134	EPA 901.1 Modified	5.54E-02	5.45E-02	5.46E-02	1.79E-01	U	pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Cesium-137	EPA 901.1 Modified	8.30E-01	1.70E-01	1.76E-01	1.40E-01		pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Europium-152	EPA 901.1 Modified	1.73E-01	2.16E-01	2.17E-01	3.13E-01	U	pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Europium-154	EPA 901.1 Modified	-3.02E-02	3.04E-01	3.04E-01	1.58E-01	U	pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Europium-155	EPA 901.1 Modified	8.28E-02	1.80E-01	1.80E-01	2.68E-01	U	pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Holmium-166m	EPA 901.1 Modified	6.06E-02	1.83E-01	1.83E-01	1.22E-01	U	pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Iodine-129	EPA 901.1 Modified	-6.17E-02	1.40E-01	1.40E-01	1.99E-01	U	pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Potassium-40	EPA 901.1 Modified	1.24E+01	2.52E+00	2.60E+00	2.16E+00		pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Manganese-54	EPA 901.1 Modified	-3.66E-02	1.19E-01	1.19E-01	1.86E-01	U	pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Molybdenum-93	EPA 901.1 Modified	5.62E-02	9.28E-02	9.28E-02	1.46E-01	U	pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Niobium-94	EPA 901.1 Modified	1.61E-02	9.14E-02	9.14E-02	1.35E-01	U	pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Lead-210	EPA 901.1 Modified	1.81E+00	2.02E+00	2.03E+00	3.38E+00	U	pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Lead-212	EPA 901.1 Modified	9.85E-01	2.35E-01	2.41E-01	3.32E-01		pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Lead-214	EPA 901.1 Modified	8.92E-01	2.30E-01	2.34E-01	3.63E-01		pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Promethium-145	EPA 901.1 Modified	3.52E-03	1.37E-01	1.37E-01	2.26E-01	U	pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Radium-226	EPA 901.1 Modified	5.20E-01	2.78E-01	2.79E-01	4.89E-01		pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Antimony-125	EPA 901.1 Modified	2.40E-01	2.64E-01	2.65E-01	4.16E-01	U	pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Thorium-234	EPA 901.1 Modified	1.22E+00	1.40E+00	1.40E+00	2.10E+00	U	pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Thallium-208	EPA 901.1 Modified	5.24E-01	2.12E-01	2.14E-01	3.42E-01		pCi/g	
19-09012-18	TRG	L1-10221D-FIGS-006-SS-A	07/08/19 12:32	9/3/2019	9/11/2019	19-09012	Uranium-235	EPA 901.1 Modified	1.08E-01	4.53E-01	4.53E-01	6.81E-01	U	pCi/g	

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



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<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:						
			Patricia Giza					SDG:	19-09012					
			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
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Actinium-228	EPA 901.1 Modified	1.08E+00	3.71E-01	3.75E-01	8.64E-01		pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Silver-108m	EPA 901.1 Modified	-3.80E-02	6.76E-02	6.76E-02	1.36E-01	U	pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Americium-241	EPA 901.1 Modified	-2.84E-01	1.63E-01	1.64E-01	2.17E-01	U	pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Barium-133	EPA 901.1 Modified	5.29E-02	5.72E-02	5.72E-02	2.11E-01	U	pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Bismuth-214	EPA 901.1 Modified	9.64E-01	2.51E-01	2.55E-01	3.25E-01		pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Cobalt-60	EPA 901.1 Modified	1.93E-01	1.56E-01	1.56E-01	2.84E-01	U	pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Cesium-134	EPA 901.1 Modified	-3.13E-02	4.76E-02	4.76E-02	1.58E-01	U	pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Cesium-137	EPA 901.1 Modified	1.22E+00	1.88E-01	1.98E-01	3.59E-01		pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Europium-152	EPA 901.1 Modified	9.37E-04	1.82E-01	1.82E-01	3.04E-01	U	pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Europium-154	EPA 901.1 Modified	-2.29E-01	3.44E-01	3.44E-01	1.56E-01	U	pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Europium-155	EPA 901.1 Modified	3.25E-01	1.68E-01	1.69E-01	3.00E-01		pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Holmium-166m	EPA 901.1 Modified	-7.73E-02	1.52E-01	1.52E-01	1.26E-01	U	pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Iodine-129	EPA 901.1 Modified	-7.26E-01	6.10E-01	6.11E-01	7.74E-01	U	pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Potassium-40	EPA 901.1 Modified	2.41E+01	4.87E+00	5.03E+00	1.81E+00		pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Manganese-54	EPA 901.1 Modified	-4.95E-03	9.08E-02	9.08E-02	1.48E-01	U	pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Molybdenum-93	EPA 901.1 Modified	-1.42E-02	7.68E-02	7.68E-02	1.20E-01	U	pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Niobium-94	EPA 901.1 Modified	2.32E-02	8.24E-02	8.24E-02	1.40E-01	U	pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Lead-210	EPA 901.1 Modified	3.13E+00	2.15E+00	2.16E+00	3.53E+00	U	pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Lead-212	EPA 901.1 Modified	9.85E-01	2.06E-01	2.12E-01	3.46E-01		pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Lead-214	EPA 901.1 Modified	6.68E-01	2.27E-01	2.29E-01	3.82E-01		pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Promethium-145	EPA 901.1 Modified	3.08E-01	3.46E-01	3.46E-01	5.14E-01	U	pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Radium-226	EPA 901.1 Modified	9.64E-01	2.51E-01	2.55E-01	3.25E-01		pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Antimony-125	EPA 901.1 Modified	-3.80E-02	3.22E-01	3.22E-01	4.34E-01	U	pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Thonium-234	EPA 901.1 Modified	1.29E+00	1.38E+00	1.38E+00	2.09E+00	U	pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Thallium-208	EPA 901.1 Modified	9.21E-01	3.64E-01	3.67E-01	5.38E-01		pCi/g
19-09012-19	TRG	L1-10221D-FIGS-007-SS-A	07/08/19 12:34	9/3/2019	9/11/2019	19-09012	Uranium-235	EPA 901.1 Modified	6.33E-02	4.62E-01	4.62E-01	6.84E-01	U	pCi/g

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



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

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11	L1-10221B-FIGS-100-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>6/20/2019</u>	<u>0955</u>	<u>5 ROC HTD</u>	<u>NA</u>	<u>627.14g</u>
12	L1-10221C-FIGS-103-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/8/2019</u>	<u>1247</u>	<u>5 ROC HTD</u>	<u>NA</u>	<u>860.24g</u>
13	L1-10221B-FIGS-102-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/8/2019</u>	<u>1310</u>	<u>5 ROC HTD</u>	<u>NA</u>	<u>680.87g</u>
14	L1-10221B-FIGS-103-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/8/2019</u>	<u>1312</u>	<u>5 ROC HTD</u>	<u>NA</u>	<u>723.59g</u>
15	L1-10221B-FIGS-104-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/8/2019</u>	<u>1314</u>	<u>5 ROC HTD</u>	<u>NA</u>	<u>824.34g</u>
16	L1-10221B-FIGS-105-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/8/2019</u>	<u>1316</u>	<u>5 ROC HTD</u>	<u>NA</u>	<u>703.93g</u>
17	L1-10221D-FIGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/8/2019</u>	<u>1230</u>	<u>5 ROC HTD</u>	<u>NA</u>	<u>626.47g</u>
18	L1-10221D-FIGS-006-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/8/2019</u>	<u>1232</u>	<u>5 ROC HTD</u>	<u>NA</u>	<u>649.53g</u>
19	L1-10221D-FIGS-007-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/8/2019</u>	<u>1234</u>	<u>5 ROC HTD</u>	<u>NA</u>	<u>485.57g</u>
	L1-10221D-FIGS-008-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/8/2019</u>	<u>1236</u>	<u>5 ROC HTD</u>	<u>NA</u>	<u>530.46g</u>
	L1-10221C-AJGS-109-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>6/5/2019</u>	<u>1236</u>	<u>FULL SUITE</u>	<u>NA</u>	<u>920.33g</u>
	L1-10221C-AJGS-102-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>6/5/2019</u>	<u>1222</u>	<u>FULL SUITE</u>	<u>NA</u>	<u>868.46g</u>
	L1-10209C-AJGS-110-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>6/6/2019</u>	<u>0738</u>	<u>FULL SUITE</u>	<u>NA</u>	<u>730.63g</u>
	L1-10209C-AJGS-109-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>6/6/2019</u>	<u>0736</u>	<u>FULL SUITE</u>	<u>NA</u>	<u>782.82g</u>
	L1-10209C-AJGS-108-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>6/6/2019</u>	<u>0734</u>	<u>FULL SUITE</u>	<u>NA</u>	<u>897.48g</u>
	L1-10209C-AJGS-107-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>6/6/2019</u>	<u>0732</u>	<u>FULL SUITE</u>	<u>NA</u>	<u>654.16g</u>
	L1-10209C-AJGS-104-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>6/6/2019</u>	<u>0726</u>	<u>FULL SUITE</u>	<u>NA</u>	<u>782.70g</u>
	L1-10209C-AJGS-103-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>6/6/2019</u>	<u>0724</u>	<u>FULL SUITE</u>	<u>NA</u>	<u>806.24g</u>
	L1-10209C-AJGS-102-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>6/6/2019</u>	<u>0722</u>	<u>FULL SUITE</u>	<u>NA</u>	<u>787.15g</u>

Rec AS 9-3-19 @ 1000

REC'D SEP 03 2019  
19-09012

L1-10221D-FIGS-021-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/17/19	0832	5 ROC HTD	NA	606.23g
L1-10221D-FIGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/27/19	0930	5 ROC HTD	NA	709.53g
Laboratory: <b>EBERLINE LABS</b>			Date Submitted To Lab:			Ship Container No.: <b>NA</b>		Cooler Temperature: FULL SUITE <b>N/A</b>		Airbill Number: Various for FedEx Ground		
Relinquished by: Jack Mucia		Date (mm/dd/yyyy): 8/28/19	Time: 0748		Received by: Richard F. Rickett		Date: (mm/dd/yyyy): 08/28/2019		0748			
Relinquished by: Richard F. Rickett		Date (mm/dd/yyyy): 08/29/2019	Time: 0800		Received by: Fed Ex Ground		Date: (mm/dd/yyyy): 08/29/2019		0800			
Relinquished by:		Date (mm/dd/yyyy):	Time:		Received by: Randall Spencer		Date: (mm/dd/yyyy): 09/03/2019		1000			
Relinquished by:		Date (mm/dd/yyyy):	Time:		Received by:		Date: (mm/dd/yyyy):					
Comments Full Site Po# 67716 HTD Po# 67718 30 Day Turn Around												



EBERLINE ANALYTICAL CORPORATION  
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EBS-OR-46232

October 22, 2019

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

CASE NARRATIVE  
Work Order # 19-09013-OR

SAMPLE RECEIPT

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

<u>CLIENT ID</u>	<u>LAB ID</u>	<u>CLIENT ID</u>	<u>LAB ID</u>
L1-10221D-FIGS-008-SS-A	19-09013-04	L1-10209D-FSGS-004-SS-A	19-09013-12
L1-10221D-FSGS-008-SS-A	19-09013-05	L1-10209D-FSGS-015-SS-A	19-09013-13
L1-10209E-FIGS-002-SS-A	19-09013-06	L1-10220J-FSGS-001-SS-A	19-09013-14
L1-10209E-QIGS-002-SS-A	19-09013-07	L1-10220I-FSGS-010-SS-A	19-09013-15
L1-10209E-FIGS-003-SS-A	19-09013-08	L1-10209D-FSGS-003-SB-A	19-09013-16
L1-10209E-FIGS-005-SS-A	19-09013-09	L1-10220J-FSGS-005-SB-A	19-09013-17
L1-10209E-FSGS-013-SS-A	19-09013-10	L1-10220G-FSGS-008-SS-A	19-09013-18
L1-10209D-FSGS-003-SS-A	19-09013-11	L1-10220G-FSGS-014-SS-A	19-09013-19

ANALYTICAL METHODS

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

Laboratory qualifiers are as follows:

U - Result is less than the MDA.

ANALYTICAL RESULTS

Combined Standard Uncertainty is reported at 1-sigma value.

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



## ANALYTICAL RESULTS CONTINUED

### TOTAL STRONTIUM

Samples were prepared by acid digestion as appropriate for the matrix. Digested samples were acidified and selectively extracted and precipitated. Precipitates were 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 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.

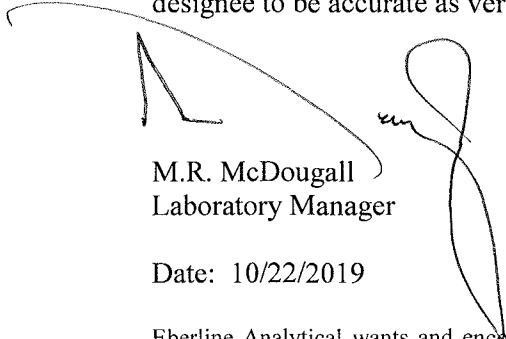
ANALYTICAL RESULTS CONTINUED

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 Cesium-137 and Potassium-40 replicate demonstrated an acceptable relative percent difference and normalized difference. Results for the Cobalt-60 and Cesium-137 laboratory control sample demonstrated an acceptable percent recovery.

CERTIFICATION OF ACCURACY

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



M.R. McDougall  
Laboratory Manager

Date: 10/22/2019

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.

<h1 style="margin: 0;">Eberline Analytical</h1> <h2 style="margin: 0;">Final Report of Analysis</h2>			Report To:					Work Order Details:							
			Patricia Giza					SDG:	19-09013						
			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	
19-09013-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	10/3/2019	19-09013	Tritium	LANL ER-210 Modified	2.04E+02	7.33E+00				pCi/g	
19-09013-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	10/3/2019	19-09013	Tritium	LANL ER-210 Modified	2.00E+02	7.77E+00	1.36E+01	5.82E+00		pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	10/3/2019	19-09013	Tritium	LANL ER-210 Modified	5.02E+00	3.56E+00	3.57E+00	5.87E+00	U	pCi/g	
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	10/3/2019	19-09013	Tritium	LANL ER-210 Modified	3.68E+00	3.36E+00	3.37E+00	5.60E+00	U	pCi/g	
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	10/3/2019	19-09013	Tritium	LANL ER-210 Modified	5.36E+00	3.43E+00	3.44E+00	5.62E+00	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	10/3/2019	19-09013	Tritium	LANL ER-210 Modified	2.09E+00	3.40E+00	3.40E+00	5.77E+00	U	pCi/g	
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	10/3/2019	19-09013	Tritium	LANL ER-210 Modified	2.45E+00	3.39E+00	3.39E+00	5.73E+00	U	pCi/g	
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	10/3/2019	19-09013	Tritium	LANL ER-210 Modified	1.15E+00	3.39E+00	3.39E+00	5.81E+00	U	pCi/g	
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	10/3/2019	19-09013	Tritium	LANL ER-210 Modified	3.46E+00	3.49E+00	3.50E+00	5.85E+00	U	pCi/g	
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	10/3/2019	19-09013	Tritium	LANL ER-210 Modified	3.65E+00	3.49E+00	3.50E+00	5.84E+00	U	pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	10/3/2019	19-09013	Tritium	LANL ER-210 Modified	5.65E-01	3.32E+00	3.32E+00	5.72E+00	U	pCi/g	
19-09013-11	TRG	L1-10209D-FSGS-003-SS-A	05/21/19 08:20	9/3/2019	10/3/2019	19-09013	Tritium	LANL ER-210 Modified	1.67E+00	3.32E+00	3.32E+00	5.66E+00	U	pCi/g	
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	10/3/2019	19-09013	Tritium	LANL ER-210 Modified	1.30E+01	3.81E+00	3.88E+00	5.83E+00		pCi/g	
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	10/3/2019	19-09013	Tritium	LANL ER-210 Modified	2.06E+00	3.35E+00	3.35E+00	5.68E+00	U	pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	10/3/2019	19-09013	Tritium	LANL ER-210 Modified	3.85E-01	3.39E+00	3.39E+00	5.86E+00	U	pCi/g	
19-09013-15	TRG	L1-10220I-FSGS-010-SS-A	05/23/19 07:45	9/3/2019	10/3/2019	19-09013	Tritium	LANL ER-210 Modified	5.57E-01	3.28E+00	3.28E+00	5.65E+00	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	10/4/2019	19-09013	Tritium	LANL ER-210 Modified	-5.79E-01	3.36E+00	3.36E+00	5.87E+00	U	pCi/g	
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	10/4/2019	19-09013	Tritium	LANL ER-210 Modified	0.00E+00	3.36E+00	3.36E+00	5.83E+00	U	pCi/g	
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	10/4/2019	19-09013	Tritium	LANL ER-210 Modified	1.81E-01	3.18E+00	3.18E+00	5.51E+00	U	pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	10/4/2019	19-09013	Tritium	LANL ER-210 Modified	7.29E-01	3.22E+00	3.22E+00	5.54E+00	U	pCi/g	

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



EBERLINE ANALYTICAL CORPORATION

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

<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:							
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG:	19-09013						
								Purchase Order:	677118						
								Analysis Category:	ENVIRONMENTAL						
					Sample Matrix:		SO								
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units	
19-09013-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	10/4/2019	19-09013	Nickel-63	ASTM 3500-Ni Modified	1.47E+03	4.41E+01				pCi/g	
19-09013-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	10/4/2019	19-09013	Nickel-63	ASTM 3500-Ni Modified	1.47E+03	1.31E+01	8.74E+01	3.27E+00		pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	10/4/2019	19-09013	Nickel-63	ASTM 3500-Ni Modified	8.74E-01	1.90E+00	1.90E+00	3.23E+00	U	pCi/g	
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	10/4/2019	19-09013	Nickel-63	ASTM 3500-Ni Modified	1.50E+00	1.93E+00	1.93E+00	3.25E+00	U	pCi/g	
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	10/4/2019	19-09013	Nickel-63	ASTM 3500-Ni Modified	7.09E-01	1.92E+00	1.92E+00	3.27E+00	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	10/4/2019	19-09013	Nickel-63	ASTM 3500-Ni Modified	-3.53E-01	1.88E+00	1.88E+00	3.26E+00	U	pCi/g	
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	10/4/2019	19-09013	Nickel-63	ASTM 3500-Ni Modified	1.66E+00	2.02E+00	2.02E+00	3.40E+00	U	pCi/g	
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	10/4/2019	19-09013	Nickel-63	ASTM 3500-Ni Modified	-4.55E-01	1.94E+00	1.94E+00	3.36E+00	U	pCi/g	
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	10/4/2019	19-09013	Nickel-63	ASTM 3500-Ni Modified	4.23E-01	1.82E+00	1.82E+00	3.12E+00	U	pCi/g	
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	10/4/2019	19-09013	Nickel-63	ASTM 3500-Ni Modified	8.57E-01	1.86E+00	1.86E+00	3.16E+00	U	pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	10/4/2019	19-09013	Nickel-63	ASTM 3500-Ni Modified	3.41E-01	1.83E+00	1.83E+00	3.14E+00	U	pCi/g	
19-09013-11	TRG	L1-10209D-FSGS-003-SS-A	05/21/19 08:20	9/3/2019	10/4/2019	19-09013	Nickel-63	ASTM 3500-Ni Modified	6.35E-01	1.96E+00	1.96E+00	3.35E+00	U	pCi/g	
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	10/4/2019	19-09013	Nickel-63	ASTM 3500-Ni Modified	8.61E-01	1.87E+00	1.87E+00	3.18E+00	U	pCi/g	
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	10/4/2019	19-09013	Nickel-63	ASTM 3500-Ni Modified	-4.55E-01	1.94E+00	1.94E+00	3.36E+00	U	pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	10/4/2019	19-09013	Nickel-63	ASTM 3500-Ni Modified	-4.34E-01	1.84E+00	1.85E+00	3.20E+00	U	pCi/g	
19-09013-15	TRG	L1-10220I-FSGS-010-SS-A	05/23/19 07:45	9/3/2019	10/4/2019	19-09013	Nickel-63	ASTM 3500-Ni Modified	7.98E-01	1.92E+00	1.92E+00	3.27E+00	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	10/4/2019	19-09013	Nickel-63	ASTM 3500-Ni Modified	1.45E+00	1.99E+00	1.99E+00	3.35E+00	U	pCi/g	
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	10/4/2019	19-09013	Nickel-63	ASTM 3500-Ni Modified	1.09E+00	1.97E+00	1.97E+00	3.34E+00	U	pCi/g	
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	10/4/2019	19-09013	Nickel-63	ASTM 3500-Ni Modified	1.22E+00	2.04E+00	2.04E+00	3.46E+00	U	pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	10/4/2019	19-09013	Nickel-63	ASTM 3500-Ni Modified	6.07E-01	1.87E+00	1.88E+00	3.20E+00	U	pCi/g	

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



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

<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:						
			Patricia Giza					SDG:	19-09013					
			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
19-09013-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	10/3/2019	19-09013	Strontium-90	EiChroM SRW01 Modified	5.06E+01	2.83E-01				pCi/g
19-09013-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	10/3/2019	19-09013	Strontium-90	EiChroM SRW01 Modified	4.80E+01	2.56E+00	1.69E+01	9.55E-01		pCi/g
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	10/3/2019	19-09013	Strontium-90	EiChroM SRW01 Modified	3.61E-01	3.78E-01	3.98E-01	7.68E-01	U	pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	10/3/2019	19-09013	Strontium-90	EiChroM SRW01 Modified	-7.38E-02	3.73E-01	3.73E-01	8.06E-01	U	pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	10/3/2019	19-09013	Strontium-90	EiChroM SRW01 Modified	5.25E-01	3.38E-01	3.84E-01	6.57E-01	U	pCi/g
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	10/3/2019	19-09013	Strontium-90	EiChroM SRW01 Modified	3.92E-01	4.03E-01	4.26E-01	8.20E-01	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	10/3/2019	19-09013	Strontium-90	EiChroM SRW01 Modified	-4.00E-01	3.41E-01	3.69E-01	7.75E-01	U	pCi/g
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	10/3/2019	19-09013	Strontium-90	EiChroM SRW01 Modified	1.24E-01	3.16E-01	3.19E-01	6.62E-01	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	10/3/2019	19-09013	Strontium-90	EiChroM SRW01 Modified	-2.70E-01	2.96E-01	3.10E-01	6.63E-01	U	pCi/g
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	10/3/2019	19-09013	Strontium-90	EiChroM SRW01 Modified	1.76E-01	3.43E-01	3.49E-01	7.15E-01	U	pCi/g
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	10/3/2019	19-09013	Strontium-90	EiChroM SRW01 Modified	1.96E-01	3.56E-01	3.63E-01	7.41E-01	U	pCi/g
19-09013-11	TRG	L1-10209D-FSGS-003-SS-A	05/21/19 08:20	9/3/2019	10/3/2019	19-09013	Strontium-90	EiChroM SRW01 Modified	-2.17E-01	3.95E-01	4.02E-01	8.65E-01	U	pCi/g
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	10/3/2019	19-09013	Strontium-90	EiChroM SRW01 Modified	-3.48E-01	3.32E-01	3.53E-01	7.48E-01	U	pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	10/3/2019	19-09013	Strontium-90	EiChroM SRW01 Modified	-2.63E-02	3.04E-01	3.04E-01	6.54E-01	U	pCi/g
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	10/3/2019	19-09013	Strontium-90	EiChroM SRW01 Modified	-6.48E-02	2.94E-01	2.95E-01	6.36E-01	U	pCi/g
19-09013-15	TRG	L1-10220I-FSGS-010-SS-A	05/23/19 07:45	9/3/2019	10/3/2019	19-09013	Strontium-90	EiChroM SRW01 Modified	8.66E-03	2.78E-01	2.79E-01	5.97E-01	U	pCi/g
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	10/3/2019	19-09013	Strontium-90	EiChroM SRW01 Modified	2.60E-01	3.42E-01	3.53E-01	7.02E-01	U	pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	10/3/2019	19-09013	Strontium-90	EiChroM SRW01 Modified	1.52E-01	3.00E-01	3.05E-01	6.25E-01	U	pCi/g
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	10/3/2019	19-09013	Strontium-90	EiChroM SRW01 Modified	-4.85E-01	3.60E-01	3.98E-01	8.14E-01	U	pCi/g
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	10/3/2019	19-09013	Strontium-90	EiChroM SRW01 Modified	1.67E-01	3.01E-01	3.06E-01	6.24E-01	U	pCi/g
19-09013-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Cobalt-60	EPA 901.1 Modified	1.31E+02	5.10E+00				pCi/g
19-09013-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Cesium-137	EPA 901.1 Modified	8.26E+01	3.39E+00				pCi/g
19-09013-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Cobalt-60	EPA 901.1 Modified	1.33E+02	8.60E+00	1.10E+01	1.21E+00		pCi/g
19-09013-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Cesium-137	EPA 901.1 Modified	8.64E+01	9.49E+00	1.05E+01	1.75E+00		pCi/g

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EBERLINE ANALYTICAL CORPORATION

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

<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:						Work Order Details:						
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099						SDG:	19-09013					
									Purchase Order:	677118					
									Analysis Category:	ENVIRONMENTAL					
						Sample Matrix:		SO							
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Actinium-228	EPA 901.1 Modified	7.41E-02	8.31E-02	8.32E-02	1.70E-01	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Silver-108m	EPA 901.1 Modified	6.96E-03	1.91E-02	1.91E-02	3.21E-02	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Americium-241	EPA 901.1 Modified	-2.57E-02	3.25E-02	3.25E-02	4.26E-02	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Barium-133	EPA 901.1 Modified	-3.21E-03	2.64E-02	2.64E-02	4.32E-02	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Bismuth-214	EPA 901.1 Modified	6.87E-02	4.10E-02	4.12E-02	6.71E-02		pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Cobalt-60	EPA 901.1 Modified	-1.26E-02	3.03E-02	3.03E-02	4.75E-02	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Cesium-134	EPA 901.1 Modified	4.67E-04	1.99E-02	1.99E-02	4.29E-02	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Cesium-137	EPA 901.1 Modified	2.36E-03	2.34E-02	2.34E-02	3.82E-02	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Europium-152	EPA 901.1 Modified	-3.74E-03	7.37E-02	7.37E-02	6.10E-02	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Europium-154	EPA 901.1 Modified	4.57E-03	7.92E-02	7.92E-02	3.21E-02	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Europium-155	EPA 901.1 Modified	1.78E-02	3.00E-02	3.00E-02	4.73E-02	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Holmium-166m	EPA 901.1 Modified	1.28E-02	4.15E-02	4.15E-02	2.97E-02	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Iodine-129	EPA 901.1 Modified	-1.90E-02	1.15E-01	1.15E-01	1.68E-01	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Potassium-40	EPA 901.1 Modified	-2.27E-02	2.60E-01	2.60E-01	4.67E-01	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Manganese-54	EPA 901.1 Modified	7.94E-03	2.52E-02	2.52E-02	4.48E-02	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Molybdenum-93	EPA 901.1 Modified	2.05E-03	2.03E-02	2.03E-02	3.15E-02	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Niobium-94	EPA 901.1 Modified	7.35E-03	2.36E-02	2.36E-02	3.52E-02	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Lead-210	EPA 901.1 Modified	3.56E-01	4.01E-01	4.01E-01	6.27E-01	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Lead-212	EPA 901.1 Modified	-1.65E-03	3.49E-02	3.49E-02	5.28E-02	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Lead-214	EPA 901.1 Modified	6.07E-02	4.98E-02	4.99E-02	7.97E-02	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Promethium-145	EPA 901.1 Modified	-4.06E-02	7.26E-02	7.26E-02	1.03E-01	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Radium-226	EPA 901.1 Modified	6.87E-02	4.10E-02	4.12E-02	6.71E-02		pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Antimony-125	EPA 901.1 Modified	1.38E-02	6.56E-02	6.56E-02	9.87E-02	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Thorium-234	EPA 901.1 Modified	2.75E-01	2.58E-01	2.59E-01	4.22E-01	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Thallium-208	EPA 901.1 Modified	3.68E-02	7.96E-02	7.96E-02	1.24E-01	U	pCi/g	
19-09013-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09013	Uranium-235	EPA 901.1 Modified	4.02E-03	1.02E-01	1.02E-01	1.55E-01	U	pCi/g	

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

<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:						
			Patricia Giza					SDG:	19-09013					
			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
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Actinium-228	EPA 901.1 Modified	1.06E+00	2.81E-01	2.86E-01	4.92E-01		pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Silver-108m	EPA 901.1 Modified	-1.03E-03	4.61E-02	4.61E-02	8.86E-02	U	pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Americium-241	EPA 901.1 Modified	-2.59E-02	1.76E-01	1.76E-01	2.26E-01	U	pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Barium-133	EPA 901.1 Modified	1.81E-02	4.08E-02	4.08E-02	1.23E-01	U	pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Bismuth-214	EPA 901.1 Modified	9.30E-01	2.09E-01	2.14E-01	3.27E-01		pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Cobalt-60	EPA 901.1 Modified	1.57E-01	1.07E-01	1.08E-01	1.62E-01	U	pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Cesium-134	EPA 901.1 Modified	-1.58E-02	3.67E-02	3.67E-02	8.78E-02	U	pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Cesium-137	EPA 901.1 Modified	9.10E-01	1.71E-01	1.78E-01	1.62E-01		pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Europium-152	EPA 901.1 Modified	-1.90E-01	2.81E-01	2.81E-01	2.84E-01	U	pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Europium-154	EPA 901.1 Modified	7.90E-02	2.27E-01	2.27E-01	1.41E-01	U	pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Europium-155	EPA 901.1 Modified	2.27E-01	1.82E-01	1.82E-01	2.72E-01	U	pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Holmium-166m	EPA 901.1 Modified	-1.31E-02	1.21E-01	1.21E-01	1.17E-01	U	pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Iodine-129	EPA 901.1 Modified	3.17E+00	1.43E+01	1.43E+01	4.97E+00	U	pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Potassium-40	EPA 901.1 Modified	1.81E+01	2.83E+00	2.98E+00	2.05E+00		pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Manganese-54	EPA 901.1 Modified	-1.01E-02	4.00E-02	4.00E-02	1.28E-01	U	pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Molybdenum-93	EPA 901.1 Modified	2.65E-02	5.70E-02	5.70E-02	9.52E-02	U	pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Niobium-94	EPA 901.1 Modified	5.51E-03	6.12E-02	6.12E-02	9.70E-02	U	pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Lead-210	EPA 901.1 Modified	4.81E+00	3.52E+00	3.53E+00	6.32E+00	U	pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Lead-212	EPA 901.1 Modified	1.13E+00	1.94E-01	2.02E-01	4.42E-01		pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Lead-214	EPA 901.1 Modified	1.22E+00	2.31E-01	2.39E-01	3.51E-01		pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Promethium-145	EPA 901.1 Modified	1.30E+00	1.24E+00	1.24E+00	1.58E+00	U	pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Radium-226	EPA 901.1 Modified	9.30E-01	2.09E-01	2.14E-01	3.27E-01		pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Antimony-125	EPA 901.1 Modified	8.95E-02	1.73E-01	1.73E-01	3.00E-01	U	pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Thorium-234	EPA 901.1 Modified	1.39E+00	1.61E+00	1.62E+00	2.20E+00	U	pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Thallium-208	EPA 901.1 Modified	5.44E-01	1.64E-01	1.66E-01	2.70E-01		pCi/g
19-09013-03	DUP	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Uranium-235	EPA 901.1 Modified	1.65E-01	4.67E-01	4.67E-01	6.34E-01	U	pCi/g

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			Patricia Giza					SDG:	19-09013					
			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
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Actinium-228	EPA 901.1 Modified	7.28E-01	2.86E-01	2.88E-01	5.16E-01		pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Silver-108m	EPA 901.1 Modified	-7.28E-02	8.74E-02	8.74E-02	9.31E-02	U	pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Americium-241	EPA 901.1 Modified	1.28E-01	1.89E-01	1.89E-01	2.50E-01	U	pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Barium-133	EPA 901.1 Modified	1.89E-02	4.45E-02	4.45E-02	1.24E-01	U	pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Bismuth-214	EPA 901.1 Modified	1.04E+00	1.88E-01	1.96E-01	3.68E-01		pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Cobalt-60	EPA 901.1 Modified	1.68E-01	7.73E-02	7.77E-02	1.33E-01		pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Cesium-134	EPA 901.1 Modified	-1.07E-01	7.61E-02	7.63E-02	9.47E-02	U	pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Cesium-137	EPA 901.1 Modified	9.93E-01	1.63E-01	1.71E-01	1.94E-01		pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Europium-152	EPA 901.1 Modified	1.50E-02	2.50E-01	2.50E-01	3.09E-01	U	pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Europium-154	EPA 901.1 Modified	-1.59E-02	2.06E-01	2.06E-01	1.56E-01	U	pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Europium-155	EPA 901.1 Modified	1.05E-01	8.55E-02	8.57E-02	2.42E-01	U	pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Holmium-166m	EPA 901.1 Modified	5.15E-02	1.18E-01	1.18E-01	1.20E-01	U	pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Iodine-129	EPA 901.1 Modified	7.55E-01	6.71E+00	6.71E+00	5.33E+00	U	pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Potassium-40	EPA 901.1 Modified	1.95E+01	2.83E+00	3.00E+00	1.36E+00		pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Manganese-54	EPA 901.1 Modified	-1.88E-02	8.01E-02	8.01E-02	1.15E-01	U	pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Molybdenum-93	EPA 901.1 Modified	2.17E-02	6.27E-02	6.27E-02	8.97E-02	U	pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Niobium-94	EPA 901.1 Modified	-5.06E-02	7.80E-02	7.80E-02	1.01E-01	U	pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Lead-210	EPA 901.1 Modified	4.82E+00	3.49E+00	3.50E+00	5.61E+00	U	pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Lead-212	EPA 901.1 Modified	1.07E+00	1.96E-01	2.03E-01	3.13E-01		pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Lead-214	EPA 901.1 Modified	1.15E+00	2.21E-01	2.28E-01	3.30E-01		pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Promethium-145	EPA 901.1 Modified	8.98E-01	1.14E+00	1.14E+00	1.55E+00	U	pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Radium-226	EPA 901.1 Modified	1.04E+00	1.88E-01	1.96E-01	3.68E-01		pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Antimony-125	EPA 901.1 Modified	-1.90E-02	1.63E-01	1.63E-01	2.73E-01	U	pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Thorium-234	EPA 901.1 Modified	1.55E+00	1.71E+00	1.71E+00	2.35E+00	U	pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Thallium-208	EPA 901.1 Modified	7.48E-01	1.66E-01	1.70E-01	1.55E-01		pCi/g
19-09013-04	DO	L1-10221D-FIGS-008-SS-A	07/08/19 12:36	9/3/2019	9/13/2019	19-09013	Uranium-235	EPA 901.1 Modified	1.57E-01	4.71E-01	4.71E-01	6.28E-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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<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:							
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG:		19-09013					
								Purchase Order:		677118					
								Analysis Category:		ENVIRONMENTAL					
					Sample Matrix:		SO								
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Actinium-228	EPA 901.1 Modified	-8.69E-02	1.03E-01	1.03E-01	4.20E-01	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Silver-108m	EPA 901.1 Modified	-1.09E-02	5.67E-02	5.67E-02	7.94E-02	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Americium-241	EPA 901.1 Modified	-1.27E-03	8.63E-02	8.63E-02	1.24E-01	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Barium-133	EPA 901.1 Modified	2.29E-01	9.18E-02	9.25E-02	1.47E-01	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Bismuth-214	EPA 901.1 Modified	3.54E-01	1.82E-01	1.83E-01	2.94E-01	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Cobalt-60	EPA 901.1 Modified	8.10E-02	4.75E-02	4.77E-02	1.22E-01	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Cesium-134	EPA 901.1 Modified	2.16E-02	2.85E-02	2.85E-02	1.05E-01	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Cesium-137	EPA 901.1 Modified	4.09E-01	9.67E-02	9.89E-02	2.10E-01	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Europium-152	EPA 901.1 Modified	-9.52E-02	2.14E-01	2.14E-01	1.92E-01	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Europium-154	EPA 901.1 Modified	2.95E-02	1.65E-01	1.65E-01	1.01E-01	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Europium-155	EPA 901.1 Modified	-4.23E-02	1.06E-01	1.06E-01	1.51E-01	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Holmium-166m	EPA 901.1 Modified	-2.22E-02	1.11E-01	1.11E-01	7.40E-02	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Iodine-129	EPA 901.1 Modified	5.37E-03	6.73E-02	6.73E-02	1.00E-01	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Potassium-40	EPA 901.1 Modified	5.95E+00	1.46E+00	1.49E+00	1.46E+00	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Manganese-54	EPA 901.1 Modified	7.23E-02	6.52E-02	6.53E-02	1.03E-01	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Molybdenum-93	EPA 901.1 Modified	-6.71E-03	4.20E-02	4.20E-02	8.24E-02	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Niobium-94	EPA 901.1 Modified	1.43E-02	5.37E-02	5.38E-02	8.37E-02	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Lead-210	EPA 901.1 Modified	6.27E-01	6.17E-01	6.18E-01	1.02E+00	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Lead-212	EPA 901.1 Modified	3.12E-01	1.28E-01	1.29E-01	1.98E-01	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Lead-214	EPA 901.1 Modified	4.30E-01	1.40E-01	1.42E-01	2.32E-01	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Promethium-145	EPA 901.1 Modified	-4.46E-02	8.39E-02	8.39E-02	1.19E-01	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Radium-226	EPA 901.1 Modified	3.54E-01	1.82E-01	1.83E-01	2.94E-01	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Antimony-125	EPA 901.1 Modified	3.73E-02	1.84E-01	1.84E-01	2.66E-01	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Thorium-234	EPA 901.1 Modified	1.09E+00	7.93E-01	7.95E-01	1.24E+00	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Thallium-208	EPA 901.1 Modified	2.25E-01	2.04E-01	2.05E-01	3.35E-01	U	pCi/g	
19-09013-05	TRG	L1-10221D-FSGS-008-SS-A	05/15/19 07:20	9/3/2019	9/13/2019	19-09013	Uranium-235	EPA 901.1 Modified	-8.24E-02	2.80E-01	2.80E-01	4.04E-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

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[473]

# Eberline Analytical Final Report of Analysis

Report To:

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

Work Order Details:

**SDG: 19-09013**  
**Purchase Order: 677118**  
**Analysis Category: ENVIRONMENTAL**  
**Sample Matrix: SO**

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Actinium-228	EPA 901.1 Modified	4.66E-01	2.54E-01	2.55E-01	4.72E-01	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Silver-108m	EPA 901.1 Modified	4.35E-02	6.30E-02	6.30E-02	7.83E-02	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Americium-241	EPA 901.1 Modified	-1.48E-01	8.82E-02	8.85E-02	1.12E-01	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Barium-133	EPA 901.1 Modified	4.35E-02	1.25E-01	1.25E-01	1.33E-01	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Bismuth-214	EPA 901.1 Modified	6.82E-01	1.81E-01	1.85E-01	1.68E-01	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Cobalt-60	EPA 901.1 Modified	1.72E-02	9.23E-02	9.23E-02	1.53E-01	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Cesium-134	EPA 901.1 Modified	-3.27E-03	2.90E-02	2.90E-02	1.28E-01	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Cesium-137	EPA 901.1 Modified	1.84E-01	7.22E-02	7.28E-02	1.35E-01	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Europium-152	EPA 901.1 Modified	-1.12E-01	2.24E-01	2.24E-01	1.80E-01	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Europium-154	EPA 901.1 Modified	-5.94E-02	2.36E-01	2.36E-01	8.92E-02	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Europium-155	EPA 901.1 Modified	9.88E-02	6.97E-02	6.99E-02	1.73E-01	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Holmium-166m	EPA 901.1 Modified	6.17E-02	9.01E-02	9.02E-02	7.91E-02	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Iodine-129	EPA 901.1 Modified	-8.24E-02	2.22E-01	2.22E-01	3.17E-01	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Potassium-40	EPA 901.1 Modified	1.58E+01	3.22E+00	3.32E+00	1.40E+00	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Manganese-54	EPA 901.1 Modified	3.73E-02	7.21E-02	7.21E-02	1.26E-01	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Molybdenum-93	EPA 901.1 Modified	-2.70E-02	5.05E-02	5.05E-02	7.62E-02	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Niobium-94	EPA 901.1 Modified	2.26E-04	5.90E-02	5.90E-02	8.25E-02	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Lead-210	EPA 901.1 Modified	1.48E+00	8.88E-01	8.92E-01	1.40E+00	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Lead-212	EPA 901.1 Modified	4.77E-01	1.22E-01	1.25E-01	2.19E-01	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Lead-214	EPA 901.1 Modified	7.09E-01	1.32E-01	1.37E-01	3.52E-01	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Promethium-145	EPA 901.1 Modified	3.12E-02	1.53E-01	1.53E-01	2.27E-01	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Radium-226	EPA 901.1 Modified	6.82E-01	1.81E-01	1.85E-01	1.68E-01	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Antimony-125	EPA 901.1 Modified	8.20E-02	1.77E-01	1.77E-01	2.61E-01	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Thorium-234	EPA 901.1 Modified	7.73E-01	7.22E-01	7.23E-01	1.11E+00	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Thallium-208	EPA 901.1 Modified	4.67E-01	2.09E-01	2.11E-01	3.14E-01	U	pCi/g
19-09013-06	TRG	L1-10209E-FIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Uranium-235	EPA 901.1 Modified	-5.98E-02	2.67E-01	2.67E-01	3.89E-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

[474]

<b>Eberline Analytical</b> <b>Final Report of Analysis</b>				Report To:					Work Order Details:									
				Patricia Giza					SDG:	19-09013								
				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				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Actinium-228	EPA 901.1 Modified	5.28E-01	1.79E-01	1.81E-01	2.57E-01		pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Silver-108m	EPA 901.1 Modified	2.20E-03	3.08E-02	3.08E-02	5.25E-02	U	pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Americium-241	EPA 901.1 Modified	1.69E-02	1.03E-01	1.03E-01	1.36E-01	U	pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Barium-133	EPA 901.1 Modified	-1.67E-02	2.53E-02	2.53E-02	7.24E-02	U	pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Bismuth-214	EPA 901.1 Modified	4.44E-01	1.12E-01	1.14E-01	1.77E-01		pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Cobalt-60	EPA 901.1 Modified	1.44E-01	6.48E-02	6.52E-02	1.21E-01		pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Cesium-134	EPA 901.1 Modified	1.97E-03	1.68E-02	1.68E-02	5.55E-02	U	pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Cesium-137	EPA 901.1 Modified	1.50E-01	7.54E-02	7.58E-02	1.14E-01		pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Europium-152	EPA 901.1 Modified	-9.51E-02	1.45E-01	1.45E-01	1.90E-01	U	pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Europium-154	EPA 901.1 Modified	1.45E-02	1.34E-01	1.34E-01	9.96E-02	U	pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Europium-155	EPA 901.1 Modified	1.14E-01	1.03E-01	1.03E-01	1.41E-01	U	pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Holmium-166m	EPA 901.1 Modified	-2.59E-02	7.77E-02	7.77E-02	7.32E-02	U	pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Iodine-129	EPA 901.1 Modified	1.08E+00	5.85E+00	5.85E+00	3.45E+00	U	pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Potassium-40	EPA 901.1 Modified	1.24E+01	1.81E+00	1.92E+00	7.50E-01		pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Manganese-54	EPA 901.1 Modified	-2.49E-03	2.59E-02	2.59E-02	8.63E-02	U	pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Molybdenum-93	EPA 901.1 Modified	1.35E-02	3.36E-02	3.36E-02	5.08E-02	U	pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Niobium-94	EPA 901.1 Modified	8.97E-03	3.99E-02	4.00E-02	6.60E-02	U	pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Lead-210	EPA 901.1 Modified	1.77E+00	1.45E+00	1.45E+00	2.39E+00	U	pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Lead-212	EPA 901.1 Modified	3.74E-01	8.97E-02	9.17E-02	2.04E-01		pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Lead-214	EPA 901.1 Modified	4.40E-01	1.14E-01	1.16E-01	2.10E-01		pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Promethium-145	EPA 901.1 Modified	4.96E-01	7.20E-01	7.21E-01	1.02E+00	U	pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Radium-226	EPA 901.1 Modified	4.44E-01	1.12E-01	1.14E-01	1.77E-01		pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Antimony-125	EPA 901.1 Modified	2.91E-02	8.97E-02	8.97E-02	1.58E-01	U	pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Thorium-234	EPA 901.1 Modified	1.11E+00	9.38E-01	9.40E-01	1.34E+00	U	pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Thallium-208	EPA 901.1 Modified	2.75E-01	8.53E-02	8.64E-02	1.05E-01		pCi/g				
19-09013-07	TRG	L1-10209E-QIGS-002-SS-A	05/17/19 10:35	9/3/2019	9/13/2019	19-09013	Uranium-235	EPA 901.1 Modified	-1.81E-01	3.17E-01	3.17E-01	3.91E-01	U	pCi/g				

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



EBERLINE ANALYTICAL CORPORATION

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

[475]

<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:						
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG:	19-09013					
								Purchase Order:	677118					
								Analysis Category:	ENVIRONMENTAL					
					Sample Matrix:		SO							
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Actinium-228	EPA 901.1 Modified	3.50E-01	2.35E-01	2.36E-01	4.39E-01	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Silver-108m	EPA 901.1 Modified	-4.60E-03	3.12E-02	3.12E-02	8.69E-02	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Americium-241	EPA 901.1 Modified	-5.52E-03	1.03E-01	1.03E-01	1.49E-01	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Barium-133	EPA 901.1 Modified	-1.51E-02	3.86E-02	3.86E-02	1.66E-01	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Bismuth-214	EPA 901.1 Modified	3.60E-01	1.42E-01	1.43E-01	2.18E-01	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Cobalt-60	EPA 901.1 Modified	6.39E-02	9.70E-02	9.70E-02	1.49E-01	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Cesium-134	EPA 901.1 Modified	4.00E-02	4.04E-02	4.05E-02	1.17E-01	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Cesium-137	EPA 901.1 Modified	2.11E-01	9.28E-02	9.35E-02	1.32E-01	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Europium-152	EPA 901.1 Modified	-2.09E-02	1.81E-01	1.81E-01	2.36E-01	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Europium-154	EPA 901.1 Modified	-1.17E-01	2.35E-01	2.35E-01	1.22E-01	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Europium-155	EPA 901.1 Modified	6.07E-02	1.11E-01	1.11E-01	1.87E-01	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Holmium-166m	EPA 901.1 Modified	-6.80E-02	1.38E-01	1.38E-01	7.99E-02	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Iodine-129	EPA 901.1 Modified	-6.82E-03	7.69E-02	7.69E-02	1.13E-01	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Potassium-40	EPA 901.1 Modified	1.01E+01	1.85E+00	1.92E+00	1.23E+00	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Manganese-54	EPA 901.1 Modified	-1.71E-02	7.70E-02	7.70E-02	1.23E-01	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Molybdenum-93	EPA 901.1 Modified	-5.85E-02	7.57E-02	7.58E-02	9.17E-02	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Niobium-94	EPA 901.1 Modified	2.92E-03	6.65E-02	6.65E-02	1.05E-01	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Lead-210	EPA 901.1 Modified	1.13E+00	8.01E-01	8.03E-01	1.28E+00	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Lead-212	EPA 901.1 Modified	4.77E-01	1.28E-01	1.31E-01	2.83E-01	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Lead-214	EPA 901.1 Modified	3.95E-01	1.51E-01	1.52E-01	2.79E-01	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Promethium-145	EPA 901.1 Modified	1.51E-02	9.35E-02	9.35E-02	1.40E-01	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Radium-226	EPA 901.1 Modified	3.60E-01	1.42E-01	1.43E-01	2.18E-01	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Antimony-125	EPA 901.1 Modified	-8.40E-02	2.16E-01	2.16E-01	2.84E-01	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Thorium-234	EPA 901.1 Modified	1.45E-01	9.85E-01	9.85E-01	1.45E+00	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Thallium-208	EPA 901.1 Modified	3.88E-01	1.66E-01	1.67E-01	1.72E-01	U	pCi/g
19-09013-08	TRG	L1-10209E-FIGS-003-SS-A	05/17/19 15:00	9/3/2019	9/13/2019	19-09013	Uranium-235	EPA 901.1 Modified	4.03E-02	3.09E-01	3.09E-01	4.62E-01	U	pCi/g

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



**EBERLINE ANALYTICAL 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:	19-09013							
			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		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Actinium-228	EPA 901.1 Modified	3.32E-01	1.99E-01	2.00E-01	3.70E-01	U	pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Silver-108m	EPA 901.1 Modified	-4.31E-02	6.33E-02	6.34E-02	7.75E-02	U	pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Americium-241	EPA 901.1 Modified	-1.50E-01	8.50E-02	8.53E-02	1.08E-01	U	pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Barium-133	EPA 901.1 Modified	-2.86E-02	1.07E-01	1.07E-01	1.26E-01	U	pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Bismuth-214	EPA 901.1 Modified	4.59E-01	1.31E-01	1.33E-01	3.60E-01		pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Cobalt-60	EPA 901.1 Modified	1.97E-01	6.33E-02	6.41E-02	9.80E-02		pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Cesium-134	EPA 901.1 Modified	-3.36E-03	2.97E-02	2.97E-02	1.16E-01	U	pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Cesium-137	EPA 901.1 Modified	3.74E-01	9.00E-02	9.20E-02	1.01E-01		pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Europium-152	EPA 901.1 Modified	3.07E-02	9.97E-02	9.97E-02	1.85E-01	U	pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Europium-154	EPA 901.1 Modified	9.53E-03	1.72E-01	1.72E-01	9.44E-02	U	pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Europium-155	EPA 901.1 Modified	9.52E-02	9.02E-02	9.03E-02	1.37E-01	U	pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Holmium-166m	EPA 901.1 Modified	-4.90E-02	9.76E-02	9.76E-02	7.77E-02	U	pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Iodine-129	EPA 901.1 Modified	1.43E-01	2.17E-01	2.18E-01	3.23E-01	U	pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Potassium-40	EPA 901.1 Modified	1.09E+01	2.38E+00	2.44E+00	1.00E+00		pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Manganese-54	EPA 901.1 Modified	3.22E-02	6.79E-02	6.79E-02	1.19E-01	U	pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Molybdenum-93	EPA 901.1 Modified	-1.36E-02	5.13E-02	5.13E-02	8.02E-02	U	pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Niobium-94	EPA 901.1 Modified	2.69E-02	5.99E-02	6.00E-02	8.82E-02	U	pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Lead-210	EPA 901.1 Modified	9.41E-01	9.52E-01	9.53E-01	1.58E+00	U	pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Lead-212	EPA 901.1 Modified	3.91E-01	1.00E-01	1.02E-01	2.33E-01		pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Lead-214	EPA 901.1 Modified	4.58E-01	1.29E-01	1.31E-01	3.11E-01		pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Promethium-145	EPA 901.1 Modified	-7.24E-02	1.49E-01	1.49E-01	2.13E-01	U	pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Radium-226	EPA 901.1 Modified	4.59E-01	1.31E-01	1.33E-01	3.60E-01		pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Antimony-125	EPA 901.1 Modified	3.88E-02	1.87E-01	1.88E-01	2.68E-01	U	pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Thorium-234	EPA 901.1 Modified	6.47E-01	7.01E-01	7.02E-01	1.07E+00	U	pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Thallium-208	EPA 901.1 Modified	3.51E-01	2.28E-01	2.29E-01	3.83E-01	U	pCi/g		
19-09013-09	TRG	L1-10209E-FIGS-005-SS-A	05/17/19 15:10	9/3/2019	9/13/2019	19-09013	Uranium-235	EPA 901.1 Modified	6.48E-02	2.50E-01	2.50E-01	3.76E-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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<h1 style="margin:0;">Eberline Analytical</h1> <h2 style="margin:0;">Final Report of Analysis</h2>			Report To:						Work Order Details:						
			<b>Patricia Giza</b> <b>Zion Solutions</b> <b>2701 Deborah Ave</b> <b>Zion, IL 60099</b>						SDG: <b>19-09013</b>						
									Purchase Order: 677118						
									Analysis Category: ENVIRONMENTAL						
						Sample Matrix: SO									
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Actinium-228	EPA 901.1 Modified	3.63E-01	1.51E-01	1.53E-01	3.07E-01	U	pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Silver-108m	EPA 901.1 Modified	1.31E-02	3.77E-02	3.77E-02	3.80E-02	U	pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Americium-241	EPA 901.1 Modified	-1.52E-02	8.45E-02	8.45E-02	1.08E-01	U	pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Barium-133	EPA 901.1 Modified	0.00E+00	2.59E-02	2.59E-02	7.07E-02	U	pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Bismuth-214	EPA 901.1 Modified	2.30E-01	8.30E-02	8.38E-02	1.37E-01		pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Cobalt-60	EPA 901.1 Modified	4.14E-03	4.73E-02	4.73E-02	7.42E-02	U	pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Cesium-134	EPA 901.1 Modified	1.24E-02	2.16E-02	2.16E-02	5.33E-02	U	pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Cesium-137	EPA 901.1 Modified	3.65E-02	3.36E-02	3.37E-02	5.41E-02	U	pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Europium-152	EPA 901.1 Modified	4.33E-02	1.59E-01	1.59E-01	1.42E-01	U	pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Europium-154	EPA 901.1 Modified	2.13E-02	1.17E-01	1.17E-01	7.36E-02	U	pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Europium-155	EPA 901.1 Modified	1.17E-01	8.38E-02	8.40E-02	1.15E-01	U	pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Holmium-166m	EPA 901.1 Modified	2.80E-02	5.93E-02	5.93E-02	5.71E-02	U	pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Iodine-129	EPA 901.1 Modified	2.17E+00	9.46E+00	9.46E+00	2.90E+00	U	pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Potassium-40	EPA 901.1 Modified	7.89E+00	1.28E+00	1.35E+00	7.37E-01		pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Manganese-54	EPA 901.1 Modified	1.21E-02	3.94E-02	3.94E-02	6.58E-02	U	pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Molybdenum-93	EPA 901.1 Modified	1.64E-02	2.66E-02	2.66E-02	4.68E-02	U	pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Niobium-94	EPA 901.1 Modified	1.06E-02	3.55E-02	3.55E-02	5.68E-02	U	pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Lead-210	EPA 901.1 Modified	1.05E+00	1.17E+00	1.17E+00	1.92E+00	U	pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Lead-212	EPA 901.1 Modified	2.71E-01	6.86E-02	7.00E-02	1.66E-01		pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Lead-214	EPA 901.1 Modified	2.43E-01	9.61E-02	9.69E-02	1.69E-01		pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Promethium-145	EPA 901.1 Modified	8.02E-01	7.04E-01	7.06E-01	8.98E-01	U	pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Radium-226	EPA 901.1 Modified	2.30E-01	8.30E-02	8.38E-02	1.37E-01		pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Antimony-125	EPA 901.1 Modified	-6.69E-02	8.34E-02	8.35E-02	1.25E-01	U	pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Thorium-234	EPA 901.1 Modified	8.11E-01	7.50E-01	7.51E-01	1.08E+00	U	pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Thallium-208	EPA 901.1 Modified	2.44E-01	7.26E-02	7.37E-02	1.30E-01		pCi/g	
19-09013-10	TRG	L1-10209E-FSGS-013-SS-A	05/20/19 08:10	9/3/2019	9/13/2019	19-09013	Uranium-235	EPA 901.1 Modified	-1.45E-01	2.52E-01	2.52E-01	3.11E-01	U	pCi/g	

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



**EBERLINE ANALYTICAL CORPORATION**

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Eberline Analytical Final Report of Analysis			Report To:					Work Order Details:								
			Patricia Giza					SDG:	19-09013							
			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		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Actinium-228	EPA 901.1 Modified	6.11E-02	3.40E-01	3.40E-01	5.68E-01	U	pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Silver-108m	EPA 901.1 Modified	8.41E-03	8.21E-02	8.21E-02	1.07E-01	U	pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Americium-241	EPA 901.1 Modified	1.21E-02	1.14E-01	1.14E-01	1.66E-01	U	pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Barium-133	EPA 901.1 Modified	2.85E-02	6.00E-02	6.00E-02	1.96E-01	U	pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Bismuth-214	EPA 901.1 Modified	4.65E-01	2.45E-01	2.47E-01	4.12E-01		pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Cobalt-60	EPA 901.1 Modified	2.21E-01	9.76E-02	9.83E-02	1.74E-01		pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Cesium-134	EPA 901.1 Modified	-1.95E-01	1.39E-01	1.39E-01	1.40E-01	U	pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Cesium-137	EPA 901.1 Modified	2.31E-01	1.14E-01	1.15E-01	2.00E-01		pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Europium-152	EPA 901.1 Modified	1.79E-02	2.17E-01	2.17E-01	2.71E-01	U	pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Europium-154	EPA 901.1 Modified	-2.22E-02	6.98E-02	6.98E-02	1.39E-01	U	pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Europium-155	EPA 901.1 Modified	1.07E-01	1.42E-01	1.43E-01	2.17E-01	U	pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Holmium-166m	EPA 901.1 Modified	8.56E-03	1.66E-01	1.66E-01	9.33E-02	U	pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Iodine-129	EPA 901.1 Modified	3.45E-02	8.86E-02	8.86E-02	1.33E-01	U	pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Potassium-40	EPA 901.1 Modified	9.41E+00	1.93E+00	1.99E+00	1.39E+00		pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Manganese-54	EPA 901.1 Modified	-1.50E-02	1.02E-01	1.02E-01	1.59E-01	U	pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Molybdenum-93	EPA 901.1 Modified	6.37E-04	8.10E-02	8.10E-02	1.17E-01	U	pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Niobium-94	EPA 901.1 Modified	4.70E-02	7.32E-02	7.33E-02	1.20E-01	U	pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Lead-210	EPA 901.1 Modified	1.82E+00	9.75E-01	9.79E-01	1.59E+00	U	pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Lead-212	EPA 901.1 Modified	3.88E-01	1.63E-01	1.64E-01	2.52E-01		pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Lead-214	EPA 901.1 Modified	3.50E-01	1.79E-01	1.80E-01	3.35E-01		pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Promethium-145	EPA 901.1 Modified	-4.07E-02	1.07E-01	1.07E-01	1.54E-01	U	pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Radium-226	EPA 901.1 Modified	4.65E-01	2.45E-01	2.47E-01	4.12E-01		pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Antimony-125	EPA 901.1 Modified	1.15E-01	1.54E-01	1.55E-01	3.36E-01	U	pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Thorium-234	EPA 901.1 Modified	1.40E+00	1.07E+00	1.08E+00	1.67E+00	U	pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Thallium-208	EPA 901.1 Modified	4.69E-01	3.09E-01	3.10E-01	4.86E-01	U	pCi/g		
19-09013-12	TRG	L1-10209D-FSGS-004-SS-A	05/21/19 08:25	9/3/2019	9/13/2019	19-09013	Uranium-235	EPA 901.1 Modified	1.03E-01	2.28E-01	2.28E-01	5.44E-01	U	pCi/g		

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



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<p><b>Eberline Analytical</b> <b>Final Report of Analysis</b></p>			Report To:					Work Order Details:						
			Patricia Giza					SDG: <b>19-09013</b>						
			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
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Actinium-228	EPA 901.1 Modified	5.60E-01	2.09E-01	2.11E-01	3.95E-01		pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Silver-108m	EPA 901.1 Modified	-1.76E-02	1.78E-02	1.78E-02	5.87E-02	U	pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Americium-241	EPA 901.1 Modified	5.72E-02	1.03E-01	1.03E-01	1.66E-01	U	pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Barium-133	EPA 901.1 Modified	-2.96E-02	6.18E-02	6.19E-02	8.73E-02	U	pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Bismuth-214	EPA 901.1 Modified	6.59E-01	1.55E-01	1.59E-01	2.47E-01		pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Cobalt-60	EPA 901.1 Modified	9.87E-02	6.89E-02	6.91E-02	1.05E-01	U	pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Cesium-134	EPA 901.1 Modified	-7.35E-04	1.98E-02	1.98E-02	6.14E-02	U	pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Cesium-137	EPA 901.1 Modified	1.88E-01	7.60E-02	7.66E-02	1.08E-01		pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Europium-152	EPA 901.1 Modified	-3.68E-02	2.02E-01	2.02E-01	2.00E-01	U	pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Europium-154	EPA 901.1 Modified	-5.05E-02	1.69E-01	1.69E-01	1.04E-01	U	pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Europium-155	EPA 901.1 Modified	2.02E-01	1.28E-01	1.29E-01	1.72E-01	U	pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Holmium-166m	EPA 901.1 Modified	-3.83E-02	7.80E-02	7.80E-02	8.73E-02	U	pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Iodine-129	EPA 901.1 Modified	1.94E+00	8.82E+00	8.82E+00	3.82E+00	U	pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Potassium-40	EPA 901.1 Modified	1.39E+01	2.06E+00	2.18E+00	1.20E+00		pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Manganese-54	EPA 901.1 Modified	5.79E-02	6.44E-02	6.45E-02	1.12E-01	U	pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Molybdenum-93	EPA 901.1 Modified	1.44E-02	4.23E-02	4.23E-02	4.37E-02	U	pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Niobium-94	EPA 901.1 Modified	1.82E-03	4.92E-02	4.92E-02	7.60E-02	U	pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Lead-210	EPA 901.1 Modified	2.53E+00	1.65E+00	1.66E+00	2.71E+00	U	pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Lead-212	EPA 901.1 Modified	6.32E-01	1.20E-01	1.24E-01	2.51E-01		pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Lead-214	EPA 901.1 Modified	6.87E-01	1.48E-01	1.52E-01	2.01E-01		pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Promethium-145	EPA 901.1 Modified	4.74E-01	7.73E-01	7.74E-01	1.12E+00	U	pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Radium-226	EPA 901.1 Modified	6.59E-01	1.55E-01	1.59E-01	2.47E-01		pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Antimony-125	EPA 901.1 Modified	1.31E-01	1.21E-01	1.21E-01	2.25E-01	U	pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Thorium-234	EPA 901.1 Modified	2.11E-01	1.22E+00	1.22E+00	1.59E+00	U	pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Thallium-208	EPA 901.1 Modified	3.93E-01	1.04E-01	1.06E-01	1.10E-01		pCi/g
19-09013-13	TRG	L1-10209D-FSGS-015-SS-A	05/21/19 09:20	9/3/2019	9/13/2019	19-09013	Uranium-235	EPA 901.1 Modified	-1.13E-01	3.40E-01	3.40E-01	4.32E-01	U	pCi/g

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



EBERLINE ANALYTICAL CORPORATION

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

<b>Eberline Analytical Final Report of Analysis</b>			Report To:						Work Order Details:						
			Patricia Giza						SDG:	<b>19-09013</b>				Report	
			Zion Solutions						Purchase Order:	677118				Units	
			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	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Actinium-228	EPA 901.1 Modified	5.63E-01	2.58E-01	2.59E-01	4.94E-01		pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Silver-108m	EPA 901.1 Modified	-2.16E-02	8.20E-02	8.20E-02	1.03E-01	U	pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Americium-241	EPA 901.1 Modified	2.79E-03	1.23E-01	1.23E-01	1.77E-01	U	pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Barium-133	EPA 901.1 Modified	-1.20E-02	3.83E-02	3.83E-02	1.88E-01	U	pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Bismuth-214	EPA 901.1 Modified	2.92E-01	1.92E-01	1.93E-01	3.48E-01	U	pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Cobalt-60	EPA 901.1 Modified	-6.87E-02	1.03E-01	1.03E-01	1.51E-01	U	pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Cesium-134	EPA 901.1 Modified	-2.48E-02	6.33E-02	6.33E-02	1.41E-01	U	pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Cesium-137	EPA 901.1 Modified	2.01E-01	9.50E-02	9.55E-02	1.32E-01		pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Europium-152	EPA 901.1 Modified	3.18E-02	9.80E-02	9.80E-02	2.47E-01	U	pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Europium-154	EPA 901.1 Modified	-1.24E-01	2.44E-01	2.45E-01	1.30E-01	U	pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Europium-155	EPA 901.1 Modified	4.35E-02	1.44E-01	1.44E-01	2.12E-01	U	pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Holmium-166m	EPA 901.1 Modified	9.68E-02	1.59E-01	1.59E-01	1.01E-01	U	pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Iodine-129	EPA 901.1 Modified	-1.32E-01	1.01E-01	1.01E-01	1.34E-01	U	pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Potassium-40	EPA 901.1 Modified	1.01E+01	1.98E+00	2.04E+00	1.03E+00		pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Manganese-54	EPA 901.1 Modified	-7.06E-02	9.88E-02	9.89E-02	1.44E-01	U	pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Molybdenum-93	EPA 901.1 Modified	-8.73E-02	9.21E-02	9.22E-02	1.04E-01	U	pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Niobium-94	EPA 901.1 Modified	-3.25E-02	7.83E-02	7.83E-02	1.21E-01	U	pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Lead-210	EPA 901.1 Modified	2.42E+00	1.09E+00	1.10E+00	1.71E+00		pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Lead-212	EPA 901.1 Modified	3.69E-01	1.80E-01	1.81E-01	2.85E-01		pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Lead-214	EPA 901.1 Modified	4.35E-01	1.90E-01	1.91E-01	3.50E-01		pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Promethium-145	EPA 901.1 Modified	3.25E-02	1.15E-01	1.15E-01	1.72E-01	U	pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Radium-226	EPA 901.1 Modified	2.92E-01	1.92E-01	1.93E-01	3.48E-01	U	pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Antimony-125	EPA 901.1 Modified	7.81E-02	2.23E-01	2.23E-01	3.35E-01	U	pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Thorium-234	EPA 901.1 Modified	1.21E+00	1.13E+00	1.13E+00	1.75E+00	U	pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Thallium-208	EPA 901.1 Modified	3.78E-01	2.12E-01	2.13E-01	4.05E-01	U	pCi/g	
19-09013-14	TRG	L1-10220J-FSGS-001-SS-A	05/22/19 07:00	9/3/2019	9/13/2019	19-09013	Uranium-235	EPA 901.1 Modified	4.42E-01	3.47E-01	3.48E-01	5.67E-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: 19-09013					
					Zion Solutions					Purchase Order: 677118					
					2701 Deborah Ave Zion, IL 60099					Analysis Category: ENVIRONMENTAL			Sample Matrix: SO		
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Actinium-228	EPA 901.1 Modified	4.23E-01	1.59E-01	1.61E-01	5.84E-01	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Silver-108m	EPA 901.1 Modified	7.07E-03	3.23E-02	3.23E-02	5.04E-02	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Americium-241	EPA 901.1 Modified	7.94E-03	7.41E-02	7.41E-02	1.46E-01	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Barium-133	EPA 901.1 Modified	1.01E-02	4.05E-02	4.05E-02	8.28E-02	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Bismuth-214	EPA 901.1 Modified	5.10E-01	1.23E-01	1.26E-01	1.66E-01	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Cobalt-60	EPA 901.1 Modified	7.25E-02	5.72E-02	5.73E-02	9.02E-02	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Cesium-134	EPA 901.1 Modified	6.16E-03	2.95E-02	2.95E-02	5.86E-02	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Cesium-137	EPA 901.1 Modified	1.31E-01	7.40E-02	7.44E-02	1.15E-01	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Europium-152	EPA 901.1 Modified	-2.83E-02	9.23E-02	9.23E-02	1.94E-01	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Europium-154	EPA 901.1 Modified	5.29E-02	1.27E-01	1.27E-01	9.27E-02	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Europium-155	EPA 901.1 Modified	2.21E-01	1.18E-01	1.19E-01	1.56E-01	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Holmium-166m	EPA 901.1 Modified	-9.63E-03	6.96E-02	6.96E-02	7.58E-02	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Iodine-129	EPA 901.1 Modified	3.12E+00	1.33E+01	1.33E+01	3.48E+00	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Potassium-40	EPA 901.1 Modified	1.45E+01	2.02E+00	2.15E+00	1.11E+00	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Manganese-54	EPA 901.1 Modified	1.77E-02	5.67E-02	5.67E-02	9.22E-02	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Molybdenum-93	EPA 901.1 Modified	1.74E-02	3.90E-02	3.90E-02	4.98E-02	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Niobium-94	EPA 901.1 Modified	-1.10E-02	4.49E-02	4.49E-02	6.11E-02	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Lead-210	EPA 901.1 Modified	9.87E-01	1.42E+00	1.42E+00	2.30E+00	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Lead-212	EPA 901.1 Modified	5.27E-01	1.08E-01	1.11E-01	2.04E-01	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Lead-214	EPA 901.1 Modified	5.83E-01	1.17E-01	1.20E-01	1.90E-01	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Promethium-145	EPA 901.1 Modified	5.18E-01	7.37E-01	7.37E-01	1.05E+00	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Radium-226	EPA 901.1 Modified	5.10E-01	1.23E-01	1.26E-01	1.66E-01	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Antimony-125	EPA 901.1 Modified	-6.59E-02	1.11E-01	1.11E-01	1.75E-01	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Thorium-234	EPA 901.1 Modified	1.91E+00	1.07E+00	1.07E+00	1.54E+00	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Thallium-208	EPA 901.1 Modified	3.32E-01	1.00E-01	1.02E-01	1.03E-01	U	pCi/g	
19-09013-16	TRG	L1-10209D-FSGS-003-SB-A	05/28/19 09:00	9/3/2019	9/13/2019	19-09013	Uranium-235	EPA 901.1 Modified	1.52E-01	3.03E-01	3.03E-01	4.15E-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:

Patricia Giza  
Zion Solutions  
2701 Deborah Ave  
Zion, IL 60099

Work Order Details:

SDG: **19-09013**  
Purchase Order: 677118  
Analysis Category: ENVIRONMENTAL  
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Actinium-228	EPA 901.1 Modified	5.10E-01	2.21E-01	2.22E-01	3.67E-01		pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Silver-108m	EPA 901.1 Modified	5.64E-03	7.81E-02	7.81E-02	8.97E-02	U	pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Americium-241	EPA 901.1 Modified	-3.36E-02	9.94E-02	9.94E-02	1.42E-01	U	pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Barium-133	EPA 901.1 Modified	2.80E-02	4.78E-02	4.78E-02	1.67E-01	U	pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Bismuth-214	EPA 901.1 Modified	2.90E-01	1.63E-01	1.64E-01	2.47E-01		pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Cobalt-60	EPA 901.1 Modified	-1.87E-02	4.93E-02	4.93E-02	1.21E-01	U	pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Cesium-134	EPA 901.1 Modified	5.52E-03	5.82E-02	5.82E-02	1.21E-01	U	pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Cesium-137	EPA 901.1 Modified	2.93E-01	1.08E-01	1.09E-01	1.45E-01		pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Europium-152	EPA 901.1 Modified	1.02E-02	1.96E-01	1.96E-01	2.20E-01	U	pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Europium-154	EPA 901.1 Modified	-8.01E-03	9.21E-02	9.21E-02	1.17E-01	U	pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Europium-155	EPA 901.1 Modified	6.60E-02	1.05E-01	1.05E-01	1.79E-01	U	pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Holmium-166m	EPA 901.1 Modified	-5.09E-02	1.41E-01	1.42E-01	8.08E-02	U	pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Iodine-129	EPA 901.1 Modified	9.77E-03	7.17E-02	7.17E-02	1.07E-01	U	pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Potassium-40	EPA 901.1 Modified	8.39E+00	1.58E+00	1.63E+00	4.15E-01		pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Manganese-54	EPA 901.1 Modified	-1.33E-02	7.55E-02	7.55E-02	1.21E-01	U	pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Molybdenum-93	EPA 901.1 Modified	1.37E-02	6.98E-02	6.98E-02	9.71E-02	U	pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Niobium-94	EPA 901.1 Modified	3.48E-02	5.99E-02	5.99E-02	1.08E-01	U	pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Lead-210	EPA 901.1 Modified	4.90E-01	8.29E-01	8.30E-01	1.26E+00	U	pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Lead-212	EPA 901.1 Modified	4.25E-01	1.46E-01	1.48E-01	2.20E-01		pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Lead-214	EPA 901.1 Modified	3.03E-01	1.11E-01	1.12E-01	2.37E-01		pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Promethium-145	EPA 901.1 Modified	-1.35E-01	9.90E-02	9.93E-02	1.28E-01	U	pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Radium-226	EPA 901.1 Modified	2.90E-01	1.63E-01	1.64E-01	2.47E-01		pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Antimony-125	EPA 901.1 Modified	3.88E-02	2.04E-01	2.04E-01	2.93E-01	U	pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Thorium-234	EPA 901.1 Modified	1.41E+00	9.13E-01	9.15E-01	1.45E+00	U	pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Thallium-208	EPA 901.1 Modified	3.77E-01	2.04E-01	2.05E-01	3.54E-01		pCi/g
19-09013-17	TRG	L1-10220J-FSGS-005-SB-A	05/28/19 13:25	9/3/2019	9/13/2019	19-09013	Uranium-235	EPA 901.1 Modified	6.72E-02	3.12E-01	3.12E-01	4.70E-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:	<b>19-09013</b>							
			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		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Actinium-228	EPA 901.1 Modified	4.30E-01	1.54E-01	1.56E-01	3.34E-01		pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Silver-108m	EPA 901.1 Modified	1.05E-02	4.44E-02	4.44E-02	6.30E-02	U	pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Americium-241	EPA 901.1 Modified	-1.25E-01	7.28E-02	7.31E-02	9.25E-02	U	pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Barium-133	EPA 901.1 Modified	2.72E-02	8.75E-02	8.75E-02	1.05E-01	U	pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Bismuth-214	EPA 901.1 Modified	2.98E-01	1.53E-01	1.54E-01	2.81E-01		pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Cobalt-60	EPA 901.1 Modified	6.59E-02	5.62E-02	5.63E-02	1.03E-01	U	pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Cesium-134	EPA 901.1 Modified	-7.57E-02	8.04E-02	8.05E-02	8.37E-02	U	pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Cesium-137	EPA 901.1 Modified	1.27E-01	5.31E-02	5.35E-02	7.27E-02		pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Europium-152	EPA 901.1 Modified	1.68E-02	1.58E-01	1.58E-01	1.51E-01	U	pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Europium-154	EPA 901.1 Modified	-1.18E-01	1.68E-01	1.68E-01	7.72E-02	U	pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Europium-155	EPA 901.1 Modified	6.58E-02	7.23E-02	7.24E-02	1.10E-01	U	pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Holmium-166m	EPA 901.1 Modified	-1.40E-02	7.56E-02	7.56E-02	6.01E-02	U	pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Iodine-129	EPA 901.1 Modified	1.11E-01	1.80E-01	1.80E-01	2.67E-01	U	pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Potassium-40	EPA 901.1 Modified	1.17E+01	2.37E+00	2.44E+00	3.29E-01		pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Manganese-54	EPA 901.1 Modified	1.79E-02	5.64E-02	5.64E-02	9.67E-02	U	pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Molybdenum-93	EPA 901.1 Modified	-1.33E-02	4.05E-02	4.05E-02	6.15E-02	U	pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Niobium-94	EPA 901.1 Modified	-6.19E-03	4.35E-02	4.35E-02	6.78E-02	U	pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Lead-210	EPA 901.1 Modified	2.26E+00	1.16E+00	1.16E+00	1.86E+00		pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Lead-212	EPA 901.1 Modified	4.03E-01	8.95E-02	9.19E-02	1.67E-01		pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Lead-214	EPA 901.1 Modified	3.93E-01	1.13E-01	1.15E-01	2.04E-01		pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Promethium-145	EPA 901.1 Modified	-1.04E-03	1.06E-01	1.06E-01	1.74E-01	U	pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Radium-226	EPA 901.1 Modified	2.98E-01	1.53E-01	1.54E-01	2.81E-01		pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Antimony-125	EPA 901.1 Modified	5.71E-02	1.33E-01	1.33E-01	1.98E-01	U	pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Thorium-234	EPA 901.1 Modified	4.84E-01	6.16E-01	6.16E-01	9.35E-01	U	pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Thallium-208	EPA 901.1 Modified	3.19E-01	1.78E-01	1.79E-01	2.80E-01		pCi/g		
19-09013-18	TRG	L1-10220G-FSGS-008-SS-A	06/03/19 07:44	9/3/2019	9/13/2019	19-09013	Uranium-235	EPA 901.1 Modified	-9.37E-02	2.27E-01	2.27E-01	3.25E-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

<b>Eberline Analytical Final Report of Analysis</b>				Report To:				Work Order Details:							
				Patricia Giza				SDG: <b>19-09013</b>				Purchase Order: 677118			
				Zion Solutions				Analysis Category: ENVIRONMENTAL				Sample Matrix: SO			
				2701 Deborah Ave											
Zion, IL 60099															
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Actinium-228	EPA 901.1 Modified	2.39E-01	1.45E-01	1.45E-01	2.87E-01	U	pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Silver-108m	EPA 901.1 Modified	-1.66E-02	3.90E-02	3.90E-02	4.99E-02	U	pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Americium-241	EPA 901.1 Modified	5.00E-02	9.80E-02	9.80E-02	1.32E-01	U	pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Barium-133	EPA 901.1 Modified	3.32E-02	3.32E-02	3.32E-02	7.40E-02	U	pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Bismuth-214	EPA 901.1 Modified	3.31E-01	9.87E-02	1.00E-01	1.42E-01		pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Cobalt-60	EPA 901.1 Modified	-6.52E-03	5.54E-02	5.54E-02	6.09E-02	U	pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Cesium-134	EPA 901.1 Modified	9.05E-03	2.76E-02	2.77E-02	5.71E-02	U	pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Cesium-137	EPA 901.1 Modified	3.09E-01	7.66E-02	7.83E-02	8.32E-02		pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Europium-152	EPA 901.1 Modified	-7.73E-02	1.93E-01	1.93E-01	1.63E-01	U	pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Europium-154	EPA 901.1 Modified	-5.94E-02	1.24E-01	1.24E-01	8.29E-02	U	pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Europium-155	EPA 901.1 Modified	1.08E-01	8.18E-02	8.20E-02	1.16E-01	U	pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Holmium-166m	EPA 901.1 Modified	-2.25E-02	7.22E-02	7.22E-02	6.32E-02	U	pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Iodine-129	EPA 901.1 Modified	2.11E+00	9.36E+00	9.36E+00	3.41E+00	U	pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Potassium-40	EPA 901.1 Modified	6.12E+00	1.19E+00	1.23E+00	8.75E-01		pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Manganese-54	EPA 901.1 Modified	7.83E-03	5.00E-02	5.00E-02	8.08E-02	U	pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Molybdenum-93	EPA 901.1 Modified	8.33E-03	3.47E-02	3.47E-02	5.54E-02	U	pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Niobium-94	EPA 901.1 Modified	1.29E-02	3.22E-02	3.22E-02	5.58E-02	U	pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Lead-210	EPA 901.1 Modified	2.21E+00	1.46E+00	1.46E+00	2.43E+00	U	pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Lead-212	EPA 901.1 Modified	2.60E-01	1.29E-01	1.30E-01	2.02E-01		pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Lead-214	EPA 901.1 Modified	3.00E-01	1.11E-01	1.12E-01	1.98E-01		pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Promethium-145	EPA 901.1 Modified	6.78E-01	7.31E-01	7.32E-01	1.02E+00	U	pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Radium-226	EPA 901.1 Modified	3.31E-01	9.87E-02	1.00E-01	1.42E-01		pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Antimony-125	EPA 901.1 Modified	-7.01E-03	8.93E-02	8.93E-02	1.53E-01	U	pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Thorium-234	EPA 901.1 Modified	6.80E-01	8.50E-01	8.51E-01	1.20E+00	U	pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Thallium-208	EPA 901.1 Modified	1.39E-01	6.81E-02	6.85E-02	1.47E-01	U	pCi/g	
19-09013-19	TRG	L1-10220G-FSGS-014-SS-A	06/03/19 07:56	9/3/2019	9/13/2019	19-09013	Uranium-235	EPA 901.1 Modified	4.14E-01	2.53E-01	2.54E-01	3.88E-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

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REC'D SEP 03 2019

19-09013

ZS-WM-131  
Revision 0  
Information Use

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L1-10221B-FIGS-100-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>6/20/2019</u>	<u>0955</u>	<u>5 ROC HTD</u>	<u>NA</u>	<u>627.14g</u>
L1-10221C-FIGS-103-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/8/2019</u>	<u>1247</u>	<u>5 ROC HTD</u>	<u>NA</u>	<u>860.24g</u>
L1-10221B-FIGS-102-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/8/2019</u>	<u>1310</u>	<u>5 ROC HTD</u>	<u>NA</u>	<u>680.87g</u>
L1-10221B-FIGS-103-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/8/2019</u>	<u>1312</u>	<u>5 ROC HTD</u>	<u>NA</u>	<u>723.59g</u>
L1-10221B-FIGS-104-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/8/2019</u>	<u>1314</u>	<u>5 ROC HTD</u>	<u>NA</u>	<u>824.34g</u>
L1-10221B-FIGS-105-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/8/2019</u>	<u>1316</u>	<u>5 ROC HTD</u>	<u>NA</u>	<u>703.93g</u>
L1-10221D-FIGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/8/2019</u>	<u>1230</u>	<u>5 ROC HTD</u>	<u>NA</u>	<u>626.47g</u>
L1-10221D-FIGS-006-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/8/2019</u>	<u>1232</u>	<u>5 ROC HTD</u>	<u>NA</u>	<u>649.53g</u>
L1-10221D-FIGS-007-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/8/2019</u>	<u>1234</u>	<u>5 ROC HTD</u>	<u>NA</u>	<u>485.57g</u>
L1-10221D-FIGS-008-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/8/2019</u>	<u>1236</u>	<u>5 ROC HTD</u>	<u>NA</u>	<u>530.46g</u>
L1-10221C-AJCS-109-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>6/5/2019</u>	<u>1236</u>	<u>FULL SUITE</u>	<u>NA</u>	<u>920.33g</u>
L1-10221C-AJCS-102-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>6/5/2019</u>	<u>1222</u>	<u>FULL SUITE</u>	<u>NA</u>	<u>868.46g</u>
L1-10209C-AJCS-110-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>6/6/2019</u>	<u>0738</u>	<u>FULL SUITE</u>	<u>NA</u>	<u>730.63g</u>
L1-10209C-AJCS-109-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>6/6/2019</u>	<u>0736</u>	<u>FULL SUITE</u>	<u>NA</u>	<u>782.82g</u>
L1-10209C-AJCS-108-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>6/6/2019</u>	<u>0734</u>	<u>FULL SUITE</u>	<u>NA</u>	<u>897.48g</u>
L1-10209C-AJCS-107-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>6/6/2019</u>	<u>0732</u>	<u>FULL SUITE</u>	<u>NA</u>	<u>654.16g</u>
L1-10209C-AJCS-104-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>6/6/2019</u>	<u>0726</u>	<u>FULL SUITE</u>	<u>NA</u>	<u>782.70g</u>
L1-10209C-AJCS-103-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>6/6/2019</u>	<u>0724</u>	<u>FULL SUITE</u>	<u>NA</u>	<u>806.24g</u>
L1-10209C-AJCS-102-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>6/6/2019</u>	<u>0722</u>	<u>FULL SUITE</u>	<u>NA</u>	<u>787.15g</u>

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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-FIGS-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-FIGS-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/17/2019	1500	5 ROC HTD	NA	723.26g
L1-10209E-FIGS-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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LI-10221D-FIGS-021-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/17/19	0832	5 ROC HTD	NA	606.23g
LI-10221D-FIGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/27/19	0930	5 ROC HTD	NA	709.53g
Laboratory: <b>EBERLINE LABS</b>			Date Submitted To Lab:			Ship Container No.: <b>NA</b>			Cooler Temperature: <b>FULL SUITE</b> <b>N/A</b>		Airbill Number: <b>Various For FedEx Ground</b>	
Relinquished by: <b>Jack Lucia</b>			Date (mm/dd/yyyy): <b>8/28/19</b>		Time: <b>0748</b>		Received by: <b>Richard E. Rickert</b>			Date: (mm/dd/yyyy): <b>08/28/2019</b>		<b>0748</b>
Relinquished by: <b>Richard E. Rickert</b>			Date (mm/dd/yyyy): <b>08/29/2019</b>		Time: <b>0800</b>		Received by: <b>FedEx Ground</b>			Date: (mm/dd/yyyy): <b>08/29/2019</b>		<b>0800</b>
Relinquished by: <b>FedEx Ground</b>			Date (mm/dd/yyyy):		Time:		Received by: <b>Randolph Spencer</b>			Date: (mm/dd/yyyy): <b>9-3-2019</b>		
Relinquished by:			Date (mm/dd/yyyy):		Time:		Received by:			Date: (mm/dd/yyyy):		
Comments <b>Full Site Po# 67716 HTD Po# 67718 30 Day Turn Around</b>												



EBS-OR-46288

November 6, 2019

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

CASE NARRATIVE  
Work Order # 19-09014-OR

SAMPLE RECEIPT

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

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

ANALYTICAL METHODS

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

Laboratory qualifiers are as follows:

U - Result is less than the MDA.

ANALYTICAL RESULTS

Combined Standard Uncertainty is reported at 1-sigma value.

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

## ANALYTICAL RESULTS CONTINUED

### TOTAL STRONTIUM

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

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

### TRITIUM

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

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

### NICKEL-63

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

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

### GAMMA SPECTROSCOPY

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

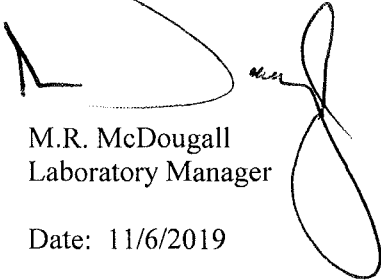
ANALYTICAL RESULTS CONTINUED

GAMMA SPECTROSCOPY CONTINUED

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

CERTIFICATION OF ACCURACY

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



M.R. McDougall  
Laboratory Manager

Date: 11/6/2019

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

<h1>Eberline Analytical</h1> <h2>Final Report of Analysis</h2>			Report To:					Work Order Details:						
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG:	19-09014					
								Purchase Order:	677118					
								Analysis Category:	ENVIRONMENTAL					
					Sample Matrix:		SO							
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	2.10E+02	7.56E+00				pCi/g
19-09014-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	2.22E+02	7.99E+00	1.48E+01	5.58E+00		pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	2.64E+00	3.31E+00	3.32E+00	5.58E+00	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	2.54E+00	3.19E+00	3.19E+00	5.38E+00	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	2.17E+00	3.17E+00	3.18E+00	5.37E+00	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	0.00E+00	3.29E+00	3.29E+00	5.71E+00	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	3.39E+00	3.34E+00	3.35E+00	5.59E+00	U	pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	-7.53E-01	3.19E+00	3.19E+00	5.58E+00	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	1.29E+00	3.21E+00	3.21E+00	5.48E+00	U	pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	-1.86E-01	3.18E+00	3.18E+00	5.53E+00	U	pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	9.21E-01	3.18E+00	3.18E+00	5.47E+00	U	pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	1.47E+00	3.19E+00	3.19E+00	5.45E+00	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	3.65E-01	3.13E+00	3.13E+00	5.41E+00	U	pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	-3.77E-01	3.20E+00	3.20E+00	5.59E+00	U	pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	5.36E-01	3.07E+00	3.07E+00	5.30E+00	U	pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	5.64E-01	3.23E+00	3.23E+00	5.58E+00	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	3.72E-01	3.19E+00	3.19E+00	5.52E+00	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	10/7/2019	19-09014	Tritium	LANL ER-210 Modified	9.03E-01	3.12E+00	3.12E+00	5.36E+00	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	10/8/2019	19-09014	Tritium	LANL ER-210 Modified	1.64E+00	3.17E+00	3.17E+00	5.39E+00	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	10/8/2019	19-09014	Tritium	LANL ER-210 Modified	0.00E+00	3.16E+00	3.16E+00	5.49E+00	U	pCi/g

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<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:						
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG:	19-09014					
								Purchase Order:	677118					
								Analysis Category:	ENVIRONMENTAL					
					Sample Matrix:		SO							
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	10/23/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	1.48E+03	4.44E+01				pCi/g
19-09014-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	10/23/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	1.47E+03	1.28E+01	8.75E+01	3.23E+00		pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	10/23/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-2.24E+00	1.85E+00	1.85E+00	3.29E+00	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-1.49E+00	1.90E+00	1.91E+00	3.36E+00	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-3.48E-01	1.92E+00	1.92E+00	3.33E+00	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-6.21E-01	1.95E+00	1.95E+00	3.40E+00	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-1.50E+00	1.92E+00	1.92E+00	3.38E+00	U	pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	3.04E+00	2.13E+00	2.14E+00	3.52E+00	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	6.32E-01	2.03E+00	2.03E+00	3.46E+00	U	pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	9.16E-01	2.06E+00	2.06E+00	3.51E+00	U	pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-1.46E+00	1.87E+00	1.87E+00	3.30E+00	U	pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-3.55E-01	1.96E+00	1.96E+00	3.40E+00	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-2.69E-01	1.98E+00	1.98E+00	3.43E+00	U	pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	7.63E-01	2.14E+00	2.14E+00	3.65E+00	U	pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-2.75E-01	2.03E+00	2.03E+00	3.50E+00	U	pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	2.67E+00	2.12E+00	2.13E+00	3.53E+00	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-1.05E+00	1.92E+00	1.92E+00	3.37E+00	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-1.24E+00	1.93E+00	1.94E+00	3.39E+00	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-1.13E+00	2.07E+00	2.07E+00	3.61E+00	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	10/24/2019	19-09014	Nickel-63	ASTM 3500-Ni Modified	-2.87E-01	2.12E+00	2.12E+00	3.66E+00	U	pCi/g

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<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:						
			<b>Patricia Giza</b> <b>Zion Solutions</b> <b>2701 Deborah Ave</b> <b>Zion, IL 60099</b>					SDG:	<b>19-09014</b>					
								Purchase Order:	677118					
								Analysis Category:	ENVIRONMENTAL					
					Sample Matrix:		SO							
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	10/11/2019	19-09014	Strontium-90	EiChroM SRW01 Modified	5.02E+01	2.81E-01				pCi/g
19-09014-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	10/11/2019	19-09014	Strontium-90	EiChroM SRW01 Modified	4.89E+01	2.65E+00	1.72E+01	1.14E+00		pCi/g
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	10/11/2019	19-09014	Strontium-90	EiChroM SRW01 Modified	5.74E-02	3.43E-01	3.44E-01	8.73E-01	U	pCi/g
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	10/11/2019	19-09014	Strontium-90	EiChroM SRW01 Modified	3.09E-01	3.75E-01	3.90E-01	9.22E-01	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	10/11/2019	19-09014	Strontium-90	EiChroM SRW01 Modified	2.51E-01	3.65E-01	3.76E-01	9.04E-01	U	pCi/g
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	10/11/2019	19-09014	Strontium-90	EiChroM SRW01 Modified	5.41E-02	3.51E-01	3.51E-01	8.91E-01	U	pCi/g
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	10/11/2019	19-09014	Strontium-90	EiChroM SRW01 Modified	5.69E-02	3.44E-01	3.44E-01	8.75E-01	U	pCi/g
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	10/11/2019	19-09014	Strontium-90	EiChroM SRW01 Modified	7.41E-01	3.63E-01	4.45E-01	8.34E-01	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	10/11/2019	19-09014	Strontium-90	EiChroM SRW01 Modified	3.55E-01	3.07E-01	3.31E-01	7.39E-01	U	pCi/g
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	10/11/2019	19-09014	Strontium-90	EiChroM SRW01 Modified	1.50E-01	3.24E-01	3.28E-01	8.12E-01	U	pCi/g
19-09014-10	TRG	L1-10220I-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	10/11/2019	19-09014	Strontium-90	EiChroM SRW01 Modified	6.18E-01	3.44E-01	4.06E-01	8.02E-01	U	pCi/g
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	10/11/2019	19-09014	Strontium-90	EiChroM SRW01 Modified	-2.22E-01	3.35E-01	3.43E-01	8.90E-01	U	pCi/g
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	10/11/2019	19-09014	Strontium-90	EiChroM SRW01 Modified	1.73E-01	2.97E-01	3.03E-01	7.40E-01	U	pCi/g
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	10/11/2019	19-09014	Strontium-90	EiChroM SRW01 Modified	1.98E-01	3.63E-01	3.69E-01	9.06E-01	U	pCi/g
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	10/11/2019	19-09014	Strontium-90	EiChroM SRW01 Modified	1.14E-02	4.30E-01	4.30E-01	1.10E+00	U	pCi/g
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	10/11/2019	19-09014	Strontium-90	EiChroM SRW01 Modified	4.57E-01	4.70E-01	4.96E-01	1.14E+00	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	10/11/2019	19-09014	Strontium-90	EiChroM SRW01 Modified	3.49E-01	3.29E-01	3.50E-01	7.96E-01	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	10/11/2019	19-09014	Strontium-90	EiChroM SRW01 Modified	-2.54E-01	4.10E-01	4.19E-01	1.08E+00	U	pCi/g
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	10/11/2019	19-09014	Strontium-90	EiChroM SRW01 Modified	-2.51E-01	3.85E-01	3.95E-01	1.02E+00	U	pCi/g
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	10/11/2019	19-09014	Strontium-90	EiChroM SRW01 Modified	2.38E-01	3.78E-01	3.87E-01	9.38E-01	U	pCi/g
19-09014-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Cobalt-60	EPA 901.1 Modified	1.31E+02	5.10E+00				pCi/g
19-09014-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Cesium-137	EPA 901.1 Modified	8.26E+01	3.39E+00				pCi/g
19-09014-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Cobalt-60	EPA 901.1 Modified	1.42E+02	1.03E+01	1.26E+01	8.42E-01		pCi/g
19-09014-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Cesium-137	EPA 901.1 Modified	8.52E+01	9.33E+00	1.03E+01	1.06E+00		pCi/g

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			Patricia Giza					SDG:	19-09014							
			Zion Solutions					Purchase Order:	677118							
			2701 Deborah Ave					Analysis Category:	ENVIRONMENTAL							
Zion, IL 60099					Sample Matrix:	SO										
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Actinium-228	EPA 901.1 Modified	0.00E+00	2.37E-02	2.37E-02	1.44E-01	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Silver-108m	EPA 901.1 Modified	-1.14E-02	2.38E-02	2.38E-02	3.47E-02	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Americium-241	EPA 901.1 Modified	-3.44E-02	3.62E-02	3.62E-02	4.79E-02	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Barium-133	EPA 901.1 Modified	3.91E-03	1.33E-02	1.33E-02	3.53E-02	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Bismuth-214	EPA 901.1 Modified	9.17E-03	5.74E-02	5.74E-02	8.51E-02	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Cobalt-60	EPA 901.1 Modified	2.28E-02	2.23E-02	2.23E-02	4.21E-02	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Cesium-134	EPA 901.1 Modified	-2.55E-04	3.00E-02	3.00E-02	4.13E-02	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Cesium-137	EPA 901.1 Modified	3.29E-02	2.18E-02	2.19E-02	4.69E-02	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Europium-152	EPA 901.1 Modified	-1.96E-02	6.80E-02	6.80E-02	6.10E-02	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Europium-154	EPA 901.1 Modified	-3.63E-02	1.07E-01	1.07E-01	3.11E-02	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Europium-155	EPA 901.1 Modified	2.98E-03	2.92E-02	2.92E-02	4.33E-02	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Holmium-166m	EPA 901.1 Modified	8.86E-03	4.01E-02	4.01E-02	3.07E-02	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Iodine-129	EPA 901.1 Modified	-4.39E-02	1.11E-01	1.11E-01	1.58E-01	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Potassium-40	EPA 901.1 Modified	-7.77E-02	3.50E-01	3.50E-01	4.67E-01	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Manganese-54	EPA 901.1 Modified	1.54E-02	1.33E-02	1.33E-02	1.85E-02	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	-5.12E-04	1.89E-02	1.89E-02	3.19E-02	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Niobium-94	EPA 901.1 Modified	1.95E-03	1.86E-02	1.86E-02	3.40E-02	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Lead-210	EPA 901.1 Modified	2.80E-01	4.00E-01	4.00E-01	6.21E-01	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Lead-212	EPA 901.1 Modified	3.43E-02	3.83E-02	3.84E-02	6.37E-02	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Lead-214	EPA 901.1 Modified	1.83E-02	3.66E-02	3.66E-02	6.35E-02	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Promethium-145	EPA 901.1 Modified	-1.35E-02	7.26E-02	7.26E-02	1.06E-01	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Radium-226	EPA 901.1 Modified	9.17E-03	5.74E-02	5.74E-02	8.51E-02	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Antimony-125	EPA 901.1 Modified	0.00E+00	7.32E-02	7.32E-02	1.06E-01	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Thorium-234	EPA 901.1 Modified	2.20E-01	2.84E-01	2.84E-01	4.46E-01	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Thallium-208	EPA 901.1 Modified	1.93E-02	6.39E-02	6.39E-02	1.03E-01	U	pCi/g		
19-09014-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/13/2019	19-09014	Uranium-235	EPA 901.1 Modified	1.11E-02	9.55E-02	9.55E-02	1.47E-01	U	pCi/g		

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

<h1 style="margin: 0;">Eberline Analytical</h1> <h2 style="margin: 0;">Final Report of Analysis</h2>			Report To:					Work Order Details:							
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG:	19-09014						
								Purchase Order:	677118						
								Analysis Category:	ENVIRONMENTAL						
					Sample Matrix:		SO								
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Actinium-228	EPA 901.1 Modified	2.63E-01	1.89E-01	1.90E-01	3.60E-01	U	pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Silver-108m	EPA 901.1 Modified	1.36E-02	5.48E-02	5.48E-02	5.68E-02	U	pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Americium-241	EPA 901.1 Modified	-7.23E-02	8.08E-02	8.09E-02	1.11E-01	U	pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Barium-133	EPA 901.1 Modified	-1.00E-02	1.58E-02	1.58E-02	1.18E-01	U	pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Bismuth-214	EPA 901.1 Modified	3.07E-01	1.38E-01	1.39E-01	2.55E-01		pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Cobalt-60	EPA 901.1 Modified	5.68E-02	6.05E-02	6.05E-02	6.81E-02	U	pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Cesium-134	EPA 901.1 Modified	4.14E-03	2.18E-02	2.18E-02	8.21E-02	U	pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Cesium-137	EPA 901.1 Modified	5.03E-02	6.22E-02	6.22E-02	9.83E-02	U	pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Europium-152	EPA 901.1 Modified	8.87E-03	9.18E-02	9.18E-02	1.71E-01	U	pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Europium-154	EPA 901.1 Modified	3.58E-02	1.57E-01	1.57E-01	8.78E-02	U	pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Europium-155	EPA 901.1 Modified	6.44E-02	9.02E-02	9.03E-02	1.36E-01	U	pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Holmium-166m	EPA 901.1 Modified	1.41E-02	9.84E-02	9.84E-02	6.12E-02	U	pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Iodine-129	EPA 901.1 Modified	-5.87E-02	5.95E-02	5.95E-02	8.19E-02	U	pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Potassium-40	EPA 901.1 Modified	7.14E+00	1.23E+00	1.28E+00	2.83E-01		pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Manganese-54	EPA 901.1 Modified	-2.38E-02	7.39E-02	7.40E-02	1.14E-01	U	pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	2.52E-02	4.51E-02	4.52E-02	6.20E-02	U	pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Niobium-94	EPA 901.1 Modified	1.75E-02	3.89E-02	3.89E-02	6.96E-02	U	pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Lead-210	EPA 901.1 Modified	8.69E-01	6.32E-01	6.33E-01	9.95E-01	U	pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Lead-212	EPA 901.1 Modified	4.05E-01	1.16E-01	1.18E-01	1.45E-01		pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Lead-214	EPA 901.1 Modified	3.31E-01	1.27E-01	1.28E-01	2.43E-01		pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Promethium-145	EPA 901.1 Modified	1.48E-02	7.13E-02	7.13E-02	1.06E-01	U	pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Radium-226	EPA 901.1 Modified	3.07E-01	1.38E-01	1.39E-01	2.55E-01		pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Antimony-125	EPA 901.1 Modified	3.34E-02	1.29E-01	1.29E-01	1.88E-01	U	pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Thorium-234	EPA 901.1 Modified	1.04E+00	7.09E-01	7.11E-01	1.11E+00	U	pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Thallium-208	EPA 901.1 Modified	3.39E-01	1.41E-01	1.42E-01	1.11E-01		pCi/g	
19-09014-03	DUP	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Uranium-235	EPA 901.1 Modified	1.94E-02	2.18E-01	2.18E-01	3.25E-01	U	pCi/g	

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 Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG:	19-09014					
								Purchase Order:	677118					
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					Sample Matrix:		SO							
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Actinium-228	EPA 901.1 Modified	4.09E-01	2.16E-01	2.17E-01	4.37E-01	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Silver-108m	EPA 901.1 Modified	3.50E-03	5.33E-02	5.33E-02	6.64E-02	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Americium-241	EPA 901.1 Modified	-5.86E-02	8.20E-02	8.20E-02	1.11E-01	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Barium-133	EPA 901.1 Modified	-3.15E-03	2.97E-02	2.97E-02	1.31E-01	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Bismuth-214	EPA 901.1 Modified	4.84E-01	1.37E-01	1.39E-01	2.04E-01		pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Cobalt-60	EPA 901.1 Modified	3.65E-02	5.87E-02	5.87E-02	9.00E-02	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Cesium-134	EPA 901.1 Modified	1.14E-03	2.70E-02	2.70E-02	1.04E-01	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Cesium-137	EPA 901.1 Modified	5.87E-02	6.90E-02	6.91E-02	1.09E-01	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Europium-152	EPA 901.1 Modified	0.00E+00	6.59E-02	6.59E-02	1.78E-01	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Europium-154	EPA 901.1 Modified	-6.96E-03	1.00E-01	1.00E-01	9.05E-02	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Europium-155	EPA 901.1 Modified	1.15E-01	1.21E-01	1.21E-01	1.84E-01	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Holmium-166m	EPA 901.1 Modified	-3.66E-02	1.15E-01	1.15E-01	6.79E-02	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Iodine-129	EPA 901.1 Modified	-3.28E-02	5.93E-02	5.93E-02	8.41E-02	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Potassium-40	EPA 901.1 Modified	8.14E+00	1.46E+00	1.52E+00	9.75E-01		pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Manganese-54	EPA 901.1 Modified	4.05E-02	5.30E-02	5.30E-02	9.93E-02	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	-5.41E-02	6.35E-02	6.35E-02	6.87E-02	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Niobium-94	EPA 901.1 Modified	8.64E-03	5.32E-02	5.32E-02	8.66E-02	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Lead-210	EPA 901.1 Modified	8.04E-01	7.38E-01	7.39E-01	1.22E+00	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Lead-212	EPA 901.1 Modified	4.68E-01	1.24E-01	1.26E-01	1.80E-01		pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Lead-214	EPA 901.1 Modified	3.56E-01	1.04E-01	1.05E-01	1.95E-01		pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Promethium-145	EPA 901.1 Modified	-7.31E-03	7.14E-02	7.14E-02	1.04E-01	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Radium-226	EPA 901.1 Modified	4.84E-01	1.37E-01	1.39E-01	2.04E-01		pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Antimony-125	EPA 901.1 Modified	1.80E-01	1.47E-01	1.48E-01	2.38E-01	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Thorium-234	EPA 901.1 Modified	4.15E-01	7.44E-01	7.44E-01	1.11E+00	U	pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Thallium-208	EPA 901.1 Modified	2.79E-01	1.45E-01	1.46E-01	2.56E-01		pCi/g
19-09014-04	DO	L1-10220A-FSGS-006-SS-A	06/03/19 06:55	9/3/2019	9/13/2019	19-09014	Uranium-235	EPA 901.1 Modified	-7.62E-02	2.51E-01	2.51E-01	3.64E-01	U	pCi/g

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



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								Purchase Order: 677118		Analysis Category: ENVIRONMENTAL					
								Sample Matrix: SO							
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Actinium-228	EPA 901.1 Modified	-6.64E-02	3.42E-01	3.42E-01	5.00E-01	U	pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Silver-108m	EPA 901.1 Modified	6.57E-03	7.15E-02	7.15E-02	6.71E-02	U	pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Americium-241	EPA 901.1 Modified	4.38E-02	9.86E-02	9.87E-02	1.32E-01	U	pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Barium-133	EPA 901.1 Modified	-1.21E-01	9.02E-02	9.04E-02	9.82E-02	U	pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Bismuth-214	EPA 901.1 Modified	2.17E-01	1.13E-01	1.14E-01	2.07E-01		pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Cobalt-60	EPA 901.1 Modified	5.75E+00	4.53E-01	5.41E-01	1.52E-01		pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Cesium-134	EPA 901.1 Modified	9.15E-03	3.89E-02	3.90E-02	7.68E-02	U	pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Cesium-137	EPA 901.1 Modified	4.39E-02	7.07E-02	7.07E-02	1.10E-01	U	pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Europium-152	EPA 901.1 Modified	3.99E-02	1.90E-01	1.90E-01	1.89E-01	U	pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Europium-154	EPA 901.1 Modified	-8.82E-03	1.33E-01	1.33E-01	9.91E-02	U	pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Europium-155	EPA 901.1 Modified	1.34E-01	1.01E-01	1.02E-01	1.35E-01	U	pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Holmium-166m	EPA 901.1 Modified	6.93E-02	1.17E-01	1.17E-01	6.81E-02	U	pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Iodine-129	EPA 901.1 Modified	2.68E+00	1.14E+01	1.14E+01	3.11E+00	U	pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Potassium-40	EPA 901.1 Modified	8.61E+00	1.42E+00	1.48E+00	1.15E+00		pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Manganese-54	EPA 901.1 Modified	-5.09E-02	9.84E-02	9.84E-02	1.39E-01	U	pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	3.59E-02	5.77E-02	5.78E-02	6.00E-02	U	pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Niobium-94	EPA 901.1 Modified	-2.34E-02	8.34E-02	8.34E-02	9.32E-02	U	pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Lead-210	EPA 901.1 Modified	3.24E-01	1.31E+00	1.31E+00	2.03E+00	U	pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Lead-212	EPA 901.1 Modified	2.80E-01	8.48E-02	8.60E-02	2.33E-01		pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Lead-214	EPA 901.1 Modified	3.58E-01	1.49E-01	1.50E-01	3.02E-01		pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Promethium-145	EPA 901.1 Modified	-1.24E-02	5.96E-01	5.96E-01	8.82E-01	U	pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Radium-226	EPA 901.1 Modified	2.17E-01	1.13E-01	1.14E-01	2.07E-01		pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Antimony-125	EPA 901.1 Modified	-5.77E-03	1.30E-01	1.30E-01	2.15E-01	U	pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Thorium-234	EPA 901.1 Modified	3.44E-01	9.50E-01	9.50E-01	1.26E+00	U	pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Thallium-208	EPA 901.1 Modified	1.68E-01	8.34E-02	8.39E-02	1.21E-01		pCi/g	
19-09014-05	TRG	L1-10220A-FSGS-016-SS-A	06/03/19 07:15	9/3/2019	9/13/2019	19-09014	Uranium-235	EPA 901.1 Modified	9.70E-02	3.21E-01	3.21E-01	4.22E-01	U	pCi/g	

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



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

<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:									
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG: <b>19-09014</b> Purchase Order: 677118 Analysis Category: ENVIRONMENTAL Sample Matrix: SO									
			Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Actinium-228	EPA 901.1 Modified	5.11E-01	1.87E-01	1.89E-01	3.85E-01		pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Silver-108m	EPA 901.1 Modified	1.76E-02	2.91E-02	2.92E-02	5.69E-02	U	pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Americium-241	EPA 901.1 Modified	-8.90E-02	6.88E-02	6.89E-02	9.10E-02	U	pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Barium-133	EPA 901.1 Modified	5.52E-02	6.72E-02	6.72E-02	9.41E-02	U	pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Bismuth-214	EPA 901.1 Modified	3.08E-01	1.31E-01	1.32E-01	2.18E-01		pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Cobalt-60	EPA 901.1 Modified	2.72E-02	7.05E-02	7.05E-02	1.18E-01	U	pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Cesium-134	EPA 901.1 Modified	-1.37E-01	7.81E-02	7.84E-02	7.73E-02	U	pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Cesium-137	EPA 901.1 Modified	2.83E-01	8.00E-02	8.13E-02	1.05E-01		pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Europium-152	EPA 901.1 Modified	7.03E-03	1.35E-01	1.35E-01	1.45E-01	U	pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Europium-154	EPA 901.1 Modified	-7.31E-02	2.04E-01	2.04E-01	7.30E-02	U	pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Europium-155	EPA 901.1 Modified	1.15E-01	6.86E-02	6.88E-02	1.30E-01	U	pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Holmium-166m	EPA 901.1 Modified	6.99E-03	7.81E-02	7.81E-02	5.61E-02	U	pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Iodine-129	EPA 901.1 Modified	1.89E-01	1.76E-01	1.77E-01	2.55E-01		pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Potassium-40	EPA 901.1 Modified	1.15E+01	2.44E+00	2.52E+00	1.54E+00		pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Manganese-54	EPA 901.1 Modified	1.63E-02	4.87E-02	4.87E-02	8.39E-02	U	pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	-1.84E-02	4.08E-02	4.08E-02	6.24E-02	U	pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Niobium-94	EPA 901.1 Modified	8.98E-03	4.19E-02	4.19E-02	6.52E-02	U	pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Lead-210	EPA 901.1 Modified	1.02E+00	8.62E-01	8.63E-01	1.42E+00	U	pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Lead-212	EPA 901.1 Modified	3.75E-01	7.82E-02	8.06E-02	1.43E-01		pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Lead-214	EPA 901.1 Modified	2.43E-01	9.97E-02	1.00E-01	1.77E-01		pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Promethium-145	EPA 901.1 Modified	1.55E-01	1.09E-01	1.09E-01	1.68E-01	U	pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Radium-226	EPA 901.1 Modified	3.08E-01	1.31E-01	1.32E-01	2.18E-01		pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Antimony-125	EPA 901.1 Modified	6.40E-02	1.34E-01	1.34E-01	1.99E-01	U	pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Thorium-234	EPA 901.1 Modified	6.57E-01	5.63E-01	5.64E-01	8.70E-01	U	pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Thallium-208	EPA 901.1 Modified	3.32E-01	1.65E-01	1.66E-01	2.56E-01		pCi/g			
19-09014-06	TRG	L1-10221B-FSGS-006-SS-A	06/10/19 13:35	9/3/2019	9/13/2019	19-09014	Uranium-235	EPA 901.1 Modified	1.02E-01	1.91E-01	1.91E-01	2.94E-01	U	pCi/g			

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

<h1>Eberline Analytical</h1> <h2>Final Report of Analysis</h2>			Report To:					Work Order Details:							
			Patricia Giza					SDG:	19-09014						
			Zion Solutions					Purchase Order:	677118						
			2701 Deborah Ave					Analysis Category:	ENVIRONMENTAL						
Zion, IL 60099					Sample Matrix:	SO									
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Actinium-228	EPA 901.1 Modified	1.13E+00	5.38E-01	5.41E-01	1.00E+00		pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Silver-108m	EPA 901.1 Modified	1.01E-01	1.31E-01	1.31E-01	2.22E-01	U	pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Americium-241	EPA 901.1 Modified	-2.62E-01	2.00E-01	2.00E-01	2.68E-01	U	pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Barium-133	EPA 901.1 Modified	3.76E-03	9.79E-02	9.79E-02	3.25E-01	U	pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Bismuth-214	EPA 901.1 Modified	1.33E+00	3.56E-01	3.63E-01	5.62E-01		pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Cobalt-60	EPA 901.1 Modified	2.16E+00	2.38E-01	2.63E-01	2.65E-01		pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Cesium-134	EPA 901.1 Modified	3.45E-02	9.81E-02	9.81E-02	2.43E-01	U	pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Cesium-137	EPA 901.1 Modified	1.06E+01	1.22E+00	1.34E+00	4.28E-01		pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Europium-152	EPA 901.1 Modified	9.64E-02	4.29E-01	4.29E-01	4.73E-01	U	pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Europium-154	EPA 901.1 Modified	-5.54E-03	3.40E-01	3.40E-01	2.46E-01	U	pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Europium-155	EPA 901.1 Modified	1.18E-01	2.38E-01	2.38E-01	3.47E-01	U	pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Holmium-166m	EPA 901.1 Modified	-4.99E-02	2.50E-01	2.50E-01	1.76E-01	U	pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Iodine-129	EPA 901.1 Modified	2.72E-01	1.70E-01	1.70E-01	2.58E-01	U	pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Potassium-40	EPA 901.1 Modified	2.04E+01	3.08E+00	3.26E+00	1.58E+00		pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Manganese-54	EPA 901.1 Modified	2.28E-01	2.00E-01	2.00E-01	3.28E-01	U	pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	5.87E-02	1.33E-01	1.33E-01	1.44E-01	U	pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Niobium-94	EPA 901.1 Modified	-6.49E-02	1.38E-01	1.38E-01	1.89E-01	U	pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Lead-210	EPA 901.1 Modified	1.73E+00	1.61E+00	1.61E+00	2.68E+00	U	pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Lead-212	EPA 901.1 Modified	1.66E+00	4.04E-01	4.13E-01	6.09E-01		pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Lead-214	EPA 901.1 Modified	1.27E+00	3.53E-01	3.59E-01	6.33E-01		pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Promethium-145	EPA 901.1 Modified	-9.67E-03	1.29E-01	1.29E-01	2.92E-01	U	pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Radium-226	EPA 901.1 Modified	1.33E+00	3.56E-01	3.63E-01	5.62E-01		pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Antimony-125	EPA 901.1 Modified	1.38E-02	5.91E-01	5.91E-01	7.98E-01	U	pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Thorium-234	EPA 901.1 Modified	1.85E+00	1.78E+00	1.78E+00	2.67E+00	U	pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Thallium-208	EPA 901.1 Modified	6.93E-01	3.05E-01	3.07E-01	4.94E-01		pCi/g	
19-09014-07	TRG	L1-10221D-FJGS-007-SS-A	06/18/19 12:30	9/3/2019	9/13/2019	19-09014	Uranium-235	EPA 901.1 Modified	-9.70E-02	5.90E-01	5.90E-01	9.50E-01	U	pCi/g	

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



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<h1 style="margin: 0;">Eberline Analytical</h1> <h2 style="margin: 0;">Final Report of Analysis</h2>			Report To:						Work Order Details:					
			Patricia Giza						SDG:		19-09014			
			Zion Solutions						Purchase Order:		677118			
			2701 Deborah Ave						Analysis Category:		ENVIRONMENTAL			
			Zion, IL 60099						Sample Matrix:		SO			
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Actinium-228	EPA 901.1 Modified	2.38E-01	1.61E-01	1.61E-01	3.01E-01	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Silver-108m	EPA 901.1 Modified	-3.49E-02	4.12E-02	4.13E-02	5.38E-02	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Americium-241	EPA 901.1 Modified	-1.85E-02	9.80E-02	9.80E-02	1.25E-01	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Barium-133	EPA 901.1 Modified	-6.08E-03	3.10E-02	3.10E-02	7.91E-02	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Bismuth-214	EPA 901.1 Modified	3.04E-01	1.08E-01	1.09E-01	1.84E-01		pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Cobalt-60	EPA 901.1 Modified	2.45E-01	5.59E-02	5.73E-02	6.76E-02		pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Cesium-134	EPA 901.1 Modified	1.30E-02	2.24E-02	2.24E-02	5.57E-02	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Cesium-137	EPA 901.1 Modified	1.06E+00	1.48E-01	1.58E-01	1.07E-01		pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Europium-152	EPA 901.1 Modified	1.06E-01	1.78E-01	1.78E-01	1.67E-01	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Europium-154	EPA 901.1 Modified	-4.58E-02	1.26E-01	1.26E-01	8.65E-02	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Europium-155	EPA 901.1 Modified	1.10E-01	9.50E-02	9.52E-02	1.30E-01	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Holmium-166m	EPA 901.1 Modified	-7.37E-03	7.15E-02	7.15E-02	6.64E-02	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Iodine-129	EPA 901.1 Modified	1.28E-01	3.64E+00	3.64E+00	3.38E+00	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Potassium-40	EPA 901.1 Modified	7.85E+00	1.46E+00	1.51E+00	1.35E+00		pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Manganese-54	EPA 901.1 Modified	6.31E-04	4.73E-02	4.73E-02	7.42E-02	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	-3.75E-03	3.59E-02	3.59E-02	5.52E-02	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Niobium-94	EPA 901.1 Modified	2.44E-02	3.43E-02	3.43E-02	5.41E-02	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Lead-210	EPA 901.1 Modified	5.86E-01	1.43E+00	1.43E+00	2.27E+00	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Lead-212	EPA 901.1 Modified	4.83E-01	1.18E-01	1.21E-01	1.53E-01		pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Lead-214	EPA 901.1 Modified	2.92E-01	1.38E-01	1.39E-01	2.14E-01		pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Promethium-145	EPA 901.1 Modified	9.00E-02	6.58E-01	6.58E-01	9.89E-01	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Radium-226	EPA 901.1 Modified	3.04E-01	1.08E-01	1.09E-01	1.84E-01		pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Antimony-125	EPA 901.1 Modified	5.47E-02	1.02E-01	1.02E-01	1.80E-01	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Thorium-234	EPA 901.1 Modified	3.83E-01	8.84E-01	8.84E-01	1.20E+00	U	pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Thallium-208	EPA 901.1 Modified	1.58E-01	7.33E-02	7.37E-02	9.59E-02		pCi/g
19-09014-08	TRG	L1-10221C-FIGS-101-SS-A	06/24/19 09:00	9/3/2019	9/13/2019	19-09014	Uranium-235	EPA 901.1 Modified	-2.78E-02	2.90E-01	2.90E-01	3.74E-01	U	pCi/g

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



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<h1 style="margin: 0;">Eberline Analytical</h1> <h2 style="margin: 0;">Final Report of Analysis</h2>			Report To:					Work Order Details:								
			Patricia Giza					SDG:	19-09014							
			Zion Solutions					Purchase Order:	677118							
			2701 Deborah Ave					Analysis Category:	ENVIRONMENTAL							
Zion, IL 60099										Sample Matrix:			SO			
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Actinium-228	EPA 901.1 Modified	8.08E-01	2.63E-01	2.67E-01	7.55E-01		pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Silver-108m	EPA 901.1 Modified	-2.41E-02	8.09E-02	8.09E-02	1.25E-01	U	pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Americium-241	EPA 901.1 Modified	-1.13E-01	1.15E-01	1.15E-01	1.59E-01	U	pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Barium-133	EPA 901.1 Modified	1.39E-02	4.28E-02	4.28E-02	1.81E-01	U	pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Bismuth-214	EPA 901.1 Modified	6.70E-01	2.35E-01	2.37E-01	3.66E-01		pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Cobalt-60	EPA 901.1 Modified	5.89E-01	1.31E-01	1.34E-01	2.22E-01		pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Cesium-134	EPA 901.1 Modified	1.89E-04	3.91E-02	3.91E-02	1.51E-01	U	pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Cesium-137	EPA 901.1 Modified	2.78E+00	3.29E-01	3.58E-01	1.91E-01		pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Europium-152	EPA 901.1 Modified	-8.45E-02	3.32E-01	3.32E-01	2.43E-01	U	pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Europium-154	EPA 901.1 Modified	-3.13E-02	2.81E-01	2.81E-01	1.24E-01	U	pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Europium-155	EPA 901.1 Modified	2.36E-01	1.39E-01	1.40E-01	2.31E-01		pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Holmium-166m	EPA 901.1 Modified	1.95E-02	1.21E-01	1.21E-01	1.06E-01	U	pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Iodine-129	EPA 901.1 Modified	-5.39E-02	1.52E-01	1.52E-01	4.43E-01	U	pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Potassium-40	EPA 901.1 Modified	2.07E+01	4.08E+00	4.22E+00	1.45E+00		pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Manganese-54	EPA 901.1 Modified	2.05E-03	8.87E-02	8.87E-02	1.38E-01	U	pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	1.90E-02	6.31E-02	6.31E-02	1.05E-01	U	pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Niobium-94	EPA 901.1 Modified	-2.10E-02	7.41E-02	7.41E-02	1.07E-01	U	pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Lead-210	EPA 901.1 Modified	4.14E+00	1.63E+00	1.64E+00	2.56E+00		pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Lead-212	EPA 901.1 Modified	6.82E-01	1.54E-01	1.58E-01	2.90E-01		pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Lead-214	EPA 901.1 Modified	6.78E-01	1.92E-01	1.95E-01	3.48E-01		pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Promethium-145	EPA 901.1 Modified	-3.26E-02	1.30E-01	1.30E-01	2.84E-01	U	pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Radium-226	EPA 901.1 Modified	6.70E-01	2.35E-01	2.37E-01	3.66E-01		pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Antimony-125	EPA 901.1 Modified	6.42E-02	2.86E-01	2.86E-01	3.97E-01	U	pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Thorium-234	EPA 901.1 Modified	5.68E-01	9.88E-01	9.88E-01	1.48E+00	U	pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Thallium-208	EPA 901.1 Modified	5.08E-01	2.29E-01	2.30E-01	5.08E-01	U	pCi/g		
19-09014-09	TRG	L1-10220I-FJGS-001-SS-A	06/27/19 09:40	9/3/2019	9/13/2019	19-09014	Uranium-235	EPA 901.1 Modified	2.19E-01	3.57E-01	3.57E-01	5.44E-01	U	pCi/g		

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<h1 style="margin: 0;">Eberline Analytical</h1> <h2 style="margin: 0;">Final Report of Analysis</h2>			Report To:						Work Order Details:						
			<b>Patricia Giza</b> <b>Zion Solutions</b> <b>2701 Deborah Ave</b> <b>Zion, IL 60099</b>						SDG:	<b>19-09014</b>					
									Purchase Order:	677118					
									Analysis Category:	ENVIRONMENTAL					
						Sample Matrix:		SO							
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Actinium-228	EPA 901.1 Modified	3.87E-01	1.39E-01	1.41E-01	2.55E-01		pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Silver-108m	EPA 901.1 Modified	-3.57E-02	4.51E-02	4.51E-02	4.05E-02	U	pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Americium-241	EPA 901.1 Modified	6.09E-02	8.95E-02	8.96E-02	1.22E-01	U	pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Barium-133	EPA 901.1 Modified	-9.67E-02	6.87E-02	6.89E-02	6.41E-02	U	pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Bismuth-214	EPA 901.1 Modified	3.79E-01	1.06E-01	1.08E-01	1.50E-01		pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Cobalt-60	EPA 901.1 Modified	1.04E-01	3.38E-02	3.42E-02	5.08E-02		pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Cesium-134	EPA 901.1 Modified	-6.60E-03	1.92E-02	1.92E-02	4.42E-02	U	pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Cesium-137	EPA 901.1 Modified	3.70E-01	8.50E-02	8.70E-02	9.95E-02		pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Europium-152	EPA 901.1 Modified	1.11E-01	1.14E-01	1.14E-01	1.50E-01	U	pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Europium-154	EPA 901.1 Modified	-2.09E-02	6.50E-02	6.50E-02	7.64E-02	U	pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Europium-155	EPA 901.1 Modified	1.02E-01	8.47E-02	8.48E-02	1.15E-01	U	pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Holmium-166m	EPA 901.1 Modified	-1.41E-03	5.68E-02	5.68E-02	5.78E-02	U	pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Iodine-129	EPA 901.1 Modified	6.91E-01	4.19E+00	4.19E+00	2.73E+00	U	pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Potassium-40	EPA 901.1 Modified	1.04E+01	1.48E+00	1.57E+00	5.00E-01		pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Manganese-54	EPA 901.1 Modified	2.21E-02	3.64E-02	3.64E-02	6.34E-02	U	pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	-9.35E-03	3.39E-02	3.39E-02	5.00E-02	U	pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Niobium-94	EPA 901.1 Modified	4.72E-03	3.54E-02	3.54E-02	4.80E-02	U	pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Lead-210	EPA 901.1 Modified	2.32E+00	1.68E+00	1.68E+00	2.69E+00	U	pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Lead-212	EPA 901.1 Modified	3.85E-01	8.99E-02	9.20E-02	1.87E-01		pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Lead-214	EPA 901.1 Modified	4.61E-01	1.11E-01	1.14E-01	1.67E-01		pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Promethium-145	EPA 901.1 Modified	5.14E-01	6.15E-01	6.16E-01	7.71E-01	U	pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Radium-226	EPA 901.1 Modified	3.79E-01	1.06E-01	1.08E-01	1.50E-01		pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Antimony-125	EPA 901.1 Modified	7.84E-02	8.25E-02	8.26E-02	1.53E-01	U	pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Thorium-234	EPA 901.1 Modified	1.07E-01	8.71E-01	8.71E-01	1.14E+00	U	pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Thallium-208	EPA 901.1 Modified	2.57E-01	7.41E-02	7.52E-02	8.21E-02		pCi/g	
19-09014-10	TRG	L1-102201-FJGS-002-SS-A	06/27/19 09:42	9/3/2019	9/16/2019	19-09014	Uranium-235	EPA 901.1 Modified	4.63E-02	2.54E-01	2.54E-01	3.37E-01	U	pCi/g	

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



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<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:								
			Patricia Giza					SDG:	19-09014							
			Zion Solutions					Purchase Order:	677118							
			2701 Deborah Ave					Analysis Category:	ENVIRONMENTAL							
Zion, IL 60099					Sample Matrix:	SO										
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Actinium-228	EPA 901.1 Modified	5.86E-01	1.87E-01	1.89E-01	3.28E-01		pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Silver-108m	EPA 901.1 Modified	1.90E-02	4.81E-02	4.81E-02	7.75E-02	U	pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Americium-241	EPA 901.1 Modified	-1.72E-02	7.08E-02	7.08E-02	1.00E-01	U	pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Barium-133	EPA 901.1 Modified	2.12E-03	2.98E-02	2.98E-02	1.04E-01	U	pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Bismuth-214	EPA 901.1 Modified	5.65E-01	1.26E-01	1.30E-01	1.63E-01		pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Cobalt-60	EPA 901.1 Modified	1.04E-01	7.27E-02	7.29E-02	1.36E-01	U	pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Cesium-134	EPA 901.1 Modified	2.22E-03	3.15E-02	3.15E-02	8.46E-02	U	pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Cesium-137	EPA 901.1 Modified	5.35E-01	9.81E-02	1.02E-01	9.68E-02		pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Europium-152	EPA 901.1 Modified	-5.58E-02	1.86E-01	1.86E-01	1.56E-01	U	pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Europium-154	EPA 901.1 Modified	3.40E-02	1.65E-01	1.65E-01	7.95E-02	U	pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Europium-155	EPA 901.1 Modified	1.60E-01	9.57E-02	9.60E-02	1.47E-01		pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Holmium-166m	EPA 901.1 Modified	4.06E-02	4.08E-02	4.09E-02	6.87E-02	U	pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Iodine-129	EPA 901.1 Modified	-7.51E-02	1.89E-01	1.89E-01	2.69E-01	U	pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Potassium-40	EPA 901.1 Modified	1.35E+01	2.70E+00	2.79E+00	1.22E+00		pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Manganese-54	EPA 901.1 Modified	1.54E-02	5.48E-02	5.48E-02	9.22E-02	U	pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	5.50E-03	2.50E-02	2.50E-02	6.35E-02	U	pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Niobium-94	EPA 901.1 Modified	1.67E-02	4.24E-02	4.24E-02	6.62E-02	U	pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Lead-210	EPA 901.1 Modified	9.63E-01	8.22E-01	8.24E-01	1.36E+00	U	pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Lead-212	EPA 901.1 Modified	4.52E-01	9.76E-02	1.00E-01	1.79E-01		pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Lead-214	EPA 901.1 Modified	4.05E-01	1.06E-01	1.08E-01	1.80E-01		pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Promethium-145	EPA 901.1 Modified	3.58E-02	1.22E-01	1.22E-01	1.81E-01	U	pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Radium-226	EPA 901.1 Modified	5.65E-01	1.26E-01	1.30E-01	1.63E-01		pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Antimony-125	EPA 901.1 Modified	-2.81E-02	1.64E-01	1.64E-01	2.23E-01	U	pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Thonium-234	EPA 901.1 Modified	5.31E-01	6.38E-01	6.39E-01	9.63E-01	U	pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Thallium-208	EPA 901.1 Modified	3.76E-01	1.73E-01	1.74E-01	2.63E-01		pCi/g		
19-09014-11	TRG	L1-10220I-FJGS-004-SS-A	06/27/19 09:46	9/3/2019	9/16/2019	19-09014	Uranium-235	EPA 901.1 Modified	1.12E-01	2.36E-01	2.36E-01	3.54E-01	U	pCi/g		

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



EBERLINE ANALYTICAL CORPORATION

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

<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:									
			<b>Patricia Giza</b> <b>Zion Solutions</b> <b>2701 Deborah Ave</b> <b>Zion, IL 60099</b>					<b>SDG: 19-09014</b> <b>Purchase Order: 677118</b> <b>Analysis Category: ENVIRONMENTAL</b> <b>Sample Matrix: SO</b>									
			Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Actinium-228	EPA 901.1 Modified	4.45E-01	2.69E-01	2.70E-01	4.80E-01	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Silver-108m	EPA 901.1 Modified	-4.42E-02	6.63E-02	6.63E-02	1.11E-01	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Americium-241	EPA 901.1 Modified	-8.38E-02	1.17E-01	1.17E-01	1.63E-01	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Barium-133	EPA 901.1 Modified	1.08E-02	4.26E-02	4.26E-02	1.90E-01	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Bismuth-214	EPA 901.1 Modified	3.89E-01	2.18E-01	2.19E-01	3.38E-01	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Cobalt-60	EPA 901.1 Modified	2.03E-01	9.54E-02	9.60E-02	2.09E-01	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Cesium-134	EPA 901.1 Modified	1.77E-02	4.73E-02	4.73E-02	1.34E-01	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Cesium-137	EPA 901.1 Modified	1.00E+00	1.88E-01	1.95E-01	1.71E-01	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Europium-152	EPA 901.1 Modified	7.19E-02	2.42E-01	2.42E-01	2.54E-01	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Europium-154	EPA 901.1 Modified	-4.35E-02	2.40E-01	2.40E-01	1.33E-01	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Europium-155	EPA 901.1 Modified	1.05E-01	1.38E-01	1.38E-01	2.06E-01	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Holmium-166m	EPA 901.1 Modified	6.91E-03	1.22E-01	1.22E-01	9.65E-02	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Iodine-129	EPA 901.1 Modified	2.90E-02	9.04E-02	9.04E-02	1.36E-01	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Potassium-40	EPA 901.1 Modified	1.05E+01	1.99E+00	2.06E+00	1.49E+00	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Manganese-54	EPA 901.1 Modified	5.01E-04	9.53E-02	9.53E-02	1.50E-01	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	9.30E-03	5.48E-02	5.48E-02	9.86E-02	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Niobium-94	EPA 901.1 Modified	-1.66E-02	7.06E-02	7.06E-02	1.10E-01	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Lead-210	EPA 901.1 Modified	2.49E+00	1.34E+00	1.34E+00	2.16E+00	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Lead-212	EPA 901.1 Modified	6.94E-01	1.95E-01	1.99E-01	2.90E-01	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Lead-214	EPA 901.1 Modified	4.05E-01	1.61E-01	1.63E-01	3.06E-01	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Promethium-145	EPA 901.1 Modified	-1.18E-01	1.13E-01	1.14E-01	1.56E-01	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Radium-226	EPA 901.1 Modified	3.89E-01	2.18E-01	2.19E-01	3.38E-01	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Antimony-125	EPA 901.1 Modified	-1.84E-02	2.65E-01	2.65E-01	3.64E-01	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Thorium-234	EPA 901.1 Modified	1.58E+00	1.89E+00	1.89E+00	3.16E+00	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Thallium-208	EPA 901.1 Modified	1.97E-01	1.59E-01	1.60E-01	3.40E-01	U	pCi/g			
19-09014-12	TRG	L1-10220H-FJGS-001-SS-A	06/27/19 09:48	9/3/2019	9/16/2019	19-09014	Uranium-235	EPA 901.1 Modified	8.79E-02	3.62E-01	3.62E-01	5.46E-01	U	pCi/g			

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



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

<b>Eberline Analytical Final Report of Analysis</b>			Report To:						Work Order Details:							
			Patricia Giza						SDG:	19-09014						
			Zion Solutions						Purchase Order:	677118						
			2701 Deborah Ave						Analysis Category:	ENVIRONMENTAL						
			Zion, IL 60099						Sample Matrix:	SO						
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Actinium-228	EPA 901.1 Modified	9.53E-01	4.20E-01	4.23E-01	1.08E+00	U	pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Silver-108m	EPA 901.1 Modified	1.47E-02	6.28E-02	6.28E-02	1.42E-01	U	pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Americium-241	EPA 901.1 Modified	-2.23E-01	2.47E-01	2.47E-01	2.97E-01	U	pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Barium-133	EPA 901.1 Modified	1.86E-02	1.09E-01	1.09E-01	2.12E-01	U	pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Bismuth-214	EPA 901.1 Modified	1.42E+00	2.60E-01	2.70E-01	4.01E-01		pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Cobalt-60	EPA 901.1 Modified	2.28E+00	2.45E-01	2.72E-01	2.29E-01		pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Cesium-134	EPA 901.1 Modified	7.64E-03	4.93E-02	4.93E-02	1.10E-01	U	pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Cesium-137	EPA 901.1 Modified	9.65E+00	1.12E+00	1.23E+00	2.84E-01		pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Europium-152	EPA 901.1 Modified	1.57E-01	4.31E-01	4.31E-01	3.99E-01	U	pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Europium-154	EPA 901.1 Modified	1.46E-01	2.74E-01	2.74E-01	2.04E-01	U	pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Europium-155	EPA 901.1 Modified	1.27E-01	1.14E-01	1.15E-01	3.12E-01	U	pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Holmium-166m	EPA 901.1 Modified	-1.35E-01	1.74E-01	1.75E-01	1.66E-01	U	pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Iodine-129	EPA 901.1 Modified	-1.25E+01	5.20E+01	5.20E+01	6.69E+00	U	pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Potassium-40	EPA 901.1 Modified	2.28E+01	3.41E+00	3.61E+00	2.35E+00		pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Manganese-54	EPA 901.1 Modified	1.71E-01	1.15E-01	1.15E-01	2.02E-01	U	pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	7.31E-02	7.86E-02	7.87E-02	1.14E-01	U	pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Niobium-94	EPA 901.1 Modified	1.43E-03	8.63E-02	8.63E-02	1.33E-01	U	pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Lead-210	EPA 901.1 Modified	8.52E+00	4.59E+00	4.61E+00	7.14E+00		pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Lead-212	EPA 901.1 Modified	1.16E+00	2.27E-01	2.34E-01	4.30E-01		pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Lead-214	EPA 901.1 Modified	1.45E+00	3.26E-01	3.34E-01	5.07E-01		pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Promethium-145	EPA 901.1 Modified	2.00E+00	1.70E+00	1.70E+00	2.02E+00	U	pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Radium-226	EPA 901.1 Modified	1.42E+00	2.60E-01	2.70E-01	4.01E-01		pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Antimony-125	EPA 901.1 Modified	6.85E-02	2.04E-01	2.04E-01	4.86E-01	U	pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Thorium-234	EPA 901.1 Modified	2.67E+00	2.04E+00	2.05E+00	2.85E+00	U	pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Thallium-208	EPA 901.1 Modified	7.59E-01	2.02E-01	2.06E-01	1.71E-01		pCi/g		
19-09014-13	TRG	L1-10221D-FIGS-004-SS-A	06/27/19 09:36	9/3/2019	9/16/2019	19-09014	Uranium-235	EPA 901.1 Modified	3.51E-01	6.50E-01	6.50E-01	8.76E-01	U	pCi/g		

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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<h1 style="margin: 0;">Eberline Analytical</h1> <h2 style="margin: 0;">Final Report of Analysis</h2>			Report To:					Work Order Details:							
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG:	19-09014						
								Purchase Order:	677118						
								Analysis Category:	ENVIRONMENTAL						
					Sample Matrix:		SO								
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Actinium-228	EPA 901.1 Modified	6.33E-01	2.40E-01	2.42E-01	5.09E-01		pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Silver-108m	EPA 901.1 Modified	-8.99E-03	6.83E-02	6.83E-02	1.01E-01	U	pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Americium-241	EPA 901.1 Modified	-4.22E-02	9.58E-02	9.59E-02	1.35E-01	U	pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Barium-133	EPA 901.1 Modified	-7.34E-03	4.33E-02	4.33E-02	1.43E-01	U	pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Bismuth-214	EPA 901.1 Modified	5.90E-01	1.77E-01	1.80E-01	2.74E-01		pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Cobalt-60	EPA 901.1 Modified	1.72E-01	8.67E-02	8.71E-02	1.69E-01		pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Cesium-134	EPA 901.1 Modified	-1.14E-02	3.18E-02	3.18E-02	1.25E-01	U	pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Cesium-137	EPA 901.1 Modified	1.37E+00	1.88E-01	2.01E-01	1.22E-01		pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Europium-152	EPA 901.1 Modified	9.46E-03	2.75E-01	2.75E-01	2.14E-01	U	pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Europium-154	EPA 901.1 Modified	6.15E-02	1.63E-01	1.63E-01	1.09E-01	U	pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Europium-155	EPA 901.1 Modified	1.35E-01	9.15E-02	9.17E-02	2.03E-01	U	pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Holmium-166m	EPA 901.1 Modified	-5.77E-02	1.08E-01	1.08E-01	9.32E-02	U	pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Iodine-129	EPA 901.1 Modified	1.32E-01	2.63E-01	2.63E-01	3.91E-01	U	pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Potassium-40	EPA 901.1 Modified	1.62E+01	3.45E+00	3.56E+00	2.13E+00		pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Manganese-54	EPA 901.1 Modified	-7.46E-03	7.89E-02	7.89E-02	1.27E-01	U	pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	-5.08E-03	5.43E-02	5.43E-02	8.51E-02	U	pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Niobium-94	EPA 901.1 Modified	-3.69E-02	6.45E-02	6.45E-02	1.01E-01	U	pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Lead-210	EPA 901.1 Modified	2.12E+00	1.06E+00	1.07E+00	1.69E+00		pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Lead-212	EPA 901.1 Modified	6.07E-01	1.28E-01	1.32E-01	2.14E-01		pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Lead-214	EPA 901.1 Modified	6.31E-01	1.38E-01	1.42E-01	3.68E-01		pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Promethium-145	EPA 901.1 Modified	-1.10E-01	1.83E-01	1.83E-01	2.59E-01	U	pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Radium-226	EPA 901.1 Modified	5.90E-01	1.77E-01	1.80E-01	2.74E-01		pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Antimony-125	EPA 901.1 Modified	-2.56E-02	2.30E-01	2.30E-01	3.15E-01	U	pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Thorium-234	EPA 901.1 Modified	1.04E+00	8.23E-01	8.25E-01	1.27E+00	U	pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Thallium-208	EPA 901.1 Modified	6.29E-01	2.44E-01	2.46E-01	3.62E-01		pCi/g	
19-09014-14	TRG	L1-10220H-FJGS-004-SS-A	07/09/19 08:20	9/3/2019	9/16/2019	19-09014	Uranium-235	EPA 901.1 Modified	-4.10E-02	3.17E-01	3.17E-01	4.64E-01	U	pCi/g	

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			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG:	19-09014						
								Purchase Order:	677118						
								Analysis Category:	ENVIRONMENTAL						
					Sample Matrix:		SO								
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Actinium-228	EPA 901.1 Modified	1.52E+00	6.43E-01	6.48E-01	1.36E+00		pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Silver-108m	EPA 901.1 Modified	2.39E-02	1.36E-01	1.36E-01	2.19E-01	U	pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Americium-241	EPA 901.1 Modified	-1.83E-02	1.87E-01	1.87E-01	2.67E-01	U	pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Barium-133	EPA 901.1 Modified	5.07E-02	1.10E-01	1.10E-01	3.18E-01	U	pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Bismuth-214	EPA 901.1 Modified	1.17E+00	3.05E-01	3.11E-01	1.60E-01		pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Cobalt-60	EPA 901.1 Modified	1.90E+00	2.34E-01	2.54E-01	2.06E-01		pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Cesium-134	EPA 901.1 Modified	-2.08E-02	8.08E-02	8.08E-02	2.41E-01	U	pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Cesium-137	EPA 901.1 Modified	8.29E+00	9.80E-01	1.07E+00	4.18E-01		pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Europium-152	EPA 901.1 Modified	-7.94E-02	2.81E-01	2.81E-01	4.76E-01	U	pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Europium-154	EPA 901.1 Modified	-3.57E-01	3.84E-01	3.84E-01	2.43E-01	U	pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Europium-155	EPA 901.1 Modified	2.57E-01	2.28E-01	2.28E-01	3.78E-01	U	pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Holmium-166m	EPA 901.1 Modified	6.47E-02	2.37E-01	2.37E-01	1.66E-01	U	pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Iodine-129	EPA 901.1 Modified	2.76E-01	1.65E-01	1.66E-01	2.54E-01	U	pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Potassium-40	EPA 901.1 Modified	2.01E+01	3.19E+00	3.35E+00	1.94E+00		pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Manganese-54	EPA 901.1 Modified	1.25E-01	1.64E-01	1.64E-01	2.74E-01	U	pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	-4.00E-02	1.47E-01	1.47E-01	1.37E-01	U	pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Niobium-94	EPA 901.1 Modified	1.56E-01	1.38E-01	1.38E-01	1.79E-01	U	pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Lead-210	EPA 901.1 Modified	1.94E+00	1.81E+00	1.81E+00	3.01E+00	U	pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Lead-212	EPA 901.1 Modified	1.10E+00	2.53E-01	2.59E-01	5.51E-01		pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Lead-214	EPA 901.1 Modified	1.04E+00	3.51E-01	3.55E-01	6.40E-01		pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Promethium-145	EPA 901.1 Modified	7.61E-02	1.54E-01	1.54E-01	2.88E-01	U	pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Radium-226	EPA 901.1 Modified	1.17E+00	3.05E-01	3.11E-01	1.60E-01		pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Antimony-125	EPA 901.1 Modified	6.02E-02	5.62E-01	5.62E-01	7.65E-01	U	pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Thonium-234	EPA 901.1 Modified	9.41E-01	1.76E+00	1.76E+00	2.62E+00	U	pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Thallium-208	EPA 901.1 Modified	1.03E+00	3.54E-01	3.57E-01	4.86E-01		pCi/g	
19-09014-15	TRG	L1-10221D-FIGS-010-SS-A	07/09/19 08:45	9/3/2019	9/16/2019	19-09014	Uranium-235	EPA 901.1 Modified	-1.64E-01	6.42E-01	6.42E-01	9.20E-01	U	pCi/g	

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



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			Patricia Giza					SDG:	19-09014					
			Zion Solutions					Purchase Order:	677118					
			2701 Deborah Ave					Analysis Category:	ENVIRONMENTAL					
			Zion, IL 60099					Sample Matrix:	SO					
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Actinium-228	EPA 901.1 Modified	4.27E-01	1.59E-01	1.60E-01	3.05E-01		pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Silver-108m	EPA 901.1 Modified	9.65E-04	1.67E-02	1.67E-02	4.61E-02	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Americium-241	EPA 901.1 Modified	5.99E-03	9.94E-02	9.94E-02	1.30E-01	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Barium-133	EPA 901.1 Modified	1.13E-02	2.67E-02	2.67E-02	7.36E-02	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Bismuth-214	EPA 901.1 Modified	5.19E-01	1.08E-01	1.11E-01	1.47E-01		pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Cobalt-60	EPA 901.1 Modified	6.43E-02	4.09E-02	4.10E-02	1.01E-01	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Cesium-134	EPA 901.1 Modified	7.17E-03	2.18E-02	2.18E-02	5.12E-02	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Cesium-137	EPA 901.1 Modified	4.74E-01	9.73E-02	1.00E-01	1.02E-01		pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Europium-152	EPA 901.1 Modified	1.60E-02	1.05E-01	1.05E-01	1.67E-01	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Europium-154	EPA 901.1 Modified	-5.66E-02	1.23E-01	1.23E-01	8.59E-02	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Europium-155	EPA 901.1 Modified	1.58E-01	1.03E-01	1.04E-01	1.38E-01	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Holmium-166m	EPA 901.1 Modified	-3.03E-02	6.94E-02	6.94E-02	7.04E-02	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Iodine-129	EPA 901.1 Modified	2.18E+00	9.58E+00	9.58E+00	3.02E+00	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Potassium-40	EPA 901.1 Modified	1.05E+01	1.57E+00	1.66E+00	1.07E+00		pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Manganese-54	EPA 901.1 Modified	2.56E-03	4.14E-02	4.14E-02	6.59E-02	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	-1.95E-02	3.59E-02	3.59E-02	5.05E-02	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Niobium-94	EPA 901.1 Modified	-8.36E-03	3.76E-02	3.77E-02	5.71E-02	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Lead-210	EPA 901.1 Modified	2.10E+00	1.94E+00	1.94E+00	3.18E+00	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Lead-212	EPA 901.1 Modified	4.90E-01	1.02E-01	1.05E-01	1.65E-01		pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Lead-214	EPA 901.1 Modified	6.04E-01	1.41E-01	1.45E-01	2.20E-01		pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Promethium-145	EPA 901.1 Modified	5.81E-01	6.70E-01	6.71E-01	9.29E-01	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Radium-226	EPA 901.1 Modified	5.19E-01	1.08E-01	1.11E-01	1.47E-01		pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Antimony-125	EPA 901.1 Modified	5.53E-04	9.70E-02	9.70E-02	1.63E-01	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Thorium-234	EPA 901.1 Modified	1.29E-01	1.01E+00	1.01E+00	1.32E+00	U	pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Thallium-208	EPA 901.1 Modified	2.79E-01	8.93E-02	9.05E-02	1.30E-01		pCi/g
19-09014-16	TRG	L1-10221D-FIGS-014-SS-A	07/09/19 08:53	9/3/2019	9/16/2019	19-09014	Uranium-235	EPA 901.1 Modified	1.82E-01	2.66E-01	2.67E-01	3.72E-01	U	pCi/g

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



EBERLINE ANALYTICAL CORPORATION

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<b>Eberline Analytical Final Report of Analysis</b>			Report To:					Work Order Details:						
			Patricia Giza					SDG: 19-09014						
			Zion Solutions					Purchase Order: 677118		Analysis Category: ENVIRONMENTAL				
			2701 Deborah Ave Zion, IL 60099					Sample Matrix: SO						
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Actinium-228	EPA 901.1 Modified	5.47E-01	2.15E-01	2.17E-01	4.05E-01		pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Silver-108m	EPA 901.1 Modified	-6.99E-02	6.09E-02	6.10E-02	6.92E-02	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Americium-241	EPA 901.1 Modified	-1.71E-02	7.34E-02	7.34E-02	1.04E-01	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Barium-133	EPA 901.1 Modified	1.14E-02	2.58E-02	2.58E-02	1.18E-01	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Bismuth-214	EPA 901.1 Modified	5.30E-01	1.36E-01	1.38E-01	1.41E-01		pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Cobalt-60	EPA 901.1 Modified	1.42E-01	7.86E-02	7.89E-02	1.46E-01	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Cesium-134	EPA 901.1 Modified	-1.05E-02	3.05E-02	3.05E-02	9.66E-02	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Cesium-137	EPA 901.1 Modified	6.57E-01	1.17E-01	1.22E-01	1.18E-01		pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Europium-152	EPA 901.1 Modified	-2.17E-01	2.04E-01	2.05E-01	1.69E-01	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Europium-154	EPA 901.1 Modified	-1.34E-01	2.14E-01	2.14E-01	8.59E-02	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Europium-155	EPA 901.1 Modified	5.99E-02	8.43E-02	8.43E-02	1.25E-01	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Holmium-166m	EPA 901.1 Modified	-3.25E-02	7.82E-02	7.83E-02	7.06E-02	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Iodine-129	EPA 901.1 Modified	2.52E-01	2.02E-01	2.02E-01	2.88E-01	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Potassium-40	EPA 901.1 Modified	1.22E+01	2.58E+00	2.66E+00	1.47E+00		pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Manganese-54	EPA 901.1 Modified	1.26E-02	5.53E-02	5.53E-02	9.34E-02	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	-3.55E-02	4.85E-02	4.85E-02	6.76E-02	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Niobium-94	EPA 901.1 Modified	2.39E-02	4.72E-02	4.72E-02	6.60E-02	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Lead-210	EPA 901.1 Modified	1.02E+00	9.58E-01	9.60E-01	1.59E+00	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Lead-212	EPA 901.1 Modified	4.68E-01	1.31E-01	1.33E-01	1.88E-01		pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Lead-214	EPA 901.1 Modified	4.47E-01	1.38E-01	1.40E-01	2.39E-01		pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Promethium-145	EPA 901.1 Modified	5.01E-02	1.32E-01	1.32E-01	1.97E-01	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Radium-226	EPA 901.1 Modified	5.30E-01	1.36E-01	1.38E-01	1.41E-01		pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Antimony-125	EPA 901.1 Modified	3.29E-02	1.60E-01	1.60E-01	2.27E-01	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Thorium-234	EPA 901.1 Modified	9.41E-01	6.72E-01	6.73E-01	1.04E+00	U	pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Thallium-208	EPA 901.1 Modified	3.57E-01	2.06E-01	2.07E-01	3.43E-01		pCi/g
19-09014-17	TRG	L1-10221D-QIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Uranium-235	EPA 901.1 Modified	2.35E-02	2.48E-01	2.48E-01	3.69E-01	U	pCi/g

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



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<h1 style="margin: 0;">Eberline Analytical</h1> <h2 style="margin: 0;">Final Report of Analysis</h2>			Report To:					Work Order Details:							
			<b>Patricia Giza</b> <b>Zion Solutions</b> <b>2701 Deborah Ave</b> <b>Zion, IL 60099</b>					SDG: <b>19-09014</b>							
								Purchase Order: 677118		Analysis Category: ENVIRONMENTAL					
								Sample Matrix: SO							
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Actinium-228	EPA 901.1 Modified	5.51E-01	2.88E-01	2.90E-01	4.95E-01		pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Silver-108m	EPA 901.1 Modified	5.46E-02	4.11E-02	4.12E-02	1.21E-01	U	pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Americium-241	EPA 901.1 Modified	1.34E-03	1.21E-01	1.21E-01	1.75E-01	U	pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Barium-133	EPA 901.1 Modified	8.86E-04	5.31E-02	5.31E-02	2.07E-01	U	pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Bismuth-214	EPA 901.1 Modified	6.78E-01	1.82E-01	1.85E-01	3.07E-01		pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Cobalt-60	EPA 901.1 Modified	1.91E-01	9.78E-02	9.83E-02	2.07E-01	U	pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Cesium-134	EPA 901.1 Modified	2.47E-02	5.54E-02	5.54E-02	1.51E-01	U	pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Cesium-137	EPA 901.1 Modified	1.08E+00	2.06E-01	2.13E-01	2.03E-01		pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Europium-152	EPA 901.1 Modified	2.53E-01	2.71E-01	2.72E-01	2.75E-01	U	pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Europium-154	EPA 901.1 Modified	9.06E-02	2.59E-01	2.59E-01	1.38E-01	U	pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Europium-155	EPA 901.1 Modified	-1.06E-01	1.55E-01	1.56E-01	2.17E-01	U	pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Holmium-166m	EPA 901.1 Modified	-5.50E-02	1.59E-01	1.59E-01	1.09E-01	U	pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Iodine-129	EPA 901.1 Modified	1.37E-02	9.59E-02	9.59E-02	1.42E-01	U	pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Potassium-40	EPA 901.1 Modified	1.34E+01	2.33E+00	2.43E+00	1.66E+00		pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Manganese-54	EPA 901.1 Modified	6.97E-02	8.36E-02	8.36E-02	1.53E-01	U	pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	-1.86E-02	8.41E-02	8.41E-02	1.15E-01	U	pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Niobium-94	EPA 901.1 Modified	-6.52E-03	7.86E-02	7.86E-02	1.28E-01	U	pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Lead-210	EPA 901.1 Modified	9.21E-01	1.10E+00	1.10E+00	1.84E+00	U	pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Lead-212	EPA 901.1 Modified	9.16E-01	2.20E-01	2.25E-01	3.18E-01		pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Lead-214	EPA 901.1 Modified	5.59E-01	2.00E-01	2.02E-01	3.60E-01		pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Promethium-145	EPA 901.1 Modified	-8.22E-02	1.15E-01	1.15E-01	1.62E-01	U	pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Radium-226	EPA 901.1 Modified	6.78E-01	1.82E-01	1.85E-01	3.07E-01		pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Antimony-125	EPA 901.1 Modified	3.57E-03	2.62E-01	2.62E-01	3.64E-01	U	pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Thorium-234	EPA 901.1 Modified	7.91E-01	1.15E+00	1.16E+00	1.74E+00	U	pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Thallium-208	EPA 901.1 Modified	6.64E-01	2.08E-01	2.10E-01	8.14E-02		pCi/g	
19-09014-18	TRG	L1-10221D-FIGS-013-SS-A	07/09/19 08:51	9/3/2019	9/16/2019	19-09014	Uranium-235	EPA 901.1 Modified	9.02E-02	3.99E-01	3.99E-01	5.91E-01	U	pCi/g	

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



**EBERLINE ANALYTICAL CORPORATION**

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<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:								
			Patricia Giza					SDG:	19-09014							
			Zion Solutions					Purchase Order:	677118							
			2701 Deborah Ave					Analysis Category:	ENVIRONMENTAL							
			Zion, IL 60099					Sample Matrix:	SO							
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Actinium-228	EPA 901.1 Modified	3.54E-01	1.71E-01	1.72E-01	3.25E-01		pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Silver-108m	EPA 901.1 Modified	-3.77E-02	4.56E-02	4.56E-02	4.80E-02	U	pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Americium-241	EPA 901.1 Modified	-4.36E-02	1.05E-01	1.05E-01	1.31E-01	U	pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Barium-133	EPA 901.1 Modified	2.50E-02	2.62E-02	2.63E-02	7.61E-02	U	pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Bismuth-214	EPA 901.1 Modified	3.34E-01	9.13E-02	9.29E-02	1.50E-01		pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Cobalt-60	EPA 901.1 Modified	2.75E-01	6.17E-02	6.33E-02	1.04E-01		pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Cesium-134	EPA 901.1 Modified	1.05E-02	2.56E-02	2.56E-02	5.31E-02	U	pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Cesium-137	EPA 901.1 Modified	1.86E-01	7.19E-02	7.25E-02	1.02E-01		pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Europium-152	EPA 901.1 Modified	-1.39E-01	1.79E-01	1.79E-01	1.65E-01	U	pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Europium-154	EPA 901.1 Modified	-3.99E-02	8.30E-02	8.30E-02	8.28E-02	U	pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Europium-155	EPA 901.1 Modified	1.11E-01	9.53E-02	9.55E-02	1.28E-01	U	pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Holmium-166m	EPA 901.1 Modified	2.62E-02	7.75E-02	7.75E-02	6.55E-02	U	pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Iodine-129	EPA 901.1 Modified	7.20E-01	4.73E+00	4.73E+00	3.10E+00	U	pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Potassium-40	EPA 901.1 Modified	1.06E+01	1.65E+00	1.74E+00	1.07E+00		pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Manganese-54	EPA 901.1 Modified	6.03E-03	4.39E-02	4.39E-02	6.97E-02	U	pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Molybdenum-93	EPA 901.1 Modified	-6.28E-03	3.71E-02	3.71E-02	4.22E-02	U	pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Niobium-94	EPA 901.1 Modified	-6.51E-03	4.52E-02	4.52E-02	6.26E-02	U	pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Lead-210	EPA 901.1 Modified	6.05E-01	1.48E+00	1.48E+00	2.27E+00	U	pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Lead-212	EPA 901.1 Modified	3.39E-01	8.11E-02	8.30E-02	1.86E-01		pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Lead-214	EPA 901.1 Modified	3.96E-01	1.14E-01	1.15E-01	1.86E-01		pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Promethium-145	EPA 901.1 Modified	2.81E-01	6.60E-01	6.60E-01	9.71E-01	U	pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Radium-226	EPA 901.1 Modified	3.34E-01	9.13E-02	9.29E-02	1.50E-01		pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Antimony-125	EPA 901.1 Modified	8.88E-03	9.46E-02	9.46E-02	1.61E-01	U	pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Thorium-234	EPA 901.1 Modified	1.15E+00	9.30E-01	9.31E-01	1.32E+00	U	pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Thallium-208	EPA 901.1 Modified	2.92E-01	1.20E-01	1.21E-01	2.42E-01	U	pCi/g		
19-09014-19	TRG	L1-10221D-FIGS-018-SS-A	07/15/19 13:45	9/3/2019	9/16/2019	19-09014	Uranium-235	EPA 901.1 Modified	-7.50E-04	2.73E-01	2.73E-01	3.58E-01	U	pCi/g		

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



EBERLINE ANALYTICAL CORPORATION

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

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

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

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LI-10221D-FI GS-021-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/17/19	0832	5 ROC HTD	NA	606.23g
LI-10221D-FI GS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/27/19	0930	5 ROC HTD	NA	709.53g
Laboratory: <b>EBERLINE LABS</b>			Date Submitted To Lab:			Ship Container No.: <b>NA</b>		Cooler Temperature: <b>FULL SUITE</b> <b>N/A</b>		Airbill Number: <b>Various For FedEx Ground</b>		
Relinquished by: <b>Jack Nucera</b>		Date (mm/dd/yyyy): <b>8/28/19</b>	Time: <b>0748</b>		Received by: <b>Richard E. Rickert</b>		Date: (mm/dd/yyyy): <b>08/28/2019</b>		<b>0748</b>			
Relinquished by: <b>Richard E. Rickert</b>		Date (mm/dd/yyyy): <b>08/29/2019</b>	Time: <b>0800</b>		Received by: <b>FedEx Ground</b>		Date: (mm/dd/yyyy): <b>08/29/2019</b>		<b>0800</b>			
Relinquished by: <b>FedEx Ground</b>		Date (mm/dd/yyyy):	Time:		Received by: <b>Brandon Spencer</b>		Date: (mm/dd/yyyy): <b>9/3/2019</b>		<b>1000</b>			
Relinquished by:		Date (mm/dd/yyyy):	Time:		Received by:		Date: (mm/dd/yyyy):					
Comments <b>Full Site Po# 67716 HTD Po# 67718 30 Day Turn Around</b>												



EBS-OR-46308

November 6, 2019

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

CASE NARRATIVE  
Work Order # 19-09016-OR

SAMPLE RECEIPT

This work order contains nine soil samples received 09/03/2019. 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>
L1-10221D-FIGS-002-SS-A	19-09016-04	L1-10221D-FIGS-001-SS-A	19-09016-09
L1-10221D-FIGS-022-SS-A	19-09016-05	L1-10221A-QIGS-001-SB-A	19-09016-10
L1-10221D-FIGS-012-SS-A	19-09016-06	L1-10221A-FJGS-007-SS-A	19-09016-11
L1-10221D-FIGS-003-SS-A	19-09016-07	L1-10221B-FJGS-002-SS-A	19-09016-12
L1-10221D-FIGS-021-SS-A	19-09016-08		

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 mounted on 47mm filters. Filters were reweighed to determine aliquot size. Sample activities were determined by gas flow proportional counting.

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

### TRITIUM

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

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

### NICKEL-63

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

Samples demonstrated acceptable results for all Nickel-63 analyses. The Nickel-63 method blank demonstrated an acceptable result. Results for the Nickel-63 duplicate demonstrated an acceptable relative percent difference and normalized difference. 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.

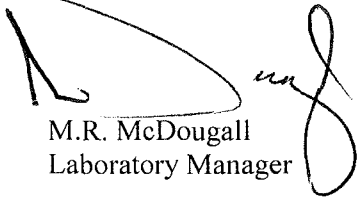
ANALYTICAL RESULTS CONTINUED

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 Cobalt-60, Cesium-137 and Potassium-40 replicate demonstrated an acceptable relative percent difference and normalized difference. Results for the Cobalt-60 and Cesium-137 laboratory control sample demonstrated an acceptable percent recovery.

CERTIFICATION OF ACCURACY

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



M.R. McDougall  
Laboratory Manager

Date: 11/6/2019

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



<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:									
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG: <b>19-09016</b> Purchase Order: 677118 Analysis Category: ENVIRONMENTAL Sample Matrix: SO									
			Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09016-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	10/11/2019	19-09016	Tritium	LANL ER-210 Modified	2.05E+02	7.38E+00				pCi/g			
19-09016-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	10/11/2019	19-09016	Tritium	LANL ER-210 Modified	2.03E+02	7.92E+00	1.38E+01	5.94E+00		pCi/g			
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	10/11/2019	19-09016	Tritium	LANL ER-210 Modified	-1.94E-01	3.38E+00	3.38E+00	5.88E+00	U	pCi/g			
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	10/11/2019	19-09016	Tritium	LANL ER-210 Modified	-3.76E-01	3.27E+00	3.27E+00	5.70E+00	U	pCi/g			
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	10/11/2019	19-09016	Tritium	LANL ER-210 Modified	5.82E-01	3.41E+00	3.41E+00	5.88E+00	U	pCi/g			
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	10/11/2019	19-09016	Tritium	LANL ER-210 Modified	-1.76E+00	3.36E+00	3.36E+00	5.94E+00	U	pCi/g			
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	10/11/2019	19-09016	Tritium	LANL ER-210 Modified	1.87E-01	3.28E+00	3.28E+00	5.68E+00	U	pCi/g			
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	10/11/2019	19-09016	Tritium	LANL ER-210 Modified	-1.84E+00	3.14E+00	3.15E+00	5.57E+00	U	pCi/g			
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	10/11/2019	19-09016	Tritium	LANL ER-210 Modified	-1.94E-01	3.38E+00	3.38E+00	5.88E+00	U	pCi/g			
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	10/11/2019	19-09016	Tritium	LANL ER-210 Modified	1.88E-01	3.30E+00	3.30E+00	5.70E+00	U	pCi/g			
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	10/11/2019	19-09016	Tritium	LANL ER-210 Modified	-1.12E+00	3.22E+00	3.22E+00	5.66E+00	U	pCi/g			
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	10/11/2019	19-09016	Tritium	LANL ER-210 Modified	5.73E-01	3.35E+00	3.35E+00	5.78E+00	U	pCi/g			
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	10/11/2019	19-09016	Tritium	LANL ER-210 Modified	3.79E-01	3.32E+00	3.32E+00	5.74E+00	U	pCi/g			
19-09016-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	10/24/2019	19-09016	Nickel-63	ASTM 3500-Ni Modified	1.50E+03	4.49E+01				pCi/g			
19-09016-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	10/24/2019	19-09016	Nickel-63	ASTM 3500-Ni Modified	1.45E+03	1.26E+01	8.62E+01	2.92E+00		pCi/g			
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	10/24/2019	19-09016	Nickel-63	ASTM 3500-Ni Modified	1.93E+00	1.75E+00	1.75E+00	2.91E+00	U	pCi/g			
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	10/24/2019	19-09016	Nickel-63	ASTM 3500-Ni Modified	6.56E+00	1.93E+00	1.97E+00	3.00E+00		pCi/g			
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	10/24/2019	19-09016	Nickel-63	ASTM 3500-Ni Modified	7.61E+00	1.99E+00	2.04E+00	3.04E+00		pCi/g			
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	10/24/2019	19-09016	Nickel-63	ASTM 3500-Ni Modified	2.44E+00	1.83E+00	1.83E+00	3.02E+00	U	pCi/g			
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	10/24/2019	19-09016	Nickel-63	ASTM 3500-Ni Modified	6.45E+00	2.00E+00	2.03E+00	3.11E+00		pCi/g			
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	10/24/2019	19-09016	Nickel-63	ASTM 3500-Ni Modified	3.70E+00	1.84E+00	1.86E+00	2.99E+00		pCi/g			
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	10/24/2019	19-09016	Nickel-63	ASTM 3500-Ni Modified	2.67E+00	1.87E+00	1.88E+00	3.09E+00	U	pCi/g			
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	10/24/2019	19-09016	Nickel-63	ASTM 3500-Ni Modified	6.56E+00	2.03E+00	2.07E+00	3.17E+00		pCi/g			
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	10/25/2019	19-09016	Nickel-63	ASTM 3500-Ni Modified	2.89E+00	1.90E+00	1.91E+00	3.13E+00	U	pCi/g			
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	10/25/2019	19-09016	Nickel-63	ASTM 3500-Ni Modified	1.54E+00	1.76E+00	1.77E+00	2.96E+00	U	pCi/g			
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	10/25/2019	19-09016	Nickel-63	ASTM 3500-Ni Modified	1.47E+00	2.02E+00	2.02E+00	3.40E+00	U	pCi/g			

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EBERLINE ANALYTICAL CORPORATION

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

<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:							
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG:	19-09016						
								Purchase Order:	677118						
								Analysis Category:	ENVIRONMENTAL						
					Sample Matrix:		SO								
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units	
19-09016-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	10/11/2019	19-09016	Strontium-90	EiChroM SRW01 Modified	5.05E+01	2.83E-01				pCi/g	
19-09016-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	10/11/2019	19-09016	Strontium-90	EiChroM SRW01 Modified	4.50E+01	2.52E+00	1.59E+01	9.12E-01		pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	10/11/2019	19-09016	Strontium-90	EiChroM SRW01 Modified	5.12E-02	3.06E-01	3.06E-01	6.48E-01	U	pCi/g	
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	10/11/2019	19-09016	Strontium-90	EiChroM SRW01 Modified	-1.11E-01	3.95E-01	3.97E-01	8.53E-01	U	pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	10/11/2019	19-09016	Strontium-90	EiChroM SRW01 Modified	3.26E-02	3.99E-01	3.99E-01	8.50E-01	U	pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	10/11/2019	19-09016	Strontium-90	EiChroM SRW01 Modified	-3.22E-01	3.29E-01	3.48E-01	7.37E-01	U	pCi/g	
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	10/11/2019	19-09016	Strontium-90	EiChroM SRW01 Modified	0.00E+00	3.63E-01	3.63E-01	7.76E-01	U	pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	10/11/2019	19-09016	Strontium-90	EiChroM SRW01 Modified	6.97E-01	3.66E-01	4.39E-01	7.06E-01	U	pCi/g	
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	10/11/2019	19-09016	Strontium-90	EiChroM SRW01 Modified	-2.67E-01	3.28E-01	3.41E-01	7.34E-01	U	pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	10/11/2019	19-09016	Strontium-90	EiChroM SRW01 Modified	2.13E-01	3.20E-01	3.28E-01	6.60E-01	U	pCi/g	
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	10/11/2019	19-09016	Strontium-90	EiChroM SRW01 Modified	2.18E-01	3.62E-01	3.70E-01	7.50E-01	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	10/11/2019	19-09016	Strontium-90	EiChroM SRW01 Modified	-2.03E-01	3.92E-01	3.98E-01	8.59E-01	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	10/11/2019	19-09016	Strontium-90	EiChroM SRW01 Modified	-2.93E-01	3.91E-01	4.04E-01	8.71E-01	U	pCi/g	
19-09016-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Cobalt-60	EPA 901.1 Modified	1.31E+02	5.10E+00				pCi/g	
19-09016-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Cesium-137	EPA 901.1 Modified	8.26E+01	3.39E+00				pCi/g	
19-09016-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Cobalt-60	EPA 901.1 Modified	1.34E+02	8.67E+00	1.11E+01	1.45E+00		pCi/g	
19-09016-01	LCS	SPIKE	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Cesium-137	EPA 901.1 Modified	8.53E+01	9.37E+00	1.03E+01	1.79E+00		pCi/g	

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

<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:						Work Order Details:						
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099						SDG:	19-09016					
									Purchase Order:	677118					
									Analysis Category:	ENVIRONMENTAL					
						Sample Matrix:		SO							
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Actinium-228	EPA 901.1 Modified	4.26E-02	9.34E-02	9.34E-02	1.81E-01	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Silver-108m	EPA 901.1 Modified	-5.10E-03	2.99E-02	2.99E-02	3.69E-02	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Americium-241	EPA 901.1 Modified	-9.88E-03	4.18E-02	4.18E-02	6.08E-02	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Barium-133	EPA 901.1 Modified	-1.08E-02	4.33E-02	4.33E-02	5.59E-02	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Bismuth-214	EPA 901.1 Modified	1.18E-01	7.10E-02	7.12E-02	1.03E-01		pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Cobalt-60	EPA 901.1 Modified	2.51E-02	3.03E-02	3.04E-02	5.05E-02	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Cesium-134	EPA 901.1 Modified	1.26E-02	2.10E-02	2.10E-02	4.02E-02	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Cesium-137	EPA 901.1 Modified	2.23E-02	2.63E-02	2.63E-02	5.10E-02	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Europium-152	EPA 901.1 Modified	-8.30E-03	9.60E-02	9.60E-02	8.90E-02	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Europium-154	EPA 901.1 Modified	7.96E-03	8.76E-02	8.76E-02	4.63E-02	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Europium-155	EPA 901.1 Modified	-1.18E-02	4.52E-02	4.52E-02	6.61E-02	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Holmium-166m	EPA 901.1 Modified	9.09E-03	6.16E-02	6.16E-02	3.71E-02	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Iodine-129	EPA 901.1 Modified	-3.87E-02	3.73E-02	3.74E-02	4.96E-02	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Potassium-40	EPA 901.1 Modified	-1.56E-01	4.66E-01	4.66E-01	5.85E-01	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Manganese-54	EPA 901.1 Modified	2.92E-02	3.09E-02	3.09E-02	6.25E-02	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Molybdenum-93	EPA 901.1 Modified	-5.49E-03	1.40E-02	1.40E-02	4.95E-02	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Niobium-94	EPA 901.1 Modified	2.18E-02	2.75E-02	2.75E-02	5.08E-02	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Lead-210	EPA 901.1 Modified	3.32E-01	3.59E-01	3.59E-01	5.97E-01	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Lead-212	EPA 901.1 Modified	1.01E-02	3.82E-02	3.82E-02	6.12E-02	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Lead-214	EPA 901.1 Modified	2.54E-02	4.90E-02	4.91E-02	8.47E-02	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Promethium-145	EPA 901.1 Modified	4.22E-02	3.99E-02	4.00E-02	6.62E-02	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Radium-226	EPA 901.1 Modified	1.18E-01	7.10E-02	7.12E-02	1.03E-01		pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Antimony-125	EPA 901.1 Modified	3.12E-03	6.29E-02	6.29E-02	1.24E-01	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Thorium-234	EPA 901.1 Modified	2.21E-01	3.69E-01	3.69E-01	5.86E-01	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Thallium-208	EPA 901.1 Modified	5.28E-02	9.82E-02	9.82E-02	1.60E-01	U	pCi/g	
19-09016-02	MBL	BLANK	09/05/19 00:00	9/3/2019	9/18/2019	19-09016	Uranium-235	EPA 901.1 Modified	9.58E-02	1.31E-01	1.31E-01	2.12E-01	U	pCi/g	

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

<h1>Eberline Analytical</h1> <h2>Final Report of Analysis</h2>			Report To:					Work Order Details:						
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG:	19-09016					
								Purchase Order:	677118					
								Analysis Category:	ENVIRONMENTAL					
					Sample Matrix:		SO							
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Actinium-228	EPA 901.1 Modified	9.86E-01	3.62E-01	3.65E-01	7.64E-01		pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Silver-108m	EPA 901.1 Modified	-8.34E-02	9.08E-02	9.09E-02	1.22E-01	U	pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Americium-241	EPA 901.1 Modified	-1.23E-01	2.09E-01	2.09E-01	2.59E-01	U	pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Barium-133	EPA 901.1 Modified	7.17E-02	7.15E-02	7.15E-02	1.91E-01	U	pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Bismuth-214	EPA 901.1 Modified	1.11E+00	2.27E-01	2.34E-01	3.65E-01		pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Cobalt-60	EPA 901.1 Modified	2.22E+00	2.19E-01	2.47E-01	1.45E-01		pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Cesium-134	EPA 901.1 Modified	-5.68E-03	5.60E-02	5.60E-02	1.06E-01	U	pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Cesium-137	EPA 901.1 Modified	1.11E+01	1.26E+00	1.39E+00	2.24E-01		pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Europium-152	EPA 901.1 Modified	-1.32E-03	3.55E-01	3.55E-01	3.44E-01	U	pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Europium-154	EPA 901.1 Modified	-3.28E-02	2.40E-01	2.40E-01	1.80E-01	U	pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Europium-155	EPA 901.1 Modified	4.99E-01	2.18E-01	2.19E-01	2.64E-01	U	pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Holmium-166m	EPA 901.1 Modified	4.58E-03	1.36E-01	1.36E-01	1.47E-01	U	pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Iodine-129	EPA 901.1 Modified	-5.20E+00	2.23E+01	2.23E+01	5.46E+00	U	pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Potassium-40	EPA 901.1 Modified	2.49E+01	3.24E+00	3.48E+00	1.20E+00		pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Manganese-54	EPA 901.1 Modified	-2.65E-02	9.72E-02	9.73E-02	1.42E-01	U	pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Molybdenum-93	EPA 901.1 Modified	-3.09E-03	7.04E-02	7.04E-02	8.69E-02	U	pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Niobium-94	EPA 901.1 Modified	5.35E-02	8.65E-02	8.66E-02	1.14E-01	U	pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Lead-210	EPA 901.1 Modified	8.68E+00	4.31E+00	4.33E+00	6.65E+00		pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Lead-212	EPA 901.1 Modified	1.15E+00	2.01E-01	2.09E-01	4.47E-01		pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Lead-214	EPA 901.1 Modified	1.38E+00	2.84E-01	2.93E-01	5.21E-01		pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Promethium-145	EPA 901.1 Modified	2.90E+00	1.90E+00	1.91E+00	1.67E+00	U	pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Radium-226	EPA 901.1 Modified	1.11E+00	2.27E-01	2.34E-01	3.65E-01		pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Antimony-125	EPA 901.1 Modified	-1.44E-01	2.83E-01	2.83E-01	4.42E-01	U	pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Thorium-234	EPA 901.1 Modified	1.00E+00	1.85E+00	1.85E+00	2.45E+00	U	pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Thallium-208	EPA 901.1 Modified	6.42E-01	1.61E-01	1.64E-01	1.36E-01		pCi/g
19-09016-03	DUP	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Uranium-235	EPA 901.1 Modified	9.01E-02	5.94E-01	5.94E-01	7.74E-01	U	pCi/g

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



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<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:							
			Patricia Giza					SDG: 19-09016							
			Zion Solutions					Purchase Order: 677118		Analysis Category: ENVIRONMENTAL					
			2701 Deborah Ave					Sample Matrix: SO							
Zion, IL 60099															
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Actinium-228	EPA 901.1 Modified	1.32E+00	3.74E-01	3.80E-01	7.43E-01		pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Silver-108m	EPA 901.1 Modified	-4.37E-03	4.37E-02	4.37E-02	1.32E-01	U	pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Americium-241	EPA 901.1 Modified	4.22E-02	1.96E-01	1.96E-01	2.55E-01	U	pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Barium-133	EPA 901.1 Modified	4.37E-02	9.66E-02	9.66E-02	1.91E-01	U	pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Bismuth-214	EPA 901.1 Modified	1.21E+00	2.20E-01	2.29E-01	2.73E-01		pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Cobalt-60	EPA 901.1 Modified	2.21E+00	2.22E-01	2.50E-01	1.69E-01		pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Cesium-134	EPA 901.1 Modified	3.17E-02	5.28E-02	5.28E-02	1.05E-01	U	pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Cesium-137	EPA 901.1 Modified	1.11E+01	1.26E+00	1.38E+00	2.41E-01		pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Europium-152	EPA 901.1 Modified	-9.22E-02	3.75E-01	3.75E-01	3.45E-01	U	pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Europium-154	EPA 901.1 Modified	7.29E-02	2.28E-01	2.28E-01	1.78E-01	U	pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Europium-155	EPA 901.1 Modified	2.12E-01	1.85E-01	1.85E-01	2.94E-01	U	pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Holmium-166m	EPA 901.1 Modified	4.59E-02	1.26E-01	1.26E-01	1.43E-01	U	pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Iodine-129	EPA 901.1 Modified	-1.03E+01	4.28E+01	4.29E+01	5.54E+00	U	pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Potassium-40	EPA 901.1 Modified	2.35E+01	3.15E+00	3.37E+00	1.58E+00		pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Manganese-54	EPA 901.1 Modified	-1.21E-02	6.33E-02	6.33E-02	1.43E-01	U	pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Molybdenum-93	EPA 901.1 Modified	3.30E-02	7.05E-02	7.05E-02	9.63E-02	U	pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Niobium-94	EPA 901.1 Modified	-4.93E-02	8.14E-02	8.15E-02	1.15E-01	U	pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Lead-210	EPA 901.1 Modified	4.05E+00	2.65E+00	2.65E+00	4.21E+00	U	pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Lead-212	EPA 901.1 Modified	6.83E-01	2.31E-01	2.33E-01	3.31E-01	U	pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Lead-214	EPA 901.1 Modified	1.27E+00	2.56E-01	2.64E-01	4.72E-01		pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Promethium-145	EPA 901.1 Modified	2.43E+00	1.71E+00	1.71E+00	1.73E+00	U	pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Radium-226	EPA 901.1 Modified	1.21E+00	2.20E-01	2.29E-01	2.73E-01		pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Antimony-125	EPA 901.1 Modified	-3.92E-02	2.61E-01	2.61E-01	4.22E-01	U	pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Thorium-234	EPA 901.1 Modified	1.86E+00	1.79E+00	1.80E+00	2.44E+00	U	pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Thallium-208	EPA 901.1 Modified	6.99E-01	1.73E-01	1.77E-01	1.89E-01		pCi/g	
19-09016-04	DO	L1-10221D-FIGS-002-SS-A	06/27/19 09:20	9/3/2019	9/18/2019	19-09016	Uranium-235	EPA 901.1 Modified	5.41E-02	5.99E-01	5.99E-01	7.81E-01	U	pCi/g	

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



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<h1 style="margin: 0;">Eberline Analytical</h1> <h2 style="margin: 0;">Final Report of Analysis</h2>			Report To:						Work Order Details:						
			<b>Patricia Giza</b> <b>Zion Solutions</b> <b>2701 Deborah Ave</b> <b>Zion, IL 60099</b>						SDG:	<b>19-09016</b>					
									Purchase Order:	677118					
									Analysis Category:	ENVIRONMENTAL					
						Sample Matrix:		SO							
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Actinium-228	EPA 901.1 Modified	6.33E-01	5.32E-01	5.33E-01	8.79E-01	U	pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Silver-108m	EPA 901.1 Modified	-5.16E-02	1.14E-01	1.14E-01	1.44E-01	U	pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Americium-241	EPA 901.1 Modified	-1.19E-01	1.02E-01	1.02E-01	1.38E-01	U	pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Barium-133	EPA 901.1 Modified	4.25E-02	1.29E-01	1.29E-01	1.61E-01	U	pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Bismuth-214	EPA 901.1 Modified	4.15E-01	2.81E-01	2.82E-01	4.78E-01	U	pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Cobalt-60	EPA 901.1 Modified	5.95E+00	5.64E-01	6.41E-01	2.67E-01		pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Cesium-134	EPA 901.1 Modified	3.88E-02	5.78E-02	5.79E-02	1.66E-01	U	pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Cesium-137	EPA 901.1 Modified	2.56E+00	3.13E-01	3.40E-01	2.39E-01		pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Europium-152	EPA 901.1 Modified	5.24E-02	1.73E-01	1.73E-01	2.40E-01	U	pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Europium-154	EPA 901.1 Modified	-2.28E-01	3.54E-01	3.54E-01	1.25E-01	U	pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Europium-155	EPA 901.1 Modified	1.77E-01	1.18E-01	1.19E-01	2.23E-01	U	pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Holmium-166m	EPA 901.1 Modified	-1.22E-01	1.78E-01	1.78E-01	1.04E-01	U	pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Iodine-129	EPA 901.1 Modified	3.20E-02	2.76E-01	2.76E-01	4.05E-01	U	pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Potassium-40	EPA 901.1 Modified	1.64E+01	3.24E+00	3.34E+00	9.27E-01		pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Manganese-54	EPA 901.1 Modified	1.31E-02	1.44E-01	1.44E-01	2.22E-01	U	pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Molybdenum-93	EPA 901.1 Modified	-2.46E-03	9.45E-02	9.45E-02	1.47E-01	U	pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Niobium-94	EPA 901.1 Modified	1.23E-01	1.21E-01	1.21E-01	1.50E-01	U	pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Lead-210	EPA 901.1 Modified	2.85E+00	1.28E+00	1.28E+00	2.02E+00		pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Lead-212	EPA 901.1 Modified	5.56E-01	1.39E-01	1.42E-01	3.16E-01		pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Lead-214	EPA 901.1 Modified	6.57E-01	1.83E-01	1.86E-01	3.94E-01		pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Promethium-145	EPA 901.1 Modified	1.03E-03	1.85E-01	1.85E-01	2.69E-01	U	pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Radium-226	EPA 901.1 Modified	4.15E-01	2.81E-01	2.82E-01	4.78E-01	U	pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Antimony-125	EPA 901.1 Modified	-1.08E-01	3.27E-01	3.27E-01	4.34E-01	U	pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Thorium-234	EPA 901.1 Modified	8.02E-01	8.94E-01	8.95E-01	1.35E+00	U	pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Thallium-208	EPA 901.1 Modified	3.82E-01	3.09E-01	3.10E-01	5.12E-01	U	pCi/g	
19-09016-05	TRG	L1-10221D-FIGS-022-SS-A	07/17/19 08:34	9/3/2019	9/18/2019	19-09016	Uranium-235	EPA 901.1 Modified	1.74E-01	3.53E-01	3.54E-01	5.29E-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

<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:								
			Patricia Giza					SDG:	19-09016							
			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		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Actinium-228	EPA 901.1 Modified	3.41E-01	1.50E-01	1.51E-01	4.44E-01	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Silver-108m	EPA 901.1 Modified	-3.40E-02	4.77E-02	4.77E-02	6.43E-02	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Americium-241	EPA 901.1 Modified	-6.25E-02	6.40E-02	6.41E-02	8.70E-02	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Barium-133	EPA 901.1 Modified	1.12E-02	2.66E-02	2.66E-02	9.78E-02	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Bismuth-214	EPA 901.1 Modified	3.47E-01	9.01E-02	9.18E-02	2.58E-01	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Cobalt-60	EPA 901.1 Modified	7.69E-02	4.95E-02	4.97E-02	1.12E-01	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Cesium-134	EPA 901.1 Modified	-1.64E-01	8.20E-02	8.24E-02	7.40E-02	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Cesium-137	EPA 901.1 Modified	2.42E-01	7.93E-02	8.03E-02	1.11E-01	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Europium-152	EPA 901.1 Modified	-6.52E-03	1.42E-01	1.42E-01	1.42E-01	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Europium-154	EPA 901.1 Modified	2.13E-02	1.76E-01	1.76E-01	7.38E-02	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Europium-155	EPA 901.1 Modified	1.10E-01	7.41E-02	7.44E-02	1.42E-01	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Holmium-166m	EPA 901.1 Modified	-2.53E-02	8.01E-02	8.01E-02	6.09E-02	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Iodine-129	EPA 901.1 Modified	-1.03E-01	1.73E-01	1.73E-01	2.39E-01	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Potassium-40	EPA 901.1 Modified	1.14E+01	2.35E+00	2.42E+00	1.12E+00	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Manganese-54	EPA 901.1 Modified	1.39E-03	5.22E-02	5.22E-02	8.55E-02	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Molybdenum-93	EPA 901.1 Modified	-2.65E-02	4.01E-02	4.01E-02	5.83E-02	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Niobium-94	EPA 901.1 Modified	3.99E-02	3.81E-02	3.81E-02	6.46E-02	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Lead-210	EPA 901.1 Modified	9.71E-01	1.02E+00	1.03E+00	1.71E+00	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Lead-212	EPA 901.1 Modified	3.61E-01	8.40E-02	8.60E-02	1.73E-01	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Lead-214	EPA 901.1 Modified	4.10E-01	1.09E-01	1.11E-01	1.64E-01	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Promethium-145	EPA 901.1 Modified	2.67E-02	9.83E-02	9.83E-02	1.62E-01	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Radium-226	EPA 901.1 Modified	3.47E-01	9.01E-02	9.18E-02	2.58E-01	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Antimony-125	EPA 901.1 Modified	-9.68E-03	1.44E-01	1.44E-01	1.94E-01	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Thorium-234	EPA 901.1 Modified	8.09E-01	5.52E-01	5.53E-01	8.56E-01	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Thallium-208	EPA 901.1 Modified	4.03E-01	1.88E-01	1.89E-01	2.89E-01	U	pCi/g		
19-09016-06	TRG	L1-10221D-FIGS-012-SS-A	07/09/19 08:49	9/3/2019	9/18/2019	19-09016	Uranium-235	EPA 901.1 Modified	7.93E-02	2.14E-01	2.14E-01	3.22E-01	U	pCi/g		

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



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			Patricia Giza					SDG: <b>19-09016</b>							
			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	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Actinium-228	EPA 901.1 Modified	1.26E+00	6.73E-01	6.76E-01	1.19E+00		pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Silver-108m	EPA 901.1 Modified	2.25E-02	1.56E-01	1.56E-01	2.50E-01	U	pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Americium-241	EPA 901.1 Modified	-2.00E-02	8.28E-02	8.28E-02	3.21E-01	U	pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Barium-133	EPA 901.1 Modified	-4.16E-02	1.61E-01	1.61E-01	3.92E-01	U	pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Bismuth-214	EPA 901.1 Modified	1.10E+00	4.10E-01	4.14E-01	9.15E-01		pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Cobalt-60	EPA 901.1 Modified	1.26E+00	2.26E-01	2.35E-01	2.60E-01		pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Cesium-134	EPA 901.1 Modified	-4.99E-01	2.71E-01	2.72E-01	2.64E-01	U	pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Cesium-137	EPA 901.1 Modified	8.02E+00	9.86E-01	1.07E+00	3.16E-01		pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Europium-152	EPA 901.1 Modified	3.44E-02	3.56E-01	3.56E-01	5.21E-01	U	pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Europium-154	EPA 901.1 Modified	-7.60E-02	1.41E-01	1.41E-01	2.66E-01	U	pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Europium-155	EPA 901.1 Modified	3.92E-01	1.80E-01	1.81E-01	6.05E-01	U	pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Holmium-166m	EPA 901.1 Modified	2.91E-01	1.98E-01	1.99E-01	3.36E-01	U	pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Iodine-129	EPA 901.1 Modified	4.35E-01	2.02E-01	2.03E-01	3.15E-01	U	pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Potassium-40	EPA 901.1 Modified	2.16E+01	3.54E+00	3.71E+00	1.31E+00		pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Manganese-54	EPA 901.1 Modified	-1.73E-01	1.90E-01	1.91E-01	2.64E-01	U	pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Molybdenum-93	EPA 901.1 Modified	6.26E-02	1.64E-01	1.64E-01	2.00E-01	U	pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Niobium-94	EPA 901.1 Modified	2.27E-02	1.48E-01	1.48E-01	2.05E-01	U	pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Lead-210	EPA 901.1 Modified	5.12E+00	2.36E+00	2.37E+00	3.77E+00	U	pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Lead-212	EPA 901.1 Modified	9.87E-01	2.69E-01	2.73E-01	6.12E-01		pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Lead-214	EPA 901.1 Modified	1.11E+00	3.60E-01	3.64E-01	6.51E-01		pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Promethium-145	EPA 901.1 Modified	9.00E-02	1.78E-01	1.78E-01	3.46E-01	U	pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Radium-226	EPA 901.1 Modified	1.10E+00	4.10E-01	4.14E-01	9.15E-01		pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Antimony-125	EPA 901.1 Modified	6.07E-02	6.44E-01	6.44E-01	8.87E-01	U	pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Thorium-234	EPA 901.1 Modified	3.38E+00	3.39E+00	3.40E+00	5.67E+00	U	pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Thallium-208	EPA 901.1 Modified	9.10E-01	3.65E-01	3.68E-01	1.33E-01		pCi/g	
19-09016-07	TRG	L1-10221D-FIGS-003-SS-A	06/27/19 09:34	9/3/2019	9/18/2019	19-09016	Uranium-235	EPA 901.1 Modified	-1.84E-01	7.40E-01	7.40E-01	1.07E+00	U	pCi/g	

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



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			2701 Deborah Ave					Analysis Category:	ENVIRONMENTAL							
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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		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Actinium-228	EPA 901.1 Modified	5.95E-01	1.85E-01	1.88E-01	3.95E-01		pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Silver-108m	EPA 901.1 Modified	-7.02E-03	4.18E-02	4.18E-02	7.65E-02	U	pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Americium-241	EPA 901.1 Modified	9.26E-02	1.24E-01	1.24E-01	1.73E-01	U	pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Barium-133	EPA 901.1 Modified	7.79E-02	6.91E-02	6.92E-02	1.17E-01	U	pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Bismuth-214	EPA 901.1 Modified	5.28E-01	1.50E-01	1.52E-01	2.46E-01		pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Cobalt-60	EPA 901.1 Modified	3.75E-01	7.71E-02	7.94E-02	1.23E-01		pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Cesium-134	EPA 901.1 Modified	6.56E-03	2.28E-02	2.28E-02	7.06E-02	U	pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Cesium-137	EPA 901.1 Modified	2.41E+00	3.09E-01	3.33E-01	1.07E-01		pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Europium-152	EPA 901.1 Modified	-7.07E-03	2.88E-01	2.88E-01	2.33E-01	U	pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Europium-154	EPA 901.1 Modified	9.79E-03	1.55E-01	1.55E-01	1.18E-01	U	pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Europium-155	EPA 901.1 Modified	1.75E-01	1.26E-01	1.26E-01	1.71E-01	U	pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Holmium-166m	EPA 901.1 Modified	-1.24E-02	9.61E-02	9.61E-02	9.51E-02	U	pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Iodine-129	EPA 901.1 Modified	-1.50E+00	7.89E+00	7.89E+00	4.40E+00	U	pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Potassium-40	EPA 901.1 Modified	1.36E+01	2.07E+00	2.18E+00	1.16E+00		pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Manganese-54	EPA 901.1 Modified	2.40E-02	6.14E-02	6.14E-02	1.01E-01	U	pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Molybdenum-93	EPA 901.1 Modified	2.70E-02	4.26E-02	4.26E-02	7.26E-02	U	pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Niobium-94	EPA 901.1 Modified	-5.91E-02	4.98E-02	4.98E-02	5.57E-02	U	pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Lead-210	EPA 901.1 Modified	3.01E+00	2.00E+00	2.01E+00	3.25E+00	U	pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Lead-212	EPA 901.1 Modified	5.51E-01	1.20E-01	1.23E-01	2.92E-01		pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Lead-214	EPA 901.1 Modified	4.11E-01	1.55E-01	1.56E-01	2.63E-01		pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Promethium-145	EPA 901.1 Modified	9.03E-01	9.47E-01	9.48E-01	1.28E+00	U	pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Radium-226	EPA 901.1 Modified	5.28E-01	1.50E-01	1.52E-01	2.46E-01		pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Antimony-125	EPA 901.1 Modified	-1.67E-03	1.58E-01	1.58E-01	2.61E-01	U	pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Thorium-234	EPA 901.1 Modified	9.57E-01	1.22E+00	1.23E+00	1.68E+00	U	pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Thallium-208	EPA 901.1 Modified	3.44E-01	1.04E-01	1.05E-01	1.25E-01		pCi/g		
19-09016-08	TRG	L1-10221D-FIGS-021-SS-A	07/17/19 08:32	9/3/2019	9/18/2019	19-09016	Uranium-235	EPA 901.1 Modified	1.85E-01	3.77E-01	3.77E-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



**EBERLINE ANALYTICAL CORPORATION**

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

<h1>Eberline Analytical</h1> <h2>Final Report of Analysis</h2>			Report To:					Work Order Details:							
			Patricia Giza					SDG: 19-09016							
			Zion Solutions					Purchase Order: 677118			Analysis Category: ENVIRONMENTAL				
			2701 Deborah Ave					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	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Actinium-228	EPA 901.1 Modified	1.41E+00	4.79E-01	4.84E-01	1.02E+00		pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Silver-108m	EPA 901.1 Modified	-2.00E-02	5.74E-02	5.74E-02	1.74E-01	U	pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Americium-241	EPA 901.1 Modified	-3.08E-01	1.50E-01	1.51E-01	1.97E-01	U	pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Barium-133	EPA 901.1 Modified	2.87E-02	6.71E-02	6.71E-02	2.33E-01	U	pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Bismuth-214	EPA 901.1 Modified	1.07E+00	3.24E-01	3.29E-01	1.80E-01		pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Cobalt-60	EPA 901.1 Modified	3.10E+00	3.30E-01	3.66E-01	3.03E-01		pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Cesium-134	EPA 901.1 Modified	1.17E-02	6.03E-02	6.03E-02	2.09E-01	U	pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Cesium-137	EPA 901.1 Modified	1.20E+01	1.16E+00	1.31E+00	3.04E-01		pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Europium-152	EPA 901.1 Modified	-8.47E-02	2.71E-01	2.71E-01	3.47E-01	U	pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Europium-154	EPA 901.1 Modified	1.31E-01	3.45E-01	3.45E-01	1.79E-01	U	pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Europium-155	EPA 901.1 Modified	2.66E-01	1.72E-01	1.72E-01	3.24E-01	U	pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Holmium-166m	EPA 901.1 Modified	4.74E-02	1.70E-01	1.70E-01	1.48E-01	U	pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Iodine-129	EPA 901.1 Modified	1.42E-02	1.52E-01	1.52E-01	6.20E-01	U	pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Potassium-40	EPA 901.1 Modified	3.31E+01	5.95E+00	6.19E+00	1.40E+00		pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Manganese-54	EPA 901.1 Modified	-7.16E-02	1.22E-01	1.22E-01	1.97E-01	U	pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Molybdenum-93	EPA 901.1 Modified	5.48E-02	8.66E-02	8.66E-02	1.43E-01	U	pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Niobium-94	EPA 901.1 Modified	2.60E-02	1.14E-01	1.14E-01	1.52E-01	U	pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Lead-210	EPA 901.1 Modified	2.97E+00	1.68E+00	1.69E+00	2.73E+00		pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Lead-212	EPA 901.1 Modified	1.11E+00	2.31E-01	2.38E-01	4.22E-01		pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Lead-214	EPA 901.1 Modified	1.08E+00	3.05E-01	3.10E-01	5.77E-01		pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Promethium-145	EPA 901.1 Modified	-4.51E-01	2.98E-01	2.98E-01	3.90E-01	U	pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Radium-226	EPA 901.1 Modified	1.07E+00	3.24E-01	3.29E-01	1.80E-01		pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Antimony-125	EPA 901.1 Modified	-4.65E-01	5.29E-01	5.29E-01	6.76E-01	U	pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Thonium-234	EPA 901.1 Modified	7.82E-01	1.29E+00	1.29E+00	1.90E+00	U	pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Thallium-208	EPA 901.1 Modified	7.86E-01	4.43E-01	4.44E-01	7.23E-01		pCi/g	
19-09016-09	TRG	L1-10221D-FIGS-001-SS-A	06/27/19 09:30	9/3/2019	9/18/2019	19-09016	Uranium-235	EPA 901.1 Modified	3.71E-02	5.15E-01	5.15E-01	7.49E-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

<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:								
			Patricia Giza					SDG:	19-09016							
			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		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Actinium-228	EPA 901.1 Modified	2.27E-01	3.86E-01	3.87E-01	6.66E-01	U	pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Silver-108m	EPA 901.1 Modified	8.09E-02	8.47E-02	8.48E-02	1.36E-01	U	pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Americium-241	EPA 901.1 Modified	-2.05E-01	1.38E-01	1.38E-01	1.81E-01	U	pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Barium-133	EPA 901.1 Modified	1.32E-01	1.58E-01	1.58E-01	2.08E-01	U	pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Bismuth-214	EPA 901.1 Modified	5.42E-01	2.33E-01	2.35E-01	3.68E-01		pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Cobalt-60	EPA 901.1 Modified	3.52E-01	1.09E-01	1.11E-01	1.37E-01		pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Cesium-134	EPA 901.1 Modified	-1.99E-02	5.31E-02	5.31E-02	1.60E-01	U	pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Cesium-137	EPA 901.1 Modified	1.37E+00	2.29E-01	2.39E-01	1.65E-01		pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Europium-152	EPA 901.1 Modified	-1.57E-02	1.23E-01	1.23E-01	2.83E-01	U	pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Europium-154	EPA 901.1 Modified	-9.75E-02	2.80E-01	2.80E-01	1.46E-01	U	pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Europium-155	EPA 901.1 Modified	8.65E-02	1.23E-01	1.23E-01	2.39E-01	U	pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Holmium-166m	EPA 901.1 Modified	1.14E-01	1.36E-01	1.36E-01	1.06E-01	U	pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Iodine-129	EPA 901.1 Modified	-2.87E-03	9.93E-02	9.93E-02	1.46E-01	U	pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Potassium-40	EPA 901.1 Modified	1.40E+01	2.36E+00	2.46E+00	1.03E+00		pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Manganese-54	EPA 901.1 Modified	-1.65E-02	1.18E-01	1.18E-01	1.88E-01	U	pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Molybdenum-93	EPA 901.1 Modified	-1.90E-02	9.51E-02	9.51E-02	9.87E-02	U	pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Niobium-94	EPA 901.1 Modified	4.11E-02	8.71E-02	8.71E-02	1.23E-01	U	pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Lead-210	EPA 901.1 Modified	3.97E-01	1.06E+00	1.06E+00	1.59E+00	U	pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Lead-212	EPA 901.1 Modified	7.48E-01	1.51E-01	1.56E-01	3.42E-01		pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Lead-214	EPA 901.1 Modified	5.28E-01	2.00E-01	2.02E-01	5.12E-01		pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Promethium-145	EPA 901.1 Modified	-7.47E-02	1.21E-01	1.21E-01	1.70E-01	U	pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Radium-226	EPA 901.1 Modified	5.42E-01	2.33E-01	2.35E-01	3.68E-01		pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Antimony-125	EPA 901.1 Modified	-7.34E-02	2.21E-01	2.21E-01	4.15E-01	U	pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Thorium-234	EPA 901.1 Modified	9.26E-01	1.20E+00	1.21E+00	1.83E+00	U	pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Thallium-208	EPA 901.1 Modified	6.86E-01	2.16E-01	2.19E-01	9.07E-02		pCi/g		
19-09016-10	TRG	L1-10221A-QIGS-001-SB-A	06/26/19 10:00	9/3/2019	9/18/2019	19-09016	Uranium-235	EPA 901.1 Modified	-1.59E-01	4.01E-01	4.01E-01	5.74E-01	U	pCi/g		

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



EBERLINE ANALYTICAL CORPORATION

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

<h1 style="margin: 0;">Eberline Analytical</h1> <h2 style="margin: 0;">Final Report of Analysis</h2>			Report To:					Work Order Details:							
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG:	19-09016						
								Purchase Order:	677118						
								Analysis Category:	ENVIRONMENTAL						
					Sample Matrix:		SO								
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Actinium-228	EPA 901.1 Modified	3.97E-01	1.95E-01	1.96E-01	3.80E-01	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Silver-108m	EPA 901.1 Modified	-3.81E-02	6.92E-02	6.93E-02	4.91E-02	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Americium-241	EPA 901.1 Modified	-4.16E-02	1.09E-01	1.09E-01	1.37E-01	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Barium-133	EPA 901.1 Modified	-6.34E-03	2.33E-02	2.33E-02	7.06E-02	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Bismuth-214	EPA 901.1 Modified	1.21E-01	1.14E-01	1.14E-01	1.87E-01	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Cobalt-60	EPA 901.1 Modified	-2.97E-02	4.80E-02	4.80E-02	6.57E-02	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Cesium-134	EPA 901.1 Modified	1.85E-02	3.08E-02	3.08E-02	6.50E-02	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Cesium-137	EPA 901.1 Modified	-5.80E-02	5.78E-02	5.79E-02	7.55E-02	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Europium-152	EPA 901.1 Modified	7.16E-02	1.80E-01	1.80E-01	1.77E-01	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Europium-154	EPA 901.1 Modified	2.29E-02	1.39E-01	1.39E-01	9.46E-02	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Europium-155	EPA 901.1 Modified	7.53E-02	9.84E-02	9.85E-02	1.36E-01	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Holmium-166m	EPA 901.1 Modified	4.19E-03	8.40E-02	8.40E-02	6.83E-02	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Iodine-129	EPA 901.1 Modified	4.19E+00	1.76E+01	1.76E+01	3.64E+00	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Potassium-40	EPA 901.1 Modified	9.45E+00	1.59E+00	1.66E+00	1.02E+00		pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Manganese-54	EPA 901.1 Modified	9.55E-03	4.53E-02	4.53E-02	8.11E-02	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Molybdenum-93	EPA 901.1 Modified	-1.71E-02	3.90E-02	3.90E-02	5.57E-02	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Niobium-94	EPA 901.1 Modified	-1.07E-02	4.09E-02	4.09E-02	5.96E-02	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Lead-210	EPA 901.1 Modified	4.27E-01	1.41E+00	1.41E+00	2.23E+00	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Lead-212	EPA 901.1 Modified	4.32E-01	9.76E-02	1.00E-01	2.56E-01		pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Lead-214	EPA 901.1 Modified	3.22E-01	1.32E-01	1.33E-01	1.93E-01		pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Promethium-145	EPA 901.1 Modified	6.86E-01	7.96E-01	7.97E-01	1.11E+00	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Radium-226	EPA 901.1 Modified	1.21E-01	1.14E-01	1.14E-01	1.87E-01	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Antimony-125	EPA 901.1 Modified	-2.52E-02	1.09E-01	1.09E-01	1.77E-01	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Thorium-234	EPA 901.1 Modified	6.99E-01	9.38E-01	9.39E-01	1.31E+00	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Thallium-208	EPA 901.1 Modified	2.17E-01	1.12E-01	1.12E-01	2.24E-01	U	pCi/g	
19-09016-11	TRG	L1-10221A-FJGS-007-SS-A	06/17/19 08:56	9/3/2019	9/18/2019	19-09016	Uranium-235	EPA 901.1 Modified	-2.35E-01	3.28E-01	3.28E-01	3.80E-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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<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:							
			Patricia Giza					SDG:		19-09016					
			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	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Actinium-228	EPA 901.1 Modified	2.66E-01	1.54E-01	1.55E-01	3.16E-01	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Silver-108m	EPA 901.1 Modified	-1.61E-02	5.04E-02	5.04E-02	6.36E-02	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Americium-241	EPA 901.1 Modified	-1.53E-01	7.81E-02	7.85E-02	9.47E-02	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Barium-133	EPA 901.1 Modified	-8.49E-03	2.57E-02	2.57E-02	1.05E-01	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Bismuth-214	EPA 901.1 Modified	2.40E-01	1.20E-01	1.21E-01	1.87E-01	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Cobalt-60	EPA 901.1 Modified	1.04E-01	4.32E-02	4.35E-02	6.95E-02	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Cesium-134	EPA 901.1 Modified	1.50E-02	2.87E-02	2.87E-02	8.51E-02	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Cesium-137	EPA 901.1 Modified	1.26E-01	7.47E-02	7.49E-02	1.15E-01	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Europium-152	EPA 901.1 Modified	5.97E-02	1.45E-01	1.45E-01	1.42E-01	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Europium-154	EPA 901.1 Modified	7.46E-02	1.84E-01	1.84E-01	7.22E-02	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Europium-155	EPA 901.1 Modified	5.60E-02	7.07E-02	7.08E-02	1.09E-01	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Holmium-166m	EPA 901.1 Modified	-1.81E-02	8.60E-02	8.60E-02	6.46E-02	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Iodine-129	EPA 901.1 Modified	1.38E-01	2.03E-01	2.03E-01	3.01E-01	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Potassium-40	EPA 901.1 Modified	7.45E+00	1.82E+00	1.86E+00	9.98E-01	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Manganese-54	EPA 901.1 Modified	-3.44E-03	5.99E-02	5.99E-02	9.47E-02	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Molybdenum-93	EPA 901.1 Modified	-2.32E-02	4.17E-02	4.17E-02	6.24E-02	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Niobium-94	EPA 901.1 Modified	4.05E-02	4.29E-02	4.30E-02	7.66E-02	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Lead-210	EPA 901.1 Modified	1.06E+00	8.46E-01	8.48E-01	1.48E+00	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Lead-212	EPA 901.1 Modified	2.79E-01	8.04E-02	8.16E-02	1.80E-01	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Lead-214	EPA 901.1 Modified	3.24E-01	8.96E-02	9.11E-02	1.73E-01	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Promethium-145	EPA 901.1 Modified	-1.52E-01	1.34E-01	1.35E-01	1.82E-01	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Radium-226	EPA 901.1 Modified	2.40E-01	1.20E-01	1.21E-01	1.87E-01	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Antimony-125	EPA 901.1 Modified	3.02E-03	1.52E-01	1.52E-01	2.16E-01	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Thorium-234	EPA 901.1 Modified	8.22E-01	6.19E-01	6.21E-01	9.78E-01	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Thallium-208	EPA 901.1 Modified	2.40E-01	1.49E-01	1.49E-01	2.33E-01	U	pCi/g	
19-09016-12	TRG	L1-10221B-FJGS-002-SS-A	06/17/19 08:30	9/3/2019	9/18/2019	19-09016	Uranium-235	EPA 901.1 Modified	-2.14E-02	2.19E-01	2.19E-01	3.20E-01	U	pCi/g	

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



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

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

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REC'D SEP 03 2019

18-09016

8	L1-10221D-FIGS-021-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/17/19	0832	5 ROC HTD	NA	606.23g
9	L1-10221D-FIGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/27/19	0930	5 ROC HTD	NA	709.53g
Laboratory:				Date Submitted To Lab:				Ship Container No.:		Cooler Temperature: FULL SUITE		Airbill Number:	
<b>EBERLINE LABS</b>								<b>NA</b>		<b>N/A</b>		Various For FedEx Ground	
Relinquished by:				Date (mm/dd/yyyy):		Time:		Received by:		Date: (mm/dd/yyyy):			
Jack Nucina				8/28/19		0748		Richard F. Rickert		08/28/2019		0748	
Relinquished by:				Date (mm/dd/yyyy):		Time:		Received by:		Date: (mm/dd/yyyy):			
Richard F. Rickert				08/29/2019		0800		FedEx Ground		08/29/2019		0800	
Relinquished by:				Date (mm/dd/yyyy):		Time:		Received by:		Date: (mm/dd/yyyy):			
FedEx Ground								Dorothy Spencer		9/3/2019		1000	
Relinquished by:				Date (mm/dd/yyyy):		Time:		Received by:		Date: (mm/dd/yyyy):			
Comments													
Full Site Po# 67716 HTD Po# 67718 30 Day Turn Around													





EBS-OR-46309

November 6, 2019

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

CASE NARRATIVE  
Work Order # 19-09131-OR

SAMPLE RECEIPT

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

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

ANALYTICAL METHODS

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

Laboratory qualifiers are as follows:

U - Result is less than the MDA.

ANALYTICAL RESULTS

Combined Standard Uncertainty is reported at 1-sigma value.

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

## ANALYTICAL RESULTS CONTINUED

### TOTAL STRONTIUM

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

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

### TRITIUM

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

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

### NICKEL-63

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

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

### GAMMA SPECTROSCOPY

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

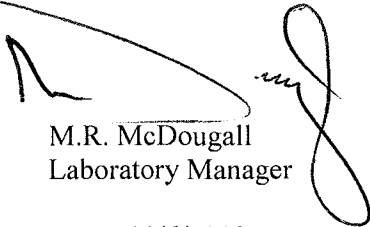
ANALYTICAL RESULTS CONTINUED

GAMMA SPECTROSCOPY CONTINUED

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

CERTIFICATION OF ACCURACY

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



M.R. McDougall  
Laboratory Manager

Date: 11/6/2019

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

<h1>Eberline Analytical</h1> <h2>Final Report of Analysis</h2>			Report To:						Work Order Details:							
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099						SDG: <b>19-09131</b> Purchase Order: 677118 Analysis Category: ENVIRONMENTAL Sample Matrix: SO							
			Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
19-09131-01	LCS	KNOWN	09/24/19 00:00	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	2.01E+02	7.25E+00				pCi/g		
19-09131-01	LCS	SPIKE	09/24/19 00:00	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	2.02E+02	7.81E+00	1.38E+01	5.82E+00		pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	-1.57E+00	3.37E+00	3.37E+00	5.94E+00	U	pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	-3.73E-01	3.24E+00	3.24E+00	5.64E+00	U	pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	1.89E-01	3.31E+00	3.31E+00	5.72E+00	U	pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	5.87E-01	3.44E+00	3.44E+00	5.93E+00	U	pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	-1.29E+00	3.16E+00	3.16E+00	5.57E+00	U	pCi/g		
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	5.90E-01	3.45E+00	3.45E+00	5.95E+00	U	pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	6.89E+00	3.41E+00	3.43E+00	5.50E+00		pCi/g		
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	-1.31E+00	3.22E+00	3.22E+00	5.67E+00	U	pCi/g		
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	-1.88E+00	3.22E+00	3.22E+00	5.71E+00	U	pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	1.13E+00	3.34E+00	3.34E+00	5.72E+00	U	pCi/g		
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	-3.85E-01	3.35E+00	3.35E+00	5.83E+00	U	pCi/g		
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	-1.86E+00	3.17E+00	3.18E+00	5.63E+00	U	pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	-3.87E-01	3.37E+00	3.37E+00	5.86E+00	U	pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	-1.88E-01	3.27E+00	3.27E+00	5.69E+00	U	pCi/g		
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	3.85E-01	3.38E+00	3.38E+00	5.84E+00	U	pCi/g		
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/25/2019	19-09131	Tritium	LANL ER-210 Modified	7.75E-01	3.41E+00	3.41E+00	5.87E+00	U	pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/26/2019	19-09131	Tritium	LANL ER-210 Modified	-2.14E+00	3.31E+00	3.31E+00	5.88E+00	U	pCi/g		

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



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

<h1>Eberline Analytical</h1> <h2>Final Report of Analysis</h2>			Report To:					Work Order Details:								
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG: <b>19-09131</b>		Purchase Order: 677118 Analysis Category: ENVIRONMENTAL Sample Matrix: SO						
			Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
19-09131-01	LCS	KNOWN	09/24/19 00:00	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	1.50E+03	4.50E+01				pCi/g		
19-09131-01	LCS	SPIKE	09/24/19 00:00	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	1.54E+03	1.33E+01	9.15E+01	3.22E+00		pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	-8.91E-02	1.88E+00	1.88E+00	3.25E+00	U	pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	-1.82E-01	1.92E+00	1.92E+00	3.33E+00	U	pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	-1.04E+00	1.98E+00	1.98E+00	3.46E+00	U	pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	2.74E-01	1.94E+00	1.94E+00	3.33E+00	U	pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	5.54E-01	1.97E+00	1.97E+00	3.37E+00	U	pCi/g		
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	1.20E+00	1.86E+00	1.86E+00	3.14E+00	U	pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	1.95E-01	2.07E+00	2.07E+00	3.56E+00	U	pCi/g		
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	-1.06E+00	2.46E+00	2.46E+00	4.29E+00	U	pCi/g		
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	-9.46E-01	2.47E+00	2.48E+00	4.32E+00	U	pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/25/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	3.45E-01	1.83E+00	1.83E+00	3.15E+00	U	pCi/g		
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/26/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	-8.89E-02	1.88E+00	1.88E+00	3.24E+00	U	pCi/g		
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/26/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	6.30E-01	1.92E+00	1.92E+00	3.29E+00	U	pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/26/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	-6.98E-01	1.83E+00	1.83E+00	3.19E+00	U	pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/26/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	-4.60E-01	1.94E+00	1.94E+00	3.36E+00	U	pCi/g		
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/26/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	-7.82E-01	2.05E+00	2.05E+00	3.57E+00	U	pCi/g		
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/26/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	7.91E-01	1.88E+00	1.89E+00	3.21E+00	U	pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/26/2019	19-09131	Nickel-63	ASTM 3500-Ni Modified	-1.10E+00	1.91E+00	1.91E+00	3.35E+00	U	pCi/g		

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



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 Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG:	19-09131					
								Purchase Order:	677118					
								Analysis Category:	ENVIRONMENTAL					
					Sample Matrix:		SO							
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units	
19-09131-01	LCS	KNOWN	09/24/19 00:00	9/23/2019	10/25/2019	19-09131	Strontium-90	EIChroM SRW01 Modified	5.03E+01	2.82E-01			pCi/g	
19-09131-01	LCS	SPIKE	09/24/19 00:00	9/23/2019	10/25/2019	19-09131	Strontium-90	EIChroM SRW01 Modified	5.18E+01	2.82E+00	1.82E+01	1.09E+00	pCi/g	
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/25/2019	19-09131	Strontium-90	EIChroM SRW01 Modified	3.07E-01	3.36E-01	3.52E-01	8.88E-01	U	
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/25/2019	19-09131	Strontium-90	EIChroM SRW01 Modified	6.81E-01	3.57E-01	4.28E-01	8.90E-01	U	
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/25/2019	19-09131	Strontium-90	EIChroM SRW01 Modified	1.97E-01	3.06E-01	3.14E-01	8.22E-01	U	
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/25/2019	19-09131	Strontium-90	EIChroM SRW01 Modified	5.77E-02	3.44E-01	3.45E-01	9.49E-01	U	
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/25/2019	19-09131	Strontium-90	EIChroM SRW01 Modified	-2.24E-01	3.60E-01	3.69E-01	1.03E+00	U	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/25/2019	19-09131	Strontium-90	EIChroM SRW01 Modified	8.03E-01	3.37E-01	4.38E-01	8.16E-01	U	
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/25/2019	19-09131	Strontium-90	EIChroM SRW01 Modified	1.66E-01	3.75E-01	3.79E-01	1.02E+00	U	
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/25/2019	19-09131	Strontium-90	EIChroM SRW01 Modified	-1.49E-01	3.74E-01	3.78E-01	1.06E+00	U	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/25/2019	19-09131	Strontium-90	EIChroM SRW01 Modified	9.22E-03	3.13E-01	3.13E-01	8.72E-01	U	
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/25/2019	19-09131	Strontium-90	EIChroM SRW01 Modified	1.86E-02	3.82E-01	3.82E-01	1.05E+00	U	
19-09131-12	TRG	L1-10221A-FSGS-110-SS-A	07/23/19 12:48	9/23/2019	10/25/2019	19-09131	Strontium-90	EIChroM SRW01 Modified	-3.01E-02	3.27E-01	3.27E-01	9.18E-01	U	
19-09131-13	TRG	L1-10221A-FSGS-112-SS-A	07/23/19 12:52	9/23/2019	10/25/2019	19-09131	Strontium-90	EIChroM SRW01 Modified	-2.50E-01	3.24E-01	3.35E-01	9.33E-01	U	
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/25/2019	19-09131	Strontium-90	EIChroM SRW01 Modified	-3.67E-02	3.28E-01	3.28E-01	9.17E-01	U	
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/25/2019	19-09131	Strontium-90	EIChroM SRW01 Modified	3.45E-01	3.38E-01	3.59E-01	8.90E-01	U	
19-09131-16	TRG	L1-10209C-FSGS-010-SS-A	08/05/19 08:20	9/23/2019	10/25/2019	19-09131	Strontium-90	EIChroM SRW01 Modified	5.14E-01	3.25E-01	3.71E-01	8.26E-01	U	
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/25/2019	19-09131	Strontium-90	EIChroM SRW01 Modified	3.17E-01	2.98E-01	3.18E-01	7.83E-01	U	
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/25/2019	19-09131	Strontium-90	EIChroM SRW01 Modified	8.74E-02	3.17E-01	3.18E-01	8.70E-01	U	
19-09131-01	LCS	KNOWN	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	1.31E+02	5.10E+00			pCi/g	
19-09131-01	LCS	KNOWN	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	8.26E+01	3.39E+00			pCi/g	
19-09131-01	LCS	SPIKE	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	1.35E+02	8.75E+00	1.12E+01	1.35E+00	pCi/g	
19-09131-01	LCS	SPIKE	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	8.81E+01	9.63E+00	1.06E+01	1.65E+00	pCi/g	

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



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<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:								
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG: <b>19-09131</b> Purchase Order: 677118 Analysis Category: ENVIRONMENTAL Sample Matrix: SO								
			Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	-2.25E-02	7.68E-02	7.68E-02	1.18E-01	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	-2.32E-03	2.89E-02	2.89E-02	3.62E-02	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	-3.31E-02	3.49E-02	3.49E-02	4.36E-02	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	1.36E-02	2.94E-02	2.94E-02	3.72E-02	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	1.33E-02	5.17E-02	5.17E-02	8.00E-02	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	-1.90E-02	3.18E-02	3.18E-02	3.43E-02	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	-2.45E-02	3.00E-02	3.01E-02	3.51E-02	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	1.83E-02	2.28E-02	2.28E-02	4.45E-02	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	-1.95E-02	9.16E-02	9.16E-02	6.55E-02	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	-1.83E-02	7.08E-02	7.08E-02	3.49E-02	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	2.11E-03	1.78E-02	1.78E-02	4.04E-02	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	-1.91E-02	4.37E-02	4.37E-02	2.76E-02	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	6.70E-02	1.07E-01	1.07E-01	1.61E-01	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.07E-01	1.87E-01	1.87E-01	4.67E-01	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	-2.43E-02	2.71E-02	2.71E-02	3.75E-02	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	8.85E-03	1.89E-02	1.89E-02	3.53E-02	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	3.55E-03	2.04E-02	2.04E-02	3.54E-02	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	6.16E-01	3.85E-01	3.86E-01	6.28E-01	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	1.99E-02	3.59E-02	3.59E-02	5.73E-02	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	3.78E-02	4.72E-02	4.72E-02	8.14E-02	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	5.47E-02	6.47E-02	6.48E-02	1.02E-01	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	1.33E-02	5.17E-02	5.17E-02	8.00E-02	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	1.53E-02	7.62E-02	7.62E-02	1.12E-01	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	5.02E-01	2.51E-01	2.52E-01	4.38E-01	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	6.58E-03	7.17E-02	7.17E-02	1.08E-01	U	pCi/g		
19-09131-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	1.56E-02	9.72E-02	9.72E-02	1.50E-01	U	pCi/g		

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<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:								
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG: <b>19-09131</b> Purchase Order: 677118 Analysis Category: ENVIRONMENTAL Sample Matrix: SO								
			Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	1.99E-01	1.80E-01	1.80E-01	3.18E-01	U	pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	1.50E-02	2.49E-02	2.49E-02	4.77E-02	U	pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	-4.40E-02	8.76E-02	8.76E-02	1.34E-01	U	pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	-1.01E-01	8.75E-02	8.76E-02	7.95E-02	U	pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	4.26E-01	1.25E-01	1.27E-01	2.17E-01		pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	1.30E-01	5.05E-02	5.10E-02	9.28E-02		pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	6.66E-03	2.03E-02	2.03E-02	5.00E-02	U	pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	8.90E-01	1.36E-01	1.43E-01	8.66E-02		pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	7.53E-02	1.50E-01	1.50E-01	1.67E-01	U	pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	-1.71E-01	1.56E-01	1.57E-01	8.30E-02	U	pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	1.69E-01	1.31E-01	1.31E-01	1.68E-01		pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	-1.40E-02	6.31E-02	6.31E-02	6.94E-02	U	pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	-1.40E+00	6.62E+00	6.63E+00	3.61E+00	U	pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.02E+01	1.60E+00	1.68E+00	1.03E+00		pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	-3.72E-02	5.08E-02	5.08E-02	6.63E-02	U	pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-1.94E-02	3.55E-02	3.55E-02	4.60E-02	U	pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	2.75E-02	3.39E-02	3.39E-02	5.60E-02	U	pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	1.85E+00	1.84E+00	1.84E+00	3.02E+00	U	pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	3.62E-01	8.70E-02	8.90E-02	2.15E-01		pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	4.49E-01	9.44E-02	9.72E-02	2.22E-01		pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	6.71E-01	7.55E-01	7.56E-01	1.02E+00	U	pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	4.26E-01	1.25E-01	1.27E-01	2.17E-01		pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	1.80E-02	1.05E-01	1.05E-01	1.80E-01	U	pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	8.88E-01	1.09E+00	1.09E+00	1.82E+00	U	pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	1.44E-01	6.57E-02	6.61E-02	9.95E-02		pCi/g		
19-09131-03	DUP	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	2.41E-01	2.71E-01	2.71E-01	3.83E-01	U	pCi/g		

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<b>Eberline Analytical Final Report of Analysis</b>			Report To:					Work Order Details:								
			Patricia Giza					SDG:			<b>19-09131</b>					
			Zion Solutions					Purchase Order:			677118					
			2701 Deborah Ave					Analysis Category:			ENVIRONMENTAL					
			Zion, IL 60099					Sample Matrix:			SO					
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA		Report Units		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	3.04E-01	1.75E-01	1.76E-01	3.23E-01	U	pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	-3.20E-02	4.77E-02	4.78E-02	5.31E-02	U	pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	3.28E-02	1.08E-01	1.08E-01	1.42E-01	U	pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	1.57E-02	2.78E-02	2.78E-02	7.85E-02	U	pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	4.59E-01	1.15E-01	1.17E-01	2.00E-01		pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	1.29E-01	4.51E-02	4.56E-02	7.54E-02		pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	2.28E-03	1.80E-02	1.80E-02	5.68E-02	U	pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	8.97E-01	1.35E-01	1.43E-01	7.86E-02		pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	5.17E-02	1.85E-01	1.85E-01	1.75E-01	U	pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	5.67E-02	1.27E-01	1.27E-01	8.97E-02	U	pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	9.21E-02	8.36E-02	8.38E-02	1.33E-01	U	pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	-9.53E-03	6.75E-02	6.75E-02	6.84E-02	U	pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	-2.99E+00	1.28E+01	1.28E+01	3.52E+00	U	pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.13E+01	1.68E+00	1.78E+00	8.95E-01		pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	-4.36E-02	5.16E-02	5.16E-02	6.74E-02	U	pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-2.30E-02	3.88E-02	3.88E-02	5.27E-02	U	pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	-3.47E-02	3.96E-02	3.97E-02	5.12E-02	U	pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	3.15E+00	2.17E+00	2.17E+00	3.47E+00	U	pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	4.23E-01	9.61E-02	9.86E-02	2.18E-01		pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	3.96E-01	1.37E-01	1.39E-01	2.22E-01		pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	6.19E-01	7.53E-01	7.54E-01	1.02E+00	U	pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	4.59E-01	1.15E-01	1.17E-01	2.00E-01		pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	1.58E-02	1.06E-01	1.06E-01	1.82E-01	U	pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	1.69E+00	9.45E-01	9.49E-01	1.37E+00	U	pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	2.06E-01	8.09E-02	8.16E-02	1.35E-01		pCi/g		
19-09131-04	DO	L1-10220H-QJGS-004-SS-A	07/09/19 08:20	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	-1.59E-01	3.02E-01	3.03E-01	3.68E-01	U	pCi/g		

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



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<h1>Eberline Analytical</h1> <h2>Final Report of Analysis</h2>			Report To:					Work Order Details:								
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG: <b>19-09131</b> Purchase Order: 677118 Analysis Category: ENVIRONMENTAL Sample Matrix: SO								
			Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	6.35E-01	2.22E-01	2.24E-01	3.65E-01		pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	6.33E-02	7.61E-02	7.62E-02	8.56E-02	U	pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	1.20E-02	5.06E-02	5.06E-02	1.48E-01	U	pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	-9.53E-03	4.12E-02	4.12E-02	1.70E-01	U	pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	6.63E-01	1.71E-01	1.75E-01	2.54E-01		pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	1.36E-01	8.24E-02	8.27E-02	1.27E-01	U	pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	-2.93E-01	1.57E-01	1.58E-01	1.42E-01	U	pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	2.30E-01	9.43E-02	9.50E-02	1.33E-01		pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	5.89E-02	1.72E-01	1.72E-01	2.32E-01	U	pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	1.12E-02	2.19E-01	2.19E-01	1.19E-01	U	pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	1.31E-01	1.11E-01	1.12E-01	1.92E-01	U	pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	2.65E-03	1.20E-01	1.20E-01	9.02E-02	U	pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	-2.49E-02	7.47E-02	7.47E-02	1.08E-01	U	pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.37E+01	2.12E+00	2.23E+00	1.00E+00		pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	8.70E-02	9.32E-02	9.33E-02	1.72E-01	U	pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	7.72E-03	7.48E-02	7.48E-02	9.11E-02	U	pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	6.47E-02	4.52E-02	4.53E-02	1.14E-01	U	pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	1.80E+00	1.41E+00	1.42E+00	2.34E+00	U	pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	7.74E-01	1.92E-01	1.96E-01	2.80E-01		pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	4.39E-01	1.63E-01	1.64E-01	2.78E-01		pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	1.62E-02	8.90E-02	8.90E-02	1.33E-01	U	pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	6.63E-01	1.71E-01	1.75E-01	2.54E-01		pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	4.20E-02	2.33E-01	2.33E-01	3.28E-01	U	pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	7.95E-01	9.99E-01	1.00E+00	1.51E+00	U	pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	5.14E-01	1.68E-01	1.70E-01	6.80E-02		pCi/g		
19-09131-05	TRG	L1-10203D-FSGS-001-SS-A	04/09/19 08:00	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	1.01E-01	3.23E-01	3.23E-01	4.84E-01	U	pCi/g		

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



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<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:								
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG: <b>19-09131</b> Purchase Order: 677118 Analysis Category: ENVIRONMENTAL Sample Matrix: SO								
			Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	2.46E-01	2.05E-01	2.05E-01	3.67E-01	U	pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	-1.75E-02	5.08E-02	5.08E-02	6.13E-02	U	pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	-1.19E-01	6.96E-02	6.99E-02	9.08E-02	U	pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	3.11E-02	2.89E-02	2.90E-02	1.01E-01	U	pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	4.88E-01	1.26E-01	1.28E-01	1.81E-01		pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	7.24E-02	7.17E-02	7.18E-02	1.07E-01	U	pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	4.33E-03	2.48E-02	2.48E-02	1.02E-01	U	pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	1.16E-01	5.03E-02	5.06E-02	7.02E-02		pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	-6.77E-03	1.00E-01	1.00E-01	1.43E-01	U	pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	-1.28E-01	2.02E-01	2.02E-01	7.38E-02	U	pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	1.40E-01	9.28E-02	9.30E-02	1.32E-01		pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	2.28E-02	7.61E-02	7.61E-02	5.75E-02	U	pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	-2.41E-02	1.65E-01	1.65E-01	2.41E-01	U	pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.30E+01	2.66E+00	2.74E+00	1.50E+00		pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	-2.46E-03	2.46E-02	2.46E-02	1.08E-01	U	pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-1.87E-02	4.00E-02	4.00E-02	6.06E-02	U	pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	1.07E-02	4.06E-02	4.06E-02	6.93E-02	U	pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	2.15E+00	1.11E+00	1.11E+00	1.78E+00		pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	3.66E-01	8.57E-02	8.77E-02	1.86E-01		pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	3.11E-01	1.11E-01	1.12E-01	2.02E-01		pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	-4.40E-03	5.92E-02	5.92E-02	1.67E-01	U	pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	4.88E-01	1.26E-01	1.28E-01	1.81E-01		pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	1.11E-02	1.49E-01	1.49E-01	2.08E-01	U	pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	1.30E+00	7.81E-01	7.84E-01	1.27E+00		pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	3.92E-01	1.96E-01	1.97E-01	3.08E-01		pCi/g		
19-09131-06	TRG	L1-10203D-FQGS-002-SS-A	04/09/19 08:05	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	8.16E-03	2.10E-01	2.10E-01	3.12E-01	U	pCi/g		

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



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<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:							
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG: <b>19-09131</b>							
								Purchase Order: 677118		Analysis Category: ENVIRONMENTAL					
								Sample Matrix: SO							
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA		Report Units	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	2.24E-01	2.63E-01	2.63E-01	4.72E-01	U	pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	-4.93E-03	6.09E-02	6.09E-02	8.67E-02	U	pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	-8.86E-02	9.96E-02	9.97E-02	1.36E-01	U	pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	-6.61E-03	4.42E-02	4.42E-02	1.64E-01	U	pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	3.60E-01	1.40E-01	1.41E-01	2.19E-01		pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	-4.18E-02	9.93E-02	9.93E-02	1.39E-01	U	pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	-2.65E-02	4.60E-02	4.60E-02	1.12E-01	U	pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	1.83E-01	9.94E-02	9.98E-02	1.52E-01		pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	1.48E-02	1.77E-01	1.77E-01	2.20E-01	U	pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	-6.84E-02	2.17E-01	2.17E-01	1.13E-01	U	pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	4.39E-02	1.19E-01	1.19E-01	1.78E-01	U	pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	-1.12E-02	5.86E-02	5.86E-02	8.25E-02	U	pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	-2.30E-02	7.25E-02	7.25E-02	1.05E-01	U	pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.06E+01	1.89E+00	1.97E+00	1.45E+00		pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	2.19E-02	9.40E-02	9.40E-02	1.59E-01	U	pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-2.09E-02	6.47E-02	6.47E-02	8.52E-02	U	pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	5.41E-03	3.30E-02	3.30E-02	9.37E-02	U	pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	6.78E-01	7.70E-01	7.71E-01	1.18E+00	U	pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	4.98E-01	1.51E-01	1.53E-01	2.25E-01		pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	4.15E-01	1.35E-01	1.36E-01	2.58E-01		pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	6.95E-02	8.40E-02	8.40E-02	1.30E-01	U	pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	3.60E-01	1.40E-01	1.41E-01	2.19E-01		pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	-4.87E-02	2.07E-01	2.07E-01	2.79E-01	U	pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	1.65E+00	1.31E+00	1.31E+00	2.16E+00	U	pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	3.58E-01	1.45E-01	1.46E-01	2.69E-01		pCi/g	
19-09131-07	TRG	L1-10203E-FSGS-001-SS-A	04/08/19 12:30	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	2.89E-02	3.02E-01	3.02E-01	4.51E-01	U	pCi/g	

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



EBERLINE ANALYTICAL CORPORATION  
 601 SCARBORO ROAD OAK RIDGE, TN 37830 865/481-0683 Fax 865/483-4621

<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:								
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG: <b>19-09131</b> Purchase Order: 677118 Analysis Category: ENVIRONMENTAL Sample Matrix: SO								
			Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	6.16E-01	2.01E-01	2.04E-01	3.25E-01		pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	-3.81E-02	5.49E-02	5.49E-02	5.52E-02	U	pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	4.81E-02	1.01E-01	1.02E-01	1.62E-01	U	pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	3.58E-02	4.56E-02	4.56E-02	9.36E-02	U	pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	6.34E-01	1.27E-01	1.31E-01	1.50E-01		pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	3.22E-02	6.20E-02	6.21E-02	1.06E-01	U	pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	1.11E-02	3.38E-02	3.39E-02	6.84E-02	U	pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	2.78E-01	8.15E-02	8.27E-02	1.03E-01		pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	3.27E-02	1.48E-01	1.48E-01	2.12E-01	U	pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	-1.51E-02	8.67E-02	8.67E-02	1.08E-01	U	pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	2.35E-01	1.33E-01	1.33E-01	1.76E-01	U	pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	-3.73E-02	7.59E-02	7.59E-02	8.10E-02	U	pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	-3.89E+00	1.64E+01	1.64E+01	3.83E+00	U	pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.45E+01	2.09E+00	2.22E+00	1.08E+00		pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	1.99E-03	6.86E-02	6.86E-02	1.05E-01	U	pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-1.17E-02	4.52E-02	4.52E-02	6.58E-02	U	pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	1.89E-02	4.25E-02	4.25E-02	6.34E-02	U	pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	2.34E+00	1.78E+00	1.78E+00	2.89E+00	U	pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	6.99E-01	1.29E-01	1.34E-01	2.16E-01		pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	6.56E-01	1.30E-01	1.34E-01	1.93E-01		pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	6.40E-01	8.07E-01	8.07E-01	1.11E+00	U	pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	6.34E-01	1.27E-01	1.31E-01	1.50E-01		pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	1.41E-02	1.17E-01	1.17E-01	1.98E-01	U	pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	1.06E+00	1.16E+00	1.16E+00	1.93E+00	U	pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	2.76E-01	1.02E-01	1.03E-01	1.50E-01		pCi/g		
19-09131-08	TRG	L1-10203E-FSGS-002-SS-A	04/08/19 12:35	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	3.42E-01	3.09E-01	3.10E-01	4.45E-01	U	pCi/g		

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



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

<b>Eberline Analytical Final Report of Analysis</b>			Report To:					Work Order Details:						
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG: <b>19-09131</b>						
								Purchase Order: 677118						
								Analysis Category: ENVIRONMENTAL						
					Sample Matrix: SO									
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units	
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	4.13E-01	2.39E-01	2.40E-01	4.10E-01		
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	-5.52E-03	1.54E-02	1.55E-02	6.23E-02	U	
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	-8.23E-02	6.48E-02	6.49E-02	8.64E-02	U	
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	1.37E-02	2.01E-02	2.01E-02	9.23E-02	U	
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	2.47E-01	1.04E-01	1.05E-01	1.57E-01		
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	1.47E-03	7.19E-02	7.19E-02	1.16E-01	U	
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	2.81E-02	2.70E-02	2.70E-02	7.80E-02	U	
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	1.62E-01	6.41E-02	6.46E-02	9.11E-02		
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	1.40E-02	1.31E-01	1.31E-01	1.38E-01	U	
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	-2.78E-02	1.70E-01	1.70E-01	7.13E-02	U	
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	6.16E-02	6.24E-02	6.25E-02	1.05E-01	U	
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	6.30E-02	3.60E-02	3.62E-02	5.79E-02		
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	9.18E-02	1.68E-01	1.68E-01	2.49E-01	U	
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.18E+01	2.35E+00	2.42E+00	4.13E-01		
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	-1.38E-02	5.02E-02	5.02E-02	7.80E-02	U	
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-2.05E-02	4.00E-02	4.00E-02	5.99E-02	U	
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	-1.34E-02	4.54E-02	4.54E-02	6.69E-02	U	
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	5.39E-01	6.72E-01	6.72E-01	1.02E+00	U	
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	4.82E-01	1.28E-01	1.30E-01	1.82E-01		
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	3.14E-01	1.02E-01	1.04E-01	1.77E-01		
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	1.12E-02	1.11E-01	1.11E-01	1.63E-01	U	
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	2.47E-01	1.04E-01	1.05E-01	1.57E-01		
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	2.70E-03	1.38E-01	1.38E-01	1.93E-01	U	
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	9.31E-01	5.39E-01	5.41E-01	8.54E-01	U	
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	4.74E-01	1.43E-01	1.45E-01	1.81E-01		
19-09131-09	TRG	L1-10221A-FIGS-007-SB-A	07/29/19 10:25	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	1.67E-01	2.08E-01	2.09E-01	3.22E-01	U	

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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<b>Eberline Analytical Final Report of Analysis</b>			Report To:					Work Order Details:							
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG:	<b>19-09131</b>						
								Purchase Order:	677118						
								Analysis Category:	ENVIRONMENTAL						
					Sample Matrix:		SO								
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units		
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	2.44E-01	1.89E-01	1.89E-01	3.38E-01	U	pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	-1.27E-02	4.97E-02	4.98E-02	7.12E-02	U	pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	-5.13E-02	7.80E-02	7.81E-02	1.08E-01	U	pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	3.81E-03	2.31E-02	2.31E-02	1.22E-01	U	pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	3.43E-01	1.17E-01	1.18E-01	3.01E-01		pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	1.51E-02	8.13E-02	8.13E-02	1.36E-01	U	pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	-1.84E-01	9.52E-02	9.57E-02	8.44E-02	U	pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	3.39E-01	7.61E-02	7.80E-02	1.48E-01		pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	-5.33E-03	1.67E-01	1.67E-01	1.87E-01	U	pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	-8.49E-02	1.74E-01	1.74E-01	9.29E-02	U	pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	3.15E-02	4.78E-02	4.78E-02	1.36E-01	U	pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	2.54E-02	9.41E-02	9.41E-02	6.83E-02	U	pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	1.88E-02	5.80E-02	5.80E-02	8.76E-02	U	pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	7.68E+00	1.37E+00	1.42E+00	5.52E-01		pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	-1.56E-02	6.93E-02	6.93E-02	1.10E-01	U	pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-1.75E-02	5.63E-02	5.63E-02	7.48E-02	U	pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	-5.43E-02	6.08E-02	6.09E-02	8.20E-02	U	pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	9.16E-01	5.91E-01	5.93E-01	9.54E-01	U	pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	2.66E-01	1.17E-01	1.18E-01	1.83E-01		pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	2.65E-01	1.18E-01	1.19E-01	2.23E-01		pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	-2.20E-02	7.05E-02	7.05E-02	1.02E-01	U	pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	3.43E-01	1.17E-01	1.18E-01	3.01E-01		pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	-6.32E-02	1.77E-01	1.77E-01	2.33E-01	U	pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	9.06E-01	7.04E-01	7.06E-01	1.10E+00	U	pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	3.19E-01	1.19E-01	1.20E-01	5.92E-02		pCi/g	
19-09131-10	TRG	L1-10221A-FSGS-002-SB-A	07/29/19 14:00	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	-8.85E-02	2.53E-01	2.54E-01	3.65E-01	U	pCi/g	

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



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<b>Eberline Analytical Final Report of Analysis</b>			Report To:					Work Order Details:								
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG: <b>19-09131</b>			Purchase Order: 677118			Analysis Category: ENVIRONMENTAL		
								Sample Matrix: SO								
			Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	2.88E-03	1.32E-01	1.33E-01	3.13E-01	U	pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	-1.51E-03	1.39E-02	1.39E-02	4.12E-02	U	pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	9.04E-02	8.49E-02	8.50E-02	1.21E-01	U	pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	1.73E-02	2.32E-02	2.32E-02	6.48E-02	U	pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	2.94E-01	8.56E-02	8.69E-02	1.31E-01		pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	-6.67E-03	4.95E-02	4.95E-02	5.94E-02	U	pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	1.57E-04	1.86E-02	1.86E-02	4.68E-02	U	pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	5.67E-02	4.52E-02	4.53E-02	7.23E-02	U	pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	3.51E-02	1.30E-01	1.30E-01	1.47E-01	U	pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	2.94E-02	1.06E-01	1.06E-01	7.68E-02	U	pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	1.15E-01	8.53E-02	8.55E-02	1.16E-01	U	pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	-6.53E-02	6.71E-02	6.72E-02	5.98E-02	U	pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	-3.42E-01	3.20E+00	3.20E+00	3.14E+00	U	pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.01E+01	1.52E+00	1.61E+00	8.38E-01		pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	-7.89E-04	3.86E-02	3.86E-02	6.04E-02	U	pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-9.65E-03	3.26E-02	3.26E-02	4.76E-02	U	pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	1.65E-02	3.02E-02	3.02E-02	5.15E-02	U	pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	1.62E+00	1.27E+00	1.27E+00	2.06E+00	U	pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	3.96E-01	8.55E-02	8.78E-02	1.26E-01		pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	3.63E-01	1.07E-01	1.09E-01	1.87E-01		pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	6.04E-01	6.44E-01	6.45E-01	8.60E-01	U	pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	2.94E-01	8.56E-02	8.69E-02	1.31E-01		pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	6.36E-02	8.98E-02	8.99E-02	1.62E-01	U	pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	6.04E-01	7.89E-01	7.90E-01	1.09E+00	U	pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	2.26E-01	7.58E-02	7.67E-02	9.04E-02		pCi/g		
19-09131-11	TRG	L1-10221A-FSGS-108-SS-A	07/23/19 12:44	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	1.02E-01	2.23E-01	2.23E-01	3.09E-01	U	pCi/g		

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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<h1 style="margin: 0;">Eberline Analytical</h1> <h2 style="margin: 0;">Final Report of Analysis</h2>			Report To:					Work Order Details:								
			<b>Patricia Giza</b> <b>Zion Solutions</b> <b>2701 Deborah Ave</b> <b>Zion, IL 60099</b>					<b>SDG: 19-09131</b> Purchase Order: 677118 Analysis Category: ENVIRONMENTAL Sample Matrix: SO								
			Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	5.07E-01	1.57E-01	1.59E-01	2.55E-01		pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	-6.25E-02	5.76E-02	5.77E-02	4.55E-02	U	pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	3.57E-02	1.02E-01	1.02E-01	1.35E-01	U	pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	-1.48E-02	2.62E-02	2.62E-02	7.20E-02	U	pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	4.23E-01	1.03E-01	1.05E-01	1.43E-01		pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	5.71E-02	5.36E-02	5.36E-02	7.05E-02	U	pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	1.11E-02	2.59E-02	2.59E-02	5.16E-02	U	pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	8.93E-02	5.74E-02	5.75E-02	9.00E-02	U	pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	-1.16E-01	1.52E-01	1.52E-01	1.61E-01	U	pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	-9.80E-02	1.54E-01	1.54E-01	8.24E-02	U	pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	1.36E-01	1.00E-01	1.01E-01	1.35E-01	U	pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	1.75E-02	6.88E-02	6.88E-02	6.95E-02	U	pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	-4.29E-01	3.45E+00	3.45E+00	3.18E+00	U	pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.41E+01	1.94E+00	2.07E+00	1.01E+00		pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	3.01E-02	4.92E-02	4.93E-02	8.20E-02	U	pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-2.53E-02	4.04E-02	4.05E-02	3.89E-02	U	pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	-6.93E-03	3.72E-02	3.72E-02	5.64E-02	U	pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	7.12E-01	9.37E-01	9.38E-01	2.03E+00	U	pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	3.98E-01	9.44E-02	9.65E-02	1.78E-01		pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	6.18E-01	1.28E-01	1.32E-01	2.04E-01		pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	4.27E-01	6.32E-01	6.32E-01	8.99E-01	U	pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	4.23E-01	1.03E-01	1.05E-01	1.43E-01		pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	-3.24E-02	8.85E-02	8.85E-02	1.42E-01	U	pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	1.41E+00	9.04E-01	9.07E-01	1.29E+00	U	pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	2.91E-01	9.38E-02	9.50E-02	1.29E-01		pCi/g		
19-09131-14	TRG	L1-10221C-FSGS-013-SB-A	07/29/19 15:20	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	1.82E-01	2.80E-01	2.80E-01	3.81E-01	U	pCi/g		

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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<b>Eberline Analytical</b> <b>Final Report of Analysis</b>			Report To:					Work Order Details:								
			Patricia Giza Zion Solutions 2701 Deborah Ave Zion, IL 60099					SDG: <b>19-09131</b> Purchase Order: 677118 Analysis Category: ENVIRONMENTAL Sample Matrix: SO								
			Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Actinium-228	EPA 901.1 Modified	2.81E-01	2.44E-01	2.44E-01	4.50E-01	U	pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Silver-108m	EPA 901.1 Modified	-3.78E-02	6.86E-02	6.86E-02	7.59E-02	U	pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Americium-241	EPA 901.1 Modified	-1.97E-01	8.63E-02	8.69E-02	1.03E-01	U	pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Barium-133	EPA 901.1 Modified	-8.45E-03	8.92E-02	8.92E-02	1.17E-01	U	pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Bismuth-214	EPA 901.1 Modified	3.64E-01	1.39E-01	1.40E-01	1.99E-01		pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Cobalt-60	EPA 901.1 Modified	4.32E-01	1.10E-01	1.12E-01	1.69E-01		pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Cesium-134	EPA 901.1 Modified	6.10E-03	3.88E-02	3.88E-02	1.09E-01	U	pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Cesium-137	EPA 901.1 Modified	3.53E-01	8.66E-02	8.85E-02	2.25E-01		pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Europium-152	EPA 901.1 Modified	-2.01E-01	2.21E-01	2.21E-01	1.59E-01	U	pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Europium-154	EPA 901.1 Modified	7.90E-02	1.29E-01	1.29E-01	8.54E-02	U	pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Europium-155	EPA 901.1 Modified	5.61E-03	8.31E-02	8.31E-02	1.22E-01	U	pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Holmium-166m	EPA 901.1 Modified	-4.42E-02	1.07E-01	1.07E-01	7.22E-02	U	pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Iodine-129	EPA 901.1 Modified	1.05E-01	2.22E-01	2.22E-01	3.31E-01	U	pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Potassium-40	EPA 901.1 Modified	9.13E+00	2.19E+00	2.24E+00	1.39E+00		pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Manganese-54	EPA 901.1 Modified	3.54E-02	6.29E-02	6.30E-02	1.12E-01	U	pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-3.02E-02	5.18E-02	5.18E-02	7.78E-02	U	pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Niobium-94	EPA 901.1 Modified	-1.01E-02	5.85E-02	5.85E-02	9.12E-02	U	pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Lead-210	EPA 901.1 Modified	1.14E+00	8.78E-01	8.80E-01	1.37E+00	U	pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Lead-212	EPA 901.1 Modified	3.91E-01	1.27E-01	1.29E-01	1.85E-01		pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Lead-214	EPA 901.1 Modified	2.79E-01	1.28E-01	1.29E-01	2.26E-01	U	pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Promethium-145	EPA 901.1 Modified	-5.93E-03	1.48E-01	1.48E-01	2.17E-01	U	pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Radium-226	EPA 901.1 Modified	3.64E-01	1.39E-01	1.40E-01	1.99E-01		pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Antimony-125	EPA 901.1 Modified	-7.98E-02	1.90E-01	1.90E-01	2.49E-01	U	pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Thorium-234	EPA 901.1 Modified	9.05E-01	6.80E-01	6.82E-01	1.07E+00	U	pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Thallium-208	EPA 901.1 Modified	3.43E-01	1.93E-01	1.94E-01	3.03E-01		pCi/g		
19-09131-15	TRG	L1-10221D-FIGS-010-SB-A	07/30/19 09:06	9/23/2019	10/8/2019	19-09131	Uranium-235	EPA 901.1 Modified	-5.19E-02	2.45E-01	2.45E-01	3.56E-01	U	pCi/g		

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<b>Eberline Analytical Final Report of Analysis</b>			Report To:					Work Order Details:					
			Patricia Giza					SDG: <b>19-09131</b>					
			Zion Solutions					Purchase Order: 677118					
			2701 Deborah Ave					Analysis Category: ENVIRONMENTAL					
			Zion, IL 60099					Sample Matrix: SO					
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Actinium-228	EPA 901.1 Modified	4.11E-01	1.81E-01	1.82E-01	3.48E-01	
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Silver-108m	EPA 901.1 Modified	4.95E-03	2.57E-02	2.57E-02	6.45E-02	U
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Americium-241	EPA 901.1 Modified	-7.38E-02	8.07E-02	8.08E-02	1.10E-01	U
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Barium-133	EPA 901.1 Modified	-2.38E-03	2.31E-02	2.31E-02	1.10E-01	U
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Bismuth-214	EPA 901.1 Modified	3.80E-01	1.12E-01	1.14E-01	1.41E-01	
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Cobalt-60	EPA 901.1 Modified	9.61E-02	5.44E-02	5.46E-02	1.19E-01	U
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Cesium-134	EPA 901.1 Modified	7.22E-03	3.38E-02	3.38E-02	9.05E-02	U
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Cesium-137	EPA 901.1 Modified	1.42E-01	6.97E-02	7.00E-02	1.05E-01	
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Europium-152	EPA 901.1 Modified	2.69E-02	1.66E-01	1.66E-01	1.77E-01	U
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Europium-154	EPA 901.1 Modified	9.95E-03	1.18E-01	1.18E-01	9.11E-02	U
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Europium-155	EPA 901.1 Modified	-1.09E-03	8.53E-02	8.53E-02	1.24E-01	U
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Holmium-166m	EPA 901.1 Modified	-6.22E-03	7.92E-02	7.92E-02	6.90E-02	U
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Iodine-129	EPA 901.1 Modified	-1.16E-02	1.93E-01	1.93E-01	2.82E-01	U
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.42E+01	2.85E+00	2.94E+00	1.19E+00	
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Manganese-54	EPA 901.1 Modified	6.34E-02	5.02E-02	5.03E-02	9.66E-02	U
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	-4.13E-02	4.75E-02	4.76E-02	6.09E-02	U
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Niobium-94	EPA 901.1 Modified	8.49E-03	4.83E-02	4.83E-02	7.44E-02	U
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Lead-210	EPA 901.1 Modified	5.94E-01	7.90E-01	7.90E-01	1.19E+00	U
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Lead-212	EPA 901.1 Modified	4.51E-01	1.01E-01	1.03E-01	2.89E-01	
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Lead-214	EPA 901.1 Modified	3.90E-01	1.12E-01	1.13E-01	2.23E-01	
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Promethium-145	EPA 901.1 Modified	3.27E-02	1.28E-01	1.28E-01	1.91E-01	U
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Radium-226	EPA 901.1 Modified	3.80E-01	1.12E-01	1.14E-01	1.41E-01	
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Antimony-125	EPA 901.1 Modified	-2.42E-02	1.57E-01	1.57E-01	2.13E-01	U
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Thorium-234	EPA 901.1 Modified	1.34E-01	7.12E-01	7.12E-01	1.05E+00	U
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Thallium-208	EPA 901.1 Modified	5.41E-01	2.26E-01	2.28E-01	4.09E-01	
19-09131-17	TRG	L1-10209C-FQGS-010-SS-A	08/05/19 08:20	9/23/2019	10/9/2019	19-09131	Uranium-235	EPA 901.1 Modified	1.23E-01	2.31E-01	2.31E-01	3.52E-01	U

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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<h1 style="margin: 0;">Eberline Analytical</h1> <h2 style="margin: 0;">Final Report of Analysis</h2>			Report To:					Work Order Details:								
			<b>Patricia Giza</b> <b>Zion Solutions</b> <b>2701 Deborah Ave</b> <b>Zion, IL 60099</b>					SDG: <b>19-09131</b> Purchase Order: 677118 Analysis Category: ENVIRONMENTAL Sample Matrix: SO								
			Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Actinium-228	EPA 901.1 Modified	1.22E+00	2.94E-01	3.00E-01	4.74E-01		pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Silver-108m	EPA 901.1 Modified	-8.47E-04	6.14E-02	6.14E-02	1.12E-01	U	pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Americium-241	EPA 901.1 Modified	9.43E-02	1.19E-01	1.19E-01	3.06E-01	U	pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Barium-133	EPA 901.1 Modified	-2.66E-02	4.69E-02	4.69E-02	2.39E-01	U	pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Bismuth-214	EPA 901.1 Modified	1.10E+00	2.24E-01	2.31E-01	2.77E-01		pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Cobalt-60	EPA 901.1 Modified	1.66E-02	1.20E-01	1.20E-01	1.68E-01	U	pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Cesium-134	EPA 901.1 Modified	-2.20E-02	7.59E-02	7.60E-02	1.66E-01	U	pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Cesium-137	EPA 901.1 Modified	3.58E-02	1.08E-01	1.08E-01	1.58E-01	U	pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Europium-152	EPA 901.1 Modified	-2.62E-02	1.60E-01	1.60E-01	3.16E-01	U	pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Europium-154	EPA 901.1 Modified	-7.58E-02	2.97E-01	2.97E-01	1.65E-01	U	pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Europium-155	EPA 901.1 Modified	3.01E-01	1.76E-01	1.77E-01	2.70E-01	U	pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Holmium-166m	EPA 901.1 Modified	-8.41E-02	1.59E-01	1.59E-01	1.21E-01	U	pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Iodine-129	EPA 901.1 Modified	1.41E-02	9.68E-02	9.68E-02	1.43E-01	U	pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Potassium-40	EPA 901.1 Modified	1.65E+01	2.87E+00	2.99E+00	2.62E+00		pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Manganese-54	EPA 901.1 Modified	-2.12E-02	1.11E-01	1.11E-01	1.75E-01	U	pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Molybdenum-93	EPA 901.1 Modified	5.40E-02	8.23E-02	8.24E-02	1.00E-01	U	pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Niobium-94	EPA 901.1 Modified	2.36E-02	8.37E-02	8.37E-02	1.30E-01	U	pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Lead-210	EPA 901.1 Modified	1.17E+00	1.27E+00	1.27E+00	2.12E+00	U	pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Lead-212	EPA 901.1 Modified	1.29E+00	2.63E-01	2.71E-01	3.68E-01		pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Lead-214	EPA 901.1 Modified	9.98E-01	2.15E-01	2.21E-01	3.37E-01		pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Promethium-145	EPA 901.1 Modified	-7.67E-02	1.24E-01	1.24E-01	1.75E-01	U	pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Radium-226	EPA 901.1 Modified	1.10E+00	2.24E-01	2.31E-01	2.77E-01		pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Antimony-125	EPA 901.1 Modified	2.01E-02	2.72E-01	2.72E-01	3.77E-01	U	pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Thorium-234	EPA 901.1 Modified	1.32E+00	1.51E+00	1.52E+00	3.00E+00	U	pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Thallium-208	EPA 901.1 Modified	8.72E-01	2.43E-01	2.47E-01	8.04E-02		pCi/g		
19-09131-18	TRG	L1-10209C-FSGS-004-SB-A	07/30/19 13:27	9/23/2019	10/9/2019	19-09131	Uranium-235	EPA 901.1 Modified	-4.06E-01	4.61E-01	4.61E-01	6.35E-01	U	pCi/g		

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



EBERLINE ANALYTICAL CORPORATION  
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L1-10212D-EJGS-437-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/14/2019	1248	FULL SUITE	NA	904.55g
L1-10212D-EJGS-438-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/14/2019	1251	FULL SUITE	NA	695.09g
L1-10212D-EJGS-439-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/14/2019	1254	FULL SUITE	NA	1067.15g
L1-10212D-AIGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/15/2019	1402	FULL SUITE	NA	950.44g
L1-10212D-AIGS-009-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/15/2019	1410	FULL SUITE	NA	447.50g
L1-10212D-AIGS-010-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/19/2019	0830	FULL SUITE	NA	680.74g
L1-10212D-AIGS-011-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/19/2019	0832	FULL SUITE	NA	520.22g
L1-10212D-AIGS-012-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/19/2019	0854	FULL SUITE	NA	765.73g
L1-10212D-AIGS-015-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/20/2019	0804	FULL SUITE	NA	686.49g
L1-10212D-AIGS-017-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/21/2019	0815	FULL SUITE	NA	1099.59g
L1-10212D-EJGS-451-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/19/2019	1340	FULL SUITE	NA	683.89g
L1-10212D-EJGS-452-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/19/2019	1342	FULL SUITE	NA	387.93g
L1-10212D-EJGS-453-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/19/2019	1344	FULL SUITE	NA	643.65g
L1-10212D-EJGS-454-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/19/2019	1346	FULL SUITE	NA	589.96g
L1-10212D-EJGS-455-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/19/2019	1348	FULL SUITE	NA	893.40g
L1-10212D-EJGS-456-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/19/2019	1220	FULL SUITE	NA	991.63g
L1-10212D-EJGS-459-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/19/2019	1235	FULL SUITE	NA	674.35g
L1-10220H-QJGS-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/9/2019	0820	5 ROC HTD	NA	780.01g
L1-10203D-FSCS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	4/9/2019	0800	5 ROC HTD	NA	852.61g

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6	L1-10203D-FQGS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>4/9/2019</u>	0805	<u>5 ROC HTD</u>	NA	868.92g
7	L1-10203E-FSGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>4/8/2019</u>	1230	<u>5 ROC HTD</u>	NA	813.36g
8	L1-10203E-FSGS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>4/8/2019</u>	1235	<u>5 ROC HTD</u>	NA	702.73g
9	L1-10221A-FIGS-007-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/29/2019</u>	1025	<u>5 ROC HTD</u>	NA	874.41g
10	L1-10221A-FSGS-002-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/29/2019</u>	1400	<u>5 ROC HTD</u>	NA	1109.56g
11	L1-10221A-FSGS-108-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/23/2019</u>	1244	<u>5 ROC HTD</u>	NA	918.06g
12	L1-10221A-FSGS-110-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/23/2019</u>	1248	<u>5 ROC HTD</u>	NA	805.48g
13	L1-10221A-FSGS-112-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/23/2019</u>	1252	<u>5 ROC HTD</u>	NA	1136.57g
14	L1-10221C-FSGS-013-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/29/2019</u>	1520	<u>5 ROC HTD</u>	NA	825.45g
15	L1-10221D-FIGS-010-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/30/2019</u>	0906	<u>5 ROC HTD</u>	NA	599.72g
16	L1-10209C-FSGS-010-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>8/5/2019</u>	0820	<u>5 ROC HTD</u>	NA	1051.63g
17	L1-10209C-FQGS-010-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>8/5/2019</u>	0820	<u>5 ROC HTD</u>	NA	795.39g
18	L1-10209C-FSGS-004-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/30/2019</u>	1327	<u>5 ROC HTD</u>	NA	709.07g
	L1-10209C-FQGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/25/2019</u>	1300	<u>5 ROC HTD</u>	NA	1062.99g
	L1-10209C-FIGS-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/25/2019</u>	1306	<u>5 ROC HTD</u>	NA	945.02g
	L1-10209C-FIGS-006-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/30/2019</u>	1240	<u>5 ROC HTD</u>	NA	752.63g
	L2-10213A-FSGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/29/2019</u>	0730	<u>5 ROC HTD</u>	NA	663.96g
	L2-10213A-FSGS-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/29/2019</u>	0734	<u>5 ROC HTD</u>	NA	865.77g
	L2-10213A-FSGS-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	<u>7/29/2019</u>	0736	<u>5 ROC HTD</u>	NA	773.20g

REC BB 9-23-19 @ 10:25

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Laboratory:		Date Submitted To Lab:		Ship Container No.:		Cooler Temperature: FULL SUITE		Airbill Number:	
EBERLINE LABS				NA		N/A		Fed Ex Ground Various	
Relinquished by:		Date (mm/dd/yyyy):	Time:	Received by:		Date: (mm/dd/yyyy):			
Jack Myers		9/18/19	0805	Richard F. Rickett		09/18/2019		0805	
Relinquished by:		Date (mm/dd/yyyy):	Time:	Received by:		Date: (mm/dd/yyyy):			
Richard F. Rickett		09/19/2019	1000	Fed Ex Ground		09/19/2019		1000	
Relinquished by:		Date (mm/dd/yyyy):	Time:	Received by:		Date: (mm/dd/yyyy):			
Fedex - Ground				Kandice Spencer		9/23/2019		1045	
Relinquished by:		Date (mm/dd/yyyy):	Time:	Received by:		Date: (mm/dd/yyyy):			
Comments									



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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

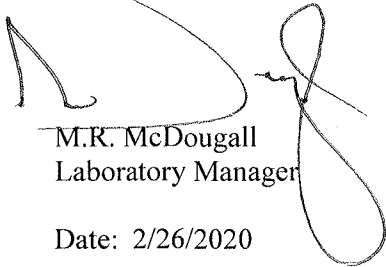
TOTAL STRONTIUM

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.

<h1 style="margin: 0;">Eberline Analytical</h1> <h2 style="margin: 0;">Final Report of Analysis</h2>			Report To:					Work Order Details:								
			Jeffrey Graham					SDG:	20-02088							
			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		
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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ZIONSOLUTIONS LLC  
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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-FIGS-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	5/17/2019	1500	5 ROC HTD	NA	723.26g
L1-10209E-FIGS-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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L1-10221A-FIGS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/11/2019	1217	5 ROC HTD	NA	922.34g
L1-10221A-FIGS-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/11/2019	1219	5 ROC HTD	NA	929.16g
L1-10221A-FIGS-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/11/2019	1221	5 ROC HTD	NA	925.96g
L1-10220I-FJGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/9/2019	0830	5 ROC HTD	NA	572.09g
L1-10220I-QJGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/9/2019	0830	5 ROC HTD	NA	648.58g
L1-10221A-FIGS-003-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/26/2019	1004	5 ROC HTD	NA	812.22g
L1-10221A-FIGS-001-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/26/2019	1000	5 ROC HTD	NA	677.47g
L1-10221A-FIGS-004-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/26/2019	1006	5 ROC HTD	NA	757.61g
L1-10221A-FIGS-002-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/26/2019	1002	5 ROC HTD	NA	756.86g
L1-10221A-QIGS-001-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/26/2019	1000	5 ROC HTD	NA	614.42g
L1-10221A-FJGS-007-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/17/2019	0856	5 ROC HTD	NA	710.95g
L1-10221B-FJGS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/17/2019	0830	5 ROC HTD	NA	714.12g
L1-10221A-FJGS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/17/2019	0846	5 ROC HTD	NA	771.65g
L1-10221A-FJGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/17/2019	0844	5 ROC HTD	NA	707.40g
L1-10221A-FIGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/13/2019	0745	5 ROC HTD	NA	774.76g
L1-10221A-FIGS-006-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/13/2019	0747	5 ROC HTD	NA	783.08g
L1-10221A-FIGS-007-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/13/2019	0749	5 ROC HTD	NA	708.49g
L1-10221A-FIGS-008-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/13/2019	0751	5 ROC HTD	NA	794.16g
L1-10221A-FIGS-009-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/13/2019	0753	5 ROC HTD	NA	774.52g



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L1-10203D-FQGS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	4/9/2019	0805	5 ROC HTD	NA	868.92g
L1-10203E-FSGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	4/8/2019	1230	5 ROC HTD	NA	813.36g
L1-10203E-FSGS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	4/8/2019	1235	5 ROC HTD	NA	702.73g
L1-10221A-FIGS-007-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	1025	5 ROC HTD	NA	874.41g
L1-10221A-FSGS-002-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	1400	5 ROC HTD	NA	1109.56g
L1-10221A-FSGS-108-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/23/2019	1244	5 ROC HTD	NA	918.06g
L1-10221A-FSGS-110-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/23/2019	1248	5 ROC HTD	NA	805.48g
L1-10221A-FSGS-112-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/23/2019	1252	5 ROC HTD	NA	1136.57g
L1-10221C-FSGS-013-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	1520	5 ROC HTD	NA	825.45g
L1-10221D-FIGS-010-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/30/2019	0906	5 ROC HTD	NA	599.72g
L1-10209C-FSGS-010-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/5/2019	0820	5 ROC HTD	NA	1051.63g
L1-10209C-FQGS-010-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/5/2019	0820	5 ROC HTD	NA	795.39g
L1-10209C-FSGS-004-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/30/2019	1327	5 ROC HTD	NA	709.07g
L1-10209C-FQGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/25/2019	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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Attachment 1 - Chain-of-Custody Form

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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-FSG5-010-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	2/9/19	1407	5 ROC HTD	NA	889.81 g
L1-12202-E-FSG5-007-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/10/19	0942	5 ROC HTD	NA	1202.80 g
L1-12202-E-FSG5-012-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/10/19	0952	5 ROC HTD	NA	1189.10 g
L1-12202-F-FSG5-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/10/19	1308	5 ROC HTD	NA	1045.64 g
L1-12202-F-FSG5-010-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/10/19	1318	5 ROC HTD	NA	1107.70 g
L1-12202-C-FSG5-007-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/11/19	0912	5 ROC HTD	NA	1054.03 g
L1-12202-D-FSG5-013-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/11/19	0836	5 ROC HTD	NA	913.68 g
L1-12110-A-FSG5-013-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/16/19	1324	5 ROC HTD	NA	958.11 g
L1-12110-A-FSG5-014-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/16/19	1326	5 ROC HTD	NA	1084.06 g
L1-12202-C-FSG5-013-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/16/19	0830	5 ROC HTD	NA	1082.40 g
L1-12202-D-FSG5-015-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/16/19	1300	5 ROC HTD	NA	922.89 g
L1-12109-A-FSG5-008-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/17/19	0914	5 ROC HTD	NA	1030.30 g
L1-12109-A-FSG5-013-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/17/19	0924	5 ROC HTD	NA	968.97 g
L1-12202-F-FJGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/17/19	0952	5 ROC HTD	NA	1017.40 g
L1-10220-I-FIGS-011-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/17/19	0838	5 ROC HTD	NA	749.70 g
L1-12108-A-FSG5-015-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/18/19	1328	5 ROC HTD	NA	948.00 g
L1-12108-A-FSG5-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	9/18/19	1308	5 ROC HTD	NA	935.70 g

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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					
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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Attachment 1 - Chain-of-Custody Form

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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					
L1-12107-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-FSGS-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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