ZION SOLUTIONS LLC
An EnergySolutions Company

ZION STATION RESTORATION PROJECT
FINAL STATUS SURVEY RELEASE RECORD

SOUTH OF PROTECTED AREA - INLAND

SURVEY UNIT 10221B

PREPARED BY / DATE: R. Mandia 2019-12-30
Radiological Engineer

REVIEWED BY / DATE: J. Graham 2019-12-30
Radiological Engineer

APPROVED BY / DATE: D. Wojtkowiak 2019-12-30
C/LT Manager

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

ALARA	As Low As Reasonably Achievable
AMCG	Average Member of the Critical Group
BcDCGL	Base Case Soil DCGLs
BcSOF	Base Case Sum of Fractions
C/LT	Characterization/Licenses 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 10221B, "South of Protected Area - Inland", has been generated for the Zion Station Restoration Project (ZSRP) in accordance with Zion*Solutions* procedure ZS-LT-300-001-005, *"Final Status Survey Data Reporting"* (Reference 1) and satisfies the requirements of Section 5.11 of the *"Zion Station Restoration Project License Termination Plan"* (LTP) (Reference 2).

A FSS package (L1-10221B-F) was developed in accordance with Zion*Solutions* procedure ZS-LT-300-001-001, *"Final Status Survey Package Development"* (Reference 3), the ZSRP LTP, and guidance from NUREG-1575, "*Multi-Agency Radiation Survey and Site Investigation Manual"* (MARSSIM) (Reference 4).

This open land survey unit has a MARSSIM classification of one. A survey plan was designed based upon use of the Sign Test as the nonparametric statistical test for compliance. Both the Type I (α) and Type II (β) decision error rates were set at 0.05. Seventeen (17) systematic surface soil samples were acquired from the survey unit. In addition, surface scanning was performed on 100% of the total surface area in the survey unit under the FSS Sample Plan. No areas of elevated activity were detected during the initial scans. However, subsequent scans were performed under a Radiological Assessment (RA) survey on June 17, 2019 on the railroad ballast located in survey unit 10221B and on the soil areas one-meter beyond the ballast gravel. The RA survey identified two (2) small areas of elevated activity (see Section 9 for further discussion). The analytical results for all soil samples (systematic and biased) taken in survey unit 10221B indicated that the Sum of Fractions (SOF) for each sample, when compared to the Operational Derived Concentration Guideline Levels (OpDCGL), was less than 1.0. For the systematic samples, the maximum Operational SOF (OpSOF) was 0.116 with a mean OpSOF of 0.038. The maximum OpSOF observed in any of the biased samples taken (judgmental and investigation) was 0.853 (sample# L1-10221B -FIGS-102-SS). For the systematic samples, the mean Base Case SOF (BcSOF), when the analytical results were compared to the Base Case DCGLs (BcDCGL), was 0.010, which results in a dose assigned to the survey unit of 0.245 mrem/yr. Therefore, the null hypothesis is rejected and survey unit 10221B is acceptable for unrestricted release.

2. SURVEY UNIT DESCRIPTION

Survey unit 10221B, "South of Protected Area - Inland", is a Class 1 open land survey unit. It is bounded on the west by survey unit 10221A, the east by survey unit 10221C, the north by survey units 10209B and 10209C; and the south by survey units 10220A and 10220H.

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 half of the survey unit.

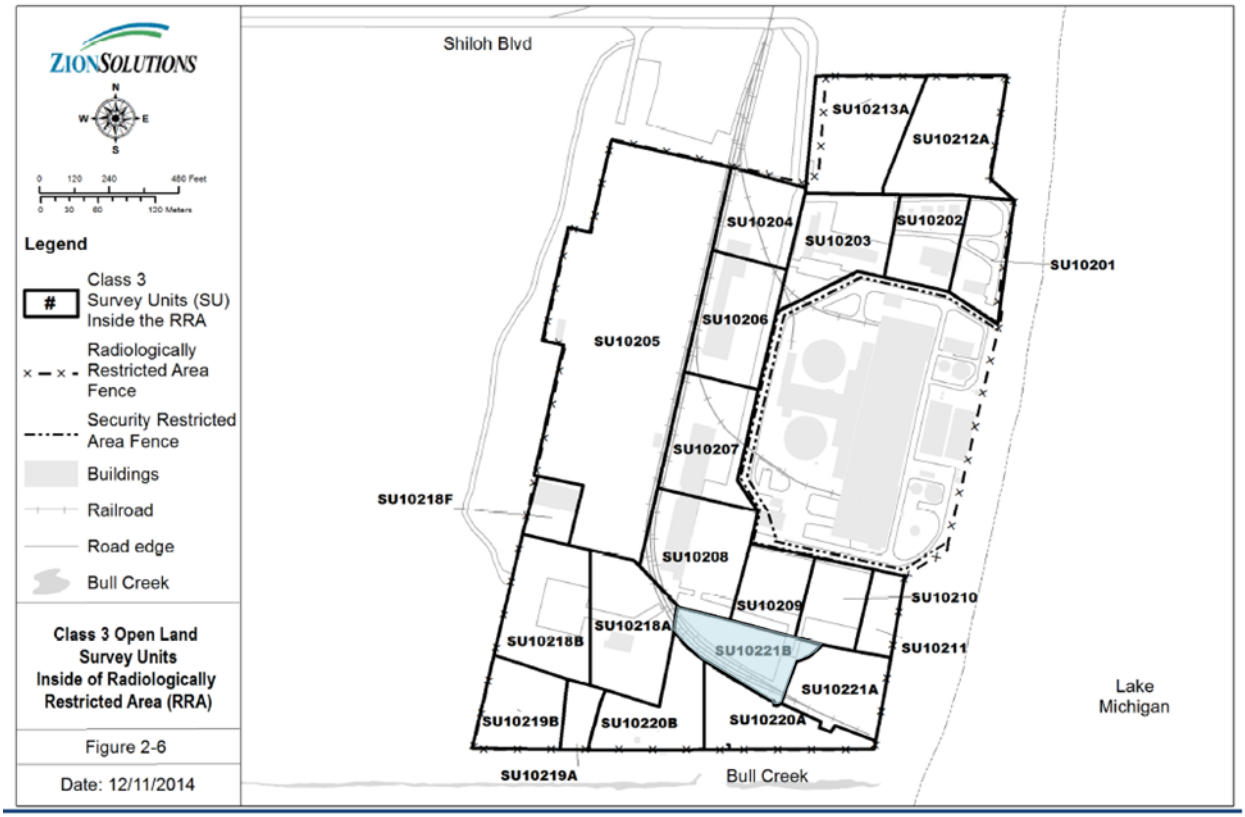
The boundary of the survey unit was defined using a Global Positioning System (GPS) based on the Illinois State Plane System North American Datum (NAD) 1983 East. The reference coordinates associated with the sample locations in this survey unit are presented in Table 8.

3. CLASSIFICATION BASIS

Survey unit 10221B 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 Figure 4 of 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 of the LTP as represented in Figure 2-6 of the LTP and 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. The HSA also discusses the potential for low levels of radiological contamination due to elevated environmental sample results from the 70's. 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:

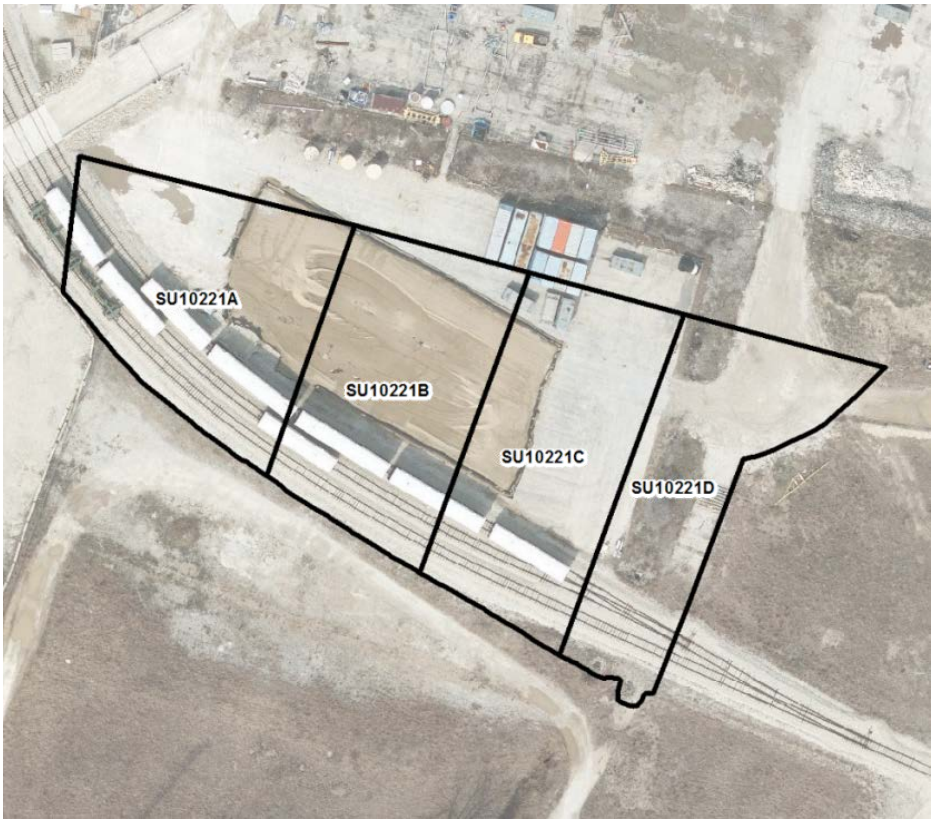
- Five (5) judgmental surface samples taken in the drainage ditch on the east side of the survey unit.
- Twenty (20) random surface samples and two (2) random subsurface samples.
- One (1) investigation surface sample and one (1) investigation subsurface sample taken in an area identified by a scan alarm.
- Sodium Iodide (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/Licenses Termination (C/LT) Supervisor performed a visual inspection and walk-down of the survey unit on June 4, 2019 prior to performing FSS. The purpose of the walk-down was to assess the physical condition of the survey unit, evaluate access points and travel paths and identify potentially hazardous conditions. A final classification assessment was performed in accordance with ZS-LT-300-001-002, as part of the survey design for FSS. The assessment confirmed that survey unit 10221B was correctly classified as Class 1.

4. DATA QUALITY OBJECTIVES

Final Status Survey planning and design hinges on coherence with the Data Quality Objective (DQO) process to ensure, through compliance with explicitly defined inputs and boundaries, that the primary objective of the survey is satisfied. The DQO process is described in the ZSRP LTP in accordance with MARSSIM. 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 10221B does not exceed the release criteria specified in the LTP and that the potential dose from residual radioactivity is As Low As Reasonably Achievable (ALARA).

Zion*Solutions* Technical Support Document (TSD) 11-001, *"Technical Support Document for Potential Radionuclides of Concern During the Decommissioning of the Zion Station"* (Reference 7), written in 2012, established the basis for an initial suite of potential ROC for the decommissioning of the Zion Nuclear Power Station (ZNPS).

Zion*Solutions* TSD 14-019, *"Radionuclides of Concern for Soil and Basement Fill Model Source Terms"* (Reference 8), completed in February 2017, was written to refine the initial selection of ROC for decommissioning at ZSRP. The list of ROC was evaluated using Containment Building(s) and Auxiliary Building concrete core analysis data to evaluate the dose significance of each radionuclide in the end state model. Section 4.4 of the TSD evaluated the results of the characterization data of surveys taken of soils. The following conclusion was reached: *"The results of surface and subsurface soil characterization in the impacted area surrounding Zion indicate that there is minimal residual radioactivity in soil. Essentially all of the soil results were reported as non-detectable. Other than Cs-137 at very low levels, and Co-60 at a concentration of 0.24 pCi/g in one sample, the results for all radionuclides were less than MDC. Therefore, the direct determination of radionuclide mixture fractions for initial suite radionuclides in soil is not technically feasible due to the MDC biasing issues discussed above. Based on a generalized assumption that the contaminated water that caused concrete contamination would be similar to the source of soil contamination, the ROC and radionuclide mixture derived for the Auxiliary Building concrete was considered to be reasonably representative of soils for FSS planning and implementation.*"

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

Table 1 - Dose Significant Radionuclides and Mixture

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

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

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

Surface soil is defined as soil residing in the first 0.15 m (6 inches) layer of soil. A subsurface soil category, which is defined as a layer of soil beginning at the surface but extending to a depth of 1 m is also assessed to allow for flexibility in compliance demonstration if contamination deeper than 0.15 m is encountered. Site-specific DCGLs for soil were calculated for both the 0.15 m and 1 m thicknesses. Based on characterization data and historical information, there are no expectations of encountering a source term geometry that is comprised of a clean surface layer of soil over a contaminated subsurface soil layer. Zion*Solutions* TSD 14-011, *"Soil Area Factors"* (Reference 9) and LTP Chapter 6, section 6.8 provides 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 for the end-state (basements, soils, buried pipe and groundwater). Basements are comprised of the summation of four structural source terms (surfaces, embedded pipe, penetrations and fill). When applied to soil, the DCGLs are expressed in units of activity per unit of mass (pCi/g). The "unity rule" is applied when there is more than one ROC. The measurement results for each singular ROC present in the mixture are compared against their respective DCGL to derive a dose fraction.

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

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

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

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

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

Each radionuclide-specific BcDCGL is equivalent to the level of residual radioactivity (above background levels) that could, when considered independently, result in a Total Effective Dose Equivalent (TEDE) of 25 mrem per year to an Average Member of the Critical Group (AMCG). To ensure that the summation of dose from each source term is 25 mrem/yr or less after all FSS is completed, the BcDCGLs are reduced based on an expected, or *a priori*, fraction of the 25 mrem/year dose limit from each source term. The reduced DCGLs, or "Operational" DCGLs can be related to the BcDCGLs as an expected fraction of dose based on an *a priori* assessment of what the expected dose should be based on the results of site characterization, process knowledge and the extent of planned remediation. The OpDCGL is then used as the DCGL for the FSS design of the survey unit (calculation of surrogate DCGLs, investigations levels, etc.). Details of the OpDCGLs derived for each dose component and the basis for the applied *a priori* dose fractions are provided in Zion*Solutions* TSD 17-004, *"Operational Derived Concentration Guideline Levels for Final Status Survey"* (Reference 10).

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

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

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

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

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

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

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

As part of the DQOs applied to laboratory processes, analysis results were reported as actual calculated results. The actual recorded value was used as the recorded FSS result for measurement and/or sample values that are less than MDC. Negative values were recorded as "zero". For radionuclides less than MDC, the value representing the highest abundance was

selected. Results were not reported as "less than MDC". Sample report summaries included unique sample identification, analytical method, radionuclide, result, uncertainty, laboratory data qualifiers, units, and the observed MDC.

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

5. SURVEY DESIGN

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

The DQO process determined that Co-60, Ni-63, Sr-90, Cs-134 and Cs-137 would be the ROC in survey unit 10221B. During FSS, concentrations for Hard-to-Detect (HTD) ROC Ni-63 and Sr-90 are inferred using a surrogate approach. Cs-137 is the principle surrogate radionuclide for Sr-90 and Co-60 is the principle surrogate radionuclide for Ni-63. The mean, maximum and 95% Upper Confidence Level (UCL) of the surrogate ratios for concrete core samples taken in the Auxiliary Building basement were calculated in Zion*Solutions* TSD 14-019, *"Radionuclides of Concern for Soil and Basement Fill Model Source Terms"* and are presented in Table 6. The maximum ratios will be used in the surrogate calculations during FSS unless area specific ratios are determined by continuing characterization.

Table 6 - Surrogate Ratios

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

For the FSS of survey unit 10221B, the surrogate OpDCGLs for Co-60 and Cs-137 were computed based on the maximum ratios from Table 6.

The equation for calculating a surrogate DCGL is as follows:

Equation 1

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

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

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

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

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

Equation 2

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

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

Equation 3

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

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

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

Equation 4

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

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

Equation 5

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

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

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

Table 7 - Investigation Levels

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

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

- background count rate of 5000 counts per minute (cpm)
- scan speed of 0.5 m/sec
- distance from detector to surface of 2-inches
- isotopic mix of 95% Cs-137 and 5% Co-60

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

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

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

will be used for Δ/σ. For this survey design, a conservative estimate of the sample variability of 0.30 was used as the coefficient of variation to calculate Δ/σ.

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

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/CAD Specialist, with coordinates based on the NAD standard topographical grid coordinate system. The number of samples generated by VSP for a systematic triangular grid was seventeen. 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: $A = \frac{A_{SU}}{N} = \frac{1885}{17} = 110.9\ m^2$
- From the LTP, Table 5-16, the Area Factors for the next larger area, 300 m^2 area were used:
  - Cs-137 - 1.46
  - Cs-134 - 1.30
  - Co-60 - 1.16
- The $DCGL_{EMC}$ is the Surrogate Base Case DCGL times the Area Factor:
  - The $DCGL_{EMC}$ for Cs-137 = $1.46 * 14.15 = 20.66\ pCi/g$
  - The $DCGL_{EMC}$ for Cs-134 = $1.30 * 6.77 = 8.80\ pCi/g$
  - The $DCGL_{EMC}$ for Co-60 = $1.16 * 3.51 = 4.07\ pCi/g$

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

The implementation of quality control (QC) measures as referenced by LTP Chapter 5, section 5.9 and Zion*Solutions* procedure ZS-LT-01, "*Quality Assurance Project Plan (for Characterization and FSS)*" (Reference 12) includes the collection of a soil sample for "split sample" analysis on 5% of the soil samples taken in a survey unit with the locations selected at random. One (1) surface soil sample (L1-10221B-FQGS-001-SS) was selected randomly for split sample analysis for the FSS of this survey unit.

In accordance with section 5.7.1.6.2 of the LTP, a subsurface soil sample was taken at 10% of the systematic surface soil sample locations in the survey unit with the location(s) selected at random. Locations L1-10221B-FSGS-004-SB and L1-10221B-FSGS-011-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)
L1-10221B-FSGS-001-SS	641501.00	343540.12
L1-10221B-FSGS-002-SS	641501.00	343551.43
L1-10221B-FSGS-003-SS	641510.80	343534.46
L1-10221B-FSGS-004-SS	641510.80	343545.78
L1-10221B-FSGS-005-SS	641510.80	343557.09
L1-10221B-FSGS-006-SS	641520.60	343528.80
L1-10221B-FSGS-007-SS	641520.60	343540.12
L1-10221B-FSGS-008-SS	641520.60	343551.43
L1-10221B-FSGS-009-SS	641520.60	343562.75
L1-10221B-FSGS-010-SS	641530.40	343534.46
L1-10221B-FSGS-011-SS	641530.40	343545.78
L1-10221B-FSGS-012-SS	641530.40	343557.09
L1-10221B-FSGS-013-SS	641540.20	343540.12
L1-10221B-FSGS-014-SS	641540.20	343551.43
L1-10221B-FSGS-015-SS	641540.20	343562.75
L1-10221B-FSGS-016-SS	641550.00	343545.78
L1-10221B-FSGS-017-SS	641550.00	343557.09
L1-10221B-FSGS-004-SB	641510.80	343545.78
L1-10221B-FSGS-011-SB	641530.40	343545.78

ZSRP LTP Chapter 5, section 5.1 states that soil samples will be collected during FSS to confirm the HTD to surrogate radionuclide ratios (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 (see Table 6). The maximum ratios (Table 6) 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 Chapter 5, 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. Seven (7) samples: L1-10221B-FSGS-006-SS, L1-10221B-FJGS-002-SS, L1-10221B-FIGS-100-SS, L1-10221B-FIGS-102-SS, L1-10221B-FIGS-103-SS, L1-10221B-FIGS-104-SS and L1-10221B-FIGS-105-SS exceeded an OpSOF of 0.1 during the FSS of survey unit 10221B.

These samples satisfy the requirement that 10% of the samples collected for the FSS of survey unit 10221B be analyzed for HTD ROC. Each selected sample was sent off-site (Eberline Analytical) for analysis of the HTD ROC as specified in LTP Chapter 5, section 5.1. Table 9 provides a synopsis of the survey design for survey unit 10221B.

Table 9 - Synopsis of Survey Design

FEATURE	DESIGN CRITERIA	BASIS
Survey Unit Area	1,885 m^2	GPS measurements of area
Number of Surface Soil Samples	17 (Systematic)	• σ = 0.30 • UBGR = SOF of 1 • LBGR = SOF of 0.5 • Type I error = 0.05 • Type II error = 0.05 • Δ/σ = 1.67 (MARSSIM Table 5.5)
Grid Spacing	11.3 m	(LTP Chapter 5, section 5.6.4.5.2)
DCGLs	• Co-60 – 1.091 pCi/g • Cs-134 – 1.733 pCi/g • Cs-137 – 3.630 pCi/g • Ni-63 – 914.458 pCi/g • Sr-90 – 3.095 pCi/g	Operational DCGLs for Surface Soils, (LTP Chapter 5, Table 5-7)
HTD ROC Analysis	A minimum of two (2) soil samples selected for HTD ROC analysis	(LTP Chapter 5, section 5.1)
Measurement Investigation Level	Operational DCGL	(LTP Chapter 5, Table 5-25)
Scan Survey Area Coverage	100%	(LTP Chapter 5, Table 5-24)
QC	One (1) surface soil sample selected randomly for split sample analysis	(LTP Chapter 5, section 5.9)
Number of Subsurface Soil Samples	Two (2) systematic surface soil sample locations selected, at locations 4 and 11	(LTP Chapter 5, 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 L1-10221B-F, which was developed in accordance with ZS-LT-300-001-001. The FSS unit was inspected and controlled in accordance with Zion*Solutions* procedure ZS-LT-300-001-003, "*Isolation and Control for Final Status Survey*" (Reference 13).

For survey unit 10221B, 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 be taken to the appropriate depth within the area of concern as part of the investigation. This threshold was encountered during an RA survey on June 17, 2019. While performing a gamma scan of the railroad ballast located in survey unit 10221B, and the soil areas one-meter beyond the ballast gravel, two (2) small areas of elevated activity were identified (these scans were performed subsequent to the scans performed under the FSS Sample Plan). Surface and subsurface investigation soil samples were taken at these locations (L1-10221B-FIGS-100-SS thru L1-10221B-FIGS-109-SS, L1-10221B-FIGS-100-SB and L1-10221B-FIGS-101-SB).

FSS field activities were conducted under FSS Sample Plan L1-10221B-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 June 7, 2019 and concluding October 14, 2019.

The seventeen (17) systematic surface soil sample locations were marked with flags based on GPS coordinates provided by VSP. Five (5) 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 22 and are shown on the systematic sample map in Attachment 1 and the posting plot in Attachment 6.

Under the FSS Sample Plan, gamma scans were performed on 100% of the surface area of the survey unit using a Ludlum 2350-1 paired with a Model 44-10 (2" x 2") NaI detector operated in the rate-meter mode and using audio response. The probe was positioned within 2-inches to the ground and was moved at a scan speed of approximately 0.5 meters per second. No areas of elevated activity were detected during the scans under the FSS Sample Plan. However, subsequent scans were performed under an RA on June 17, 2019 on the railroad ballast located

in survey unit 10221B and the soil areas one-meter beyond the ballast gravel. The RA survey identified two (2) small areas of elevated activity (see Section 9 for further discussion).

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

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

Table 10 - Instruments and Detectors

Instrument/Detector Type	Serial #	Calibration Due Date
Ludlum 2350-1/Ludlum 44-10	266668/PR363489	12/19/2019
Ludlum 2350-1/Ludlum 44-10	304712/PR372143	12/18/2019
Ludlum 2350-1/Ludlum 44-10	266657/PR308037	05/13/2020
Ludlum 2350-1/Ludlum 44-10	266669/PR311756	12/12/2019
Ludlum 2350-1/Ludlum 44-10	216166/PR372106	11/29/2019
Ludlum 2350-1/Ludlum 44-10	304711/PR321902	01/18/2020
Ludlum 2350-1/Ludlum 44-10	304726/PR363452	09/06/2019
Ludlum 2350-1/Ludlum 44-10	216173/ES0118	12/06/2019

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. In addition, ten (10) surface samples and two (2) subsurface samples were collected as part of the investigation of two (2) areas of elevated activity identified during surface scans performed under an RA; eight (8) judgmental surface samples were taken adjacent to the railroad ballast on both sides and one (1) judgmental surface sample was collected in a small area with a higher background.

Seven (7) samples (L1-10221B-FSGS-006-SS, L1-10221B-FJGS-002-SS, L1-10221B-FIGS-100-SS, L1-10221B-FIGS-102-SS, L1-10221B-FIGS-103-SS, L1-10221B-FIGS-104-SS and L1-10221B-FIGS-105-SS) were selected for HTD radionuclide analysis.

7. SURVEY RESULTS

One hundred percent (100%) of the surface of the survey unit was scanned for elevated radiation levels. Sixty (60) 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

measurements locations were identified by surface scan under the FSS Sample Plan. However, subsequent scans were performed under an RA on June 17, 2019 on the railroad ballast located in survey unit 10221B and the soil areas one meter beyond the ballast gravel. The RA survey identified two (2) small areas of elevated activity (see Section 9 for further discussion). Table 11 provides an overview of the scan results. FSS scan results are provided in Attachment 2.

Table 11 - Synopsis of Scan Results

Scan Area	Highest Logged Reading (cpm)	Action Level[(1)] (cpm)	# of Scan Alarms	Investigation Samples
Row 1	3627	3720	None	None
Row 2	3569	3720	None	None
Row 3	3661	3720	None	None
Row 4	2687	3056	None	None
Row 5	2647	3056	None	None
Row 6	2689	3056	None	None
Row 7	2476	3056	None	None
Row 8	2730	2841	None	None
Row 9	2716	2841	None	None
Row 10	2446	2841	None	None
Row 11	2840	2841	None	None
Row 12	2693	2841	None	None
Row 13	2649	2841	None	None
Row 14	2747	2841	None	None
Row 15	2708	2841	None	None
Row 16	3404	4071	None	None
Row 17	3010	3349	None	None
Row 18	3269	4071	None	None
Row 19	2972	3349	None	None
Row 20	3486	4071	None	None
Row 21	2925	3349	None	None
Row 22	3425	4071	None	None
Row 23	3045	3349	None	None
Row 24	3398	4071	None	None
Row 25	3158	3349	None	None
Row 26	3599	4071	None	None
Row 27	3219	3349	None	None
Row 28	3670	4071	None	None
Row 29	3222	3349	None	None
Row 30	3717	4071	None	None
Row 31	3310	3349	None	None
Row 32	3532	3709	None	None

Table 11 (continued) - Synopsis of Scan Results

Scan Area	Highest Logged Reading (cpm)	Action Level[1] (cpm)	# of Scan Alarms	Investigation Samples
Row 33	3429	3709	None	None
Row 34	3443	3709	None	None
Row 35	3265	3709	None	None
Row 36	3244	3709	None	None
Row 37	3274	3709	None	None
Row 38	3301	3709	None	None
Row 39	3413	3709	None	None
Row 40	3540	3851	None	None
Row 41	3455	3617	None	None
Row 42	3501	3617	None	None
Row 43	3409	3617	None	None
Row 44	3561	3617	None	None
Row 45	3603	3617	None	None
Row 46	3432	3617	None	None
Row 47	3569	3678	None	None
Row 48	3409	3527	None	None
Row 49	3257	3527	None	None
Row 50	3326	3527	None	None
Row 51	3180	3527	None	None
Row 52	3070	3527	None	None
Row 53	2976	3527	None	None
Row 54	2942	3527	None	None
Row 55	2905	3527	None	None
Row 56	2475	3322	None	None
Row 57	2969	3322	None	None
Row 58	2908	3322	None	None
Row 59	2876	3322	None	None
Row 60	2938	3322	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 nineteen (19) biased surface soil samples (investigation and judgmental) and the four (4) subsurface soil samples (two selected at random and two taken as investigations) were analyzed using the on-site gamma spectroscopy system. Summaries of the sample analysis results are provided in Tables 12, 13 and 14, respectively. The basic statistics for the systematic sample population are summarized in Table 21. For the systematic samples, the gamma spectroscopy results revealed two (2) samples with activity levels above MDC for Cs-137 and no samples with activity levels above MDC for Co-60 and Cs-134. For the biased samples, the results

showed six (6) samples with activity level above MDC for Cs-137 and four (4) samples with activity levels above the MDC for Co-60. The concentration for Ni-63 and Sr-90 were inferred based on the maximum ratios as specified in Table 6. The mean of the gamma spectroscopic analysis results for the sample population indicated that Cs-137 was present at levels lower than the concentrations of Cs-137 expected to be found in off-site soil in the vicinity of the ZNPS as presented in Zion*Solutions* TSD 13-004, "*Examination of Cs-137 Global Fallout In Soils At Zion Station*" (Reference 15). The complete gamma spectroscopy reports are presented in Attachment 7.

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

MEASUREMENT ID	Co-60[(1)] (pCi/g)	Cs-134[(1)] (pCi/g)	Cs-137[(1)] (pCi/g)	Ni-63[(2)] (pCi/g)	Sr-90[(2)] (pCi/g)
L1-10221B-FSGS-001-SS	4.18E-03	2.36E-03	6.12E-03	7.54E-01	1.22E-05
L1-10221B-FSGS-002-SS	0.00E+00	3.19E-03	1.95E-02	0.00E+00	3.90E-05
L1-10221B-FSGS-003-SS	5.66E-02	0.00E+00	6.48E-02	1.02E+01	1.30E-04
L1-10221B-FSGS-004-SS	2.90E-02	1.07E-02	3.16E-02	5.23E+00	6.32E-05
L1-10221B-FSGS-005-SS	8.44E-03	6.55E-03	**6.16E-02**	1.52E+00	1.23E-04
L1-10221B-FSGS-006-SS	3.84E-02	2.33E-02	**2.15E-01**	6.93E+00	4.30E-04
L1-10221B-FSGS-007-SS	2.27E-03	0.00E+00	1.60E-02	4.10E-01	3.20E-05
L1-10221B-FSGS-008-SS	2.61E-02	2.80E-02	6.00E-03	4.71E+00	1.20E-05
L1-10221B-FSGS-009-SS	5.59E-03	2.23E-02	2.20E-02	1.01E+00	4.40E-05
L1-10221B-FSGS-010-SS	4.56E-03	2.60E-02	3.19E-02	8.23E-01	6.38E-05
L1-10221B-FSGS-011-SS	3.61E-02	0.00E+00	3.03E-02	6.51E+00	6.06E-05
L1-10221B-FSGS-012-SS	1.74E-02	9.64E-03	0.00E+00	3.14E+00	0.00E+00
L1-10221B-FSGS-013-SS	5.96E-02	5.02E-03	0.00E+00	1.08E+01	0.00E+00
L1-10221B-FSGS-014-SS	2.86E-02	1.67E-02	0.00E+00	5.16E+00	0.00E+00
L1-10221B-FSGS-015-SS	0.00E+00	1.81E-02	0.00E+00	0.00E+00	0.00E+00
L1-10221B-FSGS-016-SS	0.00E+00	3.97E-02	1.02E-02	0.00E+00	2.04E-05
L1-10221B-FSGS-017-SS	2.08E-02	0.00E+00	4.06E-02	3.75E+00	8.12E-05

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

Table 13 - Summary of Gamma Spectroscopy Results for Biased Surface Soil Samples

MEASUREMENT ID	Co-60[1] (pCi/g)	Cs-134[1] (pCi/g)	Cs-137[1] (pCi/g)	Ni-63[2] (pCi/g)	Sr-90[2] (pCi/g)
L1-10221B-FIGS-100-SS	5.50E-02	0.00E+00	**2.09E-01**	9.92E+00	4.18E-04
L1-10221B-FIGS-101-SS	3.13E-02	9.01E-03	1.53E-03	5.65E+00	3.06E-06
L1-10221B-FIGS-102-SS	**2.23E-01**	3.17E-02	**9.51E-01**	4.02E+01	1.90E-03
L1-10221B-FIGS-103-SS	**1.82E-01**	5.46E-03	**7.58E-01**	3.28E+01	1.52E-03
L1-10221B-FIGS-104-SS	9.25E-02	1.42E-03	**9.07E-01**	1.67E+01	1.81E-03
L1-10221B-FIGS-105-SS	4.97E-02	5.24E-02	**1.74E-01**	8.97E+00	3.48E-04
L1-10221B-FIGS-106-SS	3.57E-02	0.00E+00	5.71E-02	6.44E+00	1.14E-04
L1-10221B-FIGS-107-SS	5.83E-02	0.00E+00	2.80E-02	1.05E+01	5.60E-05
L1-10221B-FIGS-108-SS	2.43E-02	1.65E-02	2.17E-02	4.38E+00	4.34E-05
L1-10221B-FIGS-109-SS	2.25E-02	0.00E+00	5.72E-04	4.06E+00	1.14E-06
L1-10221B-FJGS-001-SS	4.72E-04	0.00E+00	0.00E+00	8.52E-02	0.00E+00
L1-10221B-FJGS-002-SS	**7.54E-02**	2.70E-03	6.58E-02	1.36E+01	1.32E-04
L1-10221B-FJGS-003-SS	0.00E+00	0.00E+00	6.73E-03	0.00E+00	1.35E-05
L1-10221B-FJGS-004-SS	3.39E-03	3.47E-02	2.35E-02	6.12E-01	4.70E-05
L1-10221B-FJGS-005-SS	2.98E-02	1.60E-02	4.61E-02	5.38E+00	9.22E-05
L1-10221B-FJGS-006-SS	1.60E-02	0.00E+00	2.26E-02	2.89E+00	4.52E-05
L1-10221B-FJGS-007-SS	0.00E+00	2.01E-02	1.83E-02	0.00E+00	3.66E-05
L1-10221B-FJGS-008-SS	2.36E-02	3.28E-02	9.20E-02	4.26E+00	1.84E-04
L1-10221B-FJGS-009-SS	**5.55E-02**	0.00E+00	**6.60E-02**	1.00E+01	1.32E-04

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

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

MEASUREMENT ID	Co-60[1] (pCi/g)	Cs-134[1] (pCi/g)	Cs-137[1] (pCi/g)	Ni-63[2] (pCi/g)	Sr-90[2] (pCi/g)
L1-10221B-FSGS-004-SB	2.67E-02	2.91E-02	0.00E+00	4.82E+00	0.00E+00
L1-10221B-FSGS-011-SB	0.00E+00	1.76E-03	2.69E-02	0.00E+00	5.38E-05
L1-10221B-FIGS-100-SB	3.21E-02	1.03E-03	0.00E+00	5.79E+00	0.00E+00
L1-10221B-FIGS-101-SB	1.33E-03	4.02E-03	2.22E-02	2.40E-01	4.44E-05

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

The off-site laboratory, Eberline Analytical, processed the seven (7) samples selected for HTD ROC analysis. Samples L1-10221B-FSGS-006-SS, L1-10221B-FJGS-002-SS, L1-10221B-FIGS-100-SS, L1-10221B-FIGS-102-SS, L1-10221B-FIGS-103-SS, L1-10221B-FIGS-104-SS and L1-10221B-FIGS-105-SS were selected. Only HTD radionuclides included as ROC (Ni-63 and Sr-90 for soils) were included in the analysis. All analyses met the required MDC. Only Cs-137 and Co-60 was positively detected in the samples at concentrations greater than MDC. Consequently, comparison of existing ratios verses the maximum ratios from Table 6 was not required. The results are provided in Table 15.

Table 15 - Off-Site Analysis Results

Sample # L1-10221B-FSGS-006-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	2.72E-02	7.05E-02	1.18E-01	No
Cs-134	-1.37E-01	7.81E-02	7.73E-02	No
Cs-137	2.83E-01	8.00E-02	1.05E-01	Yes
Ni-63	-1.50E+00	1.92E+00	3.38E+00	No
Sr-90	5.69E-02	3.44E-01	8.75E-01	No

Sample # L1-10221B-FJGS-002-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	1.04E-01	4.32E-02	6.95E-02	Yes
Cs-134	1.50E-02	2.87E-02	8.51E-02	No
Cs-137	1.26E-01	7.47E-02	1.15E-01	Yes
Ni-63	1.47E+00	2.02E+00	3.40E+00	No
Sr-90	-2.93E-01	3.91E-01	8.71E-01	No

Sample # L1-10221B-FIGS-100-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	8.15E-02	4.67E-02	1.02E-01	No
Cs-134	1.02E-02	2.82E-02	7.01E-02	No
Cs-137	2.66E-01	9.61E-02	1.35E-01	Yes
Ni-63	-3.27E-01	2.29E+00	3.97E+00	No
Sr-90	1.42E-01	3.82E-01	8.01E-01	No

Table 15 (Continued) - Off-Site Analysis Results

Sample # L1-10221B-FIGS-102-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	5.05E-01	1.08E-01	1.82E-01	Yes
Cs-134	-7.22E-03	1.96E-02	9.82E-02	No
Cs-137	9.82E-01	1.60E-01	1.56E-01	Yes
Ni-63	1.49E+00	2.14E+00	3.61E+00	No
Sr-90	3.64E-01	3.67E-01	7.44E-01	No

Sample # L1-10221B-FIGS-103-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	2.25E-01	5.51E-02	9.50E-02	Yes
Cs-134	-4.54E-02	4.08E-02	5.63E-02	No
Cs-137	1.08E+00	1.52E-01	7.67E-02	Yes
Ni-63	1.31E+00	1.88E+00	3.18E+00	No
Sr-90	1.69E-01	3.58E-01	7.47E-01	No

Sample # L1-10221B-FIGS-104-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	-1.42E-02	7.83E-02	1.17E-01	No
Cs-134	-1.58E-01	1.05E-01	1.01E-01	No
Cs-137	2.08E-01	9.07E-02	1.31E-01	Yes
Ni-63	-1.84E-01	1.93E+00	3.34E+00	No
Sr-90	3.40E-02	2.86E-01	6.10E-01	No

Sample # L1-10221B-FIGS-105-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	2.64E-02	7.89E-02	1.35E-01	No
Cs-134	-3.55E-03	3.00E-02	8.99E-02	No
Cs-137	1.58E-01	8.22E-02	1.25E-01	Yes
Ni-63	2.68E-01	1.89E+00	3.25E+00	No
Sr-90	1.59E-01	3.12E-01	6.50E-01	No

The implementation of survey specific QC measures included the collection of one (1) systematic sample (L1-10221B-FQGS-001-SS) and two (2) biased samples (L1-10221B-QJGS-001-SS and L1-10221B-QJGS-009-SS) for "split sample" analysis. The on-site

laboratory analyzed the QC samples using the on-site gamma spectroscopy system. Gamma spectroscopy results are summarized in Table 16. The concentration for Ni-63 and Sr-90 are inferred based on the maximum ratios as specified in Table 6.

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

MEASUREMENT ID	Co-60[(1)] (pCi/g)	Cs-134[(1)] (pCi/g)	Cs-137[(1)] (pCi/g)	Ni-63[(2)] (pCi/g)	Sr-90[(2)] (pCi/g)
L1-10221B-FQGS-001-SS	6.82E-03	2.20E-03	2.61E-02	1.23E+00	5.22E-05
L1-10221B-QJGS-001-SS	3.29E-02	2.98E-02	0.00E+00	5.94E+00	0.00E+00
L1-10221B-QJGS-009-SS	2.71E-02	1.72E-02	**5.57E-02**	4.89E+00	1.11E-04

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

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

Equation 6

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

Where: C_n = concentration of radionuclide *n*

$DCGL_n$ = DCGL of radionuclide *n*.

The results of the unity rule calculation for the ROC in the systematic sample population when compared against the OpDCGLs for surface soils for survey unit 10221B are provided in Table 17. The results of the unity rule calculation for the ROC for the biased surface samples are provided in Table 18, the results for the subsurface samples in Table 19 and the results for the QC samples in Table 20.

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

MEASUREMENT ID	Fraction of the OpDCGLs for Surface Soils					OpSOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L1-10221B-FSGS-001-SS	3.83E-03	1.36E-03	1.69E-03	8.25E-04	3.95E-06	0.008
L1-10221B-FSGS-002-SS	0.00E+00	1.84E-03	5.37E-03	0.00E+00	1.26E-05	0.007
L1-10221B-FSGS-003-SS	5.19E-02	0.00E+00	1.79E-02	1.12E-02	4.19E-05	0.081
L1-10221B-FSGS-004-SS	2.66E-02	6.17E-03	8.71E-03	5.72E-03	2.04E-05	0.047
L1-10221B-FSGS-005-SS	7.74E-03	3.78E-03	1.70E-02	1.67E-03	3.98E-05	0.030
L1-10221B-FSGS-006-SS	3.52E-02	1.34E-02	5.92E-02	7.58E-03	1.39E-04	0.116
L1-10221B-FSGS-007-SS	2.08E-03	0.00E+00	4.41E-03	4.48E-04	1.03E-05	0.007
L1-10221B-FSGS-008-SS	2.39E-02	1.62E-02	1.65E-03	5.15E-03	3.88E-06	0.047
L1-10221B-FSGS-009-SS	5.12E-03	1.29E-02	6.06E-03	1.10E-03	1.42E-05	0.025
L1-10221B-FSGS-010-SS	4.18E-03	1.50E-02	8.79E-03	9.00E-04	2.06E-05	0.029
L1-10221B-FSGS-011-SS	3.31E-02	0.00E+00	8.35E-03	7.12E-03	1.96E-05	0.049
L1-10221B-FSGS-012-SS	1.59E-02	5.56E-03	0.00E+00	3.43E-03	0.00E+00	0.025
L1-10221B-FSGS-013-SS	5.46E-02	2.90E-03	0.00E+00	1.18E-02	0.00E+00	0.069
L1-10221B-FSGS-014-SS	2.62E-02	9.64E-03	0.00E+00	5.64E-03	0.00E+00	0.041
L1-10221B-FSGS-015-SS	0.00E+00	1.04E-02	0.00E+00	0.00E+00	0.00E+00	0.010
L1-10221B-FSGS-016-SS	0.00E+00	2.29E-02	2.81E-03	0.00E+00	6.59E-06	0.026
L1-10221B-FSGS-017-SS	1.91E-02	0.00E+00	1.12E-02	4.10E-03	2.62E-05	0.034

Systematic Measurements

Number of Systematic Measurements =	17
# of Systematic Measurements with OpSOF $\geq$ 1 =	0
# of Systematic Measurements with OpSOF > 0.1 (HTD Assessment) =	1
Max Individual Systematic Measurement OpSOF =	0.116
Mean Systematic Measurement OpSOF =	0.038

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

MEASUREMENT ID	Fraction of the OpDCGLs for Surface Soils					OpSOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L1-10221B-FIGS-100-SS	5.04E-02	0.00E+00	5.76E-02	1.09E-02	1.35E-04	0.119
L1-10221B-FIGS-101-SS	2.87E-02	5.20E-03	4.21E-04	6.18E-03	9.89E-07	0.040
L1-10221B-FIGS-102-SS	2.04E-01	1.83E-02	2.62E-01	4.40E-02	6.15E-04	0.529
L1-10221B-FIGS-103-SS	1.67E-01	3.15E-03	2.09E-01	3.59E-02	4.90E-04	0.415
L1-10221B-FIGS-104-SS	8.48E-02	8.19E-04	2.50E-01	1.83E-02	5.86E-04	0.354
L1-10221B-FIGS-105-SS	4.56E-02	3.02E-02	4.79E-02	9.81E-03	1.12E-04	0.134
L1-10221B-FIGS-106-SS	3.27E-02	0.00E+00	1.57E-02	7.04E-03	3.69E-05	0.056
L1-10221B-FIGS-107-SS	5.34E-02	0.00E+00	7.71E-03	1.15E-02	1.81E-05	0.073
L1-10221B-FIGS-108-SS	2.23E-02	9.52E-03	5.98E-03	4.80E-03	1.40E-05	0.043
L1-10221B-FIGS-109-SS	2.06E-02	0.00E+00	1.58E-04	4.44E-03	3.70E-07	0.025
L1-10221B-FJGS-001-SS	4.33E-04	0.00E+00	0.00E+00	9.31E-05	0.00E+00	0.001
L1-10221B-FJGS-002-SS	6.91E-02	1.56E-03	1.81E-02	1.49E-02	4.25E-05	0.104
L1-10221B-FJGS-003-SS	0.00E+00	0.00E+00	1.85E-03	0.00E+00	4.35E-06	0.002
L1-10221B-FJGS-004-SS	3.11E-03	2.00E-02	6.47E-03	6.69E-04	1.52E-05	0.030
L1-10221B-FJGS-005-SS	2.73E-02	9.23E-03	1.27E-02	5.88E-03	2.98E-05	0.055
L1-10221B-FJGS-006-SS	1.47E-02	0.00E+00	6.23E-03	3.16E-03	1.46E-05	0.024
L1-10221B-FJGS-007-SS	0.00E+00	1.16E-02	5.04E-03	0.00E+00	1.18E-05	0.017
L1-10221B-FJGS-008-SS	2.16E-02	1.89E-02	2.53E-02	4.66E-03	5.95E-05	0.071
L1-10221B-FJGS-009-SS	5.09E-02	0.00E+00	1.82E-02	1.10E-02	4.26E-05	0.080

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

MEASUREMENT ID	Fraction of the OpDCGLs for Subsurface Soils					OpSOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L1-10221B-FSGS-004-SB	3.03E-02	2.56E-02	0.00E+00	2.47E-02	0.00E+00	0.081
L1-10221B-FSGS-011-SB	0.00E+00	1.55E-03	1.36E-02	0.00E+00	1.27E-04	0.015
L1-10221B-FIGS-100-SB	3.64E-02	9.06E-04	0.00E+00	2.97E-02	0.00E+00	0.067
L1-10221B-FIGS-101-SB	1.51E-03	3.54E-03	1.12E-02	1.23E-03	1.04E-04	0.018

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

MEASUREMENT ID	Fraction of the OpDCGLs for Surface Soils					OpSOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L1-10221B-FQGS-001-SS	6.25E-03	1.27E-03	7.19E-03	1.35E-03	1.69E-05	0.016
L1-10221B-QJGS-001-SS	3.02E-02	1.72E-02	0.00E+00	6.49E-03	0.00E+00	0.054
L1-10221B-QJGS-009-SS	2.48E-02	9.92E-03	1.53E-02	5.35E-03	3.60E-05	0.055

Table 21 - Basic Statistical Properties of Systematic Sample Population

ROC	Mean (pCi/g)	Median (pCi/g)	Max (pCi/g)	Min (pCi/g)	Std. Dev.	BcDCGL (pCi/g)	Avg. SOF per ROC	Avg. Dose Per ROC
Co-60	1.99E-02	1.74E-02	5.96E-02	0.00E+00	0.019	4.26	4.66E-03	1.17E-01
Cs-134	1.24E-02	9.64E-03	3.97E-02	0.00E+00	0.012	6.77	1.84E-03	4.60E-02
Cs-137	3.27E-02	1.95E-02	2.15E-01	0.00E+00	0.051	14.18	2.30E-03	5.76E-02
Ni-63	3.58E+00	3.14E+00	1.08E+01	0.00E+00	3.509	3572.1	1.00E-03	2.51E-02
Sr-90	6.54E-05	3.90E-05	4.30E-04	0.00E+00	0.000	12.09	5.41E-06	1.35E-04

The mean BcSOF for survey unit 10221B is 0.010, which equates to a dose of 0.245 mrem/yr 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 three (3) split samples, L1-10221B-FQGS-001-SS, L1-10221B-QJGS-001-SS and L1-10221B-QJGS-009-SS, using gamma spectroscopy analysis. The data was evaluated using acceptance criteria specified in Zion*Solutions* procedure ZS-LT-01, "*Quality Assurance Project Plan (for Characterization and FSS).*" There was acceptable agreement between the field split results. Refer to Attachment 5 for data and quality control analysis results.

9. INVESTIGATIONS AND RESULTS

An investigation was performed based on the results of gamma scans performed under an RA on June 17, 2019 on the railroad ballast located in survey unit 10221B and the soil areas 1-meter beyond the ballast gravel (these scans were performed subsequent to the scans performed under the FSS Sample Plan). The RA identified two (2) small areas of elevated activity, both less than 100 cm^2, reading 3,200 cpm and 4,700 cpm (a map of these areas is included in Attachment 1). One (1) surface soil sample was taken at each location: L1-10221B-FIGS-100-SS and L1-10221B-FIGS-101-SS. Four (4) additional samples were taken in the immediate vicinity (within 0.5 meters) of each location: L1-10221B-FIGS-102-SS through L1-10221B-FIGS-109-SS. Gamma spectroscopy results revealed five (5) samples with activity levels above MDC for Cs-137, two (2) samples with activity levels above MDC for Co-60 and no samples with activity levels above MDC for Cs-134. Since the OpSOF for the investigation samples were all less than 1.0, with a maximum OpSOF of 0.529 for sample L1-10221B-FIGS-102-SS (0.853 by analysis by off-site laboratory for all ROC), no further action was necessary. The investigation is documented in an Attachment 13 (from ZS- LT-300-001-004), "Final

Status Survey Investigation". The gamma spectroscopy results are summarized in Table 13, and the Sum of Fractions summarized in Table 18.

Also included in Table 13 and Table 18 are the results of the eight (8) judgmental surface soil samples that were taken adjacent to the railroad ballast and the one (1) judgmental surface soil sample taken in a small area with a higher background. Maps of the judgmental sample locations are included in Attachment 1.

10. REMEDIATION AND RESULTS

No remediation was performed in this survey unit.

11. CHANGES FROM THE SURVEY PLAN

Five (5) 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 22 - Relocated Systematic Sample Locations

MEASUREMENT ID	NORTHING (meters)	EASTING (meters)
L1-10221B-FSGS-002SS	641495.60	343548.86
L1-10221B-FSGS-003SS	641505.49	343531.54
L1-10221B-FSGS-004SS	641514.32	343548.20
L1-10221B-FSGS-004SB	641514.32	343548.20
L1-10221B-FSGS-006SS	641523.80	343531.10

12. DATA QUALITY ASSESSMENT

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

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

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

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

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

13. ANOMALIES

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

14. CONCLUSION

Survey unit 10221B has met the DQOs of the FSS plan. The ALARA criteria for soils as specified in Chapter 4 of the LTP were achieved. The EMC for soils was not needed for this survey unit.

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

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

The mean BcSOF, when the analytical results were compared to the BcDCGLs, was 0.010, which results in a dose contribution from soil in survey unit 10221B of 0.245 mrem/yr 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 10221B is acceptable for unrestricted release.

15. REFERENCES

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

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

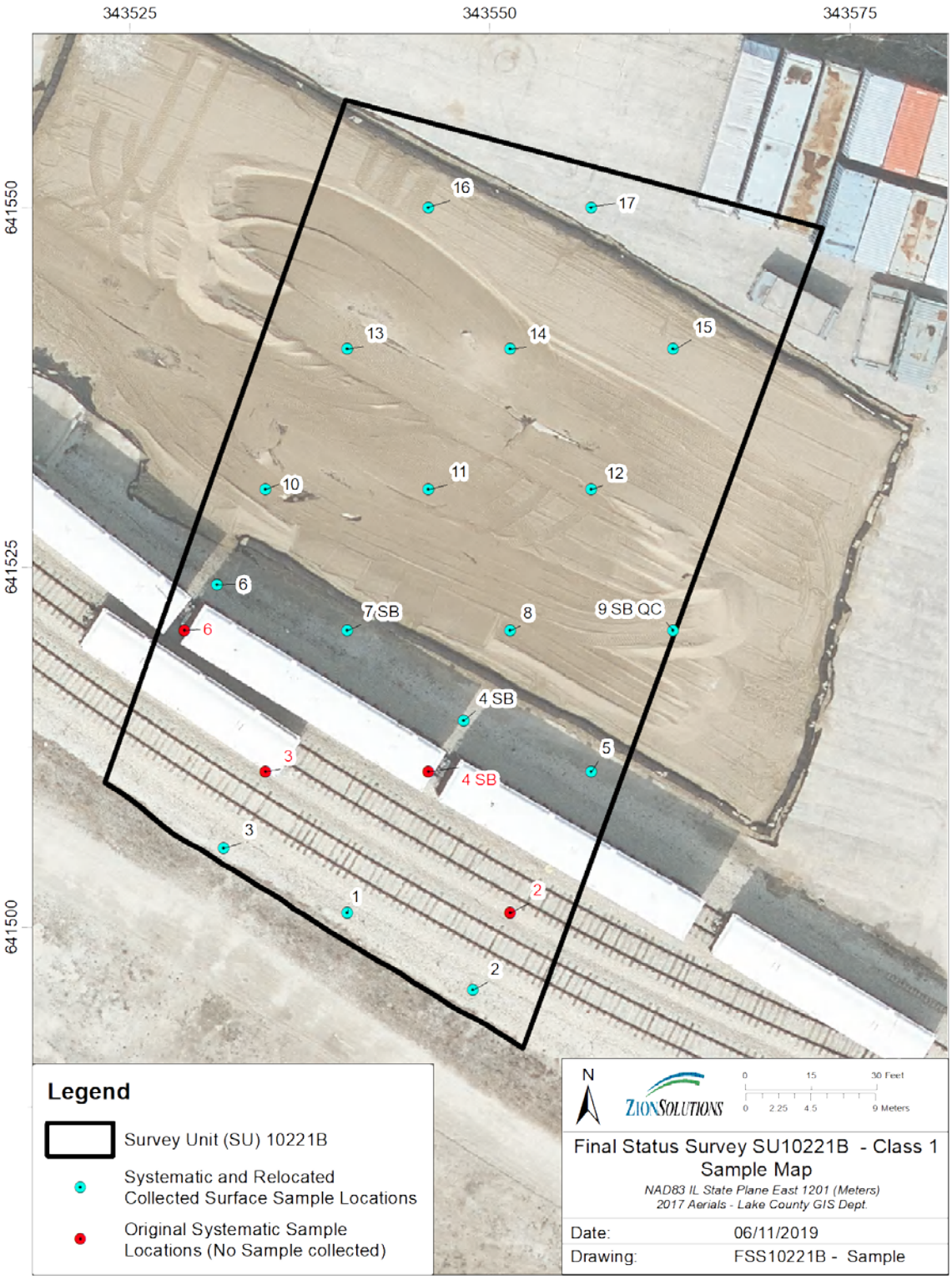
16. ATTACHMENTS

1. Attachment 1 – Figures and Maps
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

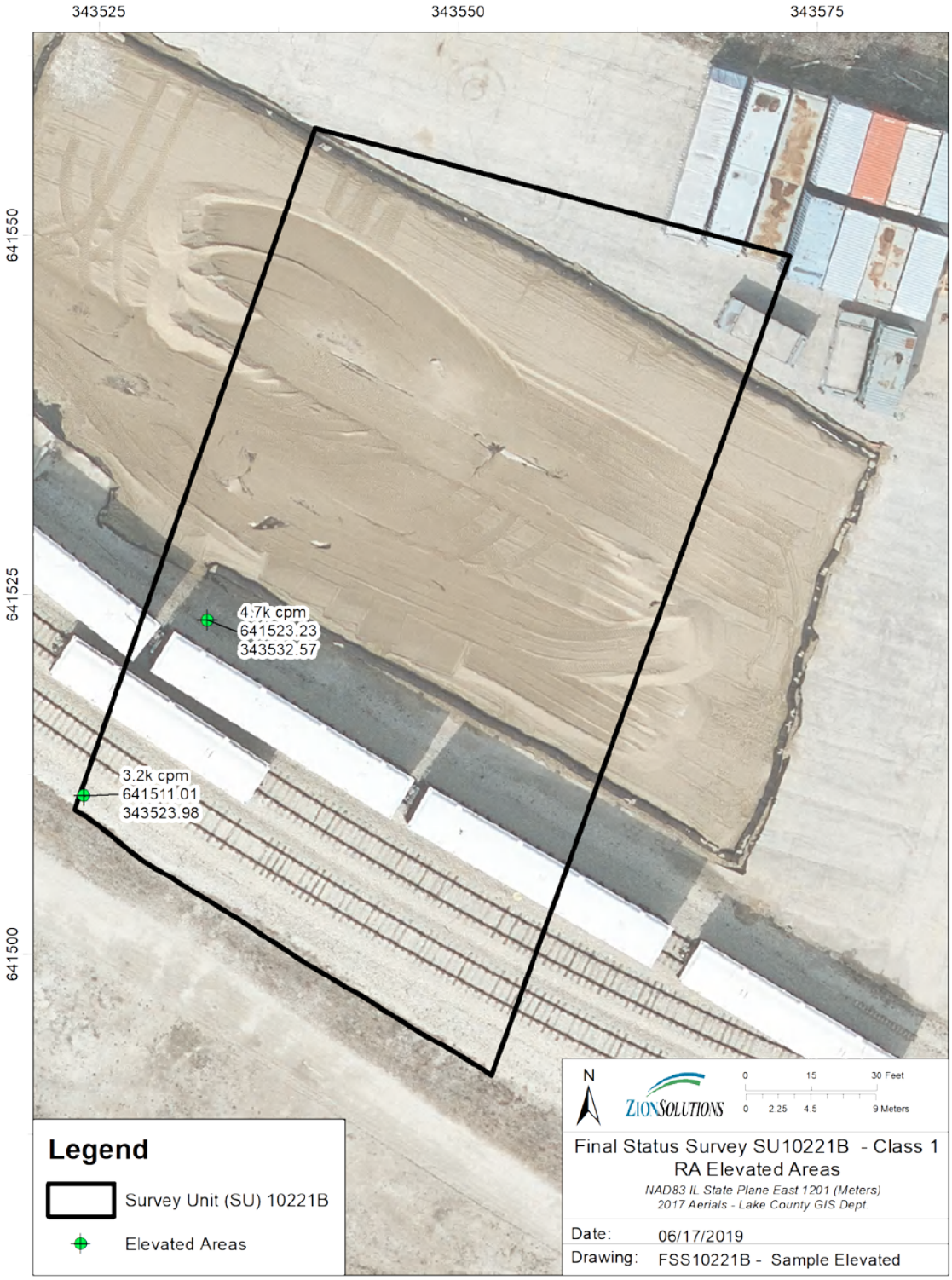
ATTACHMENT 1
FIGURES AND MAPS

Survey Unit 10221B Final Status Survey Boundaries and Systematic Sample Points

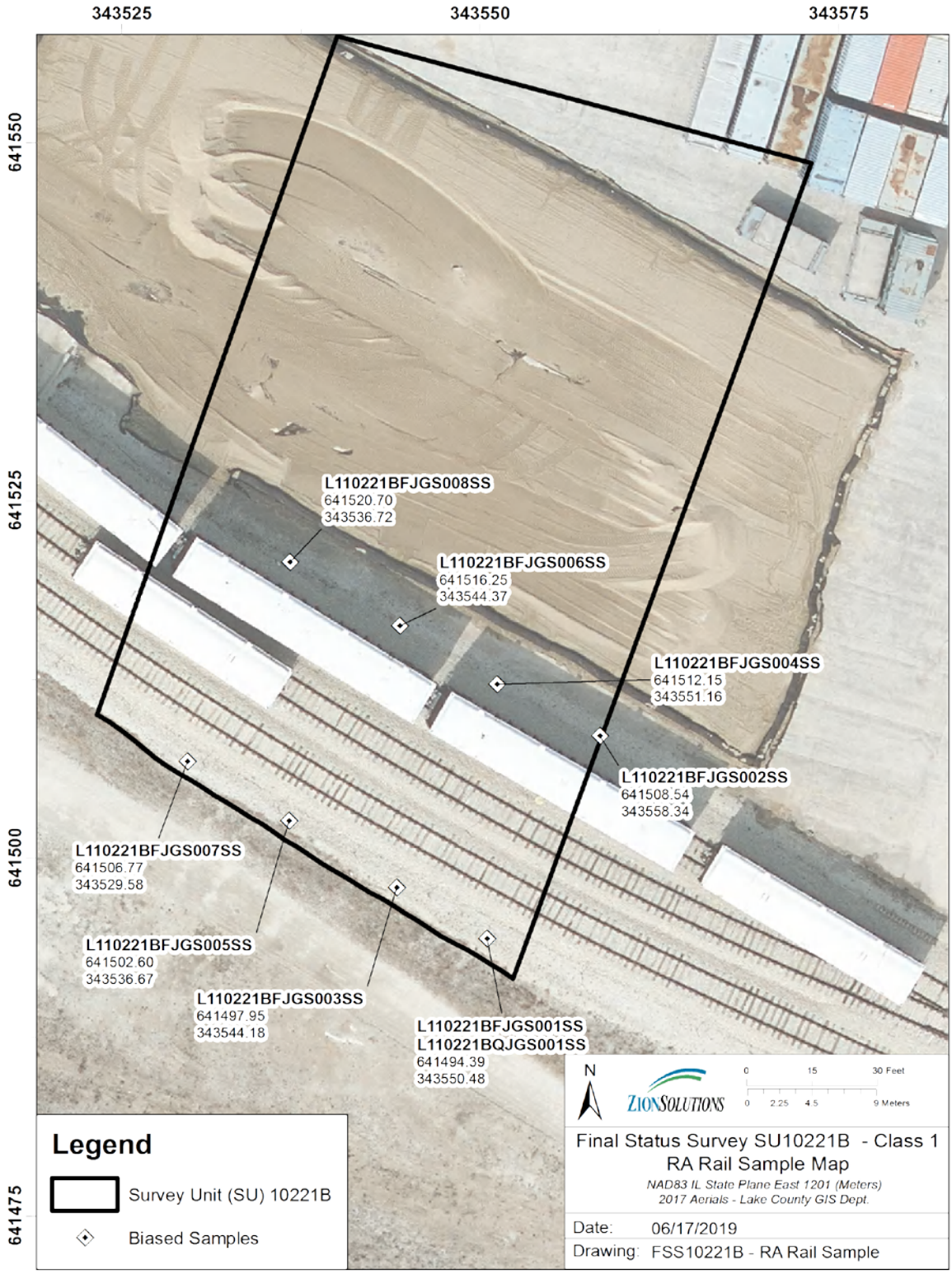
Survey Unit 10221B Final Status Survey Boundaries with Relocated Systematic Sample Points



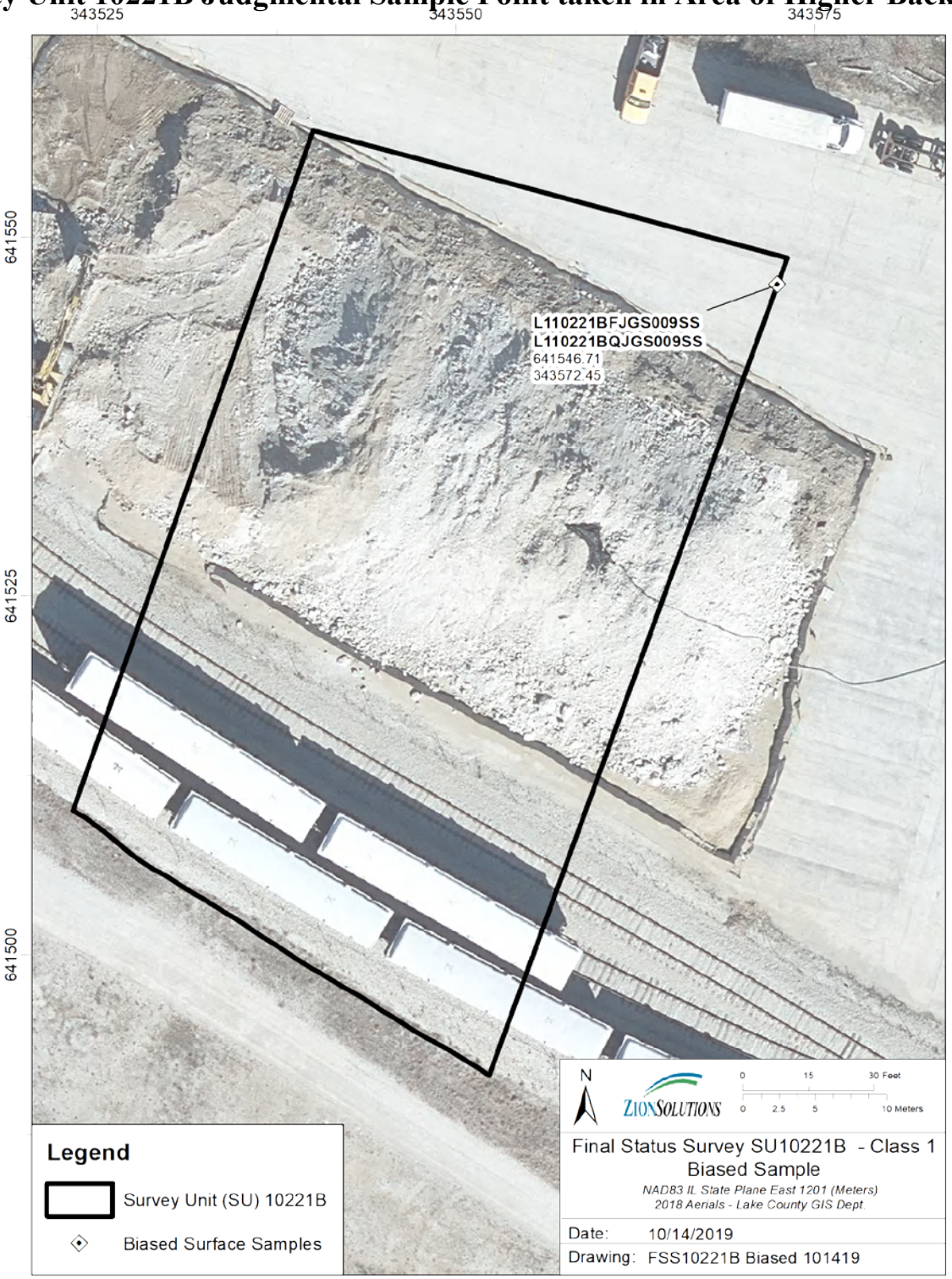
Survey Unit 10221B Elevated Areas Discovered during Radiological Assessment



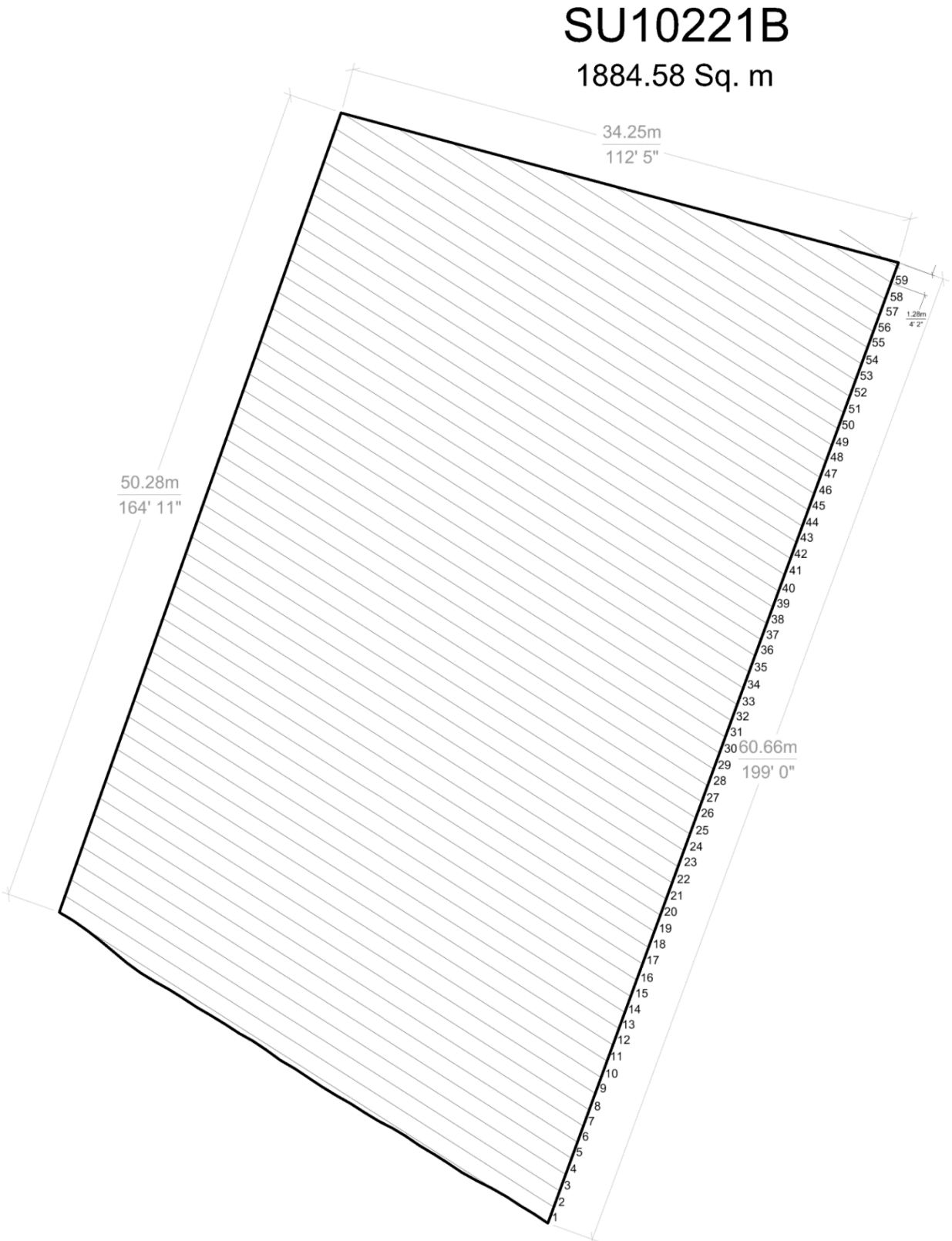
Survey Unit 10221B Judgmental Sample Points taken Adjacent to Railroad Ballast



Survey Unit 10221B Judgmental Sample Point taken in Area of Higher Background



Survey Unit 10221B Final Status Survey Scan Rows



ATTACHMENT 2
SCAN DATA

Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	PR311756	266669	10221B	GS032	6/7/2019 10:35	2948	2896	3709	No
44-10	PR311756	266669	10221B	GS032	6/7/2019 10:39	3079	2896	3709	No
44-10	PR311756	266669	10221B	GS032	6/7/2019 10:42	3532	2896	3709	No
44-10	PR311756	266669	10221B	GS032	6/7/2019 10:44	3285	2896	3709	No
44-10	PR311756	266669	10221B	GS033	6/7/2019 12:37	3402	2896	3709	No
44-10	PR311756	266669	10221B	GS033	6/7/2019 12:40	3429	2896	3709	No
44-10	PR311756	266669	10221B	GS033	6/7/2019 12:43	2906	2896	3709	No
44-10	PR311756	266669	10221B	GS033	6/7/2019 12:50	3017	2896	3709	No
44-10	PR311756	266669	10221B	GS034	6/7/2019 12:54	2954	2896	3709	No
44-10	PR311756	266669	10221B	GS034	6/7/2019 12:56	3259	2896	3709	No
44-10	PR311756	266669	10221B	GS034	6/7/2019 12:58	3288	2896	3709	No
44-10	PR311756	266669	10221B	GS034	6/7/2019 13:01	3443	2896	3709	No
44-10	PR311756	266669	10221B	GS035	6/7/2019 13:06	3265	2896	3709	No
44-10	PR311756	266669	10221B	GS035	6/7/2019 13:08	3140	2896	3709	No
44-10	PR311756	266669	10221B	GS035	6/7/2019 13:11	3020	2896	3709	No
44-10	PR311756	266669	10221B	GS035	6/7/2019 13:14	2944	2896	3709	No
44-10	PR311756	266669	10221B	GS036	6/7/2019 13:17	2944	2896	3709	No
44-10	PR311756	266669	10221B	GS036	6/7/2019 13:21	3143	2896	3709	No
44-10	PR311756	266669	10221B	GS036	6/7/2019 13:24	3244	2896	3709	No
44-10	PR311756	266669	10221B	GS036	6/7/2019 13:26	3167	2896	3709	No
44-10	PR311756	266669	10221B	GS037	6/7/2019 13:29	3274	2896	3709	No
44-10	PR311756	266669	10221B	GS037	6/7/2019 13:32	3056	2896	3709	No
44-10	PR311756	266669	10221B	GS037	6/7/2019 13:34	3019	2896	3709	No
44-10	PR311756	266669	10221B	GS037	6/7/2019 13:40	3090	2896	3709	No
44-10	PR311756	266669	10221B	GS038	6/7/2019 13:44	3177	2896	3709	No
44-10	PR311756	266669	10221B	GS038	6/7/2019 13:46	3059	2896	3709	No
44-10	PR311756	266669	10221B	GS038	6/7/2019 13:49	3205	2896	3709	No
44-10	PR311756	266669	10221B	GS038	6/7/2019 13:51	3301	2896	3709	No
44-10	PR311756	266669	10221B	GS039	6/7/2019 13:54	3413	2896	3709	No
44-10	PR311756	266669	10221B	GS039	6/7/2019 13:56	3124	2896	3709	No
44-10	PR311756	266669	10221B	GS039	6/7/2019 13:58	3116	2896	3709	No
44-10	PR311756	266669	10221B	GS039	6/7/2019 14:01	3092	2896	3709	No
44-10	PR363489	266668	10221B	GS016	6/7/2016 12:49	2659	2150	2851	No
44-10	PR363489	266668	10221B	GS016	6/7/2016 12:51	1871	2150	2851	No
44-10	PR363489	266668	10221B	GS020	6/7/2016 13:03	2748	2150	2851	No

Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	PR363489	266668	10221B	GS020	6/7/2016 13:06	2593	2150	2851	No
44-10	PR363489	266668	10221B	GS022	6/7/2016 13:10	2412	2150	2851	No
44-10	PR363489	266668	10221B	GS022	6/7/2016 13:14	2778	2150	2851	No
44-10	PR363489	266668	10221B	GS024	6/7/2016 13:17	2652	2150	2851	No
44-10	PR363489	266668	10221B	GS024	6/7/2016 13:20	2787	2150	2851	No
44-10	PR363489	266668	10221B	GS026	6/7/2016 13:24	2703	2150	2851	No
44-10	PR363489	266668	10221B	GS026	6/7/2016 13:29	2430	2150	2851	No
44-10	PR363489	266668	10221B	GS030	6/7/2016 13:42	2687	2150	2851	No
44-10	PR321902	304711	10221B	GS017	6/7/2019 12:53	2149	2013	2691	No
44-10	PR321902	304711	10221B	GS017	6/7/2019 12:57	2088	2013	2691	No
44-10	PR321902	304711	10221B	GS019	6/7/2019 13:04	2277	2013	2691	No
44-10	PR321902	304711	10221B	GS019	6/7/2019 13:08	2260	2013	2691	No
44-10	PR321902	304711	10221B	GS021	6/7/2019 13:10	2217	2013	2691	No
44-10	PR321902	304711	10221B	GS021	6/7/2019 13:16	2481	2013	2691	No
44-10	PR321902	304711	10221B	GS023	6/7/2019 13:19	2360	2013	2691	No
44-10	PR321902	304711	10221B	GS023	6/7/2019 13:21	2330	2013	2691	No
44-10	PR321902	304711	10221B	GS025	6/7/2019 13:24	2494	2013	2691	No
44-10	PR321902	304711	10221B	GS025	6/7/2019 13:28	2417	2013	2691	No
44-10	PR321902	304711	10221B	GS027	6/7/2019 13:33	2321	2013	2691	No
44-10	PR321902	304711	10221B	GS027	6/7/2019 13:36	2508	2013	2691	No
44-10	PR321902	304711	10221B	GS029	6/7/2019 13:42	2545	2013	2691	No
44-10	PR363452	304726	10221B	GS048	6/7/2019 12:48	2982	2736	3527	No
44-10	PR363452	304726	10221B	GS048	6/7/2019 12:50	3067	2736	3527	No
44-10	PR363452	304726	10221B	GS048	6/7/2019 12:52	3409	2736	3527	No
44-10	PR363452	304726	10221B	GS048	6/7/2019 12:55	3354	2736	3527	No
44-10	PR363452	304726	10221B	GS049	6/7/2019 12:58	3257	2736	3527	No
44-10	PR363452	304726	10221B	GS049	6/7/2019 13:01	3136	2736	3527	No
44-10	PR363452	304726	10221B	GS049	6/7/2019 13:04	3135	2736	3527	No
44-10	PR363452	304726	10221B	GS049	6/7/2019 13:07	2895	2736	3527	No
44-10	PR363452	304726	10221B	GS050	6/7/2019 13:11	3002	2736	3527	No
44-10	PR363452	304726	10221B	GS050	6/7/2019 13:13	3113	2736	3527	No
44-10	PR363452	304726	10221B	GS050	6/7/2019 13:16	3238	2736	3527	No
44-10	PR363452	304726	10221B	GS050	6/7/2019 13:20	3326	2736	3527	No
44-10	PR363452	304726	10221B	GS051	6/7/2019 13:27	3180	2736	3527	No
44-10	PR363452	304726	10221B	GS051	6/7/2019 13:31	2821	2736	3527	No
44-10	PR363452	304726	10221B	GS051	6/7/2019 13:35	2920	2736	3527	No

Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	PR363452	304726	10221B	GS052	6/7/2019 13:45	3070	2736	3527	No
44-10	PR363452	304726	10221B	GS052	6/7/2019 13:48	2920	2736	3527	No
44-10	PR363452	304726	10221B	GS052	6/7/2019 13:51	2929	2736	3527	No
44-10	PR363452	304726	10221B	GS053	6/7/2019 13:56	2925	2736	3527	No
44-10	PR363452	304726	10221B	GS053	6/7/2019 14:05	2976	2736	3527	No
44-10	PR363452	304726	10221B	GS054	6/7/2019 14:09	2775	2736	3527	No
44-10	PR363452	304726	10221B	GS054	6/7/2019 14:13	2682	2736	3527	No
44-10	PR363452	304726	10221B	GS054	6/7/2019 14:15	2942	2736	3527	No
44-10	PR363452	304726	10221B	GS055	6/7/2019 14:20	2787	2736	3527	No
44-10	PR363452	304726	10221B	GS055	6/7/2019 14:23	2905	2736	3527	No
44-10	PR372106	216166	10221B	GS007	6/7/2019 12:43	2476	2327	3056	No
44-10	PR372106	216166	10221B	GS007	6/7/2019 12:46	2354	2327	3056	No
44-10	PR372106	216166	10221B	GS007	6/7/2019 12:50	2402	2327	3056	No
44-10	PR372106	216166	10221B	GS007	6/7/2019 12:52	2431	2327	3056	No
44-10	PR372106	216166	10221B	GS006	6/7/2019 12:57	2438	2327	3056	No
44-10	PR372106	216166	10221B	GS006	6/7/2019 13:00	2571	2327	3056	No
44-10	PR372106	216166	10221B	GS006	6/7/2019 13:03	2419	2327	3056	No
44-10	PR372106	216166	10221B	GS006	6/7/2019 13:06	2689	2327	3056	No
44-10	PR372106	216166	10221B	GS005	6/7/2019 13:10	2647	2327	3056	No
44-10	PR372106	216166	10221B	GS005	6/7/2019 13:13	2380	2327	3056	No
44-10	PR372106	216166	10221B	GS005	6/7/2019 13:16	2413	2327	3056	No
44-10	PR372106	216166	10221B	GS005	6/7/2019 13:18	2466	2327	3056	No
44-10	PR372106	216166	10221B	GS004	6/7/2019 13:22	2367	2327	3056	No
44-10	PR372106	216166	10221B	GS004	6/7/2019 13:26	2501	2327	3056	No
44-10	PR372106	216166	10221B	GS004	6/7/2019 13:28	2628	2327	3056	No
44-10	PR372106	216166	10221B	GS004	6/7/2019 13:31	2687	2327	3056	No
44-10	PR372106	216166	10221B	GS003	6/7/2019 13:48	3661	2905	3720	No
44-10	PR372106	216166	10221B	GS003	6/7/2019 13:50	3580	2905	3720	No
44-10	PR372106	216166	10221B	GS003	6/7/2019 13:52	3645	2905	3720	No
44-10	PR372106	216166	10221B	GS003	6/7/2019 13:56	3361	2905	3720	No
44-10	PR372106	216166	10221B	GS002	6/7/2019 13:59	3569	2905	3720	No
44-10	PR372106	216166	10221B	GS002	6/7/2019 14:02	3465	2905	3720	No
44-10	PR372106	216166	10221B	GS002	6/7/2019 14:04	3057	2905	3720	No
44-10	PR372106	216166	10221B	GS002	6/7/2019 14:06	3385	2905	3720	No
44-10	PR372106	216166	10221B	GS001	6/7/2019 14:09	3627	2905	3720	No
44-10	PR372106	216166	10221B	GS001	6/7/2019 14:11	3475	2905	3720	No

Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	PR372106	216166	10221B	GS001	6/7/2019 14:16	3330	2905	3720	No
44-10	PR372106	216166	10221B	GS001	6/7/2019 14:19	3549	2905	3720	No
44-10	PR308037	266657	10221B	GS041	6/7/2019 12:34	3361	2815	3617	No
44-10	PR308037	266657	10221B	GS041	6/7/2019 12:37	3455	2815	3617	No
44-10	PR308037	266657	10221B	GS041	6/7/2019 12:40	3241	2815	3617	No
44-10	PR308037	266657	10221B	GS041	6/7/2019 12:44	2977	2815	3617	No
44-10	PR308037	266657	10221B	GS042	6/7/2019 12:51	3146	2815	3617	No
44-10	PR308037	266657	10221B	GS042	6/7/2019 12:54	3274	2815	3617	No
44-10	PR308037	266657	10221B	GS042	6/7/2019 12:57	3383	2815	3617	No
44-10	PR308037	266657	10221B	GS042	6/7/2019 13:01	3501	2815	3617	No
44-10	PR308037	266657	10221B	GS043	6/7/2019 13:06	3278	2815	3617	No
44-10	PR308037	266657	10221B	GS043	6/7/2019 13:09	3409	2815	3617	No
44-10	PR308037	266657	10221B	GS043	6/7/2019 13:12	3256	2815	3617	No
44-10	PR308037	266657	10221B	GS043	6/7/2019 13:16	2963	2815	3617	No
44-10	PR308037	266657	10221B	GS044	6/7/2019 13:20	3225	2815	3617	No
44-10	PR308037	266657	10221B	GS044	6/7/2019 13:22	3250	2815	3617	No
44-10	PR308037	266657	10221B	GS044	6/7/2019 13:25	3405	2815	3617	No
44-10	PR308037	266657	10221B	GS044	6/7/2019 13:29	3561	2815	3617	No
44-10	PR308037	266657	10221B	GS045	6/7/2019 13:32	3495	2815	3617	No
44-10	PR308037	266657	10221B	GS045	6/7/2019 13:36	3603	2815	3617	No
44-10	PR308037	266657	10221B	GS045	6/7/2019 13:40	3136	2815	3617	No
44-10	PR308037	266657	10221B	GS045	6/7/2019 13:43	2996	2815	3617	No
44-10	PR308037	266657	10221B	GS046	6/7/2019 13:46	3076	2815	3617	No
44-10	PR308037	266657	10221B	GS046	6/7/2019 13:49	3326	2815	3617	No
44-10	PR308037	266657	10221B	GS046	6/7/2019 13:53	3432	2815	3617	No
44-10	PR308037	266657	10221B	GS046	6/7/2019 13:57	3148	2815	3617	No
44-10	PR372143	304712	10221B	GS056	6/7/2019 10:50	2475	2557	3322	No
44-10	PR372143	304712	10221B	GS057	6/7/2019 12:35	2969	2557	3322	No
44-10	PR372143	304712	10221B	GS058	6/7/2019 12:40	2908	2557	3322	No
44-10	PR372143	304712	10221B	GS059	6/7/2019 12:46	2876	2557	3322	No
44-10	PR372143	304712	10221B	GS060	6/7/2019 12:51	2938	2557	3322	No
44-10	PR372143	304712	10221B	GS056	6/7/2019 14:02	2197	2108	2803	No
44-10	PR372143	304712	10221B	GS057	6/7/2019 14:09	2582	2108	2803	No
44-10	PR372143	304712	10221B	GS058	6/7/2019 14:13	2451	2108	2803	No
44-10	PR308037	266657	10221B	GS047	6/10/2019 10:43	3062	2868	3678	No
44-10	PR308037	266657	10221B	GS047	6/10/2019 10:45	3254	2868	3678	No

Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	PR308037	266657	10221B	GS047	6/10/2019 10:47	3569	2868	3678	No
44-10	PR308037	266657	10221B	GS047	6/10/2019 10:49	3425	2868	3678	No
44-10	PR321902	304711	10221B	GS017	6/10/2019 7:39	2801	2581	3349	No
44-10	PR321902	304711	10221B	GS017	6/10/2019 7:41	3010	2581	3349	No
44-10	PR321902	304711	10221B	GS019	6/10/2019 7:45	2926	2581	3349	No
44-10	PR321902	304711	10221B	GS019	6/10/2019 7:48	2972	2581	3349	No
44-10	PR321902	304711	10221B	GS021	6/10/2019 7:52	2824	2581	3349	No
44-10	PR321902	304711	10221B	GS021	6/10/2019 7:55	2925	2581	3349	No
44-10	PR321902	304711	10221B	GS023	6/10/2019 8:03	2953	2581	3349	No
44-10	PR321902	304711	10221B	GS023	6/10/2019 8:06	3045	2581	3349	No
44-10	PR321902	304711	10221B	GS025	6/10/2019 8:10	3158	2581	3349	No
44-10	PR321902	304711	10221B	GS025	6/10/2019 8:17	2759	2581	3349	No
44-10	PR321902	304711	10221B	GS027	6/10/2019 8:46	2889	2581	3349	No
44-10	PR321902	304711	10221B	GS027	6/10/2019 8:49	3219	2581	3349	No
44-10	PR321902	304711	10221B	GS029	6/10/2019 8:54	2929	2581	3349	No
44-10	PR321902	304711	10221B	GS029	6/10/2019 8:57	2906	2581	3349	No
44-10	PR321902	304711	10221B	GS029	6/10/2019 9:01	3222	2581	3349	No
44-10	PR321902	304711	10221B	GS031	6/10/2019 9:05	2867	2581	3349	No
44-10	PR321902	304711	10221B	GS031	6/10/2019 9:08	2818	2581	3349	No
44-10	PR321902	304711	10221B	GS031	6/10/2019 9:10	3310	2581	3349	No
44-10	PR321902	304711	10221B	GS031	6/10/2019 9:20	3293	2581	3349	No
44-10	ES0118	216173	10221B	GS008	6/10/2019 10:04	2730	2141	2841	No
44-10	ES0118	216173	10221B	GS008	6/10/2019 10:09	2306	2141	2841	No
44-10	ES0118	216173	10221B	GS008	6/10/2019 10:11	2333	2141	2841	No
44-10	ES0118	216173	10221B	GS008	6/10/2019 10:13	2323	2141	2841	No
44-10	ES0118	216173	10221B	GS009	6/10/2019 10:17	2188	2141	2841	No
44-10	ES0118	216173	10221B	GS009	6/10/2019 10:19	2515	2141	2841	No
44-10	ES0118	216173	10221B	GS009	6/10/2019 10:22	2716	2141	2841	No
44-10	ES0118	216173	10221B	GS009	6/10/2019 10:24	2714	2141	2841	No
44-10	ES0118	216173	10221B	GS010	6/10/2019 10:27	2446	2141	2841	No
44-10	ES0118	216173	10221B	GS010	6/10/2019 10:29	2294	2141	2841	No
44-10	ES0118	216173	10221B	GS010	6/10/2019 10:31	2325	2141	2841	No
44-10	ES0118	216173	10221B	GS010	6/10/2019 10:33	2350	2141	2841	No
44-10	ES0118	216173	10221B	GS011	6/10/2019 10:37	2173	2141	2841	No
44-10	ES0118	216173	10221B	GS011	6/10/2019 10:39	2319	2141	2841	No
44-10	ES0118	216173	10221B	GS011	6/10/2019 10:41	2840	2141	2841	No

Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	ES0118	216173	10221B	GS011	6/10/2019 10:43	2672	2141	2841	No
44-10	ES0118	216173	10221B	GS012	6/10/2019 10:45	2693	2141	2841	No
44-10	ES0118	216173	10221B	GS012	6/10/2019 10:47	2293	2141	2841	No
44-10	ES0118	216173	10221B	GS012	6/10/2019 10:50	2199	2141	2841	No
44-10	ES0118	216173	10221B	GS012	6/10/2019 10:52	2360	2141	2841	No
44-10	ES0118	216173	10221B	GS013	6/10/2019 12:12	2649	2141	2841	No
44-10	ES0118	216173	10221B	GS013	6/10/2019 12:14	2390	2141	2841	No
44-10	ES0118	216173	10221B	GS013	6/10/2019 12:16	2196	2141	2841	No
44-10	ES0118	216173	10221B	GS013	6/10/2019 12:18	2204	2141	2841	No
44-10	ES0118	216173	10221B	GS014	6/10/2019 12:21	2170	2141	2841	No
44-10	ES0118	216173	10221B	GS014	6/10/2019 12:23	2629	2141	2841	No
44-10	ES0118	216173	10221B	GS014	6/10/2019 12:25	2747	2141	2841	No
44-10	ES0118	216173	10221B	GS014	6/10/2019 12:27	2733	2141	2841	No
44-10	ES0118	216173	10221B	GS015	6/10/2019 12:29	2708	2141	2841	No
44-10	ES0118	216173	10221B	GS015	6/10/2019 12:31	2460	2141	2841	No
44-10	ES0118	216173	10221B	GS015	6/10/2019 12:33	2106	2141	2841	No
44-10	ES0118	216173	10221B	GS015	6/10/2019 12:35	2255	2141	2841	No
44-10	PR363489	266668	10221B	GS018	6/10/2016 7:46	2551	2220	2933	No
44-10	PR363489	266668	10221B	GS018	6/10/2016 7:48	2602	2220	2933	No
44-10	PR363489	266668	10221B	GS028	6/10/2016 7:51	2671	2220	2933	No
44-10	PR363489	266668	10221B	GS028	6/10/2016 7:55	2899	2220	2933	No
44-10	PR363489	266668	10221B	GS018	6/10/2016 8:45	3023	3214	4071	No
44-10	PR363489	266668	10221B	GS018	6/10/2016 8:47	3269	3214	4071	No
44-10	PR363489	266668	10221B	GS016	6/10/2016 8:50	3389	3214	4071	No
44-10	PR363489	266668	10221B	GS016	6/10/2016 8:52	3404	3214	4071	No
44-10	PR363489	266668	10221B	GS020	6/10/2016 8:56	3486	3214	4071	No
44-10	PR363489	266668	10221B	GS020	6/10/2016 8:58	3271	3214	4071	No
44-10	PR363489	266668	10221B	GS022	6/10/2016 9:01	3425	3214	4071	No
44-10	PR363489	266668	10221B	GS022	6/10/2016 9:04	3334	3214	4071	No
44-10	PR363489	266668	10221B	GS024	6/10/2016 9:06	2957	3214	4071	No
44-10	PR363489	266668	10221B	GS024	6/10/2016 9:09	3398	3214	4071	No
44-10	PR363489	266668	10221B	GS026	6/10/2016 9:12	3296	3214	4071	No
44-10	PR363489	266668	10221B	GS026	6/10/2016 9:14	3599	3214	4071	No
44-10	PR363489	266668	10221B	GS028	6/10/2016 9:18	3570	3214	4071	No
44-10	PR363489	266668	10221B	GS028	6/10/2016 9:21	3670	3214	4071	No
44-10	PR363489	266668	10221B	GS030	6/10/2016 9:24	3223	3214	4071	No

Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	PR363489	266668	10221B	GS030	6/10/2016 9:27	3525	3214	4071	No
44-10	PR363489	266668	10221B	GS030	6/10/2016 9:29	3717	3214	4071	No
44-10	PR363452	304726	10221B	GS040	6/20/2019 9:47	3159	3020	3851	No
44-10	PR363452	304726	10221B	GS040	6/20/2019 9:49	3283	3020	3851	No
44-10	PR363452	304726	10221B	GS040	6/20/2019 9:52	3540	3020	3851	No
44-10	PR363452	304726	10221B	GS040	6/20/2019 9:54	3496	3020	3851	No

ATTACHMENT 3

CONSULTATION TRIGGERS FOR RESIDENTIAL AND COMMERCIAL/INDUSTRIAL SOIL CONTAMINATION

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

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

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

ATTACHMENT 4
SIGN TEST

ZION SOLUTIONS LLC
An EnergySolutions Company

Attachment 12
Sign Statistical Test

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

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

#	Fraction of the Release Criterion						Weighted Sum (W_s)	1-W_s	Sign
	Radionuclides of Concern					Activity or SOF (as applicable)			
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90				
1	3.83E-03	1.36E-03	1.69E-03	8.25E-04	3.95E-06	SOF	0.008	0.992	+
2	0.00E+00	1.84E-03	5.37E-03	0.00E+00	1.26E-05	SOF	0.007	0.993	+
3	5.19E-02	0.00E+00	1.79E-02	1.12E-02	4.19E-05	SOF	0.081	0.919	+
4	2.66E-02	6.17E-03	8.71E-03	5.72E-03	2.04E-05	SOF	0.047	0.953	+
5	7.74E-03	3.78E-03	1.70E-02	1.67E-03	3.98E-05	SOF	0.030	0.970	+
6	3.52E-02	1.34E-02	5.92E-02	7.58E-03	1.39E-04	SOF	0.116	0.884	+
7	2.08E-03	0.00E+00	4.41E-03	4.48E-04	1.03E-05	SOF	0.007	0.993	+
8	2.39E-02	1.62E-02	1.65E-03	5.15E-03	3.88E-06	SOF	0.047	0.953	+
9	5.12E-03	1.29E-02	6.06E-03	1.10E-03	1.42E-05	SOF	0.025	0.975	+
10	4.18E-03	1.50E-02	8.79E-03	9.00E-04	2.06E-05	SOF	0.029	0.971	+
11	3.31E-02	0.00E+00	8.35E-03	7.12E-03	1.96E-05	SOF	0.049	0.951	+
12	1.59E-02	5.56E-03	0.00E+00	3.43E-03	0.00E+00	SOF	0.025	0.975	+
13	5.46E-02	2.90E-03	0.00E+00	1.18E-02	0.00E+00	SOF	0.069	0.931	+
14	2.62E-02	9.64E-03	0.00E+00	5.64E-03	0.00E+00	SOF	0.041	0.959	+
15	0.00E+00	1.04E-02	0.00E+00	0.00E+00	0.00E+00	SOF	0.010	0.990	+
16	0.00E+00	2.29E-02	2.81E-03	0.00E+00	6.59E-06	SOF	0.026	0.974	+
17	1.91E-02	0.00E+00	1.12E-02	4.10E-03	2.62E-05	SOF	0.034	0.966	+

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

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

Prepared By (RE): R.J Mandix (Print Name) (Signature) 10-22-19 (Date)

Peer Reviewed By (RE): J Graham (Print Name) (Signature) 10/22/19 (Date)

ATTACHMENT 5
QC SAMPLE ASSESSMENT

Duplicate Sample Assessment Form

Survey Area #: 10200	Survey Unit # 10221B	Survey Unit Name: South of Protected Area - Inland
Sample Plan#: L1-10221B-F		

Sample Description: Comparison of split samples collected from systematic surface soil sample location #1 and judgmental surface soil sample #1. The samples were analyzed using gamma spectroscopy by on-site HPGe system. The standard/comparison samples were L1-10221B-FSGS-001SS/L1-10221B-FQGS-001SS and L1-10221B-FJGS-001SS/L1-10221B-QJGS-0021S.

	STANDARD				COMPARISON			
Radionuclide	Activity Value	Standard Error	Resolution	Agreement Range	Activity Value	Standard Error	Comparison Ratio	Acceptable (Y/N)
Systematic Sample #1								
K-40	2.60E+00	2.55E-01	10.20	0.6-1.66	3.08E+00	2.81E-01	0.84	Y
Judgmental Sample #1								
K-40	3.00E+00	2.98E-01	10.07	0.6-1.66	3.24E+00	3.02E-01	0.93	Y

Comments/Corrective Actions:
The standard samples and QC samples did not have any positive results for a gamma emitting ROC, therefore K-40 was used in the QC comparison. There was acceptable agreement when using K-40. No further action is necessary.

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

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:	Date:	Reveiwed by:	Date:
R.S. Mandia	10-22-19	T Graham	10/22/19

Duplicate Sample Assessment Form

Survey Area #: 10200	Survey Unit # 10221B	Survey Unit Name: South of Protected Area - Inland
Sample Plan#: L1-10221B-F		

Sample Description: Comparison of split samples collected from judgmental surface soil sample #9. The samples were analyzed using gamma spectroscopy by on-site HPGe system. The standard/comparison samples were L1-10221B-FJGS-009SS/L1-10221B-QJGS-009SS.

STANDARD					COMPARISON			
Radionuclide	Activity Value	Standard Error	Resolution	Agreement Range	Activity Value	Standard Error	Comparison Ratio	Acceptable (Y/N)
Cs-137	6.60E-02	1.24E-02	5.32	0.5-2.0	5.57E-02	1.16E-02	1.18	Y

Comments/Corrective Actions:
The standard sample and QC sample both had positive activity for Cs-137. There was acceptable agreement on the Cs-137 results for this sample.

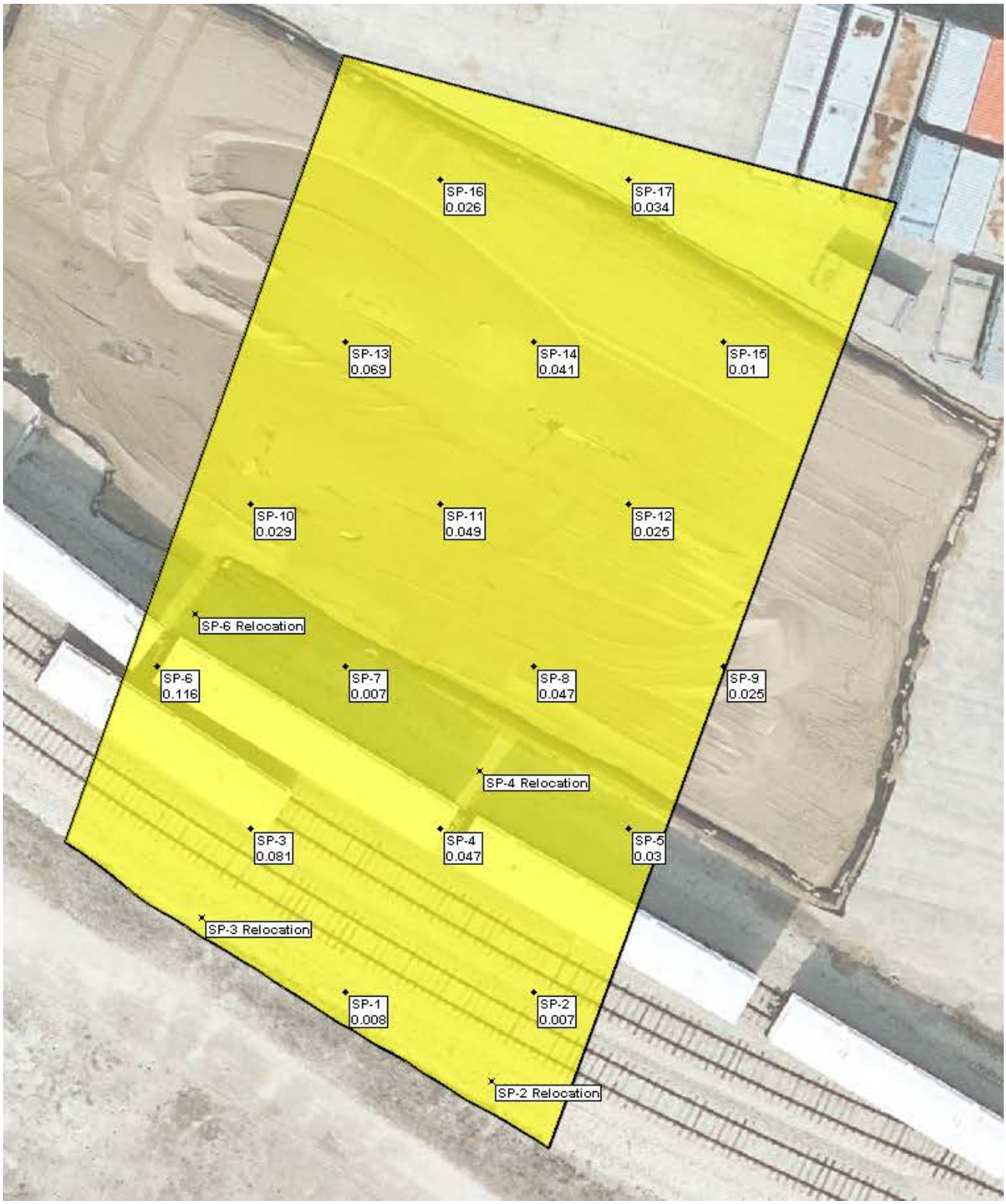
Table 4-1 from the QAPP is reproduced below to show acceptance criteria used to assess split samples.

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:	Date:	Reveiwed by:	Date:
R.S. Mantic	10-22-19	J Graham	10/22/19

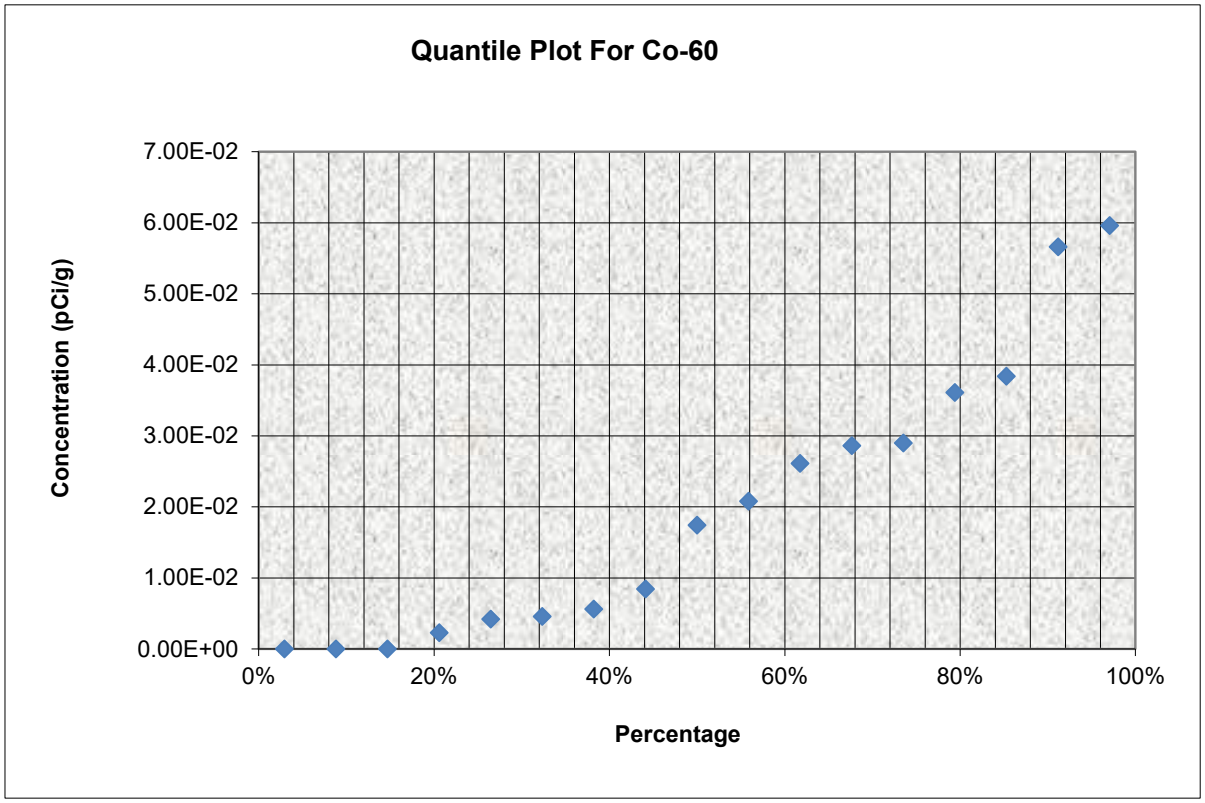
ATTACHMENT 6
GRAPHICAL PRESENTATIONS

Posting Plot



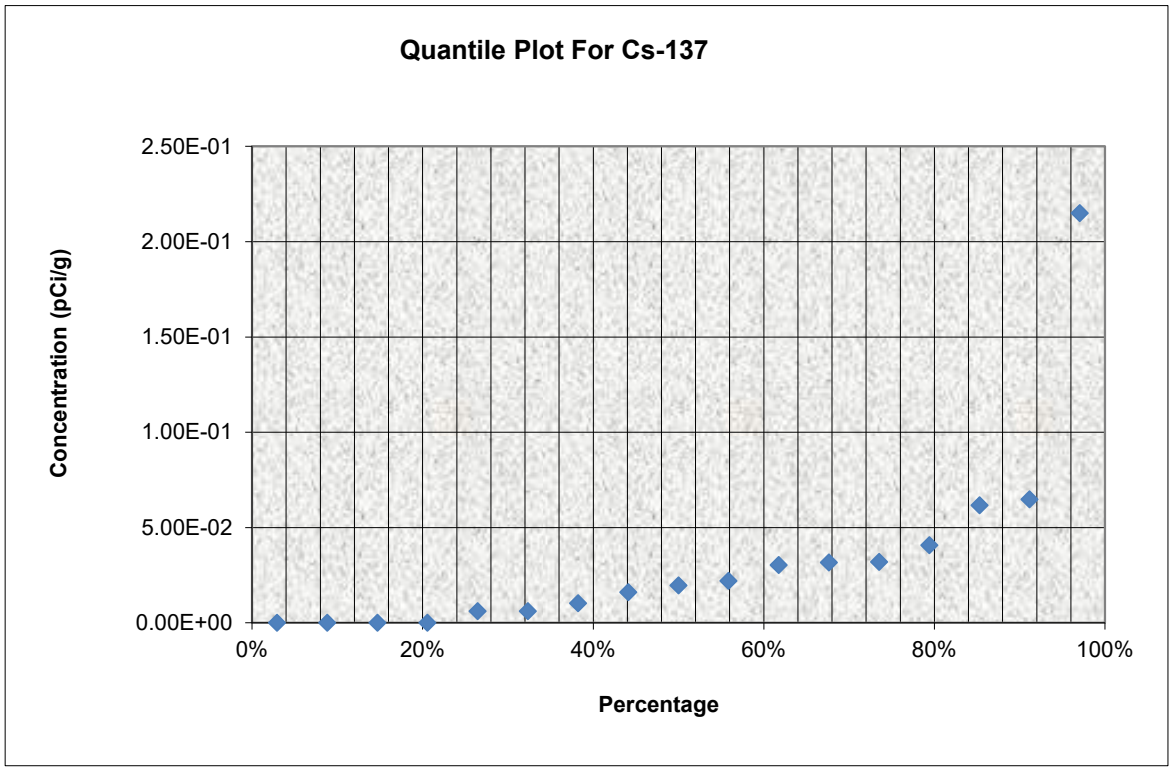
QUANTILE PLOT FOR Co-60

Survey Unit: 10221B
Survey Unit Name: South of Protected Area - Inland
Mean: 1.99E-02 pCi/g



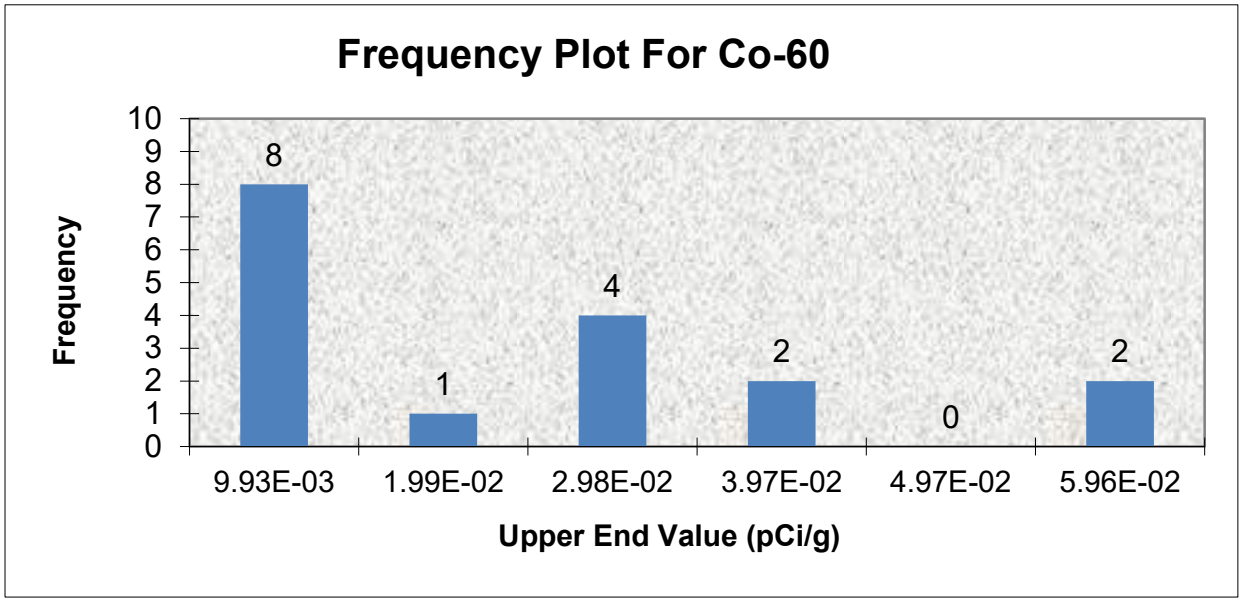
QUANTILE PLOT FOR Cs-137

Survey Unit: 10221B
Survey Unit Name: South of Protected Area - Inland
Mean: 3.27E-02 pCi/g



HISTOGRAM FOR Co-60

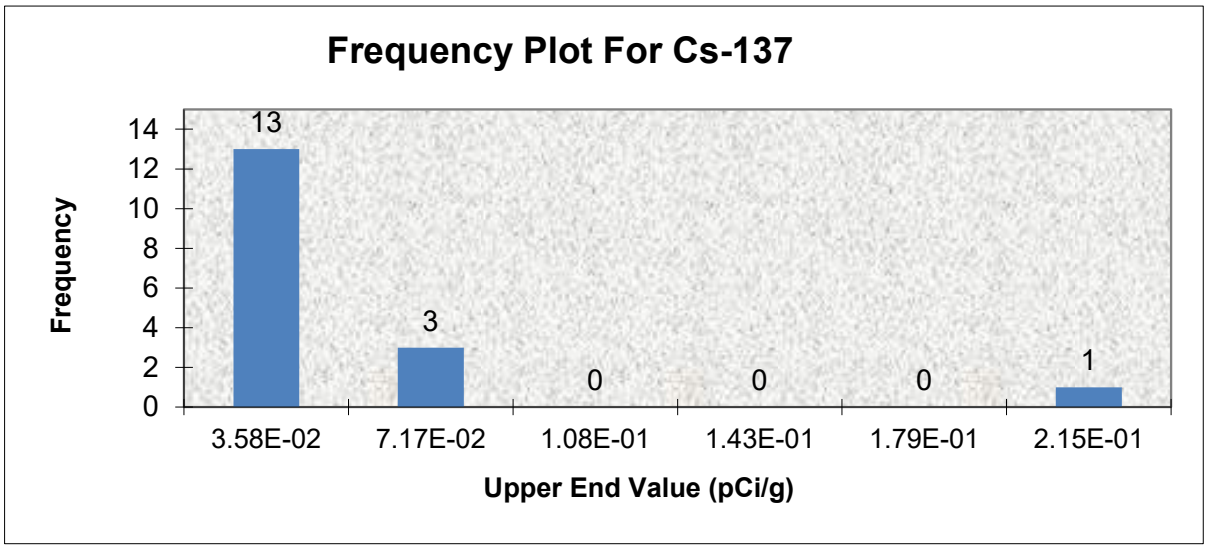
Survey Unit: 10221B
Survey Unit Name: South of Protected Area - Inland
Mean: 1.99E-02 pCi/g
Median: 1.74E-02 pCi/g
ST DEV: 0.019
Skew: 0.808



Upper Value	Observation Frequency	Observation %
9.93E-03	8	47%
1.99E-02	1	6%
2.98E-02	4	24%
3.97E-02	2	12%
4.97E-02	0	0%
5.96E-02	2	12%
TOTAL	17	100%

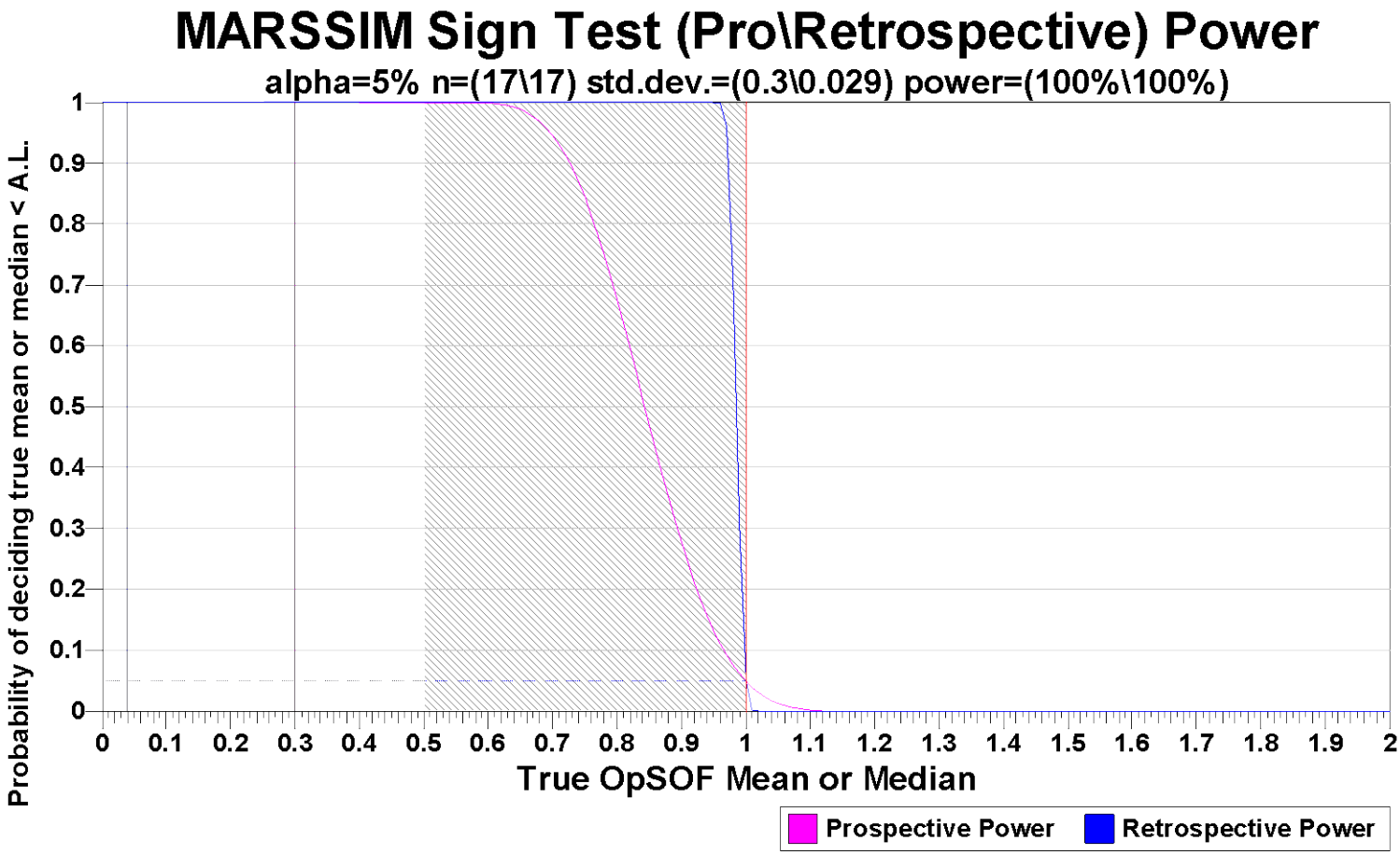
HISTOGRAM FOR Cs-137

Survey Unit: 10221B
Survey Unit Name: South of Protected Area - Inland
Mean: 3.27E-02 pCi/g
Median: 1.95E-02 pCi/g
ST DEV: 0.051
Skew: 3.125



Upper Value	Observation Frequency	Observation %
3.58E-02	13	76%
7.17E-02	3	18%
1.08E-01	0	0%
1.43E-01	0	0%
1.79E-01	0	0%
2.15E-01	1	6%
TOTAL	17	100%

Prospective and Retrospective Power Curves for Survey Unit 10221B



ATTACHMENT 7
SAMPLE ANALYTICAL REPORTS

Apex-Gamma

Analysis Report for 11-Jun-19-10023

L1-10221B-FSGS-001SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 11-Jun-19-10023
Sample Description	: L1-10221B-FSGS-001SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.761E+03 grams
Facility	: Default
Sample Taken On	: 6/10/2019 1:10:00PM
Acquisition Started	: 6/11/2019 10:34:27AM
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	: 6/11/2019
Efficiency Calibration Description	:
Sample Number	: 77252
Fill Height	: 1760.53 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/11/2019 10:49:30AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated

1530 6/11/19

Analysis Report for 11-Jun-19-10023

L1-10221B-FSGS-001SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	352.01	699 -	708	703.97	6.11E+01	10.93	2.59E+01	1.20
2	477.62	950 -	960	954.98	2.58E+01	9.41	2.63E+01	0.72
3	609.38	1213 -	1222	1218.35	4.15E+01	8.35	1.25E+01	1.46
4	911.75	1818 -	1826	1822.95	2.37E+01	5.80	4.32E+00	1.33
5	1460.84	2915 -	2928	2921.74	1.44E+02	12.62	5.47E+00	1.91

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
BE-7	1.00	477.60	*	10.44	2.34E-01	8.71E-02
K-40	1.00	1460.82	*	10.66	2.60E+00	2.55E-01
Bi-211	0.86	351.07	*	13.02	3.57E-01	7.01E-02
Bi-214	1.00	609.32	*	45.49	1.00E-01	2.10E-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		

Analysis Report for 11-Jun-19-10023

L1-10221B-FSGS-001SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	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	1.31E-01	2.56E-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	1.31E-01	3.25E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
BE-7	1.000	2.34E-01	8.71E-02	
K-40	1.000	2.60E+00	2.55E-01	

Analysis Report for 11-Jun-19-10023

L1-10221B-FSGS-001SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
?	Bi-211	0.868	3.57E-01	7.01E-02	
	Bi-214	1.000	1.00E-01	2.10E-02	
?	Pb-214	0.999	1.31E-01	2.56E-02	
	Ac-228	0.985	1.31E-01	3.25E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 11-Jun-19-10023

L1-10221B-FSGS-001SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/11/2019 10:49:30AM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

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

All peaks were identified.

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	4.82E-02	4.51E-02	4.51E-02
+	BE-7	477.60	*	10.44	2.34E-01	2.70E-01	2.70E-01
+	K-40	1460.82	*	10.66	2.60E+00	2.96E-01	2.96E-01
	Mn-54	834.85		99.98	-3.01E-02	3.13E-02	3.13E-02
	Co-60	1173.23		99.85	4.18E-03	3.88E-02	4.15E-02
		1332.49		99.98	-6.79E-03		3.88E-02
	Nb-94	702.65		99.81	1.43E-02	2.60E-02	3.35E-02
		871.09		99.89	-1.14E-02		2.60E-02
	Ag-108m	79.13		6.60	1.02E-01	3.03E-02	9.32E-01
		433.94		90.50	-2.64E-03		3.03E-02
		614.28		89.80	-4.39E-02		3.73E-02
		722.94		90.80	6.74E-04		3.13E-02
	Sb-125	176.31		6.84	-2.23E-02	8.70E-02	4.42E-01
		380.45		1.52	-5.98E-02		1.61E+00
		427.87		29.60	2.58E-02		8.70E-02
		463.36		10.49	7.88E-02		2.88E-01
		600.60		17.65	1.69E-02		1.62E-01
		606.71		4.98	-8.60E-02		9.19E-01
		635.95		11.22	6.31E-02		2.45E-01

Analysis Report for 11-Jun-19-10023

L1-10221B-FSGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-2.21E-02	8.70E-02	1.93E+00
Ba-133	79.61	2.65	-6.58E-02	5.43E-02	2.18E+00
	81.00	32.90	-7.80E-02		1.56E-01
	276.40	7.16	1.29E-01		3.83E-01
	302.85	18.34	7.11E-02		1.49E-01
	356.01	62.05	-2.54E-02		5.43E-02
	383.85	8.94	-2.24E-01		2.39E-01
Cs-134	475.36	1.48	1.52E-01	3.63E-02	2.61E+00
	563.25	8.34	7.41E-02		3.24E-01
	569.33	15.37	-5.98E-03		1.99E-01
	604.72	97.62	2.36E-03		4.12E-02
	795.86	85.46	-4.74E-03		3.63E-02
	801.95	8.69	-6.27E-02		3.59E-01
	1038.61	0.99	1.08E+00		3.35E+00
	1167.97	1.79	7.09E-01		2.45E+00
	1365.19	3.02	3.31E-02		1.19E+00
Cs-137	661.66	85.10	6.12E-03	3.65E-02	3.65E-02
Eu-152	121.78	28.67	-1.58E-02	9.55E-02	9.55E-02
	244.70	7.61	1.36E-01		4.02E-01
	295.94	0.45	6.05E+00		7.23E+00
	344.28	26.60	-3.77E-02		1.02E-01
	367.79	0.86	-5.01E-01		2.73E+00
	411.12	2.24	8.29E-01		1.29E+00
	443.96	2.83	-5.58E-01		7.67E-01
	488.68	0.42	1.98E+00		7.44E+00
	563.99	0.49	1.06E+00		5.39E+00
	586.26	0.46	1.18E+01		8.71E+00
	678.62	0.47	-3.35E+00		6.32E+00
	688.67	0.86	-3.75E-01		3.29E+00
	719.35	0.28	-4.07E+00		8.53E+00
	778.90	12.96	-2.55E-02		2.25E-01
	810.45	0.32	1.04E+00		8.55E+00
	867.37	4.26	-4.69E-02		6.93E-01
	919.33	0.43	-2.62E+00		6.75E+00
	964.08	14.65	-1.21E-01		3.15E-01
	1085.87	10.24	5.82E-02		3.03E-01
	1089.74	1.73	-1.45E-01		1.86E+00
	1112.07	13.69	-3.70E-02		2.45E-01
	1212.95	1.43	-6.24E-01		2.77E+00
	1249.94	0.19	-3.90E+00		1.85E+01
	1299.14	1.63	-1.02E+00		2.42E+00
	1408.01	21.07	2.46E-02		1.54E-01
	1457.64	0.50	-5.95E+00		2.37E+01
	1528.10	0.28	4.26E+00		1.04E+01
Eu-154	123.07	40.40	7.06E-03	6.88E-02	6.88E-02
	247.93	6.89	-1.30E-02		3.70E-01
	591.76	4.95	-2.73E-01		4.92E-01
	692.42	1.78	-7.04E-01		1.56E+00
	723.30	20.06	1.51E-02		1.49E-01
	756.80	4.52	1.72E-01		6.79E-01
	873.18	12.08	5.15E-02		2.38E-01

Analysis Report for 11-Jun-19-10023

L1-10221B-FSGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	9.44E-02	6.88E-02	3.65E-01
	1004.76	18.01	-1.40E-02		1.95E-01
	1274.43	34.80	-5.59E-02		1.05E-01
	1596.48	1.80	3.74E-01		1.89E+00
Eu-155	45.30	1.31	-6.03E-01	1.35E-01	9.17E+00
	60.01	1.22	-3.49E+00		8.73E+00
	86.55	30.70	-4.38E-02		1.35E-01
	105.31	21.10	-1.91E-02		1.47E-01
Ra-226	186.21	3.64	4.42E-01	8.89E-01	8.89E-01
Pa-231	27.36	10.30	4.09E-01	8.69E-01	8.69E-01
	283.69	1.70	-7.40E-02		1.49E+00
	300.07	2.47	-1.42E+00		1.03E+00
	302.65	2.20	5.92E-01		1.24E+00
	330.06	1.40	2.73E-01		1.94E+00
U-235	143.76	10.96	-3.45E-03	5.56E-02	2.33E-01
	163.33	5.08	-6.60E-02		5.66E-01
	185.71	57.20	-1.43E-03		5.56E-02
	202.11	1.08	-1.19E+00		2.52E+00
	205.31	5.01	-4.78E-02		5.68E-01
Am-241	59.54	35.90	-8.23E-02	3.02E-01	3.02E-01

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

Apex-Gamma

Analysis Report for 11-Jun-19-10024

L1-10221B-FQGS-001SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 11-Jun-19-10024
Sample Description	: L1-10221B-FQGS-001SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.681E+03 grams
Facility	: Default
Sample Taken On	: 6/10/2019 1:10:00PM
Acquisition Started	: 6/11/2019 10:53:19AM
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	: 6/11/2019
Efficiency Calibration Description	:
Sample Number	: 77256
Fill Height	: 1680.52 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/11/2019 11:08:22AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated

1530 6/11/19

Analysis Report for 11-Jun-19-10024

L1-10221B-FQGS-001SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.61	472 -	481	477.40	6.79E+01	15.96	8.21E+01	1.40
2	295.35	586 -	595	590.77	2.76E+01	11.70	4.84E+01	1.07
3	352.04	699 -	708	704.02	6.24E+01	11.98	3.56E+01	1.30
4	583.21	1163 -	1171	1166.02	4.32E+01	7.49	5.83E+00	1.73
5	1460.98	2915 -	2928	2922.01	1.68E+02	13.50	5.26E+00	1.91

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	3.08E+00	2.81E-01
Tl-208	1.00	583.19	*	85.00	5.46E-02	1.00E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	9.37E-02	2.33E-02
		300.09		3.30		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	1.02E-01	4.39E-02
		351.93	*	35.60	1.35E-01	2.80E-02
		785.96		1.06		

Analysis Report for 11-Jun-19-10024

L1-10221B-FQGS-001SS

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

INTERFERENCE CORRECTED REPORT

	Nuclide Name	***Nuclide Id Confidence***	***Wt mean Activity (pCi/grams)***	***Wt mean Activity Uncertainty***	***Comments***
	K-40	0.996	3.08E+00	2.81E-01	
	Tl-208	1.000	5.46E-02	1.00E-02	
X	Bi-211	0.860			
	Pb-212	1.000	9.37E-02	2.33E-02	
	Pb-214	0.998	1.25E-01	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 11-Jun-19-10024

L1-10221B-FQGS-001SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/11/2019 11:08:22AM
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	5.73E-02	4.64E-02	4.64E-02
	BE-7	477.60		10.44	1.10E-01	3.20E-01	3.20E-01
+	K-40	1460.82	*	10.66	3.08E+00	2.90E-01	2.90E-01
	Mn-54	834.85		99.98	2.63E-03	3.00E-02	3.00E-02
	Co-60	1173.23		99.85	-2.40E-02	3.51E-02	3.51E-02
		1332.49		99.98	6.82E-03		3.69E-02
	Nb-94	702.65		99.81	-3.76E-03	2.90E-02	3.32E-02
		871.09		99.89	-3.49E-04		2.90E-02
	Ag-108m	79.13		6.60	3.82E-01	2.53E-02	9.68E-01
		433.94		90.50	-1.71E-02		2.53E-02
		614.28		89.80	-3.10E-03		4.21E-02
		722.94		90.80	1.84E-02		4.31E-02
	Sb-125	176.31		6.84	1.38E-01	7.81E-02	4.32E-01
		380.45		1.52	-7.85E-01		1.63E+00
		427.87		29.60	-2.89E-02		7.81E-02
		463.36		10.49	-7.08E-03		2.82E-01
		600.60		17.65	-8.88E-02		1.61E-01
		606.71		4.98	7.65E-01		9.07E-01
		635.95		11.22	-1.34E-01		2.24E-01

Analysis Report for 11-Jun-19-10024

L1-10221B-FQGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.11E+00	7.81E-02	1.70E+00
Ba-133	79.61	2.65	1.50E-01	5.77E-02	2.22E+00
	81.00	32.90	-1.21E-01		1.53E-01
	276.40	7.16	2.12E-01		3.98E-01
	302.85	18.34	1.41E-02		1.40E-01
	356.01	62.05	-2.37E-02		5.77E-02
	383.85	8.94	-4.56E-03		2.92E-01
Cs-134	475.36	1.48	2.36E+00	3.58E-02	2.51E+00
	563.25	8.34	1.76E-02		3.07E-01
	569.33	15.37	-3.10E-02		1.71E-01
	604.72	97.62	2.20E-03		4.00E-02
	795.86	85.46	-1.29E-02		3.58E-02
	801.95	8.69	-1.02E-02		3.36E-01
	1038.61	0.99	1.55E-01		3.39E+00
	1167.97	1.79	-1.61E-01		1.96E+00
	1365.19	3.02	2.29E-01		9.03E-01
Cs-137	661.66	85.10	2.61E-02	4.45E-02	4.45E-02
Eu-152	121.78	28.67	1.25E-02	9.25E-02	9.25E-02
	244.70	7.61	2.39E-02		4.02E-01
	295.94	0.45	5.87E+00		7.46E+00
	344.28	26.60	-7.08E-02		1.08E-01
	367.79	0.86	1.87E-01		3.18E+00
	411.12	2.24	5.51E-01		1.31E+00
	443.96	2.83	-4.32E-01		9.52E-01
	488.68	0.42	-2.52E+00		6.64E+00
	563.99	0.49	3.03E-01		4.97E+00
	586.26	0.46	-3.46E+00		9.24E+00
	678.62	0.47	1.12E-01		6.99E+00
	688.67	0.86	-3.14E-01		3.54E+00
	719.35	0.28	-2.45E-01		1.14E+01
	778.90	12.96	0.00E+00		2.38E-01
	810.45	0.32	1.43E+00		9.62E+00
	867.37	4.26	6.24E-03		7.39E-01
	919.33	0.43	-4.48E+00		6.81E+00
	964.08	14.65	2.29E-03		2.47E-01
	1085.87	10.24	2.05E-01		3.90E-01
	1089.74	1.73	6.90E-01		2.36E+00
	1112.07	13.69	5.52E-02		2.40E-01
	1212.95	1.43	1.54E+00		3.36E+00
	1249.94	0.19	5.12E+00		2.26E+01
	1299.14	1.63	5.30E-01		2.69E+00
	1408.01	21.07	4.98E-02		1.94E-01
	1457.64	0.50	-2.13E+00		2.57E+01
	1528.10	0.28	5.74E+00		1.18E+01
Eu-154	123.07	40.40	-1.66E-02	6.35E-02	6.35E-02
	247.93	6.89	-1.32E-01		3.92E-01
	591.76	4.95	-9.13E-03		6.10E-01
	692.42	1.78	4.74E-01		1.78E+00
	723.30	20.06	1.71E-01		2.07E-01
	756.80	4.52	-2.13E-01		6.54E-01
	873.18	12.08	6.35E-02		2.48E-01

Analysis Report for 11-Jun-19-10024

L1-10221B-FQGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	5.08E-02	6.35E-02	3.02E-01
	1004.76	18.01	7.92E-02		1.92E-01
	1274.43	34.80	-2.55E-03		1.10E-01
	1596.48	1.80	-1.40E+00		1.58E+00
Eu-155	45.30	1.31	4.75E-02	1.48E-01	9.61E+00
	60.01	1.22	4.97E-01		1.03E+01
	86.55	30.70	5.21E-02		1.48E-01
	105.31	21.10	3.83E-02		1.60E-01
Ra-226	186.21	3.64	1.22E-03	8.64E-01	8.64E-01
Pa-231	27.36	10.30	1.21E-01	7.87E-01	7.87E-01
	283.69	1.70	-4.25E-02		1.57E+00
	300.07	2.47	-6.48E-02		1.01E+00
	302.65	2.20	1.17E-01		1.17E+00
	330.06	1.40	3.79E-01		2.22E+00
U-235	143.76	10.96	1.19E-01	5.38E-02	2.48E-01
	163.33	5.08	7.30E-02		6.03E-01
	185.71	57.20	-9.11E-03		5.38E-02
	202.11	1.08	-1.49E+00		2.48E+00
	205.31	5.01	-1.01E-01		5.12E-01
Am-241	59.54	35.90	4.93E-02	3.62E-01	3.62E-01

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

Apex-Gamma

Analysis Report for 11-Jun-19-10025

L1-10221B-FSGS-002SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 11-Jun-19-10025
Sample Description	: L1-10221B-FSGS-002SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.765E+03 grams
Facility	: Default
Sample Taken On	: 6/10/2019 1:15:00PM
Acquisition Started	: 6/11/2019 10:34:33AM
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	: 6/11/2019
Efficiency Calibration Description	:
Sample Number	: 77253
Fill Height	: 1764.53 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/11/2019 10:49:38AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

1530 6/11/19

Analysis Report for 11-Jun-19-10025

L1-10221B-FSGS-002SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.68	950 -	961	954.81	7.77E+01	13.68	4.33E+01	0.81
2	295.21	1175 -	1188	1180.74	4.10E+01	10.17	2.20E+01	0.80
3	351.87	1401 -	1414	1407.21	6.85E+01	11.09	1.95E+01	1.03
4	1460.91	5834 -	5853	5843.48	1.43E+02	12.37	2.63E+00	1.55

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82	*	10.66	3.44E+00	3.32E-01
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.36E-01	2.63E-02
		300.09		3.30		
Pb-214	1.00	241.99		7.25		
		295.22	*	18.42	1.91E-01	4.97E-02
		351.93	*	35.60	1.87E-01	3.37E-02
		785.96		1.06		

Analysis Report for 11-Jun-19-10025

L1-10221B-FSGS-002SS

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

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.999	3.44E+00	3.32E-01	
X	Bi-211	0.903			
	Pb-212	1.000	1.36E-01	2.63E-02	
	Pb-214	1.000	1.88E-01	2.79E-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 11-Jun-19-10025

L1-10221B-FSGS-002SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/11/2019 10:49:38AM
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	4.19E-02	5.09E-02	5.09E-02
	BE-7	477.60		10.44	7.86E-02	3.54E-01	3.54E-01
+	K-40	1460.82	*	10.66	3.44E+00	3.22E-01	3.22E-01
	Mn-54	834.85		99.98	3.26E-02	5.04E-02	5.04E-02
	Co-60	1173.23		99.85	-2.75E-02	4.29E-02	4.29E-02
		1332.49		99.98	-4.99E-03		5.41E-02
	Nb-94	702.65		99.81	-6.65E-03	3.75E-02	3.89E-02
		871.09		99.89	-3.25E-03		3.75E-02
	Ag-108m	79.13		6.60	-4.17E-02	3.98E-02	1.59E+00
		433.94		90.50	1.89E-02		3.98E-02
		614.28		89.80	-1.15E-02		5.79E-02
		722.94		90.80	-1.36E-02		4.53E-02
	Sb-125	176.31		6.84	-1.54E-01	1.19E-01	5.17E-01
		380.45		1.52	-1.60E+00		2.14E+00
		427.87		29.60	-2.92E-02		1.19E-01
		463.36		10.49	-5.51E-02		3.07E-01
		600.60		17.65	-5.50E-02		1.98E-01
		606.71		4.98	8.74E-01		1.14E+00
		635.95		11.22	-6.01E-02		3.17E-01

Analysis Report for 11-Jun-19-10025

L1-10221B-FSGS-002SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.85E-01	1.19E-01	1.92E+00
Ba-133	79.61	2.65	1.16E+00	6.88E-02	3.79E+00
	81.00	32.90	-2.01E-01		2.66E-01
	276.40	7.16	6.23E-02		4.90E-01
	302.85	18.34	4.16E-02		1.86E-01
	356.01	62.05	-3.16E-02		6.88E-02
	383.85	8.94	-5.78E-02		3.27E-01
Cs-134	475.36	1.48	5.67E-01	4.13E-02	2.50E+00
	563.25	8.34	2.10E-02		4.26E-01
	569.33	15.37	-4.19E-02		2.28E-01
	604.72	97.62	-3.68E-02		4.97E-02
	795.86	85.46	3.19E-03		4.13E-02
	801.95	8.69	-2.30E-01		3.39E-01
	1038.61	0.99	3.08E+00		4.40E+00
	1167.97	1.79	5.23E-01		2.30E+00
	1365.19	3.02	3.99E-01		1.39E+00
Cs-137	661.66	85.10	1.95E-02	4.56E-02	4.56E-02
Eu-152	121.78	28.67	7.43E-02	1.37E-01	1.46E-01
	244.70	7.61	2.90E-01		5.01E-01
	295.94	0.45	2.30E+00		9.17E+00
	344.28	26.60	4.04E-02		1.37E-01
	367.79	0.86	2.01E+00		4.16E+00
	411.12	2.24	7.23E-01		1.75E+00
	443.96	2.83	-1.01E-01		1.10E+00
	488.68	0.42	4.70E+00		9.08E+00
	563.99	0.49	4.61E+00		7.49E+00
	586.26	0.46	5.17E+00		8.89E+00
	678.62	0.47	1.05E+00		6.52E+00
	688.67	0.86	-6.28E-01		3.96E+00
	719.35	0.28	-3.84E+00		1.50E+01
	778.90	12.96	-1.24E-01		1.89E-01
	810.45	0.32	6.42E+00		1.04E+01
	867.37	4.26	-1.90E-01		9.79E-01
	919.33	0.43	4.66E+00		9.90E+00
	964.08	14.65	1.37E-01		3.48E-01
	1085.87	10.24	-1.73E-01		4.38E-01
	1089.74	1.73	-1.11E+00		2.44E+00
	1112.07	13.69	-3.02E-01		2.91E-01
	1212.95	1.43	-2.36E-01		4.07E+00
	1249.94	0.19	-8.18E+00		2.36E+01
	1299.14	1.63	-6.89E-01		3.10E+00
	1408.01	21.07	5.34E-02		2.22E-01
	1457.64	0.50	7.59E+01		3.16E+01
	1528.10	0.28	-7.05E-01		9.08E+00
Eu-154	123.07	40.40	6.12E-02	1.04E-01	1.04E-01
	247.93	6.89	1.53E-01		5.02E-01
	591.76	4.95	6.03E-02		6.68E-01
	692.42	1.78	6.09E-01		2.29E+00
	723.30	20.06	-4.56E-02		2.13E-01
	756.80	4.52	-9.88E-02		8.63E-01
	873.18	12.08	-2.34E-01		3.11E-01

Analysis Report for 11-Jun-19-10025

L1-10221B-FSGS-002SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-1.60E-01	1.04E-01	3.92E-01
	1004.76	18.01	8.25E-02		2.37E-01
	1274.43	34.80	-4.61E-03		1.51E-01
	1596.48	1.80	1.27E-02		1.71E+00
Eu-155	45.30	1.31	-5.49E+00	2.51E-01	2.68E+01
	60.01	1.22	-1.39E+01		2.46E+01
	86.55	30.70	6.11E-02		2.51E-01
	105.31	21.10	1.48E-01		2.52E-01
Ra-226	186.21	3.64	6.01E-01	1.10E+00	1.10E+00
Pa-231	27.36	10.30	2.08E+00	1.37E+00	3.17E+00
	283.69	1.70	-9.27E-01		1.90E+00
	300.07	2.47	-3.27E-02		1.37E+00
	302.65	2.20	1.19E+00		1.61E+00
	330.06	1.40	6.13E-01		2.39E+00
U-235	143.76	10.96	-3.19E-02	7.10E-02	3.44E-01
	163.33	5.08	-1.55E-01		6.98E-01
	185.71	57.20	6.87E-02		7.10E-02
	202.11	1.08	-3.97E-01		3.10E+00
	205.31	5.01	-5.05E-01		6.40E-01
Am-241	59.54	35.90	-6.70E-02	8.74E-01	8.74E-01

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

Apex-Gamma

Analysis Report for 11-Jun-19-10026

L1-10221B-FSGS-003SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 11-Jun-19-10026
Sample Description	: L1-10221B-FSGS-003SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.674E+03 grams
Facility	: Default
Sample Taken On	: 6/10/2019 1:20:00PM
Acquisition Started	: 6/11/2019 10:34:39AM
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	: 6/11/2019
Efficiency Calibration Description	:
Sample Number	: 77254
Fill Height	: 1673.82 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/11/2019 10:50:01AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
1530 6/11/19

Analysis Report for 11-Jun-19-10026

L1-10221B-FSGS-003SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.70	947 -	959	954.36	7.40E+01	14.14	4.80E+01	0.44
2	609.27	2428 -	2443	2435.14	7.32E+01	10.12	9.79E+00	1.18
3	1460.37	5829 -	5850	5839.42	1.55E+02	13.60	8.10E+00	2.03

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.96	1460.82	*	10.66	3.39E+00	3.32E-01
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.16E-01	2.40E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	2.08E-01	3.13E-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		

Analysis Report for 11-Jun-19-10026

L1-10221B-FSGS-003SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	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		

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.968	3.39E+00	3.32E-01	
Pb-212	0.999	1.16E-01	2.40E-02	
Bi-214	1.000	2.08E-01	3.13E-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 11-Jun-19-10026

L1-10221B-FSGS-003SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/11/2019 10:50:01AM
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	5.09E-02	5.08E-02	5.08E-02
	BE-7	477.60		10.44	9.00E-02	2.89E-01	2.89E-01
+	K-40	1460.82	*	10.66	3.39E+00	4.70E-01	4.70E-01
	Mn-54	834.85		99.98	-5.39E-03	4.14E-02	4.14E-02
	Co-60	1173.23		99.85	-4.01E-03	5.67E-02	5.67E-02
		1332.49		99.98	5.66E-02		5.95E-02
	Nb-94	702.65		99.81	6.79E-03	3.39E-02	3.39E-02
		871.09		99.89	3.45E-02		4.09E-02
	Ag-108m	79.13		6.60	5.08E-01	3.09E-02	1.09E+00
		433.94		90.50	-3.72E-02		3.09E-02
		614.28		89.80	-1.76E-02		5.52E-02
		722.94		90.80	6.15E-03		5.24E-02
	Sb-125	176.31		6.84	-1.71E-01	1.03E-01	3.83E-01
		380.45		1.52	8.78E-01		2.13E+00
		427.87		29.60	4.04E-02		1.03E-01
		463.36		10.49	2.36E-01		3.43E-01
		600.60		17.65	-1.81E-02		1.60E-01
		606.71		4.98	-3.83E-01		1.28E+00
		635.95		11.22	3.63E-02		2.95E-01

Analysis Report for 11-Jun-19-10026

L1-10221B-FSGS-003SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	1.01E+00	1.03E-01	2.03E+00
Ba-133	79.61	2.65	2.02E+00	5.55E-02	2.63E+00
	81.00	32.90	-1.30E-01		1.69E-01
	276.40	7.16	2.78E-01		4.51E-01
	302.85	18.34	-5.95E-02		1.57E-01
	356.01	62.05	-6.06E-02		5.55E-02
	383.85	8.94	7.19E-02		3.75E-01
Cs-134	475.36	1.48	5.53E-02	4.69E-02	2.21E+00
	563.25	8.34	-1.32E-01		4.65E-01
	569.33	15.37	-1.20E-02		1.82E-01
	604.72	97.62	-2.65E-02		5.36E-02
	795.86	85.46	-4.47E-03		4.69E-02
	801.95	8.69	1.68E-01		4.81E-01
	1038.61	0.99	3.51E-01		4.34E+00
	1167.97	1.79	1.81E+00		3.05E+00
	1365.19	3.02	2.81E-01		1.33E+00
Cs-137	661.66	85.10	6.48E-02	5.63E-02	5.63E-02
Eu-152	121.78	28.67	1.62E-02	1.03E-01	1.03E-01
	244.70	7.61	5.91E-02		4.59E-01
	295.94	0.45	3.73E+00		8.66E+00
	344.28	26.60	-9.42E-03		1.07E-01
	367.79	0.86	1.98E+00		3.74E+00
	411.12	2.24	-4.50E-02		1.53E+00
	443.96	2.83	-2.68E-01		1.10E+00
	488.68	0.42	-2.41E+00		7.35E+00
	563.99	0.49	-5.29E+00		7.05E+00
	586.26	0.46	9.98E+00		1.06E+01
	678.62	0.47	-2.65E+00		7.91E+00
	688.67	0.86	1.94E+00		4.15E+00
	719.35	0.28	8.64E+00		1.55E+01
	778.90	12.96	-1.78E-02		2.66E-01
	810.45	0.32	4.09E+00		1.26E+01
	867.37	4.26	-9.46E-01		7.49E-01
	919.33	0.43	5.30E+00		9.48E+00
	964.08	14.65	8.36E-02		3.81E-01
	1085.87	10.24	-3.10E-01		3.87E-01
	1089.74	1.73	1.73E+00		2.74E+00
	1112.07	13.69	-4.76E-02		3.36E-01
	1212.95	1.43	2.23E+00		4.43E+00
	1249.94	0.19	3.76E+00		2.44E+01
	1299.14	1.63	-2.31E-01		2.48E+00
	1408.01	21.07	-6.96E-02		2.17E-01
	1457.64	0.50	6.60E+01		3.01E+01
	1528.10	0.28	3.43E+00		1.07E+01
Eu-154	123.07	40.40	-4.60E-02	7.05E-02	7.05E-02
	247.93	6.89	-3.62E-02		4.31E-01
	591.76	4.95	-2.14E-01		6.23E-01
	692.42	1.78	1.54E+00		2.09E+00
	723.30	20.06	1.45E-01		2.37E-01
	756.80	4.52	2.23E-01		7.50E-01
	873.18	12.08	-4.46E-01		3.39E-01

Analysis Report for 11-Jun-19-10026

L1-10221B-FSGS-003SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.54E-01	7.05E-02	4.62E-01
	1004.76	18.01	-2.68E-02		2.75E-01
	1274.43	34.80	2.76E-02		1.23E-01
	1596.48	1.80	4.17E-01		1.56E+00
Eu-155	45.30	1.31	-5.87E-01	1.60E-01	1.00E+01
	60.01	1.22	3.91E+00		1.19E+01
	86.55	30.70	9.08E-02		1.67E-01
	105.31	21.10	2.23E-03		1.60E-01
Ra-226	186.21	3.64	7.72E-01	9.13E-01	9.13E-01
Pa-231	27.36	10.30	5.47E-01	1.14E+00	1.14E+00
	283.69	1.70	-7.03E-01		1.64E+00
	300.07	2.47	-1.41E+00		1.24E+00
	302.65	2.20	3.90E-01		1.35E+00
	330.06	1.40	7.76E-01		2.07E+00
U-235	143.76	10.96	-7.61E-02	5.85E-02	2.78E-01
	163.33	5.08	9.75E-02		5.78E-01
	185.71	57.20	3.66E-02		5.85E-02
	202.11	1.08	-1.08E+00		2.52E+00
	205.31	5.01	4.99E-03		5.83E-01
Am-241	59.54	35.90	4.92E-02	4.11E-01	4.11E-01

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

Apex-Gamma

Analysis Report for 11-Jun-19-10027

L1-10221B-FSGS-004SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 11-Jun-19-10027
Sample Description	: L1-10221B-FSGS-004SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.769E+03 grams
Facility	: Default
Sample Taken On	: 6/10/2019 1:25:00PM
Acquisition Started	: 6/11/2019 10:34:46AM
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	: 6/11/2019
Efficiency Calibration Description	:
Sample Number	: 77255
Fill Height	: 1769.01 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/11/2019 10:49:54AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

1530 6/11/19

Analysis Report for 11-Jun-19-10027

L1-10221B-FSGS-004SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.58	948 -	961	954.78	8.13E+01	16.50	6.87E+01	0.88
2	338.11	1347 -	1357	1352.47	2.16E+01	8.29	1.94E+01	0.53
3	351.70	1400 -	1414	1406.81	6.27E+01	12.05	2.83E+01	0.44
4	510.74	2037 -	2047	2042.43	2.23E+01	7.84	1.57E+01	0.35
5	583.27	2326 -	2338	2332.41	3.97E+01	7.86	8.26E+00	0.56
6	609.23	2427 -	2443	2436.20	6.08E+01	8.60	4.25E+00	0.74
7	911.19	3638 -	3651	3643.79	2.48E+01	7.47	1.12E+01	0.47
8	968.59	3868 -	3879	3873.42	1.50E+01	4.75	3.00E+00	0.50
9	1460.33	5830 -	5852	5841.67	2.09E+02	15.58	8.57E+00	1.42

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	2.45E-02	8.78E-03
K-40	0.96	1460.82	*	10.66	4.23E+00	3.64E-01
Tl-208	0.99	583.19	*	85.00	5.53E-02	1.14E-02
Bi-211	0.93	351.07	*	13.02	4.07E-01	8.48E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.25E-01	2.72E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	1.62E-01	2.50E-02

Analysis Report for 11-Jun-19-10027

L1-10221B-FSGS-004SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	1.49E-01	3.10E-02
		785.96		1.06		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	1.58E-01	6.18E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	1.52E-01	4.62E-02
		964.77		4.99		
		968.97	*	15.80	1.56E-01	4.99E-02
		1588.20		3.22		

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

INTERFERENCE CORRECTED REPORT

Analysis Report for 11-Jun-19-10027

L1-10221B-FSGS-004SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.989	2.45E-02	8.78E-03	
	K-40	0.961	4.23E+00	3.64E-01	
	Tl-208	0.999	5.53E-02	1.14E-02	
?	Bi-211	0.938	4.07E-01	8.48E-02	
	Pb-212	1.000	1.25E-01	2.72E-02	
	Bi-214	1.000	1.62E-01	2.50E-02	
?	Pb-214	0.995	1.49E-01	3.10E-02	
	Ac-228	0.995	1.55E-01	2.97E-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

Analysis Report for 11-Jun-19-10027

L1-10221B-FSGS-004SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/11/2019 10:49:54AM
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	2.45E-02	2.65E-02	2.65E-02
	BE-7	477.60		10.44	2.49E-01	3.15E-01	3.15E-01
+	K-40	1460.82	*	10.66	4.23E+00	4.54E-01	4.54E-01
	Mn-54	834.85		99.98	-1.03E-02	3.79E-02	3.79E-02
	Co-60	1173.23		99.85	2.90E-02	4.90E-02	5.50E-02
		1332.49		99.98	2.29E-02		4.90E-02
	Nb-94	702.65		99.81	-4.20E-02	3.65E-02	3.65E-02
		871.09		99.89	6.67E-03		3.89E-02
	Ag-108m	79.13		6.60	-6.01E-01	3.54E-02	1.40E+00
		433.94		90.50	2.11E-02		3.54E-02
		614.28		89.80	5.89E-03		6.12E-02
		722.94		90.80	2.51E-02		4.23E-02
	Sb-125	176.31		6.84	1.49E-01	1.12E-01	4.57E-01
		380.45		1.52	-3.55E-01		2.06E+00
		427.87		29.60	3.19E-02		1.12E-01
		463.36		10.49	1.12E-01		3.40E-01
		600.60		17.65	9.43E-02		1.96E-01
		606.71		4.98	1.23E+00		1.12E+00
		635.95		11.22	-2.04E-01		3.35E-01

Analysis Report for 11-Jun-19-10027

L1-10221B-FSGS-004SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	1.34E-01	1.12E-01	1.94E+00
Ba-133	79.61	2.65	-1.04E+00	6.68E-02	3.39E+00
	81.00	32.90	-2.45E-01		2.29E-01
	276.40	7.16	1.74E-01		3.92E-01
	302.85	18.34	-4.15E-02		1.84E-01
	356.01	62.05	1.24E-02		6.68E-02
	383.85	8.94	1.55E-01		3.63E-01
Cs-134	475.36	1.48	3.33E-01	4.93E-02	2.16E+00
	563.25	8.34	2.19E-01		3.66E-01
	569.33	15.37	3.79E-02		1.88E-01
	604.72	97.62	-5.00E-04		5.55E-02
	795.86	85.46	1.07E-02		4.93E-02
	801.95	8.69	1.66E-01		4.65E-01
	1038.61	0.99	-1.19E-01		4.13E+00
	1167.97	1.79	7.89E-01		3.01E+00
	1365.19	3.02	-1.73E-01		1.32E+00
Cs-137	661.66	85.10	3.16E-02	5.23E-02	5.23E-02
Eu-152	121.78	28.67	-9.88E-02	1.15E-01	1.15E-01
	244.70	7.61	1.57E-01		4.29E-01
	295.94	0.45	3.51E+00		8.90E+00
	344.28	26.60	-6.52E-02		1.18E-01
	367.79	0.86	1.34E+00		3.20E+00
	411.12	2.24	7.22E-01		1.60E+00
	443.96	2.83	-7.46E-02		1.05E+00
	488.68	0.42	-1.55E+00		6.50E+00
	563.99	0.49	5.89E-01		6.10E+00
	586.26	0.46	6.82E+00		1.03E+01
	678.62	0.47	-3.53E+00		7.42E+00
	688.67	0.86	-3.42E-02		4.33E+00
	719.35	0.28	-9.05E+00		1.21E+01
	778.90	12.96	-7.14E-01		2.85E-01
	810.45	0.32	7.52E+00		1.18E+01
	867.37	4.26	1.55E-01		9.10E-01
	919.33	0.43	-4.98E+00		9.97E+00
	964.08	14.65	3.50E-01		3.88E-01
	1085.87	10.24	1.12E-01		5.18E-01
	1089.74	1.73	8.25E-01		2.89E+00
	1112.07	13.69	-1.95E-01		3.12E-01
	1212.95	1.43	3.33E-01		3.69E+00
	1249.94	0.19	-1.10E+01		2.65E+01
	1299.14	1.63	3.53E+00		3.50E+00
	1408.01	21.07	-1.45E-01		1.87E-01
	1457.64	0.50	9.05E+01		3.20E+01
	1528.10	0.28	3.95E+00		1.07E+01
Eu-154	123.07	40.40	6.56E-02	8.89E-02	8.89E-02
	247.93	6.89	-3.44E-01		3.75E-01
	591.76	4.95	8.06E-02		6.12E-01
	692.42	1.78	-3.73E-01		2.35E+00
	723.30	20.06	6.71E-02		1.88E-01
	756.80	4.52	3.72E-01		8.17E-01
	873.18	12.08	2.45E-02		3.16E-01

Analysis Report for 11-Jun-19-10027

L1-10221B-FSGS-004SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.42E-02	8.89E-02	3.89E-01
	1004.76	18.01	-1.41E-01		2.12E-01
	1274.43	34.80	4.62E-03		1.40E-01
	1596.48	1.80	1.37E-02		1.99E+00
Eu-155	45.30	1.31	3.47E+00	1.88E-01	1.63E+01
	60.01	1.22	-6.51E+00		1.85E+01
	86.55	30.70	-1.89E-01		1.92E-01
	105.31	21.10	-8.85E-02		1.88E-01
Ra-226	186.21	3.64	1.35E+00	9.48E-01	9.48E-01
Pa-231	27.36	10.30	6.59E-01	1.42E+00	2.06E+00
	283.69	1.70	-8.02E-01		1.65E+00
	300.07	2.47	-1.88E+00		1.42E+00
	302.65	2.20	-8.70E-01		1.52E+00
	330.06	1.40	4.63E-01		2.51E+00
U-235	143.76	10.96	-1.39E-01	6.01E-02	3.27E-01
	163.33	5.08	-2.41E-01		5.56E-01
	185.71	57.20	5.01E-02		6.01E-02
	202.11	1.08	1.80E+00		3.06E+00
	205.31	5.01	-1.88E-01		6.53E-01
Am-241	59.54	35.90	3.90E-01	6.83E-01	6.83E-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

Apex-Gamma

Analysis Report for 11-Jun-19-10028

L1-10221B-FSGS-005SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 11-Jun-19-10028
Sample Description	: L1-10221B-FSGS-005SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.606E+03 grams
Facility	: Default
Sample Taken On	: 6/10/2019 1:30:00PM
Acquisition Started	: 6/11/2019 10:53:29AM
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	: 6/11/2019
Efficiency Calibration Description	:
Sample Number	: 77257
Fill Height	: 1606.25 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/11/2019 11:08:32AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

1530 6/11/19

Analysis Report for 11-Jun-19-10028

L1-10221B-FSGS-005SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.67	949 -	960	954.77	7.81E+01	13.19	3.79E+01	1.20
2	352.06	1401 -	1414	1407.98	4.54E+01	9.01	1.26E+01	0.92
3	583.04	2327 -	2336	2331.36	2.15E+01	7.10	1.25E+01	0.28
4	661.60	2640 -	2652	2645.48	3.43E+01	6.83	4.73E+00	1.12
5	911.56	3640 -	3651	3645.21	2.27E+01	5.08	1.28E+00	0.57
6	1460.88	5834 -	5852	5843.36	1.48E+02	12.82	4.75E+00	1.18

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	3.65E+00	3.53E-01
Cs-137	0.99	661.66	*	85.10	6.16E-02	1.28E-02
Tl-208	0.99	583.19	*	85.00	3.55E-02	1.19E-02
Bi-211	0.85	351.07	*	13.02	3.44E-01	7.38E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.38E-01	2.59E-02
		300.09		3.30		
Pb-214	0.99	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	1.26E-01	2.70E-02
		785.96		1.06		

Analysis Report for 11-Jun-19-10028

L1-10221B-FSGS-005SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	1.67E-01	3.81E-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

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.999	3.65E+00	3.53E-01	
	Cs-137	0.999	6.16E-02	1.28E-02	
	Tl-208	0.996	3.55E-02	1.19E-02	
?	Bi-211	0.854	3.44E-01	7.38E-02	
	Pb-212	1.000	1.38E-01	2.59E-02	
?	Pb-214	0.998	1.26E-01	2.70E-02	
	Ac-228	0.994	1.67E-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 11-Jun-19-10028

L1-10221B-FSGS-005SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/11/2019 11:08:32AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

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

All peaks were identified.

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	7.18E-02	5.68E-02	5.68E-02
	BE-7	477.60		10.44	1.09E-01	3.93E-01	3.93E-01
+	K-40	1460.82	*	10.66	3.65E+00	4.05E-01	4.05E-01
	Mn-54	834.85		99.98	-1.19E-02	4.26E-02	4.26E-02
	Co-60	1173.23		99.85	8.44E-03	4.41E-02	4.96E-02
		1332.49		99.98	-9.29E-03		4.41E-02
	Nb-94	702.65		99.81	-2.19E-02	3.00E-02	3.00E-02
		871.09		99.89	2.76E-02		3.95E-02
	Ag-108m	79.13		6.60	4.12E-01	4.20E-02	1.57E+00
		433.94		90.50	-5.40E-03		4.20E-02
		614.28		89.80	-5.38E-02		5.12E-02
		722.94		90.80	3.86E-03		4.25E-02
	Sb-125	176.31		6.84	5.98E-02	1.23E-01	4.96E-01
		380.45		1.52	1.51E-01		2.31E+00
		427.87		29.60	-9.05E-02		1.23E-01
		463.36		10.49	-3.42E-02		3.43E-01
		600.60		17.65	1.79E-01		2.57E-01
		606.71		4.98	3.43E-01		1.04E+00
		635.95		11.22	7.24E-02		3.50E-01

Analysis Report for 11-Jun-19-10028

L1-10221B-FSGS-005SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-1.86E+00	1.23E-01	2.19E+00
	Ba-133	79.61		2.65	1.46E+00	6.66E-02	3.76E+00
		81.00		32.90	-2.16E-01		2.47E-01
		276.40		7.16	1.82E-01		4.99E-01
		302.85		18.34	2.41E-02		1.91E-01
		356.01		62.05	1.73E-02		6.66E-02
		383.85		8.94	6.76E-02		4.20E-01
	Cs-134	475.36		1.48	1.02E+00	4.09E-02	2.80E+00
		563.25		8.34	3.67E-02		5.07E-01
		569.33		15.37	9.51E-02		2.73E-01
		604.72		97.62	-1.80E-02		5.01E-02
		795.86		85.46	6.55E-03		4.09E-02
		801.95		8.69	1.15E-01		4.42E-01
		1038.61		0.99	-1.34E+00		4.62E+00
		1167.97		1.79	3.92E-01		3.11E+00
		1365.19		3.02	-2.27E-01		1.49E+00
+	Cs-137	661.66	*	85.10	6.16E-02	2.66E-02	2.66E-02
	Eu-152	121.78		28.67	5.24E-02	1.24E-01	1.40E-01
		244.70		7.61	-8.60E-03		5.15E-01
		295.94		0.45	1.41E+00		8.21E+00
		344.28		26.60	-1.71E-02		1.24E-01
		367.79		0.86	1.27E+00		3.65E+00
		411.12		2.24	-7.49E-02		1.30E+00
		443.96		2.83	1.24E-01		1.32E+00
		488.68		0.42	-1.32E+00		8.49E+00
		563.99		0.49	3.90E+00		8.84E+00
		586.26		0.46	8.88E+00		1.17E+01
		678.62		0.47	-1.07E+00		9.01E+00
		688.67		0.86	3.63E+00		4.91E+00
		719.35		0.28	-8.92E-01		1.17E+01
		778.90		12.96	-1.65E-01		2.57E-01
		810.45		0.32	1.00E+01		1.44E+01
		867.37		4.26	-1.57E-01		8.39E-01
		919.33		0.43	1.49E+00		9.85E+00
		964.08		14.65	7.77E-02		3.74E-01
		1085.87		10.24	-1.03E-01		3.92E-01
		1089.74		1.73	1.01E+00		2.65E+00
		1112.07		13.69	6.18E-02		2.86E-01
		1212.95		1.43	-6.18E-01		3.35E+00
		1249.94		0.19	-2.06E+01		2.73E+01
		1299.14		1.63	1.05E+00		2.98E+00
		1408.01		21.07	-1.14E-01		1.77E-01
		1457.64		0.50	7.58E+01		3.30E+01
		1528.10		0.28	-6.86E+00		1.58E+01
	Eu-154	123.07		40.40	-1.15E-02	1.00E-01	1.00E-01
		247.93		6.89	4.67E-01		5.50E-01
		591.76		4.95	-5.11E-01		6.97E-01
		692.42		1.78	6.98E-01		2.30E+00
		723.30		20.06	7.89E-02		1.97E-01
		756.80		4.52	-1.20E-01		7.22E-01
		873.18		12.08	1.76E-01		3.36E-01

Analysis Report for 11-Jun-19-10028

L1-10221B-FSGS-005SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-1.86E-02	1.00E-01	4.25E-01
	1004.76	18.01	2.13E-02		2.35E-01
	1274.43	34.80	-1.63E-02		1.42E-01
	1596.48	1.80	-7.62E-01		1.95E+00
Eu-155	45.30	1.31	3.78E+00	2.15E-01	2.67E+01
	60.01	1.22	6.16E+00		2.49E+01
	86.55	30.70	4.80E-02		2.38E-01
	105.31	21.10	-1.06E-01		2.15E-01
Ra-226	186.21	3.64	3.22E-03	1.00E+00	1.00E+00
Pa-231	27.36	10.30	2.92E+00	1.46E+00	3.46E+00
	283.69	1.70	-1.52E-01		1.95E+00
	300.07	2.47	-1.08E+00		1.46E+00
	302.65	2.20	3.77E-01		1.59E+00
	330.06	1.40	1.33E+00		2.69E+00
U-235	143.76	10.96	-1.55E-01	6.55E-02	3.23E-01
	163.33	5.08	-1.64E-01		6.42E-01
	185.71	57.20	4.45E-02		6.55E-02
	202.11	1.08	-3.58E-01		3.14E+00
	205.31	5.01	1.97E-01		7.26E-01
Am-241	59.54	35.90	3.54E-01	9.16E-01	9.16E-01

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

Apex-Gamma

Analysis Report for 11-Jun-19-10029

L1-10221B-FSGS-006SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 11-Jun-19-10029
Sample Description	: L1-10221B-FSGS-006SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.692E+03 grams
Facility	: Default
Sample Taken On	: 6/10/2019 1:35:00PM
Acquisition Started	: 6/11/2019 10:53:38AM
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	: 6/11/2019
Efficiency Calibration Description	:
Sample Number	: 77258
Fill Height	: 1691.97 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/11/2019 11:08:48AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

1530 6/11/19

Analysis Report for 11-Jun-19-10029

L1-10221B-FSGS-006SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.33	307 -	315	309.83	3.09E+01	13.36	6.71E+01	0.74
2	238.72	948 -	960	954.45	1.25E+02	16.43	5.53E+01	1.23
3	351.92	1402 -	1414	1406.70	6.60E+01	11.25	2.20E+01	0.96
4	583.33	2325 -	2337	2331.45	4.29E+01	8.70	1.21E+01	0.66
5	609.43	2426 -	2442	2435.76	7.66E+01	9.52	4.35E+00	1.17
6	661.60	2636 -	2653	2644.28	1.34E+02	13.27	1.31E+01	1.30
7	1460.48	5829 -	5851	5839.86	2.74E+02	17.77	1.10E+01	1.62

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	5.98E+00	4.67E-01
Cs-137	0.99	661.66	*	85.10	2.15E-01	2.49E-02
Tl-208	0.99	583.19	*	85.00	6.32E-02	1.34E-02
Bi-211	0.89	351.07	*	13.02	4.46E-01	8.40E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.95E-01	3.01E-02
		300.09		3.30		
Pb212-XR	0.99	74.82		10.28		
		77.11	*	17.10	2.15E-01	9.56E-02
		87.35		3.97		

Analysis Report for 11-Jun-19-10029

L1-10221B-FSGS-006SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb212-XR	0.99	89.78		1.46		
Bi-214	0.99	609.32	*	45.49	2.17E-01	3.00E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	1.00	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	1.63E-01	3.07E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	3.79E-01	1.69E-01
		87.35		2.24		
		89.78		0.82		

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

INTERFERENCE CORRECTED REPORT

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

Analysis Report for 11-Jun-19-10029

L1-10221B-FSGS-006SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.982	5.98E+00	4.67E-01	
	Cs-137	0.999	2.15E-01	2.49E-02	
	Tl-208	0.997	6.32E-02	1.34E-02	
?	Bi-211	0.890	4.46E-01	8.40E-02	
	Pb-212	0.999	1.95E-01	3.01E-02	
?	Pb212-XR	0.996	2.15E-01	9.56E-02	
	Bi-214	0.999	2.17E-01	3.00E-02	
?	Pb-214	1.000	1.63E-01	3.07E-02	
?	Pb214-XR	0.996	3.79E-01	1.69E-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 11-Jun-19-10029

L1-10221B-FSGS-006SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/11/2019 11:08:48AM
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	6.11E-02	5.65E-02	5.65E-02
	BE-7	477.60		10.44	9.51E-02	3.67E-01	3.67E-01
+	K-40	1460.82	*	10.66	5.98E+00	5.41E-01	5.41E-01
	Mn-54	834.85		99.98	-5.51E-03	4.79E-02	4.79E-02
	Co-60	1173.23		99.85	3.84E-02	6.70E-02	7.22E-02
		1332.49		99.98	3.32E-02		6.70E-02
	Nb-94	702.65		99.81	-3.18E-03	4.39E-02	4.39E-02
		871.09		99.89	9.19E-03		4.85E-02
	Ag-108m	79.13		6.60	-3.43E-02	3.83E-02	1.12E+00
		433.94		90.50	-2.11E-02		3.83E-02
		614.28		89.80	-3.85E-02		5.31E-02
		722.94		90.80	1.54E-02		5.23E-02
	Sb-125	176.31		6.84	1.45E-01	1.30E-01	4.55E-01
		380.45		1.52	6.63E-01		2.55E+00
		427.87		29.60	6.49E-02		1.30E-01
		463.36		10.49	1.27E-01		4.11E-01
		600.60		17.65	-9.03E-02		2.08E-01
		606.71		4.98	1.58E+00		1.28E+00
		635.95		11.22	-2.77E-01		3.29E-01

Analysis Report for 11-Jun-19-10029

L1-10221B-FSGS-006SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-8.03E-01	1.30E-01	2.24E+00
	Ba-133	79.61		2.65	-6.17E-02	6.58E-02	2.77E+00
		81.00		32.90	-2.53E-02		1.79E-01
		276.40		7.16	1.21E-01		4.99E-01
		302.85		18.34	1.99E-02		2.00E-01
		356.01		62.05	-1.63E-02		6.58E-02
		383.85		8.94	2.72E-01		4.16E-01
	Cs-134	475.36		1.48	-1.06E+00	5.11E-02	2.53E+00
		563.25		8.34	-2.73E-01		5.14E-01
		569.33		15.37	8.01E-03		2.60E-01
		604.72		97.62	-2.97E-02		5.50E-02
		795.86		85.46	2.33E-02		5.11E-02
		801.95		8.69	-2.19E-01		4.71E-01
		1038.61		0.99	2.34E+00		5.36E+00
		1167.97		1.79	9.96E-01		3.90E+00
		1365.19		3.02	2.74E-01		1.48E+00
+	Cs-137	661.66	*	85.10	2.15E-01	3.99E-02	3.99E-02
	Eu-152	121.78		28.67	-3.98E-02	1.09E-01	1.09E-01
		244.70		7.61	-2.34E-02		5.06E-01
		295.94		0.45	1.46E+00		9.23E+00
		344.28		26.60	-4.64E-03		1.29E-01
		367.79		0.86	-1.08E+00		3.58E+00
		411.12		2.24	1.15E-01		1.63E+00
		443.96		2.83	-5.15E-01		1.31E+00
		488.68		0.42	1.04E+00		8.35E+00
		563.99		0.49	-7.25E+00		8.46E+00
		586.26		0.46	-6.09E+00		1.19E+01
		678.62		0.47	-7.28E+00		9.07E+00
		688.67		0.86	-3.56E+00		5.16E+00
		719.35		0.28	1.35E+00		1.48E+01
		778.90		12.96	-1.07E-01		2.98E-01
		810.45		0.32	-9.52E+00		1.18E+01
		867.37		4.26	4.05E-01		1.17E+00
		919.33		0.43	1.56E+00		1.19E+01
		964.08		14.65	1.66E-01		3.98E-01
		1085.87		10.24	-6.54E-02		5.16E-01
		1089.74		1.73	-1.20E+00		3.16E+00
		1112.07		13.69	-2.03E-01		4.23E-01
		1212.95		1.43	-2.02E+00		3.78E+00
		1249.94		0.19	1.61E+01		3.35E+01
		1299.14		1.63	1.04E+00		2.74E+00
		1408.01		21.07	-1.75E-01		2.31E-01
		1457.64		0.50	1.35E+02		3.92E+01
		1528.10		0.28	1.47E+00		1.41E+01
	Eu-154	123.07		40.40	-5.81E-02	7.80E-02	7.80E-02
		247.93		6.89	6.18E-02		4.98E-01
		591.76		4.95	3.22E-01		7.66E-01
		692.42		1.78	2.64E+00		2.72E+00
		723.30		20.06	-9.31E-03		2.34E-01
		756.80		4.52	-1.05E-02		9.02E-01
		873.18		12.08	2.80E-01		4.36E-01

Analysis Report for 11-Jun-19-10029

L1-10221B-FSGS-006SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	8.57E-02	7.80E-02	4.35E-01
	1004.76	18.01	-7.17E-02		2.55E-01
	1274.43	34.80	-1.39E-01		1.26E-01
	1596.48	1.80	1.11E+00		2.28E+00
Eu-155	45.30	1.31	2.76E+00	1.80E-01	1.20E+01
	60.01	1.22	1.32E+00		1.21E+01
	86.55	30.70	9.76E-02		1.80E-01
	105.31	21.10	7.30E-02		1.93E-01
Ra-226	186.21	3.64	7.89E-01	9.22E-01	9.22E-01
Pa-231	27.36	10.30	6.03E-01	1.24E+00	1.24E+00
	283.69	1.70	7.51E-01		1.98E+00
	300.07	2.47	-1.38E+00		1.46E+00
	302.65	2.20	5.91E-01		1.68E+00
	330.06	1.40	-1.45E+00		2.41E+00
U-235	143.76	10.96	2.33E-01	5.68E-02	3.07E-01
	163.33	5.08	-3.26E-01		5.54E-01
	185.71	57.20	3.12E-03		5.68E-02
	202.11	1.08	-2.61E+00		2.47E+00
	205.31	5.01	9.92E-02		6.02E-01
Am-241	59.54	35.90	3.68E-03	4.16E-01	4.16E-01

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

Apex-Gamma

Analysis Report for 11-Jun-19-10030

L1-10221B-FSGS-007SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 11-Jun-19-10030
Sample Description	: L1-10221B-FSGS-007SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.640E+03 grams
Facility	: Default
Sample Taken On	: 6/10/2019 1:40:00PM
Acquisition Started	: 6/11/2019 10:53:46AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.2 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 6/11/2019
Efficiency Calibration Description	:
Sample Number	: 77259
Fill Height	: 1640.10 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/11/2019 11:08:51AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
1530 6/11/19

Analysis Report for 11-Jun-19-10030

L1-10221B-FSGS-007SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.57	949 -	961	954.75	6.80E+01	13.56	4.40E+01	1.06
2	351.75	1401 -	1413	1407.01	5.01E+01	9.51	1.49E+01	0.46
3	583.04	2326 -	2338	2331.48	3.14E+01	7.46	8.57E+00	0.67
4	609.22	2429 -	2444	2436.13	5.33E+01	8.37	5.66E+00	0.53
5	1460.45	5830 -	5852	5842.15	1.99E+02	15.26	8.65E+00	1.36

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	4.10E+00	3.61E-01
Tl-208	0.99	583.19	*	85.00	4.43E-02	1.08E-02
Bi-211	0.92	351.07	*	13.02	3.29E-01	6.78E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.05E-01	2.27E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.45E-01	2.43E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		

Analysis Report for 11-Jun-19-10030

L1-10221B-FSGS-007SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
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	0.99	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	1.20E-01	2.48E-02
		785.96		1.06		

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

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.978	4.10E+00	3.61E-01	
	Tl-208	0.997	4.43E-02	1.08E-02	
?	Bi-211	0.928	3.29E-01	6.78E-02	
	Pb-212	0.999	1.05E-01	2.27E-02	
	Bi-214	0.999	1.45E-01	2.43E-02	
?	Pb-214	0.997	1.20E-01	2.48E-02	

Analysis Report for 11-Jun-19-10030

L1-10221B-FSGS-007SS

? = 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 11-Jun-19-10030

L1-10221B-FSGS-007SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/11/2019 11:08:51AM
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	2.67E-02	4.45E-02	4.45E-02
	BE-7	477.60		10.44	1.17E-01	3.67E-01	3.67E-01
+	K-40	1460.82	*	10.66	4.10E+00	4.63E-01	4.63E-01
	Mn-54	834.85		99.98	7.96E-03	3.43E-02	3.43E-02
	Co-60	1173.23		99.85	2.27E-03	4.76E-02	5.51E-02
		1332.49		99.98	-7.94E-03		4.76E-02
	Nb-94	702.65		99.81	1.30E-02	2.91E-02	2.91E-02
		871.09		99.89	3.36E-03		3.70E-02
	Ag-108m	79.13		6.60	-5.58E-01	3.27E-02	1.31E+00
		433.94		90.50	-2.21E-03		3.27E-02
		614.28		89.80	1.34E-02		5.86E-02
		722.94		90.80	-1.37E-02		4.81E-02
	Sb-125	176.31		6.84	2.79E-01	1.02E-01	4.51E-01
		380.45		1.52	-5.07E-01		1.84E+00
		427.87		29.60	-1.24E-03		1.02E-01
		463.36		10.49	2.78E-01		3.37E-01
		600.60		17.65	-5.05E-02		2.02E-01
		606.71		4.98	1.25E+00		1.08E+00
		635.95		11.22	-2.75E-01		2.98E-01

Analysis Report for 11-Jun-19-10030

L1-10221B-FSGS-007SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	1.98E-01	1.02E-01	2.11E+00
Ba-133	79.61	2.65	4.69E-01	5.82E-02	3.23E+00
	81.00	32.90	-2.24E-01		2.26E-01
	276.40	7.16	1.82E-01		4.44E-01
	302.85	18.34	-7.25E-02		1.45E-01
	356.01	62.05	-1.64E-02		5.82E-02
	383.85	8.94	-1.04E-01		3.22E-01
Cs-134	475.36	1.48	-3.34E-01	4.36E-02	2.36E+00
	563.25	8.34	-7.33E-02		3.42E-01
	569.33	15.37	5.84E-02		2.17E-01
	604.72	97.62	-2.30E-02		5.37E-02
	795.86	85.46	-3.08E-03		4.36E-02
	801.95	8.69	7.76E-02		4.31E-01
	1038.61	0.99	7.89E-01		4.10E+00
	1167.97	1.79	-2.63E-01		2.82E+00
	1365.19	3.02	4.84E-01		1.08E+00
Cs-137	661.66	85.10	1.60E-02	4.72E-02	4.72E-02
Eu-152	121.78	28.67	-1.69E-02	1.07E-01	1.17E-01
	244.70	7.61	-9.95E-02		3.95E-01
	295.94	0.45	2.18E+00		7.77E+00
	344.28	26.60	-4.90E-03		1.07E-01
	367.79	0.86	-9.23E-01		3.48E+00
	411.12	2.24	9.36E-01		1.36E+00
	443.96	2.83	-9.64E-02		1.05E+00
	488.68	0.42	-2.75E+00		7.94E+00
	563.99	0.49	-1.76E+00		6.06E+00
	586.26	0.46	1.11E+01		1.01E+01
	678.62	0.47	1.54E+00		7.11E+00
	688.67	0.86	3.35E+00		4.60E+00
	719.35	0.28	-2.34E+00		1.41E+01
	778.90	12.96	-2.41E-01		2.65E-01
	810.45	0.32	-8.21E+00		1.07E+01
	867.37	4.26	-4.46E-01		9.24E-01
	919.33	0.43	-5.60E+00		1.08E+01
	964.08	14.65	2.55E-01		3.77E-01
	1085.87	10.24	-4.85E-01		3.87E-01
	1089.74	1.73	-4.66E-01		2.23E+00
	1112.07	13.69	-3.00E-02		3.51E-01
	1212.95	1.43	2.84E+00		3.82E+00
	1249.94	0.19	3.71E-02		2.58E+01
	1299.14	1.63	-1.16E-01		3.02E+00
	1408.01	21.07	8.43E-04		1.75E-01
	1457.64	0.50	9.11E+01		3.18E+01
	1528.10	0.28	-7.38E+00		1.32E+01
Eu-154	123.07	40.40	7.71E-02	8.54E-02	8.54E-02
	247.93	6.89	-3.39E-01		3.92E-01
	591.76	4.95	-4.69E-01		6.68E-01
	692.42	1.78	1.09E+00		2.23E+00
	723.30	20.06	-1.53E-01		2.12E-01
	756.80	4.52	4.48E-01		8.59E-01
	873.18	12.08	4.39E-02		3.07E-01

Analysis Report for 11-Jun-19-10030

L1-10221B-FSGS-007SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	2.66E-01	8.54E-02	4.20E-01
	1004.76	18.01	-1.52E-01		2.15E-01
	1274.43	34.80	1.43E-03		1.19E-01
	1596.48	1.80	-2.96E+00		1.91E+00
Eu-155	45.30	1.31	9.94E+00	1.81E-01	1.70E+01
	60.01	1.22	-5.88E+00		1.80E+01
	86.55	30.70	-7.59E-03		2.03E-01
	105.31	21.10	1.91E-02		1.81E-01
Ra-226	186.21	3.64	-1.13E-01	8.95E-01	8.95E-01
Pa-231	27.36	10.30	1.82E+00	1.22E+00	2.19E+00
	283.69	1.70	-1.53E+00		1.82E+00
	300.07	2.47	-1.31E+00		1.22E+00
	302.65	2.20	-3.60E-01		1.24E+00
	330.06	1.40	-5.29E-01		2.28E+00
U-235	143.76	10.96	-9.92E-02	5.71E-02	2.95E-01
	163.33	5.08	2.41E-01		6.02E-01
	185.71	57.20	1.51E-02		5.71E-02
	202.11	1.08	8.62E-01		2.94E+00
	205.31	5.01	-6.95E-03		6.32E-01
Am-241	59.54	35.90	1.91E-01	6.62E-01	6.62E-01

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

Apex-Gamma

Analysis Report for 11-Jun-19-10031

L1-10221B-FSGS-008SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 11-Jun-19-10031
Sample Description	: L1-10221B-FSGS-008SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.747E+03 grams
Facility	: Default
Sample Taken On	: 6/10/2019 1:45:00PM
Acquisition Started	: 6/11/2019 11:16:07AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 324
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.03 %
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	: 6/11/2019
Efficiency Calibration Description	:
Sample Number	: 77260
Fill Height	: 1747.14 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/11/2019 11:31:10AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated

1530 6/11/19

Analysis Report for 11-Jun-19-10031

L1-10221B-FSGS-008SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.68	473 -	481	477.53	1.16E+02	16.33	6.85E+01	1.07
2	352.02	699 -	708	703.98	6.47E+01	11.23	2.73E+01	1.53
3	1460.84	2915 -	2928	2921.73	2.11E+02	14.84	3.50E+00	2.07

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.82	*	10.66	3.83E+00	3.17E-01
Bi-211	0.86	351.07	*	13.02	3.79E-01	7.25E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.59E-01	2.58E-02
		300.09		3.30		
Pb-214	0.99	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	1.38E-01	2.65E-02
		785.96		1.06		

Analysis Report for 11-Jun-19-10031

L1-10221B-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

	Nuclide Name	***Nuclide Id Confidence***	***Wt mean Activity (pCi/grams)***	***Wt mean Activity Uncertainty***	***Comments***
	K-40	1.000	3.83E+00	3.17E-01	
?	Bi-211	0.866	3.79E-01	7.25E-02	
	Pb-212	1.000	1.59E-01	2.58E-02	
?	Pb-214	0.999	1.38E-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 11-Jun-19-10031

L1-10221B-FSGS-008SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/11/2019 11:31:10AM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

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

All peaks were identified.

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	4.86E-02	4.56E-02	4.56E-02
	BE-7	477.60		10.44	1.63E-01	3.43E-01	3.43E-01
+	K-40	1460.82	*	10.66	3.83E+00	2.44E-01	2.44E-01
	Mn-54	834.85		99.98	-1.72E-02	2.81E-02	2.81E-02
	Co-60	1173.23		99.85	-8.36E-03	3.89E-02	3.89E-02
		1332.49		99.98	2.61E-02		4.51E-02
	Nb-94	702.65		99.81	-7.84E-03	3.06E-02	3.06E-02
		871.09		99.89	-6.57E-03		3.51E-02
	Ag-108m	79.13		6.60	8.62E-01	2.83E-02	1.01E+00
		433.94		90.50	-3.49E-03		2.83E-02
		614.28		89.80	-1.02E-02		4.35E-02
		722.94		90.80	-3.77E-03		4.17E-02
	Sb-125	176.31		6.84	1.81E-01	9.99E-02	4.22E-01
		380.45		1.52	-2.90E-01		1.86E+00
		427.87		29.60	3.53E-02		9.99E-02
		463.36		10.49	-1.41E-02		2.63E-01
		600.60		17.65	-6.80E-02		1.74E-01
		606.71		4.98	1.09E+00		9.59E-01
		635.95		11.22	3.08E-02		2.80E-01

Analysis Report for 11-Jun-19-10031

L1-10221B-FSGS-008SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-9.12E-01	9.99E-02	1.36E+00
Ba-133	79.61	2.65	2.29E+00	5.60E-02	2.42E+00
	81.00	32.90	-1.31E-01		1.52E-01
	276.40	7.16	-2.56E-02		3.89E-01
	302.85	18.34	3.78E-02		1.57E-01
	356.01	62.05	-2.91E-02		5.60E-02
	383.85	8.94	-1.83E-02		3.24E-01
Cs-134	475.36	1.48	1.95E+00	4.16E-02	2.30E+00
	563.25	8.34	-2.41E-01		3.18E-01
	569.33	15.37	-5.13E-03		1.96E-01
	604.72	97.62	-3.35E-04		4.16E-02
	795.86	85.46	2.80E-02		4.25E-02
	801.95	8.69	-4.69E-01		2.72E-01
	1038.61	0.99	9.61E-01		3.64E+00
	1167.97	1.79	3.93E-01		2.21E+00
	1365.19	3.02	-3.24E-01		8.32E-01
Cs-137	661.66	85.10	6.00E-03	3.72E-02	3.72E-02
Eu-152	121.78	28.67	6.33E-03	9.98E-02	9.98E-02
	244.70	7.61	-1.88E-02		3.60E-01
	295.94	0.45	1.82E+00		7.12E+00
	344.28	26.60	-1.23E-02		1.12E-01
	367.79	0.86	-5.57E-01		2.85E+00
	411.12	2.24	4.17E-01		1.27E+00
	443.96	2.83	2.58E-02		9.59E-01
	488.68	0.42	-5.02E+00		6.69E+00
	563.99	0.49	-3.49E+00		5.50E+00
	586.26	0.46	1.05E+01		9.81E+00
	678.62	0.47	1.27E+00		6.20E+00
	688.67	0.86	-1.69E+00		3.44E+00
	719.35	0.28	-2.10E+00		1.20E+01
	778.90	12.96	8.01E-02		2.94E-01
	810.45	0.32	7.86E-02		9.31E+00
	867.37	4.26	-1.14E-01		8.21E-01
	919.33	0.43	-3.68E+00		7.78E+00
	964.08	14.65	1.78E-01		2.98E-01
	1085.87	10.24	-6.17E-02		3.52E-01
	1089.74	1.73	2.34E-01		2.14E+00
	1112.07	13.69	-3.17E-02		2.30E-01
	1212.95	1.43	1.72E-01		3.16E+00
	1249.94	0.19	-1.25E+01		2.43E+01
	1299.14	1.63	6.21E-01		2.49E+00
	1408.01	21.07	1.79E-02		1.31E-01
	1457.64	0.50	-3.94E+00		2.85E+01
	1528.10	0.28	0.00E+00		2.04E+00
Eu-154	123.07	40.40	2.22E-02	7.18E-02	7.18E-02
	247.93	6.89	2.30E-02		3.75E-01
	591.76	4.95	-4.40E-02		6.62E-01
	692.42	1.78	2.30E-01		1.74E+00
	723.30	20.06	-7.44E-04		1.96E-01
	756.80	4.52	-4.26E-02		6.80E-01
	873.18	12.08	3.78E-02		2.79E-01

Analysis Report for 11-Jun-19-10031

L1-10221B-FSGS-008SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-3.75E-02	7.18E-02	3.43E-01
	1004.76	18.01	2.02E-02		2.14E-01
	1274.43	34.80	-1.97E-03		1.18E-01
	1596.48	1.80	-1.69E-01		1.89E+00
Eu-155	45.30	1.31	-2.01E+00	1.50E-01	8.55E+00
	60.01	1.22	-4.46E+00		1.06E+01
	86.55	30.70	6.97E-02		1.50E-01
	105.31	21.10	-6.68E-03		1.65E-01
Ra-226	186.21	3.64	7.25E-01	8.57E-01	8.57E-01
Pa-231	27.36	10.30	2.16E-01	9.91E-01	9.91E-01
	283.69	1.70	-4.14E-01		1.51E+00
	300.07	2.47	-1.29E+00		1.13E+00
	302.65	2.20	3.15E-01		1.31E+00
	330.06	1.40	-2.50E-01		1.93E+00
U-235	143.76	10.96	1.39E-02	5.52E-02	2.46E-01
	163.33	5.08	1.09E-01		5.76E-01
	185.71	57.20	4.76E-02		5.52E-02
	202.11	1.08	-1.03E+00		2.57E+00
	205.31	5.01	-2.24E-01		5.69E-01
Am-241	59.54	35.90	-2.05E-01	3.57E-01	3.57E-01

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

Apex-Gamma

Analysis Report for 11-Jun-19-10032

L1-10221B-FSGS-009SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 11-Jun-19-10032
Sample Description	: L1-10221B-FSGS-009SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.735E+03 grams
Facility	: Default
Sample Taken On	: 6/10/2019 1:50:00PM
Acquisition Started	: 6/11/2019 11:16:14AM
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	: 6/11/2019
Efficiency Calibration Description	:
Sample Number	: 77261
Fill Height	: 1734.95 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/11/2019 11:31:18AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

1530 6/11/19

Analysis Report for 11-Jun-19-10032

L1-10221B-FSGS-009SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.20	307 -	315	309.54	3.03E+01	12.82	6.08E+01	0.50
2	185.99	740 -	751	744.23	3.73E+01	13.59	5.77E+01	0.88
3	238.66	948 -	961	954.73	1.41E+02	17.93	6.41E+01	0.75
4	295.21	1175 -	1186	1180.74	4.59E+01	10.02	2.11E+01	0.37
5	338.44	1350 -	1360	1353.54	3.19E+01	8.69	1.81E+01	0.87
6	352.02	1402 -	1416	1407.81	8.19E+01	12.04	2.21E+01	1.16
7	583.22	2326 -	2340	2332.09	4.35E+01	8.45	9.45E+00	1.11
8	609.43	2430 -	2442	2436.89	6.36E+01	8.97	6.44E+00	1.67
9	911.13	3637 -	3649	3643.48	3.38E+01	7.07	6.24E+00	0.70
10	1461.02	5833 -	5854	5843.93	2.67E+02	17.56	1.10E+01	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	0.99	1460.82	*	10.66	6.44E+00	5.07E-01
Tl-208	1.00	583.19	*	85.00	7.08E-02	1.44E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.47E-01	3.72E-02
		300.09		3.30		
Pb212-XR	0.99	74.82		10.28		
		77.11	*	17.10	3.65E-01	1.59E-01

Analysis Report for 11-Jun-19-10032

L1-10221B-FSGS-009SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb212-XR	0.99	87.35		3.97		
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	1.99E-01	3.05E-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	2.14E-01	4.98E-02
		351.93	*	35.60	2.24E-01	3.75E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	6.43E-01	2.82E-01
		87.35		2.24		
		89.78		0.82		
Ra-226	0.99	186.21	*	3.64	6.98E-01	2.61E-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	2.68E-01	7.62E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.44E-01	5.22E-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	4.44E-02	1.66E-02
		202.11		1.08		
		205.31		5.01		

Analysis Report for 11-Jun-19-10032

L1-10221B-FSGS-009SS

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

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.994	6.44E+00	5.07E-01	
	Tl-208	1.000	7.08E-02	1.44E-02	
X	Bi-211	0.866			
	Pb-212	1.000	2.47E-01	3.72E-02	
?	Pb212-XR	0.999	3.65E-01	1.59E-01	
	Bi-214	0.999	1.99E-01	3.05E-02	
	Pb-214	0.999	2.20E-01	3.00E-02	
?	Pb214-XR	0.999	6.43E-01	2.82E-01	
?	Ra-226	0.992	6.98E-01	2.61E-01	
	Ac-228	0.999	2.52E-01	4.31E-02	
?	U-235	0.992	4.44E-02	1.66E-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 11-Jun-19-10032

L1-10221B-FSGS-009SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/11/2019 11:31:18AM
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	8.15E-03	5.56E-02	5.56E-02
	BE-7	477.60		10.44	1.65E-01	4.26E-01	4.26E-01
+	K-40	1460.82	*	10.66	6.44E+00	5.96E-01	5.96E-01
	Mn-54	834.85		99.98	1.86E-02	4.73E-02	4.73E-02
	Co-60	1173.23		99.85	-1.15E-01	6.09E-02	6.14E-02
		1332.49		99.98	5.59E-03		6.09E-02
	Nb-94	702.65		99.81	1.33E-02	4.51E-02	4.51E-02
		871.09		99.89	5.06E-02		5.11E-02
	Ag-108m	79.13		6.60	2.04E-01	3.84E-02	1.82E+00
		433.94		90.50	-3.40E-02		3.84E-02
		614.28		89.80	-6.77E-02		6.85E-02
		722.94		90.80	-1.50E-02		6.04E-02
	Sb-125	176.31		6.84	-2.05E-05	1.25E-01	5.58E-01
		380.45		1.52	-1.64E+00		2.41E+00
		427.87		29.60	-9.27E-02		1.25E-01
		463.36		10.49	4.82E-01		4.02E-01
		600.60		17.65	9.57E-03		2.29E-01
		606.71		4.98	1.78E+00		1.34E+00
		635.95		11.22	-1.28E-01		3.51E-01

Analysis Report for 11-Jun-19-10032

L1-10221B-FSGS-009SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.23E+00	1.25E-01	2.07E+00
Ba-133	79.61	2.65	-5.01E-01	7.16E-02	4.27E+00
	81.00	32.90	-8.90E-02		2.88E-01
	276.40	7.16	-1.53E-01		5.30E-01
	302.85	18.34	-8.72E-02		2.01E-01
	356.01	62.05	-4.01E-02		7.16E-02
	383.85	8.94	3.23E-01		4.38E-01
Cs-134	475.36	1.48	1.06E+00	5.06E-02	2.94E+00
	563.25	8.34	4.97E-01		5.38E-01
	569.33	15.37	-2.08E-01		2.84E-01
	604.72	97.62	-2.18E-02		5.72E-02
	795.86	85.46	2.23E-02		5.06E-02
	801.95	8.69	5.72E-02		4.58E-01
	1038.61	0.99	3.75E+00		5.43E+00
	1167.97	1.79	3.78E+00		3.99E+00
	1365.19	3.02	-1.03E-01		1.52E+00
Cs-137	661.66	85.10	2.20E-02	5.74E-02	5.74E-02
Eu-152	121.78	28.67	-4.85E-02	1.28E-01	1.54E-01
	244.70	7.61	2.82E-01		5.82E-01
	295.94	0.45	5.02E+00		9.72E+00
	344.28	26.60	-4.66E-02		1.28E-01
	367.79	0.86	2.27E+00		4.56E+00
	411.12	2.24	1.33E-01		1.75E+00
	443.96	2.83	-6.74E-01		1.27E+00
	488.68	0.42	1.02E+00		7.24E+00
	563.99	0.49	-4.64E+00		8.48E+00
	586.26	0.46	1.13E+00		1.28E+01
	678.62	0.47	-4.51E+00		7.16E+00
	688.67	0.86	2.09E+00		5.09E+00
	719.35	0.28	-4.37E+00		1.81E+01
	778.90	12.96	-1.13E-01		3.28E-01
	810.45	0.32	2.43E+00		1.31E+01
	867.37	4.26	-5.22E-01		1.20E+00
	919.33	0.43	-5.59E+00		1.09E+01
	964.08	14.65	1.57E-01		5.09E-01
	1085.87	10.24	-1.35E-01		4.98E-01
	1089.74	1.73	3.04E-01		3.32E+00
	1112.07	13.69	-1.51E-01		3.87E-01
	1212.95	1.43	7.90E-02		4.24E+00
	1249.94	0.19	-1.11E+01		3.60E+01
	1299.14	1.63	-1.09E-01		3.37E+00
	1408.01	21.07	1.09E-01		2.62E-01
	1457.64	0.50	1.38E+02		4.27E+01
	1528.10	0.28	2.83E+00		1.06E+01
Eu-154	123.07	40.40	-6.27E-03	1.09E-01	1.09E-01
	247.93	6.89	2.24E-01		5.45E-01
	591.76	4.95	-5.44E-01		7.57E-01
	692.42	1.78	-1.88E+00		2.39E+00
	723.30	20.06	1.79E-01		2.73E-01
	756.80	4.52	1.16E-01		1.05E+00
	873.18	12.08	-1.56E-03		3.95E-01

Analysis Report for 11-Jun-19-10032

L1-10221B-FSGS-009SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	-5.96E-03	1.09E-01	4.89E-01
		1004.76		18.01	-7.81E-02		2.97E-01
		1274.43		34.80	2.17E-02		1.76E-01
		1596.48		1.80	-7.20E-01		2.08E+00
	Eu-155	45.30		1.31	1.76E+00	2.59E-01	3.30E+01
		60.01		1.22	1.12E+00		3.13E+01
		86.55		30.70	5.60E-02		2.70E-01
		105.31		21.10	-6.31E-02		2.59E-01
+	Ra-226	186.21	*	3.64	6.98E-01	8.25E-01	8.25E-01
	Pa-231	27.36		10.30	2.39E+00	1.50E+00	3.51E+00
		283.69		1.70	-7.53E-02		2.08E+00
		300.07		2.47	-8.59E-02		1.50E+00
		302.65		2.20	-6.12E-01		1.66E+00
		330.06		1.40	-8.30E-02		2.51E+00
+	U-235	143.76		10.96	-1.86E-01	5.25E-02	3.76E-01
		163.33		5.08	2.09E-01		7.72E-01
		185.71	*	57.20	4.44E-02		5.25E-02
		202.11		1.08	-1.53E+00		3.43E+00
		205.31		5.01	-2.67E-01		7.17E-01
	Am-241	59.54		35.90	-1.11E-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

Apex-Gamma

Analysis Report for 11-Jun-19-10033

L1-10221B-FSGS-010SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 11-Jun-19-10033
Sample Description	: L1-10221B-FSGS-010SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.760E+03 grams
Facility	: Default
Sample Taken On	: 6/10/2019 1:55:00PM
Acquisition Started	: 6/11/2019 11:16:20AM
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	: 6/11/2019
Efficiency Calibration Description	:
Sample Number	: 77262
Fill Height	: 1760.39 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/11/2019 11:31:31AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

1530 6/11/19

Analysis Report for 11-Jun-19-10033

L1-10221B-FSGS-010SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.10	305 -	315	308.95	6.12E+01	15.10	6.68E+01	0.93
2	238.79	949 -	962	954.76	1.30E+02	19.14	8.07E+01	0.96
3	295.21	1175 -	1185	1180.13	5.49E+01	10.15	2.01E+01	0.41
4	338.61	1348 -	1360	1353.53	2.94E+01	9.84	2.56E+01	0.44
5	351.92	1398 -	1414	1406.70	9.40E+01	11.89	1.50E+01	1.57
6	583.22	2324 -	2338	2330.98	5.65E+01	9.18	9.53E+00	0.44
7	609.35	2427 -	2441	2435.43	5.87E+01	9.24	9.28E+00	0.61
8	911.06	3635 -	3649	3641.70	3.66E+01	7.99	9.43E+00	1.21
9	1460.44	5830 -	5852	5839.71	2.46E+02	16.23	4.96E+00	1.16

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
K-40	0.97	1460.82	*	10.66	5.32E+00	4.20E-01
Tl-208	1.00	583.19	*	85.00	8.26E-02	1.43E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	2.02E-01	3.39E-02
		300.09		3.30		
Pb212-XR	1.00	74.82		10.28		
		77.11	*	17.10	4.28E-01	1.14E-01
		87.35		3.97		

Analysis Report for 11-Jun-19-10033

L1-10221B-FSGS-010SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb212-XR	1.00	89.78		1.46		
Bi-214	1.00	609.32	*	45.49	1.65E-01	2.78E-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	2.29E-01	4.61E-02
		351.93	*	35.60	2.31E-01	3.45E-02
		785.96		1.06		
Pb214-XR	1.00	74.82		5.80		
		77.11	*	9.70	7.55E-01	2.05E-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	2.22E-01	7.64E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.38E-01	5.30E-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 11-Jun-19-10033

L1-10221B-FSGS-010SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.977	5.32E+00	4.20E-01	
	Tl-208	1.000	8.26E-02	1.43E-02	
X	Bi-211	0.891			
	Pb-212	0.996	2.02E-01	3.39E-02	
?	Pb212-XR	1.000	4.28E-01	1.14E-01	
	Bi-214	1.000	1.65E-01	2.78E-02	
	Pb-214	1.000	2.30E-01	2.77E-02	
?	Pb214-XR	1.000	7.55E-01	2.05E-01	
	Ac-228	0.997	2.33E-01	4.35E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 11-Jun-19-10033

L1-10221B-FSGS-010SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/11/2019 11:31:31AM
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	9.09E-02	5.75E-02	5.75E-02
	BE-7	477.60		10.44	1.68E-01	3.93E-01	3.93E-01
+	K-40	1460.82	*	10.66	5.32E+00	3.69E-01	3.69E-01
	Mn-54	834.85		99.98	-1.78E-02	4.62E-02	4.62E-02
	Co-60	1173.23		99.85	4.56E-03	4.04E-02	4.93E-02
		1332.49		99.98	-3.77E-03		4.04E-02
	Nb-94	702.65		99.81	-2.30E-02	3.39E-02	3.58E-02
		871.09		99.89	-2.98E-02		3.39E-02
	Ag-108m	79.13		6.60	-1.47E-01	3.76E-02	1.12E+00
		433.94		90.50	-2.27E-02		3.76E-02
		614.28		89.80	-3.81E-02		5.65E-02
		722.94		90.80	1.16E-02		4.81E-02
	Sb-125	176.31		6.84	-2.27E-01	1.13E-01	4.18E-01
		380.45		1.52	-2.37E-01		1.95E+00
		427.87		29.60	3.20E-02		1.13E-01
		463.36		10.49	-3.60E-02		3.36E-01
		600.60		17.65	7.47E-02		1.93E-01
		606.71		4.98	1.56E+00		1.22E+00
		635.95		11.22	7.25E-02		3.53E-01

Analysis Report for 11-Jun-19-10033

L1-10221B-FSGS-010SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-2.12E+00	1.13E-01	1.73E+00
Ba-133	79.61	2.65	-8.54E-02	5.90E-02	2.73E+00
	81.00	32.90	-1.28E-01		1.62E-01
	276.40	7.16	2.80E-02		4.26E-01
	302.85	18.34	1.15E-01		1.90E-01
	356.01	62.05	-3.52E-02		5.90E-02
	383.85	8.94	1.59E-01		3.46E-01
Cs-134	475.36	1.48	2.94E-02	5.14E-02	2.59E+00
	563.25	8.34	-8.57E-01		4.61E-01
	569.33	15.37	2.69E-01		2.73E-01
	604.72	97.62	-1.23E-02		5.14E-02
	795.86	85.46	2.60E-02		5.53E-02
	801.95	8.69	-1.25E-01		5.24E-01
	1038.61	0.99	2.54E+00		4.97E+00
	1167.97	1.79	-2.53E+00		3.22E+00
	1365.19	3.02	-1.14E-01		1.13E+00
Cs-137	661.66	85.10	3.19E-02	4.97E-02	4.97E-02
Eu-152	121.78	28.67	-2.19E-02	1.10E-01	1.10E-01
	244.70	7.61	9.98E-02		4.57E-01
	295.94	0.45	1.60E+00		9.38E+00
	344.28	26.60	-2.39E-02		1.10E-01
	367.79	0.86	-1.47E+00		3.48E+00
	411.12	2.24	1.61E+00		1.71E+00
	443.96	2.83	2.96E-02		1.08E+00
	488.68	0.42	-1.22E-01		7.40E+00
	563.99	0.49	-1.59E+01		7.53E+00
	586.26	0.46	-2.71E+00		1.23E+01
	678.62	0.47	-4.56E+00		7.10E+00
	688.67	0.86	2.54E+00		4.72E+00
	719.35	0.28	5.32E+00		1.54E+01
	778.90	12.96	5.70E-02		3.29E-01
	810.45	0.32	-3.23E+00		1.20E+01
	867.37	4.26	2.57E-01		8.62E-01
	919.33	0.43	-3.90E+00		8.94E+00
	964.08	14.65	-9.22E-02		4.30E-01
	1085.87	10.24	1.21E-01		4.37E-01
	1089.74	1.73	-2.13E-01		2.34E+00
	1112.07	13.69	2.35E-01		3.62E-01
	1212.95	1.43	-1.28E+00		4.01E+00
	1249.94	0.19	-7.15E+00		2.93E+01
	1299.14	1.63	7.59E-01		2.63E+00
	1408.01	21.07	8.48E-02		2.15E-01
	1457.64	0.50	1.17E+02		3.65E+01
	1528.10	0.28	7.62E+00		1.46E+01
Eu-154	123.07	40.40	-1.64E-02	7.77E-02	7.77E-02
	247.93	6.89	-9.80E-02		4.32E-01
	591.76	4.95	-1.91E-01		5.74E-01
	692.42	1.78	3.55E-01		2.25E+00
	723.30	20.06	5.74E-02		2.21E-01
	756.80	4.52	1.65E-01		7.97E-01
	873.18	12.08	-6.83E-02		3.21E-01

Analysis Report for 11-Jun-19-10033

L1-10221B-FSGS-010SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	2.92E-01	7.77E-02	4.80E-01
	1004.76	18.01	5.65E-02		2.47E-01
	1274.43	34.80	-3.55E-02		1.25E-01
	1596.48	1.80	5.50E-01		1.71E+00
Eu-155	45.30	1.31	4.23E+00	1.84E-01	1.16E+01
	60.01	1.22	4.35E+00		1.18E+01
	86.55	30.70	9.23E-02		1.88E-01
	105.31	21.10	2.58E-02		1.84E-01
Ra-226	186.21	3.64	8.44E-01	9.73E-01	9.73E-01
Pa-231	27.36	10.30	1.40E+00	1.31E+00	1.31E+00
	283.69	1.70	8.17E-01		1.79E+00
	300.07	2.47	-3.63E-01		1.35E+00
	302.65	2.20	2.05E-01		1.54E+00
	330.06	1.40	-1.01E-01		2.31E+00
U-235	143.76	10.96	9.72E-02	6.29E-02	2.91E-01
	163.33	5.08	-1.81E-01		5.57E-01
	185.71	57.20	8.79E-02		6.29E-02
	202.11	1.08	-8.90E-01		2.51E+00
	205.31	5.01	-2.09E-01		5.52E-01
Am-241	59.54	35.90	1.84E-01	4.21E-01	4.21E-01

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

Apex-Gamma

Analysis Report for 11-Jun-19-10034

L1-10221B-FSGS-011SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 11-Jun-19-10034
Sample Description	: L1-10221B-FSGS-011SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.704E+03 grams
Facility	: Default
Sample Taken On	: 6/10/2019 2:00:00PM
Acquisition Started	: 6/11/2019 11:16:27AM
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	: 6/11/2019
Efficiency Calibration Description	:
Sample Number	: 77263
Fill Height	: 1703.65 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/11/2019 11:31:39AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

1530 6/11/19

Analysis Report for 11-Jun-19-10034

L1-10221B-FSGS-011SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	89.86	356 -	365	360.70	2.39E+01	11.33	4.61E+01	0.74
2	238.56	949 -	960	954.71	1.46E+02	17.40	6.09E+01	0.94
3	295.07	1174 -	1187	1180.49	5.30E+01	11.44	2.80E+01	0.47
4	338.20	1347 -	1357	1352.85	2.80E+01	8.97	2.20E+01	1.14
5	351.68	1399 -	1414	1406.70	8.75E+01	12.57	2.35E+01	1.38
6	609.28	2428 -	2445	2436.37	9.14E+01	11.48	1.26E+01	0.48
7	911.20	3637 -	3651	3643.83	4.52E+01	7.89	5.76E+00	0.97
8	1460.41	5830 -	5852	5842.01	2.99E+02	18.81	1.42E+01	1.69

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.97	1460.82	*	10.66	6.08E+00	4.65E-01
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	2.25E-01	3.24E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	2.46E-01	3.42E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		

Analysis Report for 11-Jun-19-10034

L1-10221B-FSGS-011SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	2.17E-01	4.99E-02
		351.93	*	35.60	2.09E-01	3.44E-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	2.06E-01	6.79E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.79E-01	5.01E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		
Ac228-XR	0.99	89.96	*	1.90	1.30E+00	6.62E-01
		93.35		3.10		
U235-XR	1.00	89.96	*	3.47	7.11E-01	3.45E-01
		93.35		5.60		
		105.60		1.32		

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

INTERFERENCE CORRECTED REPORT

Analysis Report for 11-Jun-19-10034

L1-10221B-FSGS-011SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.973	6.08E+00	4.65E-01	
X	Bi-211	0.943			
	Pb-212	0.999	2.25E-01	3.24E-02	
	Bi-214	1.000	2.46E-01	3.42E-02	
	Pb-214	0.993	2.11E-01	2.83E-02	
	Ac-228	1.000	2.53E-01	4.03E-02	
?	Ac228-XR	0.999	1.30E+00	6.62E-01	
?	U235-XR	1.000	7.11E-01	3.45E-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 11-Jun-19-10034

L1-10221B-FSGS-011SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/11/2019 11:31:39AM
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	4.80E-02	5.17E-02	5.17E-02
	BE-7	477.60		10.44	3.70E-02	3.92E-01	3.92E-01
+	K-40	1460.82	*	10.66	6.08E+00	5.70E-01	5.70E-01
	Mn-54	834.85		99.98	3.69E-02	5.11E-02	5.11E-02
	Co-60	1173.23		99.85	3.61E-02	4.60E-02	5.70E-02
		1332.49		99.98	1.58E-02		4.60E-02
	Nb-94	702.65		99.81	9.66E-03	4.21E-02	4.21E-02
		871.09		99.89	-3.31E-02		4.36E-02
	Ag-108m	79.13		6.60	2.27E-01	4.06E-02	1.47E+00
		433.94		90.50	1.22E-02		4.06E-02
		614.28		89.80	1.20E-02		7.41E-02
		722.94		90.80	1.49E-02		5.23E-02
	Sb-125	176.31		6.84	-5.87E-01	1.16E-01	4.75E-01
		380.45		1.52	1.06E+00		2.28E+00
		427.87		29.60	5.49E-02		1.16E-01
		463.36		10.49	-1.62E-01		3.24E-01
		600.60		17.65	2.80E-03		2.15E-01
		606.71		4.98	1.41E+00		1.35E+00
		635.95		11.22	3.38E-02		3.37E-01

Analysis Report for 11-Jun-19-10034

L1-10221B-FSGS-011SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-2.16E-01	1.16E-01	2.31E+00
Ba-133	79.61	2.65	7.17E-01	6.93E-02	3.53E+00
	81.00	32.90	-4.94E-01		2.32E-01
	276.40	7.16	1.27E-02		4.65E-01
	302.85	18.34	5.83E-02		1.86E-01
	356.01	62.05	6.00E-03		6.93E-02
	383.85	8.94	-1.03E-02		3.72E-01
Cs-134	475.36	1.48	5.22E-01	5.26E-02	2.76E+00
	563.25	8.34	-4.59E-01		4.01E-01
	569.33	15.37	7.82E-02		2.56E-01
	604.72	97.62	-1.00E-02		6.41E-02
	795.86	85.46	-2.13E-03		5.26E-02
	801.95	8.69	-5.10E-01		4.98E-01
	1038.61	0.99	1.82E+00		4.44E+00
	1167.97	1.79	5.12E-01		3.42E+00
	1365.19	3.02	-4.18E-01		1.77E+00
Cs-137	661.66	85.10	3.03E-02	5.48E-02	5.48E-02
Eu-152	121.78	28.67	-2.14E-02	1.27E-01	1.27E-01
	244.70	7.61	9.73E-02		5.11E-01
	295.94	0.45	8.00E+00		9.94E+00
	344.28	26.60	-3.77E-02		1.28E-01
	367.79	0.86	-3.87E-01		3.64E+00
	411.12	2.24	9.07E-02		1.64E+00
	443.96	2.83	-1.26E-01		1.10E+00
	488.68	0.42	3.34E+00		8.75E+00
	563.99	0.49	-5.67E-01		7.32E+00
	586.26	0.46	8.34E+00		1.17E+01
	678.62	0.47	-2.71E+00		8.81E+00
	688.67	0.86	2.24E-01		4.43E+00
	719.35	0.28	1.15E+01		1.64E+01
	778.90	12.96	-3.59E-01		2.81E-01
	810.45	0.32	4.03E+00		1.30E+01
	867.37	4.26	-1.03E+00		9.87E-01
	919.33	0.43	-9.40E+00		1.00E+01
	964.08	14.65	5.43E-01		4.72E-01
	1085.87	10.24	3.58E-01		5.71E-01
	1089.74	1.73	-6.29E-01		3.62E+00
	1112.07	13.69	-3.73E-01		3.61E-01
	1212.95	1.43	-2.75E+00		3.85E+00
	1249.94	0.19	-6.41E+00		2.86E+01
	1299.14	1.63	1.12E+00		3.12E+00
	1408.01	21.07	7.60E-02		2.21E-01
	1457.64	0.50	1.35E+02		3.84E+01
	1528.10	0.28	-1.68E+00		1.24E+01
Eu-154	123.07	40.40	-2.92E-02	8.88E-02	8.88E-02
	247.93	6.89	-3.23E-01		4.64E-01
	591.76	4.95	6.19E-01		8.60E-01
	692.42	1.78	-1.30E-01		2.08E+00
	723.30	20.06	1.47E-01		2.37E-01
	756.80	4.52	-4.25E-01		9.09E-01
	873.18	12.08	1.09E-01		3.89E-01

Analysis Report for 11-Jun-19-10034

L1-10221B-FSGS-011SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-1.19E-01	8.88E-02	4.25E-01
	1004.76	18.01	-8.77E-02		2.39E-01
	1274.43	34.80	1.04E-01		1.65E-01
	1596.48	1.80	1.42E+00		2.43E+00
Eu-155	45.30	1.31	3.48E+00	2.09E-01	1.93E+01
	60.01	1.22	6.85E-01		2.09E+01
	86.55	30.70	2.03E-01		2.47E-01
	105.31	21.10	1.17E-01		2.09E-01
Ra-226	186.21	3.64	-1.10E-01	1.02E+00	1.02E+00
Pa-231	27.36	10.30	8.78E-01	1.38E+00	2.14E+00
	283.69	1.70	1.70E+00		2.02E+00
	300.07	2.47	-4.63E-01		1.38E+00
	302.65	2.20	4.21E-01		1.54E+00
	330.06	1.40	-9.73E-01		2.36E+00
U-235	143.76	10.96	1.57E-01	6.62E-02	3.39E-01
	163.33	5.08	2.84E-01		6.72E-01
	185.71	57.20	-1.65E-02		6.62E-02
	202.11	1.08	-2.09E-01		3.54E+00
	205.31	5.01	-4.79E-01		7.30E-01
Am-241	59.54	35.90	4.01E-02	7.47E-01	7.47E-01

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

Apex-Gamma

Analysis Report for 11-Jun-19-10035

L1-10221B-FSGS-012SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 11-Jun-19-10035
Sample Description	: L1-10221B-FSGS-012SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.730E+03 grams
Facility	: Default
Sample Taken On	: 6/10/2019 2:05:00PM
Acquisition Started	: 6/11/2019 11:47:12AM
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	: 6/11/2019
Efficiency Calibration Description	:
Sample Number	: 77264
Fill Height	: 1730.15 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/11/2019 12:02:15PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated

1530 6/11/19

Analysis Report for 11-Jun-19-10035

L1-10221B-FSGS-012SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	185.85	367 -	376	372.00	5.51E+01	17.68	1.14E+02	0.62
2	238.64	473 -	481	477.47	1.18E+02	18.40	9.93E+01	1.07
3	295.11	587 -	594	590.28	6.78E+01	12.11	3.92E+01	1.11
4	338.31	674 -	681	676.59	3.01E+01	9.33	2.79E+01	0.78
5	351.90	698 -	708	703.74	1.15E+02	15.00	4.65E+01	1.32
6	510.81	1018 -	1026	1021.30	3.99E+01	10.46	3.21E+01	1.31
7	583.30	1160 -	1171	1166.21	5.00E+01	11.18	3.00E+01	1.45
8	609.56	1214 -	1224	1218.69	8.90E+01	11.31	1.50E+01	1.30
9	969.32	1933 -	1942	1938.10	2.76E+01	7.73	1.34E+01	1.42
10	1461.06	2915 -	2929	2922.18	4.06E+02	20.77	9.00E+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
An Pk	0.99	511.00	*	100.00	3.97E-02	1.07E-02
K-40	0.99	1460.82	*	10.66	7.40E+00	4.96E-01
Tl-208	0.99	583.19	*	85.00	6.29E-02	1.46E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.62E-01	2.85E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	2.15E-01	3.02E-02

Analysis Report for 11-Jun-19-10035

L1-10221B-FSGS-012SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	2.49E-01	4.87E-02
		351.93	*	35.60	2.46E-01	3.77E-02
		785.96		1.06		
Ra-226	0.97	186.21	*	3.64	8.07E-01	2.67E-01
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	1.98E-01	6.36E-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	2.60E-01	7.36E-02
		1588.20		3.22		
U-235	0.99	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	5.14E-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 11-Jun-19-10035

L1-10221B-FSGS-012SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.994	3.97E-02	1.07E-02	
	K-40	0.991	7.40E+00	4.96E-01	
	Tl-208	0.998	6.29E-02	1.46E-02	
X	Bi-211	0.896			
	Pb-212	1.000	1.62E-01	2.85E-02	
	Bi-214	0.996	2.15E-01	3.02E-02	
	Pb-214	0.999	2.47E-01	2.98E-02	
?	Ra-226	0.979	8.07E-01	2.67E-01	
	Ac-228	0.996	2.25E-01	4.81E-02	
?	U-235	0.998	5.14E-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

Analysis Report for 11-Jun-19-10035

L1-10221B-FSGS-012SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/11/2019 12:02:15PM
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	3.97E-02	3.10E-02	3.10E-02
	BE-7	477.60		10.44	3.19E-02	3.06E-01	3.06E-01
+	K-40	1460.82	*	10.66	7.40E+00	3.64E-01	3.64E-01
	Mn-54	834.85		99.98	1.92E-02	3.94E-02	3.94E-02
	Co-60	1173.23		99.85	-7.05E-03	4.97E-02	5.10E-02
		1332.49		99.98	1.74E-02		4.97E-02
	Nb-94	702.65		99.81	6.38E-03	3.36E-02	3.36E-02
		871.09		99.89	-7.51E-04		4.04E-02
	Ag-108m	79.13		6.60	9.81E-01	3.16E-02	1.17E+00
		433.94		90.50	9.40E-03		3.16E-02
		614.28		89.80	-4.26E-03		5.96E-02
		722.94		90.80	-8.22E-04		4.60E-02
	Sb-125	176.31		6.84	2.11E-01	9.34E-02	5.18E-01
		380.45		1.52	1.67E-01		2.04E+00
		427.87		29.60	-5.32E-02		9.34E-02
		463.36		10.49	9.18E-02		3.11E-01
		600.60		17.65	2.11E-02		2.03E-01
		606.71		4.98	-6.27E-01		1.21E+00
		635.95		11.22	3.75E-02		3.27E-01

Analysis Report for 11-Jun-19-10035

L1-10221B-FSGS-012SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-3.80E-01	9.34E-02	2.12E+00
Ba-133	79.61	2.65	1.04E+00	6.74E-02	2.69E+00
	81.00	32.90	-2.17E-01		1.74E-01
	276.40	7.16	-2.14E-01		3.91E-01
	302.85	18.34	8.09E-02		1.81E-01
	356.01	62.05	-3.49E-02		6.74E-02
	383.85	8.94	-1.95E-01		3.28E-01
Cs-134	475.36	1.48	-1.33E+00	4.39E-02	2.03E+00
	563.25	8.34	2.96E-02		3.97E-01
	569.33	15.37	4.45E-02		2.28E-01
	604.72	97.62	-4.35E-02		4.92E-02
	795.86	85.46	9.64E-03		4.39E-02
	801.95	8.69	-1.19E-02		4.28E-01
	1038.61	0.99	2.41E+00		5.15E+00
	1167.97	1.79	7.01E-01		3.20E+00
	1365.19	3.02	-3.53E-01		1.24E+00
Cs-137	661.66	85.10	-1.41E-02	4.63E-02	4.63E-02
Eu-152	121.78	28.67	6.05E-02	1.05E-01	1.18E-01
	244.70	7.61	-1.07E-01		4.55E-01
	295.94	0.45	8.11E+00		8.67E+00
	344.28	26.60	-3.97E-02		1.05E-01
	367.79	0.86	3.28E-01		3.71E+00
	411.12	2.24	-2.59E-01		1.58E+00
	443.96	2.83	9.40E-01		1.23E+00
	488.68	0.42	2.34E+00		7.88E+00
	563.99	0.49	1.97E+00		7.00E+00
	586.26	0.46	-3.35E+00		1.13E+01
	678.62	0.47	3.02E+00		7.50E+00
	688.67	0.86	3.09E-01		4.22E+00
	719.35	0.28	1.50E-01		1.42E+01
	778.90	12.96	3.98E-02		2.57E-01
	810.45	0.32	-2.06E+00		1.25E+01
	867.37	4.26	1.52E-01		9.87E-01
	919.33	0.43	5.06E-01		1.02E+01
	964.08	14.65	-9.48E-02		2.99E-01
	1085.87	10.24	-1.46E-03		4.68E-01
	1089.74	1.73	5.67E-01		2.85E+00
	1112.07	13.69	6.96E-03		3.50E-01
	1212.95	1.43	-4.50E-01		3.94E+00
	1249.94	0.19	3.42E+00		2.52E+01
	1299.14	1.63	1.26E+00		3.25E+00
	1408.01	21.07	1.52E-01		2.23E-01
	1457.64	0.50	-5.29E+00		3.90E+01
	1528.10	0.28	-1.57E+00		9.69E+00
Eu-154	123.07	40.40	1.39E-02	8.00E-02	8.00E-02
	247.93	6.89	-1.41E-01		4.52E-01
	591.76	4.95	2.32E-01		6.99E-01
	692.42	1.78	-3.47E-01		2.07E+00
	723.30	20.06	2.03E-02		2.13E-01
	756.80	4.52	-6.30E-01		6.34E-01
	873.18	12.08	9.43E-02		3.35E-01

Analysis Report for 11-Jun-19-10035

L1-10221B-FSGS-012SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	9.81E-02	8.00E-02	4.21E-01
		1004.76		18.01	-1.40E-01		1.96E-01
		1274.43		34.80	-3.21E-02		1.50E-01
		1596.48		1.80	-6.35E-01		1.80E+00
	Eu-155	45.30		1.31	-1.89E+00	1.70E-01	1.15E+01
		60.01		1.22	-2.12E+00		1.23E+01
		86.55		30.70	8.67E-02		1.76E-01
		105.31		21.10	-9.93E-02		1.70E-01
+	Ra-226	186.21	*	3.64	8.07E-01	8.39E-01	8.39E-01
	Pa-231	27.36		10.30	8.29E-01	1.16E+00	1.16E+00
		283.69		1.70	5.45E-01		1.78E+00
		300.07		2.47	-1.09E+00		1.27E+00
		302.65		2.20	6.74E-01		1.50E+00
		330.06		1.40	6.58E-01		2.39E+00
+	U-235	143.76		10.96	-2.80E-02	5.34E-02	2.82E-01
		163.33		5.08	3.89E-03		6.64E-01
		185.71	*	57.20	5.14E-02		5.34E-02
		202.11		1.08	5.36E-01		3.32E+00
		205.31		5.01	-3.33E-01		6.67E-01
	Am-241	59.54		35.90	-5.96E-02	4.30E-01	4.30E-01

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

Apex-Gamma

Analysis Report for 11-Jun-19-10036

L1-10221B-FSGS-013SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 11-Jun-19-10036
Sample Description	: L1-10221B-FSGS-013SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.668E+03 grams
Facility	: Default
Sample Taken On	: 6/10/2019 2:10:00PM
Acquisition Started	: 6/11/2019 11:47:18AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.3 seconds
Dead Time	: 0.15 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/29/2019
Efficiency Calibration Used Done On	: 6/11/2019
Efficiency Calibration Description	:
Sample Number	: 77265
Fill Height	: 1668.15 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/11/2019 12:02:22PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

1530 6/11/19

Analysis Report for 11-Jun-19-10036

L1-10221B-FSGS-013SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.67	949 -	960	954.79	1.31E+02	15.26	4.05E+01	0.95
2	295.18	1173 -	1187	1180.62	5.95E+01	11.70	2.65E+01	0.70
3	338.41	1348 -	1358	1353.42	2.38E+01	8.90	2.32E+01	1.00
4	352.06	1400 -	1414	1407.99	1.06E+02	12.66	1.88E+01	1.02
5	609.31	2431 -	2444	2436.40	6.25E+01	9.26	8.46E+00	0.45
6	1460.87	5832 -	5855	5843.33	3.04E+02	18.07	5.72E+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

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.82	*	10.66	7.41E+00	5.45E-01
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.32E-01	3.28E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	1.97E-01	3.15E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		

Analysis Report for 11-Jun-19-10036

L1-10221B-FSGS-013SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
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	0.99	241.99		7.25		
		295.22	*	18.42	2.79E-01	5.92E-02
		351.93	*	35.60	2.93E-01	4.20E-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	2.01E-01	7.70E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20		25.80		
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

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

INTERFERENCE CORRECTED REPORT

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

Analysis Report for 11-Jun-19-10036

L1-10221B-FSGS-013SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	1.000	7.41E+00	5.45E-01	
X	Bi-211	0.854			
	Pb-212	1.000	2.32E-01	3.28E-02	
	Bi-214	1.000	1.97E-01	3.15E-02	
	Pb-214	0.998	2.88E-01	3.43E-02	
	Ac-228	1.000	2.01E-01	7.70E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 11-Jun-19-10036

L1-10221B-FSGS-013SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/11/2019 12:02:22PM
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	6.43E-02	5.75E-02	5.75E-02
	BE-7	477.60		10.44	1.29E-01	4.16E-01	4.16E-01
+	K-40	1460.82	*	10.66	7.41E+00	4.59E-01	4.59E-01
	Mn-54	834.85		99.98	-5.23E-03	4.93E-02	4.93E-02
	Co-60	1173.23		99.85	5.96E-02	5.76E-02	7.32E-02
		1332.49		99.98	-3.04E-02		5.76E-02
	Nb-94	702.65		99.81	2.09E-04	4.88E-02	4.88E-02
		871.09		99.89	-3.09E-02		5.32E-02
	Ag-108m	79.13		6.60	3.99E-01	4.91E-02	2.00E+00
		433.94		90.50	5.75E-03		4.91E-02
		614.28		89.80	-3.81E-02		5.91E-02
		722.94		90.80	2.06E-02		5.68E-02
	Sb-125	176.31		6.84	-2.43E-03	1.46E-01	5.80E-01
		380.45		1.52	1.85E+00		2.58E+00
		427.87		29.60	1.00E-01		1.46E-01
		463.36		10.49	3.40E-01		4.57E-01
		600.60		17.65	-1.55E-01		2.20E-01
		606.71		4.98	2.21E+00		1.39E+00
		635.95		11.22	2.39E-01		4.01E-01

Analysis Report for 11-Jun-19-10036

L1-10221B-FSGS-013SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-6.99E-01	1.46E-01	2.34E+00
Ba-133	79.61	2.65	-1.02E+00	8.06E-02	4.68E+00
	81.00	32.90	-2.33E-01		3.26E-01
	276.40	7.16	3.13E-01		5.86E-01
	302.85	18.34	4.73E-02		1.98E-01
	356.01	62.05	-4.98E-03		8.06E-02
	383.85	8.94	-2.22E-01		4.17E-01
Cs-134	475.36	1.48	-9.31E-01	5.20E-02	2.90E+00
	563.25	8.34	-7.36E-02		4.61E-01
	569.33	15.37	1.60E-02		2.79E-01
	604.72	97.62	-4.40E-02		6.07E-02
	795.86	85.46	5.02E-03		5.20E-02
	801.95	8.69	-2.00E-01		4.83E-01
	1038.61	0.99	1.35E+00		6.05E+00
	1167.97	1.79	2.22E+00		3.93E+00
	1365.19	3.02	4.31E-01		1.59E+00
Cs-137	661.66	85.10	-4.25E-02	6.25E-02	6.25E-02
Eu-152	121.78	28.67	6.09E-02	1.49E-01	1.62E-01
	244.70	7.61	2.25E-01		5.42E-01
	295.94	0.45	-1.33E+00		1.01E+01
	344.28	26.60	-2.48E-02		1.49E-01
	367.79	0.86	-1.26E+00		4.32E+00
	411.12	2.24	1.39E-02		1.93E+00
	443.96	2.83	-4.99E-01		1.49E+00
	488.68	0.42	-1.28E+00		9.17E+00
	563.99	0.49	-8.17E+00		7.57E+00
	586.26	0.46	8.37E+00		1.29E+01
	678.62	0.47	7.27E-01		9.67E+00
	688.67	0.86	3.20E+00		5.44E+00
	719.35	0.28	1.69E+01		1.80E+01
	778.90	12.96	-1.07E-01		3.17E-01
	810.45	0.32	-3.07E+00		1.32E+01
	867.37	4.26	2.35E-01		1.21E+00
	919.33	0.43	3.00E+00		1.17E+01
	964.08	14.65	2.38E-01		4.28E-01
	1085.87	10.24	6.62E-02		6.78E-01
	1089.74	1.73	-8.81E-01		3.78E+00
	1112.07	13.69	1.61E-01		3.98E-01
	1212.95	1.43	3.80E+00		5.48E+00
	1249.94	0.19	-1.89E+01		3.47E+01
	1299.14	1.63	-1.95E+00		3.23E+00
	1408.01	21.07	-1.51E-01		2.33E-01
	1457.64	0.50	1.61E+02		4.52E+01
	1528.10	0.28	-3.97E-01		1.39E+01
Eu-154	123.07	40.40	1.26E-02	1.13E-01	1.13E-01
	247.93	6.89	-2.33E-01		5.48E-01
	591.76	4.95	2.78E-01		8.88E-01
	692.42	1.78	-7.46E-01		2.53E+00
	723.30	20.06	3.21E-01		2.67E-01
	756.80	4.52	-6.26E-01		9.68E-01
	873.18	12.08	1.55E-02		4.27E-01

Analysis Report for 11-Jun-19-10036

L1-10221B-FSGS-013SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-1.85E-01	1.13E-01	5.12E-01
	1004.76	18.01	1.51E-01		3.53E-01
	1274.43	34.80	-3.87E-02		1.45E-01
	1596.48	1.80	-3.87E-01		2.10E+00
Eu-155	45.30	1.31	-2.28E+01	2.64E-01	3.02E+01
	60.01	1.22	-2.99E-02		3.20E+01
	86.55	30.70	5.10E-02		2.64E-01
	105.31	21.10	-8.86E-02		2.67E-01
Ra-226	186.21	3.64	6.81E-01	1.13E+00	1.13E+00
Pa-231	27.36	10.30	2.54E+00	1.46E+00	3.51E+00
	283.69	1.70	-7.84E-01		2.21E+00
	300.07	2.47	-3.13E-02		1.46E+00
	302.65	2.20	3.71E-01		1.64E+00
	330.06	1.40	2.10E-01		2.86E+00
U-235	143.76	10.96	-2.48E-02	7.15E-02	4.09E-01
	163.33	5.08	-7.00E-01		7.81E-01
	185.71	57.20	1.53E-02		7.15E-02
	202.11	1.08	5.23E-01		3.39E+00
	205.31	5.01	-5.43E-01		7.15E-01
Am-241	59.54	35.90	-2.25E-01	1.11E+00	1.11E+00

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

Apex-Gamma

Analysis Report for 11-Jun-19-10037

L1-10221B-FSGS-014SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 11-Jun-19-10037
Sample Description	: L1-10221B-FSGS-014SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.675E+03 grams
Facility	: Default
Sample Taken On	: 6/10/2019 2:15:00PM
Acquisition Started	: 6/11/2019 11:47:26AM
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	: 6/11/2019
Efficiency Calibration Description	:
Sample Number	: 77266
Fill Height	: 1675.44 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/11/2019 12:02:39PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

1530 6/11/19

Analysis Report for 11-Jun-19-10037

L1-10221B-FSGS-014SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.72	947 -	961	954.47	9.33E+01	17.94	7.87E+01	0.68
2	352.07	1400 -	1414	1407.31	9.63E+01	12.50	2.07E+01	0.61
3	583.19	2324 -	2337	2330.86	5.78E+01	8.15	3.22E+00	0.44
4	609.43	2431 -	2443	2435.76	5.49E+01	10.66	2.21E+01	0.59
5	1460.48	5827 -	5852	5839.84	3.73E+02	20.00	6.50E+00	1.35

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	8.15E+00	5.63E-01
Tl-208	1.00	583.19	*	85.00	8.52E-02	1.31E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.46E-01	3.04E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.56E-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		

Analysis Report for 11-Jun-19-10037

L1-10221B-FSGS-014SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
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	0.51	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	2.38E-01	3.63E-02
		785.96		1.06		

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.981	8.15E+00	5.63E-01	
Tl-208	1.000	8.52E-02	1.31E-02	
Pb-212	0.999	1.46E-01	3.04E-02	
Bi-214	0.999	1.56E-01	3.17E-02	
Pb-214	0.511	2.38E-01	3.63E-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 11-Jun-19-10037

L1-10221B-FSGS-014SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/11/2019 12:02:39PM
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	7.02E-02	5.36E-02	5.36E-02
	BE-7	477.60		10.44	3.62E-01	4.10E-01	4.10E-01
+	K-40	1460.82	*	10.66	8.15E+00	4.53E-01	4.53E-01
	Mn-54	834.85		99.98	1.84E-02	4.80E-02	4.80E-02
	Co-60	1173.23		99.85	2.86E-02	4.80E-02	5.48E-02
		1332.49		99.98	-9.39E-03		4.80E-02
	Nb-94	702.65		99.81	-3.87E-03	4.15E-02	4.15E-02
		871.09		99.89	1.73E-02		4.57E-02
	Ag-108m	79.13		6.60	5.15E-01	3.96E-02	1.19E+00
		433.94		90.50	2.08E-03		3.96E-02
		614.28		89.80	-9.45E-03		6.22E-02
		722.94		90.80	1.23E-02		5.12E-02
	Sb-125	176.31		6.84	1.69E-01	1.22E-01	4.33E-01
		380.45		1.52	-4.03E+00		2.02E+00
		427.87		29.60	7.08E-02		1.22E-01
		463.36		10.49	1.74E-01		4.27E-01
		600.60		17.65	-1.92E-01		2.08E-01
		606.71		4.98	-4.05E-01		1.42E+00
		635.95		11.22	1.25E-01		3.46E-01

Analysis Report for 11-Jun-19-10037

L1-10221B-FSGS-014SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-2.36E+00	1.22E-01	2.28E+00
Ba-133	79.61	2.65	1.47E+00	7.00E-02	2.90E+00
	81.00	32.90	-3.16E-01		1.91E-01
	276.40	7.16	1.35E-01		4.66E-01
	302.85	18.34	-1.09E-01		1.81E-01
	356.01	62.05	4.60E-03		7.00E-02
	383.85	8.94	9.22E-02		4.27E-01
Cs-134	475.36	1.48	1.05E+00	5.28E-02	2.91E+00
	563.25	8.34	-7.54E-01		4.41E-01
	569.33	15.37	1.62E-02		2.48E-01
	604.72	97.62	-3.17E-02		6.07E-02
	795.86	85.46	1.67E-02		5.28E-02
	801.95	8.69	4.21E-01		5.14E-01
	1038.61	0.99	4.48E+00		6.21E+00
	1167.97	1.79	-2.93E+00		2.59E+00
	1365.19	3.02	8.27E-01		1.94E+00
Cs-137	661.66	85.10	-1.14E-02	5.33E-02	5.33E-02
Eu-152	121.78	28.67	5.38E-02	1.24E-01	1.24E-01
	244.70	7.61	1.80E-02		4.86E-01
	295.94	0.45	-1.87E+00		8.87E+00
	344.28	26.60	2.03E-02		1.35E-01
	367.79	0.86	-2.20E+00		3.66E+00
	411.12	2.24	8.67E-02		1.62E+00
	443.96	2.83	-6.38E-01		1.22E+00
	488.68	0.42	-9.96E-01		8.47E+00
	563.99	0.49	6.11E-01		7.80E+00
	586.26	0.46	-6.09E+00		1.18E+01
	678.62	0.47	5.02E+00		8.84E+00
	688.67	0.86	3.51E+00		4.54E+00
	719.35	0.28	-2.48E+00		1.39E+01
	778.90	12.96	-6.76E-02		3.16E-01
	810.45	0.32	-2.36E+00		1.33E+01
	867.37	4.26	-7.36E-01		1.09E+00
	919.33	0.43	6.98E-01		8.04E+00
	964.08	14.65	9.02E-03		4.70E-01
	1085.87	10.24	2.44E-01		4.90E-01
	1089.74	1.73	-5.44E-01		2.96E+00
	1112.07	13.69	-1.70E-01		3.66E-01
	1212.95	1.43	-2.05E+00		4.82E+00
	1249.94	0.19	-2.39E+01		3.31E+01
	1299.14	1.63	1.94E+00		3.72E+00
	1408.01	21.07	-2.14E-01		1.47E-01
	1457.64	0.50	1.78E+02		4.49E+01
	1528.10	0.28	5.14E+00		1.25E+01
Eu-154	123.07	40.40	-1.20E-02	8.59E-02	8.59E-02
	247.93	6.89	-4.26E-01		4.53E-01
	591.76	4.95	1.92E-01		7.00E-01
	692.42	1.78	9.16E-01		2.20E+00
	723.30	20.06	6.59E-02		2.35E-01
	756.80	4.52	-1.68E-01		8.39E-01
	873.18	12.08	1.67E-02		3.91E-01

Analysis Report for 11-Jun-19-10037

L1-10221B-FSGS-014SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-1.09E-01	8.59E-02	5.23E-01
	1004.76	18.01	-1.30E-01		2.39E-01
	1274.43	34.80	-1.13E-02		1.80E-01
	1596.48	1.80	-6.61E-01		1.34E+00
Eu-155	45.30	1.31	-2.08E+00	1.78E-01	1.21E+01
	60.01	1.22	8.71E+00		1.35E+01
	86.55	30.70	-3.22E-02		1.82E-01
	105.31	21.10	-1.11E-01		1.78E-01
Ra-226	186.21	3.64	-1.87E-01	9.23E-01	9.23E-01
Pa-231	27.36	10.30	2.32E-01	1.09E+00	1.09E+00
	283.69	1.70	1.05E-01		1.96E+00
	300.07	2.47	-1.96E+00		1.36E+00
	302.65	2.20	-9.13E-01		1.49E+00
	330.06	1.40	1.97E+00		2.54E+00
U-235	143.76	10.96	6.99E-02	5.98E-02	3.00E-01
	163.33	5.08	-2.17E-01		6.47E-01
	185.71	57.20	1.21E-02		5.98E-02
	202.11	1.08	-3.14E-01		2.94E+00
	205.31	5.01	-5.53E-02		6.34E-01
Am-241	59.54	35.90	1.61E-01	4.70E-01	4.70E-01

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

Apex-Gamma

Analysis Report for 11-Jun-19-10038

L1-10221B-FSGS-015SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 11-Jun-19-10038
Sample Description	: L1-10221B-FSGS-015SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.729E+03 grams
Facility	: Default
Sample Taken On	: 6/10/2019 2:20:00PM
Acquisition Started	: 6/11/2019 11:47:32AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 6/11/2019
Efficiency Calibration Description	:
Sample Number	: 77267
Fill Height	: 1729.13 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/11/2019 12:02:47PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

1530 6/11/19

Analysis Report for 11-Jun-19-10038

L1-10221B-FSGS-015SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	116.13	461 -	470	465.62	2.16E+01	11.28	4.34E+01	1.02
2	186.04	740 -	750	744.88	2.42E+01	11.76	4.78E+01	0.59
3	238.60	949 -	960	954.89	1.30E+02	16.67	5.87E+01	1.02
4	338.12	1348 -	1357	1352.52	2.60E+01	9.20	2.60E+01	0.34
5	351.69	1400 -	1413	1406.75	8.55E+01	12.92	2.85E+01	0.72
6	583.01	2325 -	2338	2331.37	4.59E+01	8.89	1.21E+01	1.24
7	609.13	2428 -	2444	2435.77	7.59E+01	10.05	8.14E+00	1.56
8	911.22	3636 -	3651	3643.92	3.90E+01	8.30	9.96E+00	0.43
9	1120.49	4476 -	4487	4481.23	1.62E+01	5.38	4.76E+00	0.81
10	1460.56	5828 -	5855	5842.61	3.77E+02	19.84	3.53E+00	1.64

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.82	*	10.66	7.66E+00	5.22E-01
Tl-208	0.99	583.19	*	85.00	6.41E-02	1.30E-02
Bi-211	0.94	351.07	*	13.02	5.57E-01	9.53E-02
Pb-212	0.89	115.18	*	0.60	2.52E+00	1.34E+00
		238.63	*	43.60	2.00E-01	3.03E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	2.04E-01	2.96E-02

Analysis Report for 11-Jun-19-10038

L1-10221B-FSGS-015SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	1.97E-01	6.58E-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		
		351.93	*	35.60	2.04E-01	3.48E-02
		785.96		1.06		
Ra-226	0.99	186.21	*	3.64	3.99E-01	1.96E-01
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	1.91E-01	6.92E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.40E-01	5.21E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		
U-235	0.98	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	2.54E-02	1.25E-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 11-Jun-19-10038

L1-10221B-FSGS-015SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.989	7.66E+00	5.22E-01	
	Tl-208	0.995	6.41E-02	1.30E-02	
?	Bi-211	0.941	5.57E-01	9.53E-02	
	Pb-212	0.894	2.02E-01	3.03E-02	
	Bi-214	0.997	2.03E-01	2.70E-02	
?	Pb-214	0.995	2.04E-01	3.48E-02	
?	Ra-226	0.995	3.99E-01	1.96E-01	
	Ac-228	0.999	2.22E-01	4.16E-02	
?	U-235	0.988	2.54E-02	1.25E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 11-Jun-19-10038

L1-10221B-FSGS-015SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/11/2019 12:02:47PM
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	6.22E-02	4.95E-02	4.95E-02
	BE-7	477.60		10.44	-1.42E-01	3.46E-01	3.46E-01
+	K-40	1460.82	*	10.66	7.66E+00	3.34E-01	3.34E-01
	Mn-54	834.85		99.98	1.20E-02	4.44E-02	4.44E-02
	Co-60	1173.23		99.85	-6.27E-03	5.13E-02	5.83E-02
		1332.49		99.98	-5.66E-03		5.13E-02
	Nb-94	702.65		99.81	2.79E-02	4.06E-02	4.89E-02
		871.09		99.89	-7.70E-04		4.06E-02
	Ag-108m	79.13		6.60	-3.13E-01	3.79E-02	1.43E+00
		433.94		90.50	-7.90E-03		3.79E-02
		614.28		89.80	-1.85E-02		6.82E-02
		722.94		90.80	1.72E-02		4.18E-02
	Sb-125	176.31		6.84	1.46E-01	1.16E-01	5.11E-01
		380.45		1.52	1.08E+00		2.19E+00
		427.87		29.60	-1.39E-02		1.16E-01
		463.36		10.49	1.16E-01		3.65E-01
		600.60		17.65	1.56E-02		2.28E-01
		606.71		4.98	2.11E+00		1.31E+00
		635.95		11.22	-2.84E-01		3.45E-01

Analysis Report for 11-Jun-19-10038

L1-10221B-FSGS-015SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.47E+00	1.16E-01	2.30E+00
Ba-133	79.61	2.65	-2.62E+00	7.58E-02	3.44E+00
	81.00	32.90	-1.22E-01		2.60E-01
	276.40	7.16	-2.48E-01		5.10E-01
	302.85	18.34	1.23E-01		2.12E-01
	356.01	62.05	-1.52E-02		7.58E-02
	383.85	8.94	-7.36E-02		3.67E-01
Cs-134	475.36	1.48	-1.16E+00	5.31E-02	2.23E+00
	563.25	8.34	-3.69E-01		4.35E-01
	569.33	15.37	1.43E-01		2.69E-01
	604.72	97.62	1.55E-02		6.45E-02
	795.86	85.46	1.81E-02		5.31E-02
	801.95	8.69	1.24E-01		5.04E-01
	1038.61	0.99	2.66E+00		5.31E+00
	1167.97	1.79	5.41E-01		3.49E+00
	1365.19	3.02	6.67E-01		1.59E+00
Cs-137	661.66	85.10	-2.17E-02	4.79E-02	4.79E-02
Eu-152	121.78	28.67	6.03E-02	1.28E-01	1.30E-01
	244.70	7.61	-4.02E-02		5.07E-01
	295.94	0.45	7.02E+00		1.04E+01
	344.28	26.60	-5.73E-03		1.28E-01
	367.79	0.86	-2.69E-02		3.77E+00
	411.12	2.24	-2.50E-01		1.66E+00
	443.96	2.83	-8.79E-01		1.27E+00
	488.68	0.42	-3.94E+00		8.73E+00
	563.99	0.49	2.29E+00		7.86E+00
	586.26	0.46	1.16E+01		1.27E+01
	678.62	0.47	-5.72E-01		8.90E+00
	688.67	0.86	3.88E+00		5.29E+00
	719.35	0.28	2.64E+00		1.21E+01
	778.90	12.96	2.51E-02		3.58E-01
	810.45	0.32	-6.94E+00		1.27E+01
	867.37	4.26	-5.66E-01		1.00E+00
	919.33	0.43	-1.24E+01		9.65E+00
	964.08	14.65	-1.03E-01		4.13E-01
	1085.87	10.24	-4.88E-01		4.98E-01
	1089.74	1.73	-4.95E-01		3.18E+00
	1112.07	13.69	-8.68E-02		4.38E-01
	1212.95	1.43	4.47E+00		5.09E+00
	1249.94	0.19	1.69E+01		3.56E+01
	1299.14	1.63	4.20E-01		3.29E+00
	1408.01	21.07	1.06E-01		2.26E-01
	1457.64	0.50	1.65E+02		4.18E+01
	1528.10	0.28	3.97E+00		1.08E+01
Eu-154	123.07	40.40	-1.17E-02	9.30E-02	9.30E-02
	247.93	6.89	-3.53E-01		4.64E-01
	591.76	4.95	1.99E-01		9.07E-01
	692.42	1.78	1.39E-01		2.56E+00
	723.30	20.06	7.74E-02		1.89E-01
	756.80	4.52	-1.01E-01		9.46E-01
	873.18	12.08	6.38E-03		3.36E-01

Analysis Report for 11-Jun-19-10038

L1-10221B-FSGS-015SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	-4.97E-02	9.30E-02	4.53E-01
		1004.76		18.01	-1.85E-01		2.57E-01
		1274.43		34.80	-3.67E-02		1.40E-01
		1596.48		1.80	1.16E+00		2.22E+00
	Eu-155	45.30		1.31	-7.88E+00	2.13E-01	1.99E+01
		60.01		1.22	1.13E+01		2.22E+01
		86.55		30.70	-1.91E-01		2.15E-01
		105.31		21.10	-8.92E-02		2.13E-01
+	Ra-226	186.21	*	3.64	3.99E-01	6.44E-01	6.44E-01
	Pa-231	27.36		10.30	2.94E+00	1.58E+00	2.50E+00
		283.69		1.70	-3.01E-01		2.00E+00
		300.07		2.47	-4.14E+00		1.58E+00
		302.65		2.20	2.00E+00		1.80E+00
		330.06		1.40	-1.82E+00		2.48E+00
+	U-235	143.76		10.96	-3.33E-02	4.10E-02	3.45E-01
		163.33		5.08	7.98E-02		6.81E-01
		185.71	*	57.20	2.54E-02		4.10E-02
		202.11		1.08	-3.45E-01		3.04E+00
		205.31		5.01	-9.35E-01		6.90E-01
	Am-241	59.54		35.90	1.91E-02	7.73E-01	7.73E-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

Apex-Gamma

Analysis Report for 11-Jun-19-10039

L1-10221B-FSGS-016SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 11-Jun-19-10039
Sample Description	: L1-10221B-FSGS-016SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.727E+03 grams
Facility	: Default
Sample Taken On	: 6/10/2019 2:25:00PM
Acquisition Started	: 6/11/2019 12:09:03PM
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	: 6/11/2019
Efficiency Calibration Description	:
Sample Number	: 77268
Fill Height	: 1727.21 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/11/2019 12:24:06PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated

1530 6/11/19

Analysis Report for 11-Jun-19-10039

L1-10221B-FSGS-016SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.74	473 -	481	477.67	1.20E+02	19.51	1.18E+02	0.92
2	295.15	587 -	595	590.35	6.68E+01	12.36	4.02E+01	0.96
3	338.29	672 -	681	676.55	5.57E+01	11.82	3.73E+01	1.08
4	351.78	699 -	708	703.51	9.15E+01	13.61	4.15E+01	1.19
5	583.24	1161 -	1171	1166.08	6.27E+01	10.92	2.33E+01	0.90
6	609.26	1213 -	1223	1218.09	8.03E+01	11.74	2.37E+01	1.66
7	911.31	1816 -	1827	1822.08	4.68E+01	8.85	1.22E+01	1.18
8	1460.86	2914 -	2929	2921.78	3.94E+02	20.29	5.97E+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	1.00	1460.82	*	10.66	7.18E+00	4.84E-01
Tl-208	1.00	583.19	*	85.00	7.89E-02	1.45E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.65E-01	3.00E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	1.94E-01	3.07E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		

Analysis Report for 11-Jun-19-10039

L1-10221B-FSGS-016SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	2.45E-01	4.94E-02
		351.93	*	35.60	1.96E-01	3.31E-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	3.67E-01	8.35E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.59E-01	5.03E-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 11-Jun-19-10039

L1-10221B-FSGS-016SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	1.000	7.18E+00	4.84E-01	
	Tl-208	1.000	7.89E-02	1.45E-02	
X	Bi-211	0.922			
	Pb-212	0.998	1.65E-01	3.00E-02	
	Bi-214	1.000	1.94E-01	3.07E-02	
	Pb-214	0.998	2.11E-01	2.75E-02	
	Ac-228	0.999	2.88E-01	4.31E-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 11-Jun-19-10039

L1-10221B-FSGS-016SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/11/2019 12:24:06PM
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	1.08E-01	5.81E-02	5.81E-02
	BE-7	477.60		10.44	1.63E-01	3.67E-01	3.67E-01
+	K-40	1460.82	*	10.66	7.18E+00	3.14E-01	3.14E-01
	Mn-54	834.85		99.98	5.74E-03	4.06E-02	4.06E-02
	Co-60	1173.23		99.85	-1.00E-02	4.52E-02	5.38E-02
		1332.49		99.98	-1.48E-02		4.52E-02
	Nb-94	702.65		99.81	-1.12E-02	3.73E-02	3.73E-02
		871.09		99.89	1.54E-02		4.45E-02
	Ag-108m	79.13		6.60	2.33E-01	3.30E-02	1.16E+00
		433.94		90.50	1.04E-02		3.30E-02
		614.28		89.80	-2.08E-02		5.44E-02
		722.94		90.80	-1.73E-02		4.18E-02
	Sb-125	176.31		6.84	2.48E-01	1.16E-01	5.17E-01
		380.45		1.52	-1.21E+00		1.92E+00
		427.87		29.60	6.09E-02		1.16E-01
		463.36		10.49	-3.37E-02		2.88E-01
		600.60		17.65	3.12E-02		2.17E-01
		606.71		4.98	-2.58E-02		1.23E+00
		635.95		11.22	-1.21E-01		2.76E-01

Analysis Report for 11-Jun-19-10039

L1-10221B-FSGS-016SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	7.29E-01	1.16E-01	2.15E+00
Ba-133	79.61	2.65	4.56E-01	6.37E-02	2.75E+00
	81.00	32.90	-1.97E-01		1.83E-01
	276.40	7.16	-4.74E-02		4.09E-01
	302.85	18.34	1.34E-01		1.89E-01
	356.01	62.05	-1.92E-02		6.37E-02
	383.85	8.94	-3.40E-02		3.18E-01
Cs-134	475.36	1.48	5.80E-01	5.43E-02	2.41E+00
	563.25	8.34	-8.25E-04		4.07E-01
	569.33	15.37	4.61E-02		2.35E-01
	604.72	97.62	1.01E-02		5.43E-02
	795.86	85.46	3.97E-02		5.58E-02
	801.95	8.69	-4.59E-01		3.92E-01
	1038.61	0.99	-1.21E-01		4.64E+00
	1167.97	1.79	-2.25E-01		2.92E+00
	1365.19	3.02	-3.16E-02		1.35E+00
Cs-137	661.66	85.10	1.02E-02	4.32E-02	4.32E-02
Eu-152	121.78	28.67	1.10E-02	1.15E-01	1.15E-01
	244.70	7.61	-3.46E-02		4.72E-01
	295.94	0.45	4.96E+00		8.44E+00
	344.28	26.60	-6.95E-02		1.20E-01
	367.79	0.86	1.10E+00		3.98E+00
	411.12	2.24	2.11E-03		1.45E+00
	443.96	2.83	1.21E+00		1.25E+00
	488.68	0.42	-2.07E+00		7.35E+00
	563.99	0.49	2.45E-01		7.08E+00
	586.26	0.46	-4.55E+00		1.22E+01
	678.62	0.47	9.47E-01		7.07E+00
	688.67	0.86	-7.15E-01		4.50E+00
	719.35	0.28	1.22E+01		1.51E+01
	778.90	12.96	-8.71E-02		3.07E-01
	810.45	0.32	3.71E+00		1.16E+01
	867.37	4.26	-4.28E-01		9.46E-01
	919.33	0.43	-5.96E+00		8.52E+00
	964.08	14.65	8.09E-02		3.79E-01
	1085.87	10.24	1.15E-01		4.81E-01
	1089.74	1.73	-3.75E-01		2.93E+00
	1112.07	13.69	-5.92E-03		3.65E-01
	1212.95	1.43	-1.29E+00		3.94E+00
	1249.94	0.19	1.23E+00		2.99E+01
	1299.14	1.63	-8.49E-01		2.85E+00
	1408.01	21.07	-1.03E-02		1.87E-01
	1457.64	0.50	-2.22E+00		3.82E+01
	1528.10	0.28	-3.74E+00		5.47E+00
Eu-154	123.07	40.40	-1.08E-02	8.00E-02	8.00E-02
	247.93	6.89	-1.11E-02		4.48E-01
	591.76	4.95	-6.61E-02		8.17E-01
	692.42	1.78	-2.74E-01		2.21E+00
	723.30	20.06	-6.64E-02		1.89E-01
	756.80	4.52	-3.49E-01		8.41E-01
	873.18	12.08	5.51E-02		3.64E-01

Analysis Report for 11-Jun-19-10039

L1-10221B-FSGS-016SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	6.28E-02	8.00E-02	4.08E-01
	1004.76	18.01	1.43E-01		2.50E-01
	1274.43	34.80	-9.16E-02		1.41E-01
	1596.48	1.80	3.14E-01		1.80E+00
Eu-155	45.30	1.31	-6.40E+00	1.73E-01	9.82E+00
	60.01	1.22	-6.81E+00		1.25E+01
	86.55	30.70	6.06E-02		1.75E-01
	105.31	21.10	-6.12E-02		1.73E-01
Ra-226	186.21	3.64	5.67E-01	9.85E-01	9.85E-01
Pa-231	27.36	10.30	4.76E-01	1.07E+00	1.07E+00
	283.69	1.70	7.16E-01		1.83E+00
	300.07	2.47	-1.54E-01		1.30E+00
	302.65	2.20	1.12E+00		1.57E+00
	330.06	1.40	1.66E+00		2.58E+00
U-235	143.76	10.96	4.83E-02	6.29E-02	2.87E-01
	163.33	5.08	1.10E-01		6.87E-01
	185.71	57.20	3.02E-02		6.29E-02
	202.11	1.08	-1.58E-01		2.83E+00
	205.31	5.01	-2.72E-01		6.15E-01
Am-241	59.54	35.90	-8.96E-02	4.44E-01	4.44E-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

Apex-Gamma

Analysis Report for 11-Jun-19-10040

L1-10221B-FSGS-017SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 11-Jun-19-10040
Sample Description	: L1-10221B-FSGS-017SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.789E+03 grams
Facility	: Default
Sample Taken On	: 6/10/2019 2:30:00PM
Acquisition Started	: 6/11/2019 12:09:10PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.1 seconds
Dead Time	: 0.12 %
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	: 6/11/2019
Efficiency Calibration Description	:
Sample Number	: 77269
Fill Height	: 1788.51 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/11/2019 12:24:14PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

1530 6/11/19

Analysis Report for 11-Jun-19-10040

L1-10221B-FSGS-017SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.68	948 -	959	954.81	9.11E+01	13.45	3.59E+01	1.28
2	351.99	1401 -	1413	1407.68	4.46E+01	10.84	2.74E+01	0.69
3	609.77	2431 -	2445	2438.25	3.49E+01	7.43	7.10E+00	1.06
4	1461.04	5832 -	5854	5844.00	1.96E+02	14.00	0.00E+00	1.36

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	4.69E+00	3.92E-01
Bi-211	0.87	351.07	*	13.02	3.32E-01	8.50E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.59E-01	2.68E-02
		300.09		3.30		
Bi-214	0.98	609.32	*	45.49	1.09E-01	2.40E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		

Analysis Report for 11-Jun-19-10040

L1-10221B-FSGS-017SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.98	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	1.21E-01	3.11E-02
		785.96		1.06		

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

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.992	4.69E+00	3.92E-01	
?	Bi-211	0.874	3.32E-01	8.50E-02	
	Pb-212	1.000	1.59E-01	2.68E-02	
	Bi-214	0.987	1.09E-01	2.40E-02	
?	Pb-214	1.000	1.21E-01	3.11E-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 11-Jun-19-10040

L1-10221B-FSGS-017SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/11/2019 12:24:14PM
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	1.43E-02	5.08E-02	5.08E-02
	BE-7	477.60		10.44	4.54E-02	3.94E-01	3.94E-01
+	K-40	1460.82	*	10.66	4.69E+00	6.89E-02	6.89E-02
	Mn-54	834.85		99.98	-9.14E-04	4.44E-02	4.44E-02
	Co-60	1173.23		99.85	1.60E-02	5.25E-02	6.10E-02
		1332.49		99.98	2.08E-02		5.25E-02
	Nb-94	702.65		99.81	6.90E-03	4.26E-02	4.26E-02
		871.09		99.89	2.72E-02		4.37E-02
	Ag-108m	79.13		6.60	6.08E-01	4.56E-02	1.64E+00
		433.94		90.50	3.43E-02		4.56E-02
		614.28		89.80	7.35E-03		5.61E-02
		722.94		90.80	3.84E-03		4.94E-02
	Sb-125	176.31		6.84	1.75E-01	1.22E-01	4.89E-01
		380.45		1.52	-1.52E-01		2.22E+00
		427.87		29.60	-4.10E-03		1.22E-01
		463.36		10.49	2.02E-01		3.76E-01
		600.60		17.65	4.37E-02		2.13E-01
		606.71		4.98	-3.29E-01		1.08E+00
		635.95		11.22	2.45E-01		4.01E-01

Analysis Report for 11-Jun-19-10040

L1-10221B-FSGS-017SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.30E+00	1.22E-01	2.05E+00
Ba-133	79.61	2.65	1.93E+00	6.95E-02	3.93E+00
	81.00	32.90	-1.21E-01		2.63E-01
	276.40	7.16	-2.55E-01		4.84E-01
	302.85	18.34	6.86E-02		2.00E-01
	356.01	62.05	-5.20E-02		6.95E-02
	383.85	8.94	2.56E-01		4.24E-01
Cs-134	475.36	1.48	1.62E-01	4.51E-02	2.59E+00
	563.25	8.34	1.07E-02		4.90E-01
	569.33	15.37	-2.15E-01		2.56E-01
	604.72	97.62	-2.86E-02		4.51E-02
	795.86	85.46	-9.90E-04		4.82E-02
	801.95	8.69	4.28E-01		5.44E-01
	1038.61	0.99	6.33E-01		5.08E+00
	1167.97	1.79	3.25E-02		3.61E+00
	1365.19	3.02	3.69E-01		1.51E+00
Cs-137	661.66	85.10	4.06E-02	5.64E-02	5.64E-02
Eu-152	121.78	28.67	-3.49E-02	1.25E-01	1.36E-01
	244.70	7.61	1.29E-01		5.33E-01
	295.94	0.45	1.23E+00		8.73E+00
	344.28	26.60	6.00E-03		1.25E-01
	367.79	0.86	-1.17E+00		3.81E+00
	411.12	2.24	3.04E-01		1.62E+00
	443.96	2.83	7.05E-02		1.14E+00
	488.68	0.42	5.88E-01		9.18E+00
	563.99	0.49	5.80E-02		8.32E+00
	586.26	0.46	1.68E+01		1.27E+01
	678.62	0.47	-1.61E-01		7.67E+00
	688.67	0.86	-1.02E+00		3.95E+00
	719.35	0.28	1.98E+00		1.50E+01
	778.90	12.96	1.92E-01		3.13E-01
	810.45	0.32	5.78E-01		1.14E+01
	867.37	4.26	-6.58E-01		9.02E-01
	919.33	0.43	6.97E+00		9.62E+00
	964.08	14.65	-8.27E-02		4.16E-01
	1085.87	10.24	7.74E-02		4.10E-01
	1089.74	1.73	9.65E-02		2.18E+00
	1112.07	13.69	1.49E-01		3.31E-01
	1212.95	1.43	-8.59E-01		3.82E+00
	1249.94	0.19	-9.08E+00		2.74E+01
	1299.14	1.63	1.73E+00		2.81E+00
	1408.01	21.07	6.74E-02		2.13E-01
	1457.64	0.50	1.01E+02		3.57E+01
	1528.10	0.28	8.43E+00		1.62E+01
Eu-154	123.07	40.40	8.85E-04	9.94E-02	9.94E-02
	247.93	6.89	1.16E-01		5.47E-01
	591.76	4.95	-3.70E-01		8.29E-01
	692.42	1.78	3.78E-01		2.11E+00
	723.30	20.06	1.48E-01		2.24E-01
	756.80	4.52	-1.85E-01		8.20E-01
	873.18	12.08	1.75E-01		3.85E-01

Analysis Report for 11-Jun-19-10040

L1-10221B-FSGS-017SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	2.70E-01	9.94E-02	4.36E-01
	1004.76	18.01	-9.14E-02		2.62E-01
	1274.43	34.80	-1.85E-02		1.72E-01
	1596.48	1.80	-3.42E-01		2.07E+00
Eu-155	45.30	1.31	-1.25E+01	2.33E-01	2.62E+01
	60.01	1.22	-1.05E+01		2.76E+01
	86.55	30.70	5.79E-02		2.33E-01
	105.31	21.10	-2.14E-01		2.41E-01
Ra-226	186.21	3.64	2.49E-01	9.99E-01	9.99E-01
Pa-231	27.36	10.30	1.92E+00	1.43E+00	3.12E+00
	283.69	1.70	1.57E+00		2.14E+00
	300.07	2.47	-1.20E+00		1.43E+00
	302.65	2.20	9.42E-01		1.69E+00
	330.06	1.40	9.88E-02		2.49E+00
U-235	143.76	10.96	-2.11E-01	6.43E-02	3.36E-01
	163.33	5.08	-6.35E-01		6.65E-01
	185.71	57.20	1.88E-02		6.43E-02
	202.11	1.08	1.11E+00		3.20E+00
	205.31	5.01	3.19E-02		7.08E-01
Am-241	59.54	35.90	-2.52E-01	9.73E-01	9.73E-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

Apex-Gamma

Analysis Report for 18-Jun-19-10008

L1-10221B-FJGS-001SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 18-Jun-19-10008
Sample Description	: L1-10221B-FJGS-001SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.642E+03 grams
Facility	: Default
Sample Taken On	: 6/17/2019 8:28:00AM
Acquisition Started	: 6/18/2019 8:58:01AM
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	: 77441
Fill Height	: 1642.42 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/18/2019 9:13:05AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
1700 6/19/19

Analysis Report for 18-Jun-19-10008

L1-10221B-FJGS-001SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.52	949 -	959	954.19	7.63E+01	12.70	3.58E+01	0.67
2	295.21	1176 -	1186	1180.75	4.26E+01	9.16	1.74E+01	1.05
3	351.60	1402 -	1412	1406.14	4.36E+01	9.85	2.14E+01	0.52
4	608.87	2427 -	2440	2434.65	4.28E+01	7.55	5.16E+00	1.65
5	1459.80	5831 -	5850	5839.02	1.32E+02	11.49	0.00E+00	0.88

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
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.35E-01	2.49E-02
		300.09		3.30		
Bi-214	0.98	609.32	*	45.49	1.35E-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		
		1280.98		1.43		
		1377.67		3.99		

Analysis Report for 18-Jun-19-10008

L1-10221B-FJGS-001SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.98	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	2.00E-01	4.60E-02
		351.93	*	35.60	1.20E-01	2.88E-02
		785.96		1.06		

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

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
X	Bi-211	0.956			
	Pb-212	0.998	1.35E-01	2.49E-02	
	Bi-214	0.987	1.35E-01	2.52E-02	
	Pb-214	0.990	1.43E-01	2.44E-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 18-Jun-19-10008

L1-10221B-FJGS-001SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/18/2019 9:13:05AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
5	1459.80	1.46667E-01	8.70		

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	8.20E-02	5.95E-02	5.95E-02
BE-7	477.60	10.44	-1.71E-02	3.74E-01	3.74E-01
K-40	1460.82	10.66	3.28E+00	1.43E+00	1.43E+00
Mn-54	834.85	99.98	-1.48E-02	3.71E-02	3.71E-02
Co-60	1173.23	99.85	1.10E-02	4.94E-02	4.94E-02
	1332.49	99.98	3.89E-02		5.36E-02
Nb-94	702.65	99.81	1.54E-02	3.30E-02	3.77E-02
	871.09	99.89	-1.01E-02		3.30E-02
Ag-108m	79.13	6.60	1.71E+00	3.93E-02	1.68E+00
	433.94	90.50	1.77E-02		3.93E-02
	614.28	89.80	-8.02E-02		4.48E-02
	722.94	90.80	-8.25E-03		5.02E-02
Sb-125	176.31	6.84	6.97E-02	1.01E-01	5.47E-01
	380.45	1.52	5.41E-02		2.22E+00
	427.87	29.60	-2.30E-02		1.01E-01
	463.36	10.49	6.25E-02		3.21E-01
	600.60	17.65	-7.87E-02		1.68E-01
	606.71	4.98	1.20E+00		1.14E+00

Analysis Report for 18-Jun-19-10008

L1-10221B-FJGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	635.95	11.22	8.47E-02	1.01E-01	2.57E-01
	671.44	1.79	1.29E-01		2.13E+00
Ba-133	79.61	2.65	1.47E-01	7.01E-02	3.89E+00
	81.00	32.90	-3.26E-01		2.69E-01
	276.40	7.16	9.98E-02		4.37E-01
	302.85	18.34	9.37E-03		1.63E-01
	356.01	62.05	1.05E-02		7.01E-02
	383.85	8.94	1.46E-01		3.93E-01
Cs-134	475.36	1.48	4.71E-01	4.57E-02	2.60E+00
	563.25	8.34	2.45E-02		3.98E-01
	569.33	15.37	6.16E-02		2.22E-01
	604.72	97.62	2.75E-03		5.55E-02
	795.86	85.46	1.01E-03		4.57E-02
	801.95	8.69	8.74E-02		4.52E-01
	1038.61	0.99	1.71E-01		4.84E+00
	1167.97	1.79	1.09E+00		3.09E+00
	1365.19	3.02	-5.54E-01		1.20E+00
Cs-137	661.66	85.10	9.34E-03	4.25E-02	4.25E-02
Eu-152	121.78	28.67	5.83E-02	1.26E-01	1.44E-01
	244.70	7.61	2.50E-01		5.12E-01
	295.94	0.45	8.54E+00		9.37E+00
	344.28	26.60	-1.01E-01		1.26E-01
	367.79	0.86	2.30E+00		3.68E+00
	411.12	2.24	2.52E-01		1.68E+00
	443.96	2.83	2.49E-01		1.16E+00
	488.68	0.42	-1.28E+00		8.05E+00
	563.99	0.49	-2.43E+00		6.61E+00
	586.26	0.46	2.34E+00		1.02E+01
	678.62	0.47	7.21E+00		8.32E+00
	688.67	0.86	4.28E-01		4.12E+00
	719.35	0.28	1.46E+00		1.31E+01
	778.90	12.96	2.06E-01		3.58E-01
	810.45	0.32	1.49E+00		1.10E+01
	867.37	4.26	-1.95E-03		8.04E-01
	919.33	0.43	2.11E+00		9.80E+00
	964.08	14.65	4.31E-01		4.24E-01
	1085.87	10.24	1.62E-01		4.45E-01
	1089.74	1.73	-1.41E+00		2.40E+00
	1112.07	13.69	-9.29E-02		3.38E-01
	1212.95	1.43	-1.52E+00		3.43E+00
	1249.94	0.19	1.24E+01		3.31E+01
	1299.14	1.63	-2.57E-01		2.76E+00
	1408.01	21.07	-5.21E-02		2.08E-01
	1457.64	0.50	5.85E+01		3.03E+01
	1528.10	0.28	1.82E+00		1.30E+01
Eu-154	123.07	40.40	1.95E-02	1.02E-01	1.02E-01
	247.93	6.89	-8.81E-02		5.04E-01
	591.76	4.95	-1.32E-01		6.78E-01
	692.42	1.78	-1.12E+00		2.05E+00
	723.30	20.06	-6.04E-03		2.35E-01
	756.80	4.52	-2.37E-01		8.76E-01

Analysis Report for 18-Jun-19-10008

L1-10221B-FJGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	873.18	12.08	-5.87E-01	1.02E-01	2.74E-01
	996.29	10.48	-2.28E-01		4.11E-01
	1004.76	18.01	2.19E-02		2.54E-01
	1274.43	34.80	9.60E-03		1.17E-01
	1596.48	1.80	6.21E-01		1.94E+00
Eu-155	45.30	1.31	-4.00E+00	2.37E-01	2.89E+01
	60.01	1.22	-8.63E+00		2.58E+01
	86.55	30.70	-3.09E-02		2.59E-01
	105.31	21.10	1.18E-01		2.37E-01
Ra-226	186.21	3.64	1.10E-01	1.05E+00	1.05E+00
Pa-231	27.36	10.30	1.37E+00	1.26E+00	2.83E+00
	283.69	1.70	2.61E-01		1.95E+00
	300.07	2.47	-3.82E-01		1.26E+00
	302.65	2.20	-1.58E-01		1.38E+00
	330.06	1.40	-2.18E-01		2.49E+00
U-235	143.76	10.96	-2.63E-03	6.84E-02	3.75E-01
	163.33	5.08	7.07E-02		7.11E-01
	185.71	57.20	3.00E-02		6.84E-02
	202.11	1.08	2.35E-01		2.77E+00
	205.31	5.01	-1.10E-01		6.34E-01
Am-241	59.54	35.90	-2.56E-01	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

Apex-Gamma

Analysis Report for 19-Jun-19-10008
L1-10221B-FJGS-001SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 19-Jun-19-10008
Sample Description	: L1-10221B-FJGS-001SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.642E+03 grams
Facility	: Default
Sample Taken On	: 6/17/2019 8:28:00AM
Acquisition Started	: 6/19/2019 8:08:56AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 1800.0 seconds
Real Time	: 1802.1 seconds
Dead Time	: 0.11 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 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	: 6/19/2019
Efficiency Calibration Description	:
Sample Number	: 77500
Fill Height	: 1642.42 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/19/2019 8:43:34AM

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

Data Validated
0900 6-21-19

Analysis Report for 19-Jun-19-10008

L1-10221B-FJGS-001SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	186.06	740 -	750	744.54	4.51E+01	15.46	8.09E+01	0.57
2	238.44	947 -	960	953.86	1.16E+02	21.14	1.17E+02	0.68
3	295.05	1173 -	1188	1180.12	7.01E+01	16.37	6.59E+01	0.45
4	338.18	1347 -	1357	1352.49	4.32E+01	11.33	3.58E+01	0.93
5	351.58	1401 -	1414	1406.05	1.23E+02	15.37	4.09E+01	0.76
6	582.66	2323 -	2334	2329.86	5.00E+01	10.17	2.00E+01	0.52
7	608.74	2427 -	2442	2434.14	9.59E+01	12.99	2.41E+01	1.10
8	910.44	3635 -	3646	3640.72	2.08E+01	8.18	1.82E+01	1.06
9	1119.65	4472 -	4483	4477.71	1.54E+01	6.48	1.06E+01	0.71
10	1459.83	5828 -	5850	5839.13	2.74E+02	17.28	6.05E+00	1.58
11	1763.05	7047 -	7060	7053.22	2.00E+01	4.47	0.00E+00	0.42

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	3.35E+00	2.56E-01
Tl-208	0.95	583.19	*	85.00	4.11E-02	8.70E-03
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.03E-01	2.04E-02
		300.09		3.30		
Bi-214	0.97	609.32	*	45.49	1.51E-01	2.24E-02

Analysis Report for 19-Jun-19-10008

L1-10221B-FJGS-001SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.97	768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	1.12E-01	4.73E-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	0.98	241.99		7.25		
		295.22	*	18.42	1.65E-01	4.07E-02
		351.93	*	35.60	1.70E-01	2.52E-02
		785.96		1.06		
Ra-226	0.99	186.21	*	3.64	4.26E-01	1.50E-01
Ac-228	0.97	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	1.83E-01	5.03E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	7.62E-02	3.01E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		
U-235	0.98	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	2.71E-02	9.55E-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 19-Jun-19-10008

L1-10221B-FJGS-001SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.853	3.35E+00	2.56E-01	
	Tl-208	0.957	4.11E-02	8.70E-03	
X	Bi-211	0.959			
	Pb-212	0.995	1.03E-01	2.04E-02	
	Bi-214	0.970	1.44E-01	2.03E-02	
	Pb-214	0.987	1.68E-01	2.14E-02	
?	Ra-226	0.997	4.26E-01	1.50E-01	
	Ac-228	0.972	1.04E-01	2.58E-02	
?	U-235	0.986	2.71E-02	9.55E-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 19-Jun-19-10008

L1-10221B-FJGS-001SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/19/2019 8:43:34AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
11	1763.05	1.11111E-02	22.36		

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	4.27E-02	3.72E-02	3.72E-02
	BE-7	477.60		10.44	-1.25E-01	2.57E-01	2.57E-01
+	K-40	1460.82	*	10.66	3.35E+00	2.40E-01	2.40E-01
	Mn-54	834.85		99.98	-2.43E-02	2.79E-02	2.79E-02
	Co-60	1173.23		99.85	1.59E-02	3.21E-02	3.41E-02
		1332.49		99.98	5.39E-03		3.21E-02
	Nb-94	702.65		99.81	-8.60E-04	2.61E-02	2.61E-02
		871.09		99.89	-5.12E-03		2.75E-02
	Ag-108m	79.13		6.60	1.14E+00	2.38E-02	1.14E+00
		433.94		90.50	-2.94E-02		2.38E-02
		614.28		89.80	-2.16E-02		3.44E-02
		722.94		90.80	1.03E-02		3.27E-02
	Sb-125	176.31		6.84	-5.41E-02	8.79E-02	3.54E-01
		380.45		1.52	-3.74E-01		1.52E+00
		427.87		29.60	8.98E-02		8.79E-02
		463.36		10.49	7.66E-02		2.48E-01
		600.60		17.65	2.67E-02		1.62E-01
		606.71		4.98	1.44E+00		9.02E-01

Analysis Report for 19-Jun-19-10008

L1-10221B-FJGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	635.95	11.22	1.21E-02	8.79E-02	2.34E-01
	671.44	1.79	-3.19E-01		1.36E+00
Ba-133	79.61	2.65	-2.64E-01	4.29E-02	2.64E+00
	81.00	32.90	-6.13E-02		1.87E-01
	276.40	7.16	8.64E-02		3.37E-01
	302.85	18.34	-3.45E-02		1.26E-01
	356.01	62.05	1.42E-02		4.29E-02
	383.85	8.94	-2.94E-01		2.40E-01
Cs-134	475.36	1.48	-1.42E-02	3.15E-02	1.72E+00
	563.25	8.34	-1.37E-01		2.69E-01
	569.33	15.37	-1.65E-02		1.60E-01
	604.72	97.62	3.67E-03		4.38E-02
	795.86	85.46	-1.13E-02		3.15E-02
	801.95	8.69	2.03E-01		3.16E-01
	1038.61	0.99	1.28E+00		2.75E+00
	1167.97	1.79	1.39E+00		1.95E+00
	1365.19	3.02	-1.01E+00		8.29E-01
Cs-137	661.66	85.10	-2.52E-02	3.00E-02	3.00E-02
Eu-152	121.78	28.67	-4.92E-02	8.71E-02	9.60E-02
	244.70	7.61	1.86E-01		3.64E-01
	295.94	0.45	4.75E+00		6.72E+00
	344.28	26.60	1.00E-02		8.71E-02
	367.79	0.86	-3.61E-01		2.85E+00
	411.12	2.24	4.02E-02		1.14E+00
	443.96	2.83	-1.37E+00		7.80E-01
	488.68	0.42	3.91E+00		6.33E+00
	563.99	0.49	-2.07E+00		4.40E+00
	586.26	0.46	-8.88E+00		8.28E+00
	678.62	0.47	7.40E-01		5.32E+00
	688.67	0.86	1.28E-02		2.99E+00
	719.35	0.28	4.85E-01		1.00E+01
	778.90	12.96	-1.25E-02		1.97E-01
	810.45	0.32	4.37E+00		8.03E+00
	867.37	4.26	-1.64E-01		6.60E-01
	919.33	0.43	-6.72E+00		6.07E+00
	964.08	14.65	3.50E-01		3.05E-01
	1085.87	10.24	-1.16E-01		2.79E-01
	1089.74	1.73	7.55E-02		1.82E+00
	1112.07	13.69	3.63E-02		2.23E-01
	1212.95	1.43	1.17E-01		2.75E+00
	1249.94	0.19	-8.96E+00		1.80E+01
	1299.14	1.63	-1.05E+00		1.94E+00
	1408.01	21.07	4.42E-02		1.43E-01
	1457.64	0.50	7.06E+01		2.19E+01
	1528.10	0.28	3.59E+00		9.96E+00
Eu-154	123.07	40.40	-5.04E-02	6.69E-02	6.69E-02
	247.93	6.89	9.13E-03		3.40E-01
	591.76	4.95	1.48E-01		6.13E-01
	692.42	1.78	3.33E-01		1.58E+00
	723.30	20.06	1.08E-01		1.51E-01
	756.80	4.52	-5.85E-02		6.32E-01

Analysis Report for 19-Jun-19-10008

L1-10221B-FJGS-001SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	873.18		12.08	-3.29E-02	6.69E-02	2.18E-01
		996.29		10.48	-2.39E-01		2.33E-01
		1004.76		18.01	9.39E-02		1.58E-01
		1274.43		34.80	8.48E-03		9.58E-02
		1596.48		1.80	-6.80E-02		9.69E-01
	Eu-155	45.30		1.31	8.61E+00	1.63E-01	2.01E+01
		60.01		1.22	-1.11E+01		1.76E+01
		86.55		30.70	-1.18E-02		1.67E-01
		105.31		21.10	-1.52E-01		1.63E-01
+	Ra-226	186.21	*	3.64	4.26E-01	4.73E-01	4.73E-01
	Pa-231	27.36		10.30	1.91E+00	9.60E-01	2.13E+00
		283.69		1.70	-6.61E-02		1.39E+00
		300.07		2.47	-6.82E-02		9.60E-01
		302.65		2.20	-3.26E-01		1.05E+00
		330.06		1.40	7.23E-02		1.73E+00
+	U-235	143.76		10.96	-8.31E-02	3.01E-02	2.39E-01
		163.33		5.08	1.61E-02		4.94E-01
		185.71	*	57.20	2.71E-02		3.01E-02
		202.11		1.08	-2.42E-02		2.23E+00
		205.31		5.01	1.01E-02		4.98E-01
	Am-241	59.54		35.90	-5.16E-01	6.22E-01	6.22E-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

Apex-Gamma

Analysis Report for 20-Jun-19-10008

L1-10221B-FJGS-001SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 20-Jun-19-10008
Sample Description	: L1-10221B-FJGS-001SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.642E+03 grams
Facility	: Default
Sample Taken On	: 6/17/2019 8:28:00AM
Acquisition Started	: 6/20/2019 6:06:06AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.2 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 6/20/2019
Efficiency Calibration Description	:
Sample Number	: 77534
Fill Height	: 1642.42 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/20/2019 6:21:08AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
0900 6/21/19

Analysis Report for 20-Jun-19-10008

L1-10221B-FJGS-001SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.62	945 -	960	954.94	9.95E+01	14.84	4.05E+01	0.93
2	295.24	1177 -	1186	1181.20	3.75E+01	9.05	1.95E+01	1.14
3	351.63	1398 -	1413	1406.53	8.43E+01	11.22	1.37E+01	1.20
4	583.22	2327 -	2337	2332.20	2.64E+01	6.35	5.64E+00	0.30
5	609.19	2429 -	2444	2436.04	6.34E+01	9.26	7.56E+00	0.56
6	911.34	3639 -	3650	3644.39	2.66E+01	5.48	1.37E+00	0.31
7	1460.45	5830 -	5853	5842.16	1.46E+02	13.04	5.94E+00	0.91

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	3.00E+00	2.98E-01
Tl-208	1.00	583.19	*	85.00	3.72E-02	9.22E-03
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.54E-01	2.61E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.72E-01	2.71E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		

Analysis Report for 20-Jun-19-10008

L1-10221B-FJGS-001SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	1.54E-01	3.92E-02
		351.93	*	35.60	2.02E-01	3.14E-02
		785.96		1.06		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	1.66E-01	3.48E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

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

INTERFERENCE CORRECTED REPORT

Analysis Report for 20-Jun-19-10008

L1-10221B-FJGS-001SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.978	3.00E+00	2.98E-01	
	Tl-208	1.000	3.72E-02	9.22E-03	
X	Bi-211	0.951			
	Pb-212	1.000	1.54E-01	2.61E-02	
	Bi-214	0.999	1.72E-01	2.71E-02	
	Pb-214	0.992	1.83E-01	2.45E-02	
	Ac-228	0.999	1.66E-01	3.48E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 20-Jun-19-10008

L1-10221B-FJGS-001SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/20/2019 6:21:08AM
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	6.54E-02	5.00E-02	5.00E-02
	BE-7	477.60		10.44	-5.00E-02	3.35E-01	3.35E-01
+	K-40	1460.82	*	10.66	3.00E+00	4.00E-01	4.00E-01
	Mn-54	834.85		99.98	1.71E-02	4.37E-02	4.37E-02
	Co-60	1173.23		99.85	4.72E-04	3.93E-02	3.93E-02
		1332.49		99.98	-1.39E-02		4.13E-02
	Nb-94	702.65		99.81	6.78E-04	3.51E-02	3.51E-02
		871.09		99.89	1.85E-02		4.03E-02
	Ag-108m	79.13		6.60	5.64E-03	2.87E-02	1.28E+00
		433.94		90.50	-1.13E-02		2.87E-02
		614.28		89.80	-4.00E-02		5.93E-02
		722.94		90.80	-6.59E-03		4.00E-02
	Sb-125	176.31		6.84	2.65E-01	1.01E-01	4.34E-01
		380.45		1.52	-9.98E-01		1.74E+00
		427.87		29.60	-2.35E-02		1.01E-01
		463.36		10.49	3.17E-01		3.52E-01
		600.60		17.65	6.14E-02		2.14E-01
		606.71		4.98	1.70E+00		1.20E+00
		635.95		11.22	3.28E-02		2.75E-01

Analysis Report for 20-Jun-19-10008

L1-10221B-FJGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	2.79E-01	1.01E-01	1.79E+00
Ba-133	79.61	2.65	-1.57E+00	6.66E-02	2.97E+00
	81.00	32.90	-2.52E-01		2.09E-01
	276.40	7.16	-1.92E-01		4.18E-01
	302.85	18.34	4.62E-02		1.70E-01
	356.01	62.05	-1.40E-02		6.66E-02
	383.85	8.94	-6.10E-02		3.01E-01
Cs-134	475.36	1.48	7.81E-01	3.47E-02	2.25E+00
	563.25	8.34	-4.96E-01		3.91E-01
	569.33	15.37	-2.18E-02		2.28E-01
	604.72	97.62	-3.15E-02		5.73E-02
	795.86	85.46	-7.97E-03		3.47E-02
	801.95	8.69	-4.99E-01		3.31E-01
	1038.61	0.99	-4.73E-01		3.68E+00
	1167.97	1.79	-2.58E-01		2.67E+00
	1365.19	3.02	2.77E-01		8.63E-01
Cs-137	661.66	85.10	-8.41E-03	3.46E-02	3.46E-02
Eu-152	121.78	28.67	-6.95E-02	1.03E-01	1.09E-01
	244.70	7.61	3.45E-01		4.55E-01
	295.94	0.45	5.36E+00		8.73E+00
	344.28	26.60	-4.67E-03		1.03E-01
	367.79	0.86	-2.12E+00		3.36E+00
	411.12	2.24	6.23E-01		1.41E+00
	443.96	2.83	6.06E-01		1.06E+00
	488.68	0.42	5.22E-01		7.06E+00
	563.99	0.49	-1.58E+00		7.17E+00
	586.26	0.46	5.81E+00		8.68E+00
	678.62	0.47	-1.77E+00		7.11E+00
	688.67	0.86	-2.92E+00		3.95E+00
	719.35	0.28	-9.84E+00		1.22E+01
	778.90	12.96	-3.28E-01		2.46E-01
	810.45	0.32	-1.05E+01		9.63E+00
	867.37	4.26	3.96E-04		9.42E-01
	919.33	0.43	-2.83E+00		8.76E+00
	964.08	14.65	2.76E-01		3.64E-01
	1085.87	10.24	-3.69E-01		3.65E-01
	1089.74	1.73	-1.20E+00		2.23E+00
	1112.07	13.69	-1.13E-02		3.24E-01
	1212.95	1.43	1.16E+00		3.63E+00
	1249.94	0.19	1.69E+01		2.69E+01
	1299.14	1.63	-3.41E+00		1.81E+00
	1408.01	21.07	-1.79E-01		1.38E-01
	1457.64	0.50	6.40E+01		2.74E+01
	1528.10	0.28	4.02E+00		1.09E+01
Eu-154	123.07	40.40	-3.47E-02	7.98E-02	7.98E-02
	247.93	6.89	-4.45E-01		3.91E-01
	591.76	4.95	-8.59E-02		5.81E-01
	692.42	1.78	1.61E+00		2.23E+00
	723.30	20.06	5.03E-02		1.81E-01
	756.80	4.52	6.02E-01		8.59E-01
	873.18	12.08	-7.09E-02		3.07E-01

Analysis Report for 20-Jun-19-10008

L1-10221B-FJGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-2.75E-01	7.98E-02	3.58E-01
	1004.76	18.01	8.79E-02		2.36E-01
	1274.43	34.80	-4.26E-02		1.03E-01
	1596.48	1.80	0.00E+00		2.03E+00
Eu-155	45.30	1.31	8.43E+00	1.76E-01	1.76E+01
	60.01	1.22	-2.68E+00		1.80E+01
	86.55	30.70	-7.34E-03		1.76E-01
	105.31	21.10	-4.20E-02		1.85E-01
Ra-226	186.21	3.64	3.26E-01	8.76E-01	8.76E-01
Pa-231	27.36	10.30	1.17E+00	1.35E+00	2.08E+00
	283.69	1.70	-2.38E-01		1.92E+00
	300.07	2.47	-2.64E-01		1.35E+00
	302.65	2.20	5.27E-01		1.41E+00
	330.06	1.40	1.90E+00		2.23E+00
U-235	143.76	10.96	8.15E-02	5.59E-02	3.05E-01
	163.33	5.08	-1.29E-01		5.63E-01
	185.71	57.20	4.14E-02		5.59E-02
	202.11	1.08	-2.39E+00		2.53E+00
	205.31	5.01	1.38E-01		5.67E-01
Am-241	59.54	35.90	2.55E-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

Apex-Gamma

Analysis Report for 18-Jun-19-10009

L1-10221B-QJGS-001SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 18-Jun-19-10009
Sample Description	: L1-10221B-QJGS-001SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.622E+03 grams
Facility	: Default
Sample Taken On	: 6/17/2019 8:28:00AM
Acquisition Started	: 6/18/2019 9:23:44AM
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	: 77444
Fill Height	: 1621.98 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/18/2019 9:38:48AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated 1700 6/20/19

Analysis Report for 18-Jun-19-10009

L1-10221B-QJGS-001SS

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	309.61	3.16E+01	10.94	3.44E+01	0.54
2	238.40	947 -	961	953.71	7.94E+01	15.80	5.86E+01	0.89
3	351.68	1400 -	1414	1406.47	7.59E+01	10.78	1.41E+01	0.44
4	608.96	2427 -	2441	2435.00	6.53E+01	8.72	3.75E+00	1.15
5	1459.76	5830 -	5849	5838.88	1.41E+02	12.32	2.77E+00	1.99

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-211	0.94	351.07	*	13.02	5.74E-01	9.37E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.40E-01	3.02E-02
		300.09		3.30		
Pb212-XR	0.99	74.82		10.28		
		77.11	*	17.10	3.82E-01	1.38E-01
		87.35		3.97		
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	2.07E-01	3.03E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		

Analysis Report for 18-Jun-19-10009

L1-10221B-QJGS-001SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.50	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	2.10E-01	3.42E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	6.74E-01	2.45E-01
		87.35		2.24		
		89.78		0.82		

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

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
?	Bi-211	0.942	5.74E-01	9.37E-02	
	Pb-212	0.992	1.40E-01	3.02E-02	
?	Pb212-XR	0.999	3.82E-01	1.38E-01	
	Bi-214	0.991	2.07E-01	3.03E-02	
?	Pb-214	0.508	2.10E-01	3.42E-02	

Analysis Report for 18-Jun-19-10009

L1-10221B-QJGS-001SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
?	Pb214-XR	0.999	6.74E-01	2.45E-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-19-10009

L1-10221B-QJGS-001SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/18/2019 9:38:48AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
5	1459.76	1.56925E-01	8.72		

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	4.69E-02	5.42E-02	5.42E-02
BE-7	477.60	10.44	1.76E-01	4.15E-01	4.15E-01
K-40	1460.82	10.66	3.30E+00	1.50E+00	1.50E+00
Mn-54	834.85	99.98	-4.28E-02	3.48E-02	3.48E-02
Co-60	1173.23	99.85	-2.75E-02	3.80E-02	5.34E-02
	1332.49	99.98	1.71E-02		3.80E-02
Nb-94	702.65	99.81	-1.03E-02	3.31E-02	3.31E-02
	871.09	99.89	3.81E-03		3.70E-02
Ag-108m	79.13	6.60	-5.43E-02	3.57E-02	1.44E+00
	433.94	90.50	-2.43E-02		3.57E-02
	614.28	89.80	-4.90E-02		4.49E-02
	722.94	90.80	-6.69E-03		4.96E-02
Sb-125	176.31	6.84	-2.83E-01	1.34E-01	4.88E-01
	380.45	1.52	-6.29E-01		1.94E+00
	427.87	29.60	1.78E-03		1.34E-01
	463.36	10.49	-8.10E-02		3.37E-01
	600.60	17.65	-6.60E-02		1.97E-01
	606.71	4.98	1.85E+00		1.32E+00

Analysis Report for 18-Jun-19-10009

L1-10221B-QJGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	635.95	11.22	2.14E-01	1.34E-01	3.86E-01
	671.44	1.79	-6.83E-01		2.14E+00
Ba-133	79.61	2.65	-4.05E-01	6.31E-02	3.48E+00
	81.00	32.90	-4.20E-02		2.40E-01
	276.40	7.16	-4.39E-03		4.95E-01
	302.85	18.34	-3.31E-02		1.76E-01
	356.01	62.05	-1.22E-02		6.31E-02
	383.85	8.94	-8.20E-02		3.47E-01
Cs-134	475.36	1.48	2.51E+00	3.32E-02	2.98E+00
	563.25	8.34	1.12E-01		4.71E-01
	569.33	15.37	5.40E-02		2.53E-01
	604.72	97.62	-1.69E-02		6.53E-02
	795.86	85.46	-1.55E-02		3.32E-02
	801.95	8.69	-1.19E-02		4.03E-01
	1038.61	0.99	2.93E+00		4.35E+00
	1167.97	1.79	8.43E-01		2.97E+00
	1365.19	3.02	-5.19E-01		1.72E+00
Cs-137	661.66	85.10	8.92E-03	4.26E-02	4.26E-02
Eu-152	121.78	28.67	-4.30E-02	1.21E-01	1.36E-01
	244.70	7.61	3.61E-01		5.31E-01
	295.94	0.45	5.26E+00		8.42E+00
	344.28	26.60	-1.30E-01		1.21E-01
	367.79	0.86	2.51E-01		3.59E+00
	411.12	2.24	3.82E-01		1.48E+00
	443.96	2.83	1.37E-02		1.08E+00
	488.68	0.42	3.34E+00		7.93E+00
	563.99	0.49	-1.26E+00		7.62E+00
	586.26	0.46	2.98E+00		1.05E+01
	678.62	0.47	-4.69E+00		7.05E+00
	688.67	0.86	-1.51E+00		4.54E+00
	719.35	0.28	-2.02E+00		1.31E+01
	778.90	12.96	1.35E-03		2.97E-01
	810.45	0.32	4.00E+00		1.41E+01
	867.37	4.26	-6.26E-02		8.37E-01
	919.33	0.43	-2.20E+00		8.37E+00
	964.08	14.65	2.25E-01		4.25E-01
	1085.87	10.24	-6.59E-02		3.59E-01
	1089.74	1.73	-1.03E-01		2.40E+00
	1112.07	13.69	-7.41E-02		3.19E-01
	1212.95	1.43	-1.83E+00		3.54E+00
	1249.94	0.19	-3.49E+01		2.13E+01
	1299.14	1.63	-1.34E+00		2.77E+00
	1408.01	21.07	7.01E-02		2.43E-01
	1457.64	0.50	7.23E+01		3.18E+01
	1528.10	0.28	4.80E+00		1.31E+01
Eu-154	123.07	40.40	1.86E-02	9.54E-02	9.54E-02
	247.93	6.89	-5.45E-02		5.10E-01
	591.76	4.95	2.14E-01		7.94E-01
	692.42	1.78	-9.68E-02		2.34E+00
	723.30	20.06	-1.05E-02		2.24E-01
	756.80	4.52	-7.45E-01		6.38E-01

Analysis Report for 18-Jun-19-10009

L1-10221B-QJGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	873.18	12.08	-5.32E-03	9.54E-02	3.26E-01
	996.29	10.48	-3.97E-01		2.81E-01
	1004.76	18.01	7.67E-02		2.27E-01
	1274.43	34.80	2.89E-02		1.54E-01
	1596.48	1.80	3.75E-01		2.56E+00
Eu-155	45.30	1.31	-9.34E+00	2.27E-01	2.56E+01
	60.01	1.22	1.73E+01		2.97E+01
	86.55	30.70	-5.33E-03		2.27E-01
	105.31	21.10	9.76E-02		2.38E-01
Ra-226	186.21	3.64	5.85E-01	1.00E+00	1.00E+00
Pa-231	27.36	10.30	3.13E+00	1.34E+00	3.23E+00
	283.69	1.70	4.62E-01		2.23E+00
	300.07	2.47	2.86E-01		1.34E+00
	302.65	2.20	1.83E-01		1.48E+00
	330.06	1.40	2.44E+00		2.42E+00
U-235	143.76	10.96	-1.30E-01	6.18E-02	3.43E-01
	163.33	5.08	8.40E-03		6.73E-01
	185.71	57.20	1.37E-02		6.18E-02
	202.11	1.08	-6.16E-03		3.14E+00
	205.31	5.01	-2.77E-01		6.27E-01
Am-241	59.54	35.90	5.71E-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

Apex-Gamma

Analysis Report for 19-Jun-19-10009

L1-10221B-QJGS-001SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 19-Jun-19-10009
Sample Description	: L1-10221B-QJGS-001SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.622E+03 grams
Facility	: Default
Sample Taken On	: 6/17/2019 8:28:00AM
Acquisition Started	: 6/19/2019 8:56:30AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 1800.0 seconds
Real Time	: 1802.1 seconds
Dead Time	: 0.12 %
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	: 6/19/2019
Efficiency Calibration Description	:
Sample Number	: 77505
Fill Height	: 1621.98 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/19/2019 9:26:36AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
0900 6/21/19

Analysis Report for 19-Jun-19-10009

L1-10221B-QJGS-001SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	238.58	948 -	972	954.40	1.63E+02	14.59	7.70E+01	0.92
m	2	241.70	948 -	972	966.89	3.80E+01	8.72	7.15E+01	0.93
	3	294.95	1174 -	1186	1179.72	6.10E+01	14.98	6.10E+01	0.76
	4	338.07	1346 -	1357	1352.05	3.14E+01	12.24	4.56E+01	0.83
	5	351.66	1400 -	1412	1406.39	1.20E+02	16.26	5.42E+01	1.12
	6	582.72	2322 -	2337	2330.09	6.60E+01	10.69	1.60E+01	0.67
	7	608.77	2427 -	2442	2434.26	1.17E+02	12.85	1.60E+01	1.31
	8	910.67	3633 -	3649	3641.63	3.93E+01	8.91	1.27E+01	0.71
	9	1459.79	5828 -	5852	5838.98	2.79E+02	17.30	5.49E+00	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
Tl-208	0.96	583.19	*	85.00	5.43E-02	9.38E-03
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.44E-01	1.74E-02
		300.09		3.30		
Bi-214	0.98	609.32	*	45.49	1.85E-01	2.32E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		

Analysis Report for 19-Jun-19-10009

L1-10221B-QJGS-001SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.98	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	0.98	241.99	*	7.25	2.04E-01	4.95E-02
		295.22	*	18.42	1.44E-01	3.71E-02
		351.93	*	35.60	1.66E-01	2.61E-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	1.34E-01	5.31E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	1.44E-01	3.33E-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 19-Jun-19-10009

L1-10221B-QJGS-001SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	Tl-208	0.966	5.43E-02	9.38E-03	
X	Bi-211	0.945			
	Pb-212	1.000	1.44E-01	1.74E-02	
	Bi-214	0.981	1.85E-01	2.32E-02	
	Pb-214	0.988	1.66E-01	1.96E-02	
	Ac-228	0.985	1.41E-01	2.82E-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 19-Jun-19-10009

L1-10221B-QJGS-001SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/19/2019 9:26:36AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
9	1459.79	1.54729E-01	6.21		

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	5.60E-02	3.75E-02	3.75E-02
BE-7	477.60	10.44	2.07E-01	2.42E-01	2.42E-01
K-40	1460.82	10.66	3.20E+00	1.04E+00	1.04E+00
Mn-54	834.85	99.98	1.13E-02	2.80E-02	2.80E-02
Co-60	1173.23	99.85	-1.45E-02	2.96E-02	2.96E-02
	1332.49	99.98	-1.00E-03		3.03E-02
Nb-94	702.65	99.81	-3.26E-02	2.64E-02	2.64E-02
	871.09	99.89	1.67E-02		2.87E-02
Ag-108m	79.13	6.60	6.34E-01	2.53E-02	1.16E+00
	433.94	90.50	-7.88E-04		2.53E-02
	614.28	89.80	-2.96E-02		3.31E-02
	722.94	90.80	2.19E-02		3.43E-02
Sb-125	176.31	6.84	1.33E-01	8.50E-02	3.68E-01
	380.45	1.52	-1.49E+00		1.51E+00
	427.87	29.60	5.00E-02		8.50E-02
	463.36	10.49	2.28E-01		2.76E-01
	600.60	17.65	-1.66E-02		1.36E-01
	606.71	4.98	1.83E+00		9.08E-01

Analysis Report for 19-Jun-19-10009

L1-10221B-QJGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	635.95	11.22	-4.52E-02	8.50E-02	2.12E-01
	671.44	1.79	-2.32E-01		1.38E+00
Ba-133	79.61	2.65	2.63E-01	4.46E-02	2.73E+00
	81.00	32.90	-3.07E-01		1.87E-01
	276.40	7.16	3.24E-02		3.24E-01
	302.85	18.34	-1.38E-02		1.30E-01
	356.01	62.05	-1.00E-02		4.46E-02
	383.85	8.94	-4.86E-02		2.79E-01
Cs-134	475.36	1.48	7.92E-01	3.47E-02	1.65E+00
	563.25	8.34	-1.19E-01		3.05E-01
	569.33	15.37	9.76E-02		1.71E-01
	604.72	97.62	-6.27E-03		4.49E-02
	795.86	85.46	3.31E-02		3.47E-02
	801.95	8.69	4.98E-02		2.96E-01
	1038.61	0.99	1.08E+00		3.44E+00
	1167.97	1.79	-1.63E-01		1.85E+00
	1365.19	3.02	-5.34E-01		9.34E-01
Cs-137	661.66	85.10	-2.47E-03	3.17E-02	3.17E-02
Eu-152	121.78	28.67	-1.09E-02	8.44E-02	1.01E-01
	244.70	7.61	-1.34E-01		3.44E-01
	295.94	0.45	3.47E+00		6.68E+00
	344.28	26.60	-1.40E-02		8.44E-02
	367.79	0.86	7.92E-01		2.68E+00
	411.12	2.24	-6.17E-01		1.08E+00
	443.96	2.83	5.15E-01		9.22E-01
	488.68	0.42	7.05E-01		5.77E+00
	563.99	0.49	-4.76E-01		5.22E+00
	586.26	0.46	-4.20E+00		7.73E+00
	678.62	0.47	-3.88E-01		5.21E+00
	688.67	0.86	7.41E-01		2.96E+00
	719.35	0.28	-1.15E-01		1.02E+01
	778.90	12.96	2.08E-01		2.23E-01
	810.45	0.32	-2.08E+00		8.94E+00
	867.37	4.26	-9.52E-01		6.26E-01
	919.33	0.43	-2.23E+00		6.96E+00
	964.08	14.65	-7.47E-02		2.52E-01
	1085.87	10.24	-1.43E-01		3.16E-01
	1089.74	1.73	5.86E-01		1.88E+00
	1112.07	13.69	-4.43E-01		1.79E-01
	1212.95	1.43	-2.02E-01		2.48E+00
	1249.94	0.19	-9.79E-01		1.96E+01
	1299.14	1.63	9.35E-01		1.91E+00
	1408.01	21.07	8.99E-03		1.62E-01
	1457.64	0.50	7.66E+01		2.21E+01
	1528.10	0.28	7.68E+00		1.06E+01
Eu-154	123.07	40.40	-2.63E-02	6.92E-02	6.92E-02
	247.93	6.89	1.66E-02		3.41E-01
	591.76	4.95	4.85E-01		5.45E-01
	692.42	1.78	5.01E-01		1.50E+00
	723.30	20.06	7.19E-02		1.54E-01
	756.80	4.52	-3.17E-02		5.38E-01

Analysis Report for 19-Jun-19-10009

L1-10221B-QJGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	873.18	12.08	-1.62E-01	6.92E-02	2.28E-01
	996.29	10.48	6.12E-02		3.26E-01
	1004.76	18.01	1.32E-01		1.91E-01
	1274.43	34.80	-1.82E-02		1.04E-01
	1596.48	1.80	-1.24E+00		1.28E+00
Eu-155	45.30	1.31	1.83E+00	1.69E-01	2.01E+01
	60.01	1.22	-7.59E+00		1.71E+01
	86.55	30.70	-1.23E-02		1.69E-01
	105.31	21.10	-4.80E-02		1.74E-01
Ra-226	186.21	3.64	2.75E-01	7.19E-01	7.19E-01
Pa-231	27.36	10.30	1.34E+00	9.90E-01	2.13E+00
	283.69	1.70	8.87E-01		1.32E+00
	300.07	2.47	2.46E-01		9.90E-01
	302.65	2.20	-3.33E-01		1.08E+00
	330.06	1.40	-7.22E-02		1.68E+00
U-235	143.76	10.96	2.89E-02	4.67E-02	2.46E-01
	163.33	5.08	-1.94E-01		5.14E-01
	185.71	57.20	4.78E-02		4.67E-02
	202.11	1.08	8.32E-01		2.26E+00
	205.31	5.01	-3.40E-01		4.56E-01
Am-241	59.54	35.90	1.64E-02	6.39E-01	6.39E-01

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

Apex-Gamma

Analysis Report for 20-Jun-19-10009

L1-10221B-QJGS-001SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 20-Jun-19-10009
Sample Description	: L1-10221B-QJGS-001SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.622E+03 grams
Facility	: Default
Sample Taken On	: 6/17/2019 8:28:00AM
Acquisition Started	: 6/20/2019 6:24:59AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.2 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 6/20/2019
Efficiency Calibration Description	:
Sample Number	: 77535
Fill Height	: 1621.98 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/20/2019 6:40:01AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
0900 6/21/19

Analysis Report for 20-Jun-19-10009

L1-10221B-QJGS-001SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.73	950 -	961	955.39	5.91E+01	13.62	4.99E+01	0.92
2	295.18	1175 -	1186	1180.93	3.48E+01	9.15	1.92E+01	0.80
3	338.38	1348 -	1358	1353.58	2.15E+01	7.33	1.35E+01	0.75
4	351.91	1400 -	1413	1407.62	6.12E+01	12.52	3.48E+01	1.02
5	608.93	2428 -	2442	2434.97	5.63E+01	9.34	1.07E+01	0.45
6	911.14	3638 -	3649	3643.59	1.90E+01	5.83	6.00E+00	0.71
7	1460.59	5832 -	5853	5842.72	1.57E+02	12.99	2.93E+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

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82	*	10.66	3.24E+00	3.02E-01
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	9.16E-02	2.24E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.53E-01	2.70E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		

Analysis Report for 20-Jun-19-10009

L1-10221B-QJGS-001SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
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	1.43E-01	3.94E-02
		351.93	*	35.60	1.47E-01	3.24E-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	1.59E-01	5.57E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	1.18E-01	3.67E-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

INTERFERENCE CORRECTED REPORT

Analysis Report for 20-Jun-19-10009

L1-10221B-QJGS-001SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.991	3.24E+00	3.02E-01	
X	Bi-211	0.894			
	Pb-212	0.999	9.16E-02	2.24E-02	
	Bi-214	0.990	1.53E-01	2.70E-02	
	Pb-214	1.000	1.46E-01	2.50E-02	
	Ac-228	1.000	1.31E-01	3.07E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 20-Jun-19-10009

L1-10221B-QJGS-001SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/20/2019 6:40:01AM
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	5.35E-02	4.28E-02	4.28E-02
	BE-7	477.60		10.44	5.44E-02	2.91E-01	2.91E-01
+	K-40	1460.82	*	10.66	3.24E+00	2.97E-01	2.97E-01
	Mn-54	834.85		99.98	2.23E-02	3.87E-02	3.87E-02
	Co-60	1173.23		99.85	1.55E-02	4.53E-02	4.71E-02
		1332.49		99.98	3.29E-02		4.53E-02
	Nb-94	702.65		99.81	-2.22E-04	3.52E-02	3.52E-02
		871.09		99.89	1.56E-03		3.62E-02
	Ag-108m	79.13		6.60	1.00E-01	2.98E-02	1.43E+00
		433.94		90.50	2.46E-03		2.98E-02
		614.28		89.80	-3.42E-02		5.75E-02
		722.94		90.80	-4.17E-02		3.70E-02
	Sb-125	176.31		6.84	3.84E-01	9.66E-02	4.77E-01
		380.45		1.52	6.52E-01		1.92E+00
		427.87		29.60	4.84E-02		9.66E-02
		463.36		10.49	-1.17E-01		2.69E-01
		600.60		17.65	9.74E-02		2.23E-01
		606.71		4.98	1.84E+00		1.20E+00
		635.95		11.22	-1.74E-01		3.05E-01

Analysis Report for 20-Jun-19-10009

L1-10221B-QJGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.00E+00	9.66E-02	2.08E+00
Ba-133	79.61	2.65	1.71E+00	7.28E-02	3.50E+00
	81.00	32.90	-4.20E-01		2.28E-01
	276.40	7.16	-2.71E-01		4.06E-01
	302.85	18.34	7.86E-02		1.55E-01
	356.01	62.05	-2.96E-02		7.28E-02
	383.85	8.94	-2.30E-01		2.88E-01
Cs-134	475.36	1.48	2.47E-01	4.95E-02	1.95E+00
	563.25	8.34	-2.09E-01		3.86E-01
	569.33	15.37	2.49E-02		2.07E-01
	604.72	97.62	-2.78E-02		5.75E-02
	795.86	85.46	2.98E-02		4.95E-02
	801.95	8.69	-1.36E-02		4.15E-01
	1038.61	0.99	2.45E+00		4.41E+00
	1167.97	1.79	-1.84E+00		2.94E+00
	1365.19	3.02	-1.03E+00		1.45E+00
Cs-137	661.66	85.10	-3.31E-03	4.26E-02	4.26E-02
Eu-152	121.78	28.67	7.64E-03	1.15E-01	1.19E-01
	244.70	7.61	2.34E-01		4.75E-01
	295.94	0.45	3.25E+00		8.29E+00
	344.28	26.60	-7.09E-02		1.15E-01
	367.79	0.86	9.19E-02		3.70E+00
	411.12	2.24	-6.31E-01		1.38E+00
	443.96	2.83	-7.75E-01		1.05E+00
	488.68	0.42	-2.70E+00		5.91E+00
	563.99	0.49	4.03E+00		6.76E+00
	586.26	0.46	9.51E+00		1.06E+01
	678.62	0.47	-2.75E+00		6.53E+00
	688.67	0.86	1.25E+00		4.19E+00
	719.35	0.28	4.32E+00		1.20E+01
	778.90	12.96	1.19E-01		2.78E-01
	810.45	0.32	-2.25E-01		1.05E+01
	867.37	4.26	-9.33E-01		8.27E-01
	919.33	0.43	-1.42E-02		9.20E+00
	964.08	14.65	1.42E-01		3.32E-01
	1085.87	10.24	-2.56E-01		3.30E-01
	1089.74	1.73	-8.02E-01		2.30E+00
	1112.07	13.69	-3.06E-01		3.46E-01
	1212.95	1.43	-5.21E-02		3.70E+00
	1249.94	0.19	6.51E+00		2.54E+01
	1299.14	1.63	1.65E+00		3.09E+00
	1408.01	21.07	-2.65E-01		1.58E-01
	1457.64	0.50	7.24E+01		2.82E+01
	1528.10	0.28	-1.52E+01		1.01E+01
Eu-154	123.07	40.40	1.41E-02	8.74E-02	8.74E-02
	247.93	6.89	-8.67E-02		4.31E-01
	591.76	4.95	8.02E-02		7.46E-01
	692.42	1.78	3.89E-01		2.14E+00
	723.30	20.06	-6.61E-02		1.71E-01
	756.80	4.52	1.81E-01		7.99E-01
	873.18	12.08	1.12E-01		3.21E-01

Analysis Report for 20-Jun-19-10009

L1-10221B-QJGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.70E-01	8.74E-02	3.78E-01
	1004.76	18.01	-2.22E-01		1.72E-01
	1274.43	34.80	3.81E-02		1.19E-01
	1596.48	1.80	5.23E-01		1.63E+00
Eu-155	45.30	1.31	3.65E+00	1.71E-01	1.57E+01
	60.01	1.22	-4.36E+00		1.97E+01
	86.55	30.70	-8.50E-02		1.80E-01
	105.31	21.10	-3.83E-02		1.71E-01
Ra-226	186.21	3.64	8.61E-02	8.85E-01	8.85E-01
Pa-231	27.36	10.30	7.80E-01	1.18E+00	1.74E+00
	283.69	1.70	7.09E-01		1.68E+00
	300.07	2.47	-4.66E-03		1.18E+00
	302.65	2.20	1.02E-01		1.27E+00
	330.06	1.40	1.83E-01		2.43E+00
U-235	143.76	10.96	-1.84E-01	5.63E-02	2.79E-01
	163.33	5.08	-1.55E-01		6.17E-01
	185.71	57.20	2.62E-02		5.63E-02
	202.11	1.08	1.44E+00		2.83E+00
	205.31	5.01	-1.92E-01		5.47E-01
Am-241	59.54	35.90	-8.80E-02	6.93E-01	6.93E-01

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

Apex-Gamma

Analysis Report for 18-Jun-19-10010
L1-10221B-FJGS-002SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 18-Jun-19-10010
Sample Description	: L1-10221B-FJGS-002SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.646E+03 grams
Facility	: Default
Sample Taken On	: 6/17/2019 8:30:00AM
Acquisition Started	: 6/18/2019 8:58:10AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P11314
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/24/2019
Efficiency Calibration Used Done On	: 6/18/2019
Efficiency Calibration Description	:
Sample Number	: 77442
Fill Height	: 1621.98 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/18/2019 9:13:13AM

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

Data Validated
1700 6/18/19

Analysis Report for 18-Jun-19-10010

L1-10221B-FJGS-002SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.79	948 -	959	954.75	7.03E+01	13.70	4.67E+01	0.68
2	351.93	1401 -	1413	1406.72	3.90E+01	9.72	2.00E+01	0.68
3	583.26	2325 -	2337	2331.17	3.41E+01	6.87	4.95E+00	1.16
4	609.10	2429 -	2441	2434.42	5.60E+01	8.46	6.04E+00	0.47
5	1173.07	4684 -	4697	4689.71	2.80E+01	6.22	3.96E+00	1.01
6	1331.98	5319 -	5334	5325.57	4.90E+01	7.00	0.00E+00	0.58
7	1460.36	5829 -	5850	5839.36	1.50E+02	13.41	8.05E+00	1.91

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	3.26E+00	3.24E-01
Co-60	0.97	1173.23	*	99.85	5.58E-02	1.26E-02
		1332.49	*	99.98	1.06E-01	1.57E-02
Tl-208	0.99	583.19	*	85.00	4.99E-02	1.05E-02
Bi-211	0.88	351.07	*	13.02	2.62E-01	6.85E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.09E-01	2.30E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.58E-01	2.56E-02
		768.36		4.89		

Analysis Report for 18-Jun-19-10010

L1-10221B-FJGS-002SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	1.00	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	9.56E-02	2.50E-02
		785.96		1.06		

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

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.966	3.26E+00	3.24E-01	
	Co-60	0.977	7.54E-02	9.82E-03	
	Tl-208	0.999	4.99E-02	1.05E-02	
?	Bi-211	0.889	2.62E-01	6.85E-02	
	Pb-212	0.996	1.09E-01	2.30E-02	
	Bi-214	0.997	1.58E-01	2.56E-02	
?	Pb-214	1.000	9.56E-02	2.50E-02	

Analysis Report for 18-Jun-19-10010

L1-10221B-FJGS-002SS

? = 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-19-10010

L1-10221B-FJGS-002SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/18/2019 9:13:13AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

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

All peaks were identified.

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	4.94E-02	5.05E-02	5.05E-02
	BE-7	477.60		10.44	9.88E-02	3.49E-01	3.49E-01
+	K-40	1460.82	*	10.66	3.26E+00	4.65E-01	4.65E-01
	Mn-54	834.85		99.98	-5.56E-03	3.60E-02	3.60E-02
+	Co-60	1173.23	*	99.85	5.58E-02	6.21E-03	2.78E-02
		1332.49	*	99.98	1.06E-01		6.21E-03
	Nb-94	702.65		99.81	-7.01E-03	3.50E-02	4.36E-02
		871.09		99.89	-7.07E-03		3.50E-02
	Ag-108m	79.13		6.60	3.10E-01	2.84E-02	9.99E-01
		433.94		90.50	-1.18E-02		2.84E-02
		614.28		89.80	-1.25E-02		5.47E-02
		722.94		90.80	8.68E-03		4.55E-02
	Sb-125	176.31		6.84	1.70E-01	9.74E-02	3.77E-01
		380.45		1.52	4.47E-01		2.14E+00
		427.87		29.60	5.69E-02		9.74E-02
		463.36		10.49	2.28E-03		2.99E-01
		600.60		17.65	1.26E-01		2.16E-01
		606.71		4.98	1.14E+00		1.15E+00
		635.95		11.22	1.48E-01		3.05E-01

Analysis Report for 18-Jun-19-10010

L1-10221B-FJGS-002SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.15E-01	9.74E-02	1.78E+00
Ba-133	79.61	2.65	1.05E+00	5.85E-02	2.43E+00
	81.00	32.90	-1.66E-01		1.61E-01
	276.40	7.16	-4.51E-02		4.06E-01
	302.85	18.34	-4.21E-03		1.66E-01
	356.01	62.05	-1.24E-02		5.85E-02
	383.85	8.94	3.30E-02		3.46E-01
Cs-134	475.36	1.48	7.88E-01	4.56E-02	2.32E+00
	563.25	8.34	-2.71E-01		4.44E-01
	569.33	15.37	3.59E-02		2.06E-01
	604.72	97.62	-7.81E-02		5.11E-02
	795.86	85.46	2.70E-03		4.56E-02
	801.95	8.69	1.05E-01		5.18E-01
	1038.61	0.99	-2.54E+00		3.87E+00
	1167.97	1.79	-2.34E+00		3.88E+00
	1365.19	3.02	-3.47E-01		1.20E+00
Cs-137	661.66	85.10	6.58E-02	6.90E-02	6.90E-02
Eu-152	121.78	28.67	-2.34E-02	9.87E-02	9.87E-02
	244.70	7.61	3.10E-02		3.85E-01
	295.94	0.45	-2.67E+00		7.86E+00
	344.28	26.60	-2.62E-02		1.09E-01
	367.79	0.86	1.82E+00		3.63E+00
	411.12	2.24	4.36E-01		1.50E+00
	443.96	2.83	2.61E-01		1.18E+00
	488.68	0.42	-9.26E+00		5.62E+00
	563.99	0.49	-8.80E+00		6.77E+00
	586.26	0.46	-6.17E-01		1.01E+01
	678.62	0.47	-1.40E+00		7.27E+00
	688.67	0.86	9.10E-01		3.95E+00
	719.35	0.28	-1.99E+01		1.19E+01
	778.90	12.96	-6.20E-02		2.84E-01
	810.45	0.32	2.09E+00		1.41E+01
	867.37	4.26	6.34E-02		8.65E-01
	919.33	0.43	-1.03E+01		8.24E+00
	964.08	14.65	2.33E-01		3.78E-01
	1085.87	10.24	1.76E-01		5.22E-01
	1089.74	1.73	3.90E-01		2.78E+00
	1112.07	13.69	-9.22E-02		3.83E-01
	1212.95	1.43	4.53E-01		3.62E+00
	1249.94	0.19	-1.04E+01		2.35E+01
	1299.14	1.63	1.11E+00		2.80E+00
	1408.01	21.07	-1.20E-02		1.03E-01
	1457.64	0.50	6.68E+01		2.95E+01
	1528.10	0.28	4.26E+00		1.16E+01
Eu-154	123.07	40.40	2.72E-02	7.32E-02	7.32E-02
	247.93	6.89	-3.16E-01		3.99E-01
	591.76	4.95	-7.72E-02		6.04E-01
	692.42	1.78	-1.31E+00		2.00E+00
	723.30	20.06	4.29E-02		2.06E-01
	756.80	4.52	1.23E-01		6.84E-01
	873.18	12.08	-2.67E-01		2.82E-01

Analysis Report for 18-Jun-19-10010

L1-10221B-FJGS-002SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.49E-01	7.32E-02	4.15E-01
	1004.76	18.01	7.66E-02		2.43E-01
	1274.43	34.80	-3.32E-02		1.26E-01
	1596.48	1.80	4.15E-01		1.55E+00
Eu-155	45.30	1.31	2.83E+00	1.58E-01	9.57E+00
	60.01	1.22	4.68E+00		1.04E+01
	86.55	30.70	8.67E-02		1.58E-01
	105.31	21.10	-3.76E-02		1.60E-01
Ra-226	186.21	3.64	4.88E-01	8.37E-01	8.37E-01
Pa-231	27.36	10.30	3.41E-01	1.08E+00	1.08E+00
	283.69	1.70	2.93E-01		1.70E+00
	300.07	2.47	-9.13E-01		1.29E+00
	302.65	2.20	5.21E-01		1.42E+00
	330.06	1.40	2.49E+00		2.47E+00
U-235	143.76	10.96	-7.09E-02	5.27E-02	2.58E-01
	163.33	5.08	-2.54E-01		4.80E-01
	185.71	57.20	1.61E-02		5.27E-02
	202.11	1.08	3.64E-01		2.40E+00
	205.31	5.01	-2.18E-01		4.87E-01
Am-241	59.54	35.90	8.11E-02	3.64E-01	3.64E-01

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

Apex-Gamma

Analysis Report for 18-Jun-19-10011

L1-10221B-FJGS-003SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 18-Jun-19-10011
Sample Description	: L1-10221B-FJGS-003SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.621E+03 grams
Facility	: Default
Sample Taken On	: 6/17/2019 8:32:00AM
Acquisition Started	: 6/18/2019 8:58:17AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.2 seconds
Dead Time	: 0.02 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 6/18/2019
Efficiency Calibration Description	:
Sample Number	: 77443
Fill Height	: 1620.52 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/18/2019 9:13:38AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated 1700 6/18/19

Analysis Report for 18-Jun-19-10011

L1-10221B-FJGS-003SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.67	950 -	962	955.16	4.58E+01	12.49	4.02E+01	1.11
2	351.76	1400 -	1416	1407.04	5.63E+01	9.83	1.28E+01	0.44
3	510.76	2037 -	2049	2042.55	3.19E+01	7.82	1.11E+01	0.58
4	609.40	2428 -	2443	2436.86	4.70E+01	8.06	5.98E+00	1.32
5	1460.38	5832 -	5851	5841.90	1.18E+02	12.36	9.89E+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
An Pk	0.99	511.00	*	100.00	3.56E-02	9.07E-03
K-40	0.97	1460.82	*	10.66	2.43E+00	2.76E-01
Bi-211	0.92	351.07	*	13.02	3.70E-01	7.12E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	7.11E-02	2.02E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	1.28E-01	2.32E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		

Analysis Report for 18-Jun-19-10011

L1-10221B-FJGS-003SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	1.35E-01	2.60E-02
		785.96		1.06		

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

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.991	3.56E-02	9.07E-03	
	K-40	0.970	2.43E+00	2.76E-01	
?	Bi-211	0.926	3.70E-01	7.12E-02	
	Pb-212	1.000	7.11E-02	2.02E-02	
	Bi-214	1.000	1.28E-01	2.32E-02	
?	Pb-214	0.997	1.35E-01	2.60E-02	

Analysis Report for 18-Jun-19-10011

L1-10221B-FJGS-003SS

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

Errors quoted at 1.000sigma

Analysis Report for 18-Jun-19-10011

L1-10221B-FJGS-003SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/18/2019 9:13:38AM
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	3.56E-02	2.37E-02	2.37E-02
	BE-7	477.60		10.44	-9.66E-02	3.03E-01	3.03E-01
+	K-40	1460.82	*	10.66	2.43E+00	4.70E-01	4.70E-01
	Mn-54	834.85		99.98	7.08E-03	3.86E-02	3.86E-02
	Co-60	1173.23		99.85	-2.85E-02	3.71E-02	4.29E-02
		1332.49		99.98	-2.45E-02		3.71E-02
	Nb-94	702.65		99.81	-6.79E-04	3.45E-02	3.45E-02
		871.09		99.89	9.04E-03		3.54E-02
	Ag-108m	79.13		6.60	-2.51E-01	3.36E-02	1.10E+00
		433.94		90.50	-1.93E-03		3.50E-02
		614.28		89.80	-1.45E-02		5.62E-02
		722.94		90.80	2.02E-03		3.36E-02
	Sb-125	176.31		6.84	-5.56E-02	1.03E-01	3.88E-01
		380.45		1.52	-7.41E-01		1.45E+00
		427.87		29.60	1.46E-02		1.03E-01
		463.36		10.49	3.08E-04		2.96E-01
		600.60		17.65	8.42E-02		1.65E-01
		606.71		4.98	6.04E-01		9.84E-01
		635.95		11.22	1.45E-01		2.99E-01

Analysis Report for 18-Jun-19-10011

L1-10221B-FJGS-003SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	3.29E-01	1.03E-01	1.67E+00
Ba-133	79.61	2.65	-6.60E-01	5.79E-02	2.66E+00
	81.00	32.90	-1.71E-01		1.93E-01
	276.40	7.16	1.07E-01		4.17E-01
	302.85	18.34	5.58E-04		1.45E-01
	356.01	62.05	-1.10E-02		5.79E-02
	383.85	8.94	-7.98E-02		2.74E-01
Cs-134	475.36	1.48	8.71E-01	4.19E-02	2.14E+00
	563.25	8.34	-1.88E-02		3.03E-01
	569.33	15.37	7.51E-02		1.60E-01
	604.72	97.62	-2.01E-02		4.72E-02
	795.86	85.46	-6.59E-03		4.19E-02
	801.95	8.69	2.89E-01		3.86E-01
	1038.61	0.99	3.01E+00		4.01E+00
	1167.97	1.79	1.03E+00		2.39E+00
	1365.19	3.02	3.47E-02		5.32E-01
Cs-137	661.66	85.10	6.73E-03	3.81E-02	3.81E-02
Eu-152	121.78	28.67	4.72E-02	1.03E-01	1.05E-01
	244.70	7.61	-2.44E-01		3.78E-01
	295.94	0.45	7.41E+00		7.97E+00
	344.28	26.60	4.04E-02		1.03E-01
	367.79	0.86	1.51E+00		3.63E+00
	411.12	2.24	6.46E-01		1.32E+00
	443.96	2.83	8.87E-02		9.00E-01
	488.68	0.42	-3.38E+00		6.47E+00
	563.99	0.49	3.83E+00		5.28E+00
	586.26	0.46	2.80E+00		8.80E+00
	678.62	0.47	3.48E+00		6.68E+00
	688.67	0.86	2.54E+00		4.41E+00
	719.35	0.28	-3.09E+00		9.27E+00
	778.90	12.96	-1.39E-01		2.47E-01
	810.45	0.32	-1.90E+00		9.65E+00
	867.37	4.26	-8.83E-01		7.83E-01
	919.33	0.43	6.84E+00		9.79E+00
	964.08	14.65	-7.00E-02		3.22E-01
	1085.87	10.24	-2.88E-01		3.98E-01
	1089.74	1.73	3.85E-01		2.30E+00
	1112.07	13.69	-3.71E-01		3.18E-01
	1212.95	1.43	-3.20E-01		3.70E+00
	1249.94	0.19	1.20E+01		2.42E+01
	1299.14	1.63	1.43E-01		2.51E+00
	1408.01	21.07	-9.64E-03		1.38E-01
	1457.64	0.50	5.89E+01		2.56E+01
	1528.10	0.28	0.00E+00		2.32E+00
Eu-154	123.07	40.40	2.21E-02	7.48E-02	7.48E-02
	247.93	6.89	2.38E-01		4.05E-01
	591.76	4.95	-1.76E-01		6.46E-01
	692.42	1.78	-1.74E+00		1.92E+00
	723.30	20.06	-3.19E-02		1.52E-01
	756.80	4.52	-3.88E-02		6.35E-01
	873.18	12.08	1.41E-01		2.93E-01

Analysis Report for 18-Jun-19-10011

L1-10221B-FJGS-003SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-3.13E-01	7.48E-02	3.87E-01
	1004.76	18.01	7.56E-02		2.10E-01
	1274.43	34.80	-1.24E-01		9.43E-02
	1596.48	1.80	3.92E-01		1.46E+00
Eu-155	45.30	1.31	-1.27E+01	1.64E-01	1.59E+01
	60.01	1.22	-7.93E+00		1.55E+01
	86.55	30.70	5.56E-02		1.73E-01
	105.31	21.10	9.86E-03		1.64E-01
Ra-226	186.21	3.64	1.95E-01	7.62E-01	7.62E-01
Pa-231	27.36	10.30	1.13E+00	1.18E+00	1.82E+00
	283.69	1.70	5.41E-01		1.71E+00
	300.07	2.47	-1.72E+00		1.18E+00
	302.65	2.20	2.83E-02		1.21E+00
	330.06	1.40	-1.73E-01		2.06E+00
U-235	143.76	10.96	-7.37E-02	4.95E-02	2.54E-01
	163.33	5.08	3.73E-01		5.94E-01
	185.71	57.20	4.85E-02		4.95E-02
	202.11	1.08	-9.61E-01		2.35E+00
	205.31	5.01	-8.29E-02		5.17E-01
Am-241	59.54	35.90	-4.40E-01	5.31E-01	5.31E-01

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

Apex-Gamma

Analysis Report for 18-Jun-19-10012

L1-10221B-FJGS-004SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 18-Jun-19-10012
Sample Description	: L1-10221B-FJGS-004SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.639E+03 grams
Facility	: Default
Sample Taken On	: 6/17/2019 8:34:00AM
Acquisition Started	: 6/18/2019 9:23:50AM
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	: 77445
Fill Height	: 1638.86 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/18/2019 9:38:53AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated 1700 6/18/19

Analysis Report for 18-Jun-19-10012

L1-10221B-FJGS-004SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.20	151 -	158	155.00	3.41E+01	14.58	8.79E+01	0.60
2	238.66	473 -	481	477.51	5.70E+01	16.54	1.00E+02	1.08
3	352.00	700 -	708	703.95	6.48E+01	11.06	2.62E+01	1.69
4	583.45	1162 -	1172	1166.51	4.11E+01	8.76	1.49E+01	1.07
5	911.23	1816 -	1826	1821.90	2.80E+01	6.12	4.02E+00	0.82
6	969.43	1933 -	1942	1938.31	2.00E+01	6.54	1.00E+01	1.04
7	1460.99	2915 -	2928	2922.03	1.98E+02	14.25	1.78E+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	0.99	1460.82	*	10.66	3.66E+00	3.07E-01
Tl-208	0.98	583.19	*	85.00	5.22E-02	1.16E-02
Bi-211	0.87	351.07	*	13.02	3.83E-01	7.24E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	7.90E-02	2.38E-02
		300.09		3.30		
Pb212-XR	0.99	74.82		10.28		
		77.11	*	17.10	2.21E-01	9.72E-02
		87.35		3.97		
		89.78		1.46		

Analysis Report for 18-Jun-19-10012

L1-10221B-FJGS-004SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb-214	1.00	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	1.40E-01	2.64E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	3.90E-01	1.72E-01
		87.35		2.24		
		89.78		0.82		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	1.57E-01	3.49E-02
		964.77		4.99		
		968.97	*	15.80	1.90E-01	6.28E-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

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.996	3.66E+00	3.07E-01	
	Tl-208	0.989	5.22E-02	1.16E-02	
?	Bi-211	0.870	3.83E-01	7.24E-02	
	Pb-212	1.000	7.90E-02	2.38E-02	
?	Pb212-XR	0.999	2.21E-01	9.72E-02	
?	Pb-214	1.000	1.40E-01	2.64E-02	
?	Pb214-XR	0.999	3.90E-01	1.72E-01	

Analysis Report for 18-Jun-19-10012

L1-10221B-FJGS-004SS

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
Ac-228	0.994	1.65E-01	3.05E-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-19-10012

L1-10221B-FJGS-004SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/18/2019 9:38:53AM
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	5.42E-02	4.59E-02	4.59E-02
	BE-7	477.60		10.44	-9.22E-02	2.87E-01	2.87E-01
+	K-40	1460.82	*	10.66	3.66E+00	1.92E-01	1.92E-01
	Mn-54	834.85		99.98	1.20E-02	3.54E-02	3.54E-02
	Co-60	1173.23		99.85	3.39E-03	4.27E-02	4.56E-02
		1332.49		99.98	-8.15E-03		4.27E-02
	Nb-94	702.65		99.81	-1.86E-02	2.70E-02	2.70E-02
		871.09		99.89	1.46E-02		3.26E-02
	Ag-108m	79.13		6.60	-1.88E-01	2.99E-02	8.83E-01
		433.94		90.50	-2.78E-03		2.99E-02
		614.28		89.80	-3.72E-02		4.04E-02
		722.94		90.80	4.51E-03		3.99E-02
	Sb-125	176.31		6.84	-4.67E-02	8.40E-02	4.09E-01
		380.45		1.52	-4.25E-01		1.63E+00
		427.87		29.60	-3.24E-02		8.40E-02
		463.36		10.49	9.29E-02		2.90E-01
		600.60		17.65	-2.90E-02		1.85E-01
		606.71		4.98	9.12E-01		9.45E-01
		635.95		11.22	-5.07E-02		2.59E-01

Analysis Report for 18-Jun-19-10012

L1-10221B-FJGS-004SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.24E+00	8.40E-02	1.50E+00
Ba-133	79.61	2.65	-8.93E-01	5.45E-02	2.07E+00
	81.00	32.90	-6.91E-02		1.48E-01
	276.40	7.16	7.07E-02		4.14E-01
	302.85	18.34	9.56E-04		1.55E-01
	356.01	62.05	-5.35E-02		5.45E-02
	383.85	8.94	-1.80E-01		2.71E-01
Cs-134	475.36	1.48	5.72E-01	4.36E-02	2.22E+00
	563.25	8.34	1.39E-01		3.69E-01
	569.33	15.37	-1.00E-01		1.83E-01
	604.72	97.62	3.60E-03		4.36E-02
	795.86	85.46	3.47E-02		4.64E-02
	801.95	8.69	-1.76E-01		4.04E-01
	1038.61	0.99	-3.97E-01		3.86E+00
	1167.97	1.79	-1.68E+00		2.19E+00
	1365.19	3.02	-2.89E-01		1.17E+00
Cs-137	661.66	85.10	2.35E-02	4.36E-02	4.36E-02
Eu-152	121.78	28.67	1.50E-02	9.86E-02	9.86E-02
	244.70	7.61	7.39E-02		4.14E-01
	295.94	0.45	5.45E+00		7.58E+00
	344.28	26.60	-1.04E-01		1.02E-01
	367.79	0.86	2.02E-01		3.45E+00
	411.12	2.24	-1.73E-01		1.20E+00
	443.96	2.83	-2.63E-01		9.14E-01
	488.68	0.42	-1.55E+00		6.86E+00
	563.99	0.49	2.54E+00		6.36E+00
	586.26	0.46	-7.07E-01		9.86E+00
	678.62	0.47	1.99E+00		6.15E+00
	688.67	0.86	5.84E-01		3.25E+00
	719.35	0.28	-4.44E-01		1.10E+01
	778.90	12.96	3.02E-02		2.55E-01
	810.45	0.32	-4.17E-01		9.68E+00
	867.37	4.26	-1.95E-01		7.04E-01
	919.33	0.43	4.42E-01		7.29E+00
	964.08	14.65	-1.90E-02		2.49E-01
	1085.87	10.24	-8.67E-02		3.84E-01
	1089.74	1.73	-2.81E-01		2.28E+00
	1112.07	13.69	6.99E-02		2.91E-01
	1212.95	1.43	-4.08E-01		3.08E+00
	1249.94	0.19	-1.09E+01		2.17E+01
	1299.14	1.63	-1.38E+00		2.01E+00
	1408.01	21.07	7.88E-02		1.77E-01
	1457.64	0.50	-3.71E+00		2.79E+01
	1528.10	0.28	-8.52E+00		9.00E+00
Eu-154	123.07	40.40	-1.56E-02	6.76E-02	6.76E-02
	247.93	6.89	-7.31E-02		3.79E-01
	591.76	4.95	1.47E-02		6.12E-01
	692.42	1.78	-1.21E-01		1.54E+00
	723.30	20.06	3.93E-02		1.86E-01
	756.80	4.52	1.06E-01		6.57E-01
	873.18	12.08	-3.54E-02		2.49E-01

Analysis Report for 18-Jun-19-10012

L1-10221B-FJGS-004SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-1.02E-01	6.76E-02	3.85E-01
	1004.76	18.01	1.08E-01		2.17E-01
	1274.43	34.80	-1.18E-01		1.00E-01
	1596.48	1.80	3.22E-01		2.02E+00
Eu-155	45.30	1.31	7.52E-01	1.47E-01	8.64E+00
	60.01	1.22	-6.99E+00		9.54E+00
	86.55	30.70	4.69E-03		1.47E-01
	105.31	21.10	1.90E-02		1.49E-01
Ra-226	186.21	3.64	3.21E-01	8.82E-01	8.82E-01
Pa-231	27.36	10.30	8.14E-01	1.04E+00	1.04E+00
	283.69	1.70	-2.82E-01		1.59E+00
	300.07	2.47	-1.30E+00		1.16E+00
	302.65	2.20	7.97E-03		1.30E+00
	330.06	1.40	1.14E-01		2.10E+00
U-235	143.76	10.96	4.22E-02	5.63E-02	2.45E-01
	163.33	5.08	-3.10E-01		5.62E-01
	185.71	57.20	3.42E-02		5.63E-02
	202.11	1.08	9.53E-01		2.80E+00
	205.31	5.01	-4.89E-01		5.60E-01
Am-241	59.54	35.90	-2.70E-01	3.28E-01	3.28E-01

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

Apex-Gamma

Analysis Report for 18-Jun-19-10013

L1-10221B-FJGS-005SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 18-Jun-19-10013
Sample Description	: L1-10221B-FJGS-005SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.566E+03 grams
Facility	: Default
Sample Taken On	: 6/17/2019 8:36:00AM
Acquisition Started	: 6/18/2019 9:23:56AM
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	: 6/18/2019
Efficiency Calibration Description	:
Sample Number	: 77446
Fill Height	: 1565.58 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/18/2019 9:39:17AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated 1700 6/19/19

Analysis Report for 18-Jun-19-10013

L1-10221B-FJGS-005SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.89	950 -	960	955.14	9.34E+01	12.42	2.56E+01	0.77
2	352.00	1401 -	1413	1407.03	4.55E+01	9.29	1.55E+01	1.09
3	609.00	2428 -	2439	2434.03	2.77E+01	7.33	1.03E+01	0.35
4	911.27	3637 -	3648	3642.54	1.97E+01	6.17	7.34E+00	0.75
5	1460.46	5829 -	5850	5839.78	1.86E+02	14.66	7.85E+00	1.40

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	4.15E+00	3.73E-01
Bi-211	0.87	351.07	*	13.02	3.12E-01	6.84E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.48E-01	2.30E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	7.98E-02	2.17E-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		

Analysis Report for 18-Jun-19-10013

L1-10221B-FJGS-005SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
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	1.14E-01	2.50E-02
		785.96		1.06		
Ac-228	1.00	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	1.31E-01	4.16E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

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

INTERFERENCE CORRECTED REPORT

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

Analysis Report for 18-Jun-19-10013

L1-10221B-FJGS-005SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.979	4.15E+00	3.73E-01	
?	Bi-211	0.870	3.12E-01	6.84E-02	
	Pb-212	0.990	1.48E-01	2.30E-02	
	Bi-214	0.993	7.98E-02	2.17E-02	
?	Pb-214	1.000	1.14E-01	2.50E-02	
	Ac-228	1.000	1.31E-01	4.16E-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-19-10013

L1-10221B-FJGS-005SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/18/2019 9:39:17AM
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	6.59E-02	5.19E-02	5.19E-02
	BE-7	477.60		10.44	2.34E-01	3.88E-01	3.88E-01
+	K-40	1460.82	*	10.66	4.15E+00	4.70E-01	4.70E-01
	Mn-54	834.85		99.98	3.03E-02	4.37E-02	4.37E-02
	Co-60	1173.23		99.85	2.98E-02	4.62E-02	4.96E-02
		1332.49		99.98	1.76E-02		4.62E-02
	Nb-94	702.65		99.81	-3.12E-02	3.11E-02	3.11E-02
		871.09		99.89	-2.23E-02		3.37E-02
	Ag-108m	79.13		6.60	2.60E-01	3.93E-02	9.42E-01
		433.94		90.50	-8.35E-03		3.93E-02
		614.28		89.80	-5.35E-03		4.65E-02
		722.94		90.80	6.69E-03		5.45E-02
	Sb-125	176.31		6.84	-7.18E-02	1.20E-01	3.54E-01
		380.45		1.52	7.14E-01		1.92E+00
		427.87		29.60	2.99E-02		1.20E-01
		463.36		10.49	-8.52E-03		2.88E-01
		600.60		17.65	4.05E-02		1.94E-01
		606.71		4.98	7.29E-01		1.03E+00
		635.95		11.22	-1.53E-01		3.06E-01

Analysis Report for 18-Jun-19-10013

L1-10221B-FJGS-005SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	3.26E-01	1.20E-01	2.03E+00
Ba-133	79.61	2.65	5.04E-01	5.29E-02	2.27E+00
	81.00	32.90	-1.73E-01		1.49E-01
	276.40	7.16	-7.72E-02		3.64E-01
	302.85	18.34	5.91E-02		1.72E-01
	356.01	62.05	-4.36E-03		5.29E-02
	383.85	8.94	6.33E-02		3.32E-01
Cs-134	475.36	1.48	7.40E-01	4.17E-02	2.73E+00
	563.25	8.34	-3.30E-01		4.08E-01
	569.33	15.37	3.88E-02		2.30E-01
	604.72	97.62	-7.39E-03		4.88E-02
	795.86	85.46	1.60E-02		4.17E-02
	801.95	8.69	-1.35E-01		2.99E-01
	1038.61	0.99	-2.07E+00		4.42E+00
	1167.97	1.79	2.43E+00		3.16E+00
	1365.19	3.02	7.49E-01		1.35E+00
Cs-137	661.66	85.10	4.61E-02	5.29E-02	5.29E-02
Eu-152	121.78	28.67	1.06E-03	9.65E-02	9.65E-02
	244.70	7.61	1.23E-01		3.88E-01
	295.94	0.45	3.73E+00		8.50E+00
	344.28	26.60	5.46E-02		1.15E-01
	367.79	0.86	4.07E-01		3.55E+00
	411.12	2.24	7.58E-02		1.30E+00
	443.96	2.83	-5.59E-01		1.15E+00
	488.68	0.42	3.18E-01		7.45E+00
	563.99	0.49	-4.22E+00		6.43E+00
	586.26	0.46	9.51E+00		1.02E+01
	678.62	0.47	-7.28E-01		7.11E+00
	688.67	0.86	2.92E+00		4.61E+00
	719.35	0.28	3.72E+00		1.58E+01
	778.90	12.96	-2.00E-01		2.49E-01
	810.45	0.32	-3.03E+00		1.03E+01
	867.37	4.26	9.11E-02		7.61E-01
	919.33	0.43	-3.04E+00		8.69E+00
	964.08	14.65	3.62E-01		3.92E-01
	1085.87	10.24	4.73E-03		3.69E-01
	1089.74	1.73	-2.13E+00		2.11E+00
	1112.07	13.69	7.36E-02		3.72E-01
	1212.95	1.43	1.18E+00		4.38E+00
	1249.94	0.19	-1.72E+01		2.34E+01
	1299.14	1.63	-2.25E+00		2.88E+00
	1408.01	21.07	8.77E-02		1.80E-01
	1457.64	0.50	9.20E+01		3.37E+01
	1528.10	0.28	-5.67E+00		8.43E+00
Eu-154	123.07	40.40	3.04E-02	6.90E-02	6.90E-02
	247.93	6.89	6.87E-02		3.81E-01
	591.76	4.95	-3.78E-01		6.03E-01
	692.42	1.78	-9.33E-02		2.04E+00
	723.30	20.06	7.69E-02		2.49E-01
	756.80	4.52	7.02E-02		7.61E-01
	873.18	12.08	-7.77E-02		2.97E-01

Analysis Report for 18-Jun-19-10013

L1-10221B-FJGS-005SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-1.57E-01	6.90E-02	2.87E-01
	1004.76	18.01	-2.41E-03		2.32E-01
	1274.43	34.80	8.66E-02		1.29E-01
	1596.48	1.80	-2.07E+00		1.37E+00
Eu-155	45.30	1.31	-2.79E+00	1.51E-01	9.40E+00
	60.01	1.22	-1.28E-01		1.07E+01
	86.55	30.70	1.16E-02		1.51E-01
	105.31	21.10	4.45E-02		1.58E-01
Ra-226	186.21	3.64	4.77E-01	8.61E-01	8.61E-01
Pa-231	27.36	10.30	9.71E-01	1.23E+00	1.23E+00
	283.69	1.70	-4.89E-01		1.58E+00
	300.07	2.47	-6.91E-01		1.38E+00
	302.65	2.20	3.98E-01		1.42E+00
	330.06	1.40	-2.57E-01		2.07E+00
U-235	143.76	10.96	-1.03E-01	5.52E-02	2.55E-01
	163.33	5.08	-3.88E-02		5.20E-01
	185.71	57.20	4.20E-02		5.52E-02
	202.11	1.08	4.18E-01		2.29E+00
	205.31	5.01	-1.43E-01		5.25E-01
Am-241	59.54	35.90	1.44E-02	3.73E-01	3.73E-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

Apex-Gamma

Analysis Report for 18-Jun-19-10014

L1-10221B-FJGS-006SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 18-Jun-19-10014
Sample Description	: L1-10221B-FJGS-006SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.474E+03 grams
Facility	: Default
Sample Taken On	: 6/17/2019 8:38:00AM
Acquisition Started	: 6/18/2019 9:24:03AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.2 seconds
Dead Time	: 0.02 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 6/18/2019
Efficiency Calibration Description	:
Sample Number	: 77447
Fill Height	: 1474.17 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/18/2019 9:39:10AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
1700 6/19/19

Analysis Report for 18-Jun-19-10014

L1-10221B-FJGS-006SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	185.80	739 -	751	743.92	3.96E+01	10.50	2.64E+01	0.68
M	2	238.57	949 -	972	954.76	6.46E+01	9.35	3.40E+01	0.88
m	3	241.81	949 -	972	967.70	2.17E+01	6.48	3.55E+01	0.89
	4	295.04	1177 -	1187	1180.37	4.19E+01	8.43	1.21E+01	0.67
	5	351.91	1400 -	1415	1407.65	7.03E+01	11.11	1.77E+01	1.06
	6	609.34	2427 -	2443	2436.64	6.10E+01	8.93	6.04E+00	0.35
	7	1460.59	5835 -	5852	5842.72	1.35E+02	13.15	1.22E+01	1.22

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	2.85E+00	3.05E-01
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.02E-01	1.69E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	1.69E-01	2.68E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		

Analysis Report for 18-Jun-19-10014

L1-10221B-FJGS-006SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	2.07E-01	6.41E-02
		295.22	*	18.42	1.76E-01	3.80E-02
		351.93	*	35.60	1.72E-01	3.05E-02
		785.96		1.06		
Ra-226	0.97	186.21	*	3.64	6.70E-01	1.86E-01
U-235	0.99	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	4.26E-02	1.18E-02
		202.11		1.08		
		205.31		5.01		

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

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.991	2.85E+00	3.05E-01	
X	Bi-211	0.892			
	Pb-212	0.999	1.02E-01	1.69E-02	
	Bi-214	1.000	1.69E-01	2.68E-02	
	Pb-214	0.998	1.78E-01	2.23E-02	

Analysis Report for 18-Jun-19-10014

L1-10221B-FJGS-006SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
?	Ra-226	0.973	6.70E-01	1.86E-01	
?	U-235	0.999	4.26E-02	1.18E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 18-Jun-19-10014

L1-10221B-FJGS-006SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/18/2019 9:39:10AM
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	5.86E-02	4.96E-02	4.96E-02
	BE-7	477.60		10.44	2.34E-01	3.58E-01	3.58E-01
+	K-40	1460.82	*	10.66	2.85E+00	5.05E-01	5.05E-01
	Mn-54	834.85		99.98	-2.99E-02	2.92E-02	2.92E-02
	Co-60	1173.23		99.85	1.60E-02	4.65E-02	4.93E-02
		1332.49		99.98	6.26E-03		4.65E-02
	Nb-94	702.65		99.81	1.63E-02	3.11E-02	3.92E-02
		871.09		99.89	-1.49E-02		3.11E-02
	Ag-108m	79.13		6.60	1.90E-01	2.82E-02	1.33E+00
		433.94		90.50	-1.38E-02		2.82E-02
		614.28		89.80	-5.65E-02		6.04E-02
		722.94		90.80	3.07E-02		4.60E-02
	Sb-125	176.31		6.84	2.44E-02	9.68E-02	3.70E-01
		380.45		1.52	1.74E+00		1.88E+00
		427.87		29.60	2.04E-03		9.68E-02
		463.36		10.49	5.25E-02		3.33E-01
		600.60		17.65	2.10E-01		2.19E-01
		606.71		4.98	8.26E-01		1.16E+00
		635.95		11.22	-9.86E-02		2.75E-01

Analysis Report for 18-Jun-19-10014

L1-10221B-FJGS-006SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	1.01E+00	9.68E-02	1.83E+00
Ba-133	79.61	2.65	1.55E+00	6.42E-02	3.28E+00
	81.00	32.90	-3.58E-01		2.14E-01
	276.40	7.16	-1.68E-01		4.10E-01
	302.85	18.34	1.45E-01		1.72E-01
	356.01	62.05	-1.13E-02		6.42E-02
	383.85	8.94	4.69E-02		2.98E-01
Cs-134	475.36	1.48	-4.62E-01	3.67E-02	2.35E+00
	563.25	8.34	4.76E-02		4.13E-01
	569.33	15.37	-8.54E-03		2.26E-01
	604.72	97.62	-3.86E-03		5.57E-02
	795.86	85.46	-5.98E-03		3.67E-02
	801.95	8.69	-7.08E-02		4.14E-01
	1038.61	0.99	-9.06E-02		4.87E+00
	1167.97	1.79	-1.58E+00		2.45E+00
	1365.19	3.02	-2.79E-01		1.04E+00
Cs-137	661.66	85.10	2.26E-02	3.73E-02	3.73E-02
Eu-152	121.78	28.67	4.71E-02	9.83E-02	1.09E-01
	244.70	7.61	-1.87E-01		4.52E-01
	295.94	0.45	6.95E+00		8.39E+00
	344.28	26.60	-2.69E-02		9.83E-02
	367.79	0.86	-3.02E-01		3.59E+00
	411.12	2.24	-1.62E-01		1.37E+00
	443.96	2.83	6.15E-02		1.08E+00
	488.68	0.42	5.02E+00		8.11E+00
	563.99	0.49	2.40E-01		6.90E+00
	586.26	0.46	1.36E+01		1.09E+01
	678.62	0.47	4.32E+00		7.71E+00
	688.67	0.86	-1.65E+00		4.20E+00
	719.35	0.28	-3.98E+00		1.23E+01
	778.90	12.96	9.13E-02		3.39E-01
	810.45	0.32	-4.48E+00		1.18E+01
	867.37	4.26	-6.02E-02		8.67E-01
	919.33	0.43	2.28E+00		9.62E+00
	964.08	14.65	2.01E-01		3.40E-01
	1085.87	10.24	2.06E-01		4.18E-01
	1089.74	1.73	2.03E+00		2.54E+00
	1112.07	13.69	-4.84E-01		3.02E-01
	1212.95	1.43	-1.46E+00		3.15E+00
	1249.94	0.19	-4.10E+00		2.48E+01
	1299.14	1.63	-1.85E+00		2.66E+00
	1408.01	21.07	-1.28E-01		1.01E-01
	1457.64	0.50	7.12E+01		2.84E+01
	1528.10	0.28	1.65E+00		7.99E+00
Eu-154	123.07	40.40	-4.93E-02	7.44E-02	7.44E-02
	247.93	6.89	-1.39E-01		4.08E-01
	591.76	4.95	3.37E-01		6.22E-01
	692.42	1.78	-3.00E-01		2.04E+00
	723.30	20.06	1.76E-01		2.11E-01
	756.80	4.52	-4.92E-01		6.71E-01
	873.18	12.08	-7.33E-02		2.48E-01

Analysis Report for 18-Jun-19-10014

L1-10221B-FJGS-006SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	-4.37E-01	7.44E-02	3.25E-01
		1004.76		18.01	-1.52E-01		2.15E-01
		1274.43		34.80	-4.86E-02		1.26E-01
		1596.48		1.80	3.69E-01		2.42E+00
	Eu-155	45.30		1.31	-7.68E+00	1.86E-01	1.53E+01
		60.01		1.22	-2.58E+01		1.76E+01
		86.55		30.70	-1.51E-03		1.86E-01
		105.31		21.10	1.66E-01		1.98E-01
+	Ra-226	186.21	*	3.64	6.70E-01	5.31E-01	5.31E-01
	Pa-231	27.36		10.30	1.24E+00	1.26E+00	1.87E+00
		283.69		1.70	-1.70E+00		1.69E+00
		300.07		2.47	-7.74E-01		1.26E+00
		302.65		2.20	6.76E-01		1.41E+00
		330.06		1.40	8.86E-01		2.19E+00
+	U-235	143.76		10.96	-4.73E-03	3.38E-02	2.95E-01
		163.33		5.08	-2.79E-03		5.53E-01
		185.71	*	57.20	4.26E-02		3.38E-02
		202.11		1.08	-2.53E-01		2.68E+00
		205.31		5.01	-2.01E-01		5.48E-01
	Am-241	59.54		35.90	-2.58E-01	6.26E-01	6.26E-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

Apex-Gamma

Analysis Report for 18-Jun-19-10015

L1-10221B-FJGS-007SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 18-Jun-19-10015
Sample Description	: L1-10221B-FJGS-007SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.643E+03 grams
Facility	: Default
Sample Taken On	: 6/17/2019 8:40:00AM
Acquisition Started	: 6/18/2019 9:42:47AM
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	: 77448
Fill Height	: 1643.47 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/18/2019 9:57:50AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated 1700 6/18/19

Analysis Report for 18-Jun-19-10015

L1-10221B-FJGS-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	8.74E+01	17.73	1.02E+02	1.28
2	352.23	699 -	708	704.40	7.25E+01	12.07	3.25E+01	1.07
3	609.62	1213 -	1224	1218.82	6.64E+01	11.45	2.56E+01	1.45
4	1460.90	2916 -	2929	2921.86	2.35E+02	15.82	5.94E+00	1.62

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	4.34E+00	3.47E-01
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.21E-01	2.64E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.62E-01	2.96E-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		

Analysis Report for 18-Jun-19-10015

L1-10221B-FJGS-007SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	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	1.57E-01	2.90E-02
		785.96		1.06		

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.999	4.34E+00	3.47E-01	
Pb-212	1.000	1.21E-01	2.64E-02	
Bi-214	0.994	1.62E-01	2.96E-02	
Pb-214	0.992	1.57E-01	2.90E-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 18-Jun-19-10015

L1-10221B-FJGS-007SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/18/2019 9:57:50AM
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	2.42E-02	4.01E-02	4.01E-02
	BE-7	477.60		10.44	6.75E-02	3.28E-01	3.28E-01
+	K-40	1460.82	*	10.66	4.34E+00	2.96E-01	2.96E-01
	Mn-54	834.85		99.98	-3.96E-03	3.86E-02	3.86E-02
	Co-60	1173.23		99.85	-2.06E-03	4.27E-02	4.94E-02
		1332.49		99.98	-1.38E-03		4.27E-02
	Nb-94	702.65		99.81	1.53E-03	3.09E-02	3.28E-02
		871.09		99.89	1.83E-02		3.09E-02
	Ag-108m	79.13		6.60	3.10E-01	3.10E-02	1.02E+00
		433.94		90.50	-3.35E-03		3.10E-02
		614.28		89.80	-9.41E-03		5.31E-02
		722.94		90.80	8.41E-03		3.98E-02
	Sb-125	176.31		6.84	2.49E-02	9.76E-02	4.45E-01
		380.45		1.52	-1.78E-01		1.90E+00
		427.87		29.60	7.77E-03		9.76E-02
		463.36		10.49	7.98E-02		3.22E-01
		600.60		17.65	2.69E-03		1.90E-01
		606.71		4.98	-8.23E-02		1.19E+00
		635.95		11.22	7.03E-02		3.01E-01

Analysis Report for 18-Jun-19-10015

L1-10221B-FJGS-007SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	3.57E-01	9.76E-02	1.87E+00
Ba-133	79.61	2.65	9.69E-01	6.88E-02	2.47E+00
	81.00	32.90	-1.02E-01		1.68E-01
	276.40	7.16	1.69E-01		4.16E-01
	302.85	18.34	1.03E-01		1.69E-01
	356.01	62.05	-2.52E-02		6.88E-02
	383.85	8.94	-5.86E-02		3.24E-01
Cs-134	475.36	1.48	8.04E-01	4.51E-02	2.22E+00
	563.25	8.34	4.43E-02		3.63E-01
	569.33	15.37	5.19E-02		2.10E-01
	604.72	97.62	-1.22E-02		4.91E-02
	795.86	85.46	2.01E-02		4.51E-02
	801.95	8.69	-3.50E-01		3.46E-01
	1038.61	0.99	1.36E+00		3.86E+00
	1167.97	1.79	3.37E-03		2.67E+00
	1365.19	3.02	3.10E-02		1.07E+00
Cs-137	661.66	85.10	1.83E-02	4.73E-02	4.73E-02
Eu-152	121.78	28.67	1.41E-02	1.01E-01	1.01E-01
	244.70	7.61	-5.45E-02		4.36E-01
	295.94	0.45	1.96E+00		7.58E+00
	344.28	26.60	-5.33E-02		1.11E-01
	367.79	0.86	1.04E+00		3.60E+00
	411.12	2.24	1.17E-01		1.29E+00
	443.96	2.83	7.31E-02		1.02E+00
	488.68	0.42	-1.76E+00		6.36E+00
	563.99	0.49	-8.58E-01		6.08E+00
	586.26	0.46	1.55E+01		1.12E+01
	678.62	0.47	2.10E-02		6.66E+00
	688.67	0.86	1.54E+00		3.83E+00
	719.35	0.28	-1.10E+00		1.15E+01
	778.90	12.96	2.96E-02		2.75E-01
	810.45	0.32	4.06E+00		1.06E+01
	867.37	4.26	-2.40E-01		7.23E-01
	919.33	0.43	-6.78E+00		6.85E+00
	964.08	14.65	-1.61E-01		3.24E-01
	1085.87	10.24	1.92E-01		4.45E-01
	1089.74	1.73	4.42E-01		2.51E+00
	1112.07	13.69	4.31E-02		2.91E-01
	1212.95	1.43	2.57E-02		3.32E+00
	1249.94	0.19	-7.00E+00		2.22E+01
	1299.14	1.63	-7.95E-03		2.77E+00
	1408.01	21.07	-3.94E-02		1.77E-01
	1457.64	0.50	-8.82E+00		3.06E+01
	1528.10	0.28	1.69E+00		9.81E+00
Eu-154	123.07	40.40	-2.45E-02	6.86E-02	6.86E-02
	247.93	6.89	1.15E-01		4.28E-01
	591.76	4.95	-1.26E-01		5.36E-01
	692.42	1.78	1.50E+00		1.92E+00
	723.30	20.06	4.40E-02		1.83E-01
	756.80	4.52	2.70E-01		7.86E-01
	873.18	12.08	-2.56E-01		2.09E-01

Analysis Report for 18-Jun-19-10015

L1-10221B-FJGS-007SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.26E-01	6.86E-02	3.70E-01
	1004.76	18.01	4.35E-02		2.12E-01
	1274.43	34.80	-1.75E-01		1.04E-01
	1596.48	1.80	1.25E-01		1.82E+00
Eu-155	45.30	1.31	-5.59E-01	1.46E-01	9.90E+00
	60.01	1.22	-3.57E+00		1.06E+01
	86.55	30.70	6.72E-02		1.59E-01
	105.31	21.10	-6.08E-02		1.46E-01
Ra-226	186.21	3.64	5.82E-01	8.91E-01	8.91E-01
Pa-231	27.36	10.30	8.45E-01	1.08E+00	1.12E+00
	283.69	1.70	-2.50E-01		1.70E+00
	300.07	2.47	-2.30E+00		1.08E+00
	302.65	2.20	8.60E-01		1.41E+00
	330.06	1.40	1.36E-01		2.32E+00
U-235	143.76	10.96	3.82E-02	5.74E-02	2.54E-01
	163.33	5.08	-8.94E-02		6.26E-01
	185.71	57.20	4.27E-02		5.74E-02
	202.11	1.08	-1.31E-02		2.77E+00
	205.31	5.01	-6.97E-02		6.24E-01
Am-241	59.54	35.90	-6.38E-02	3.75E-01	3.75E-01

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

Apex-Gamma

Analysis Report for 18-Jun-19-10016

L1-10221B-FJGS-008SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 18-Jun-19-10016
Sample Description	: L1-10221B-FJGS-008SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.610E+03 grams
Facility	: Default
Sample Taken On	: 6/17/2019 8:42:00AM
Acquisition Started	: 6/18/2019 9:42:53AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.1 seconds
Dead Time	: 0.13 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/29/2019
Efficiency Calibration Used Done On	: 6/18/2019
Efficiency Calibration Description	:
Sample Number	: 77449
Fill Height	: 1609.72 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/18/2019 9:57:58AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated 1700 6/18/19

Analysis Report for 18-Jun-19-10016

L1-10221B-FJGS-008SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.55	946 -	960	954.31	1.23E+02	17.17	5.96E+01	1.10
2	295.08	1175 -	1185	1180.22	2.45E+01	9.00	2.35E+01	0.90
3	351.45	1401 -	1414	1405.54	3.75E+01	9.99	2.25E+01	1.15
4	582.78	2326 -	2337	2330.31	3.54E+01	7.97	1.06E+01	0.41
5	608.82	2428 -	2440	2434.44	4.99E+01	8.44	8.14E+00	0.87
6	1459.59	5829 -	5850	5838.17	1.86E+02	13.93	2.45E+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
Tl-208	0.97	583.19	*	85.00	5.84E-02	1.36E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	2.19E-01	3.52E-02
		300.09		3.30		
Bi-214	0.98	609.32	*	45.49	1.58E-01	2.84E-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		

Analysis Report for 18-Jun-19-10016

L1-10221B-FJGS-008SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.98	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	0.97	241.99		7.25		
		295.22	*	18.42	1.15E-01	4.35E-02
		351.93	*	35.60	1.04E-01	2.89E-02
		785.96		1.06		

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

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	Tl-208	0.973	5.84E-02	1.36E-02	
X	Bi-211	0.977			
	Pb-212	0.999	2.19E-01	3.52E-02	
	Bi-214	0.984	1.58E-01	2.84E-02	
	Pb-214	0.978	1.07E-01	2.41E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 18-Jun-19-10016

L1-10221B-FJGS-008SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/18/2019 9:57:58AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
6	1459.59	2.06163E-01	7.51		

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

NUCLIDE MDA REPORT

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

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
An Pk	511.00	100.00	6.01E-02	5.65E-02	5.65E-02
BE-7	477.60	10.44	-1.97E-02	4.20E-01	4.20E-01
K-40	1460.82	10.66	4.61E+00	1.71E+00	1.71E+00
Mn-54	834.85	99.98	1.73E-02	4.36E-02	4.36E-02
Co-60	1173.23	99.85	2.36E-02	5.81E-02	7.03E-02
	1332.49	99.98	1.53E-02		5.81E-02
Nb-94	702.65	99.81	1.39E-02	3.79E-02	3.79E-02
	871.09	99.89	1.79E-02		4.57E-02
Ag-108m	79.13	6.60	2.69E-01	3.33E-02	1.76E+00
	433.94	90.50	-3.15E-02		3.33E-02
	614.28	89.80	-4.03E-02		4.57E-02
	722.94	90.80	2.74E-02		5.36E-02
Sb-125	176.31	6.84	2.42E-02	1.16E-01	5.55E-01
	380.45	1.52	8.04E-01		2.29E+00
	427.87	29.60	2.16E-02		1.16E-01
	463.36	10.49	5.71E-02		3.79E-01
	600.60	17.65	6.00E-02		2.40E-01
	606.71	4.98	1.79E+00		1.29E+00

Analysis Report for 18-Jun-19-10016

L1-10221B-FJGS-008SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	635.95	11.22	-5.64E-02	1.16E-01	3.56E-01
	671.44	1.79	-1.29E+00		2.14E+00
Ba-133	79.61	2.65	5.15E-01	6.11E-02	4.19E+00
	81.00	32.90	-2.87E-01		2.87E-01
	276.40	7.16	5.22E-02		5.13E-01
	302.85	18.34	1.25E-01		2.03E-01
	356.01	62.05	-1.96E-02		6.11E-02
	383.85	8.94	-2.47E-01		3.57E-01
Cs-134	475.36	1.48	2.27E+00	5.63E-02	3.01E+00
	563.25	8.34	4.08E-02		4.49E-01
	569.33	15.37	1.58E-01		2.32E-01
	604.72	97.62	-1.80E-02		6.34E-02
	795.86	85.46	3.28E-02		5.63E-02
	801.95	8.69	1.54E-01		5.18E-01
	1038.61	0.99	-8.06E-01		5.10E+00
	1167.97	1.79	5.63E-01		3.59E+00
	1365.19	3.02	-6.04E-01		1.61E+00
Cs-137	661.66	85.10	9.20E-02	7.25E-02	7.25E-02
Eu-152	121.78	28.67	-7.33E-02	1.32E-01	1.55E-01
	244.70	7.61	4.44E-02		5.26E-01
	295.94	0.45	-2.58E-01		9.06E+00
	344.28	26.60	-2.45E-02		1.32E-01
	367.79	0.86	-1.65E+00		4.10E+00
	411.12	2.24	5.55E-01		1.80E+00
	443.96	2.83	-2.59E-01		1.41E+00
	488.68	0.42	-1.48E+00		8.62E+00
	563.99	0.49	-1.82E+00		7.22E+00
	586.26	0.46	2.96E-01		1.24E+01
	678.62	0.47	-6.18E+00		7.27E+00
	688.67	0.86	1.72E+00		5.25E+00
	719.35	0.28	-9.12E+00		1.44E+01
	778.90	12.96	2.01E-02		2.98E-01
	810.45	0.32	1.91E+00		1.44E+01
	867.37	4.26	-5.05E-01		1.09E+00
	919.33	0.43	-5.37E+00		1.01E+01
	964.08	14.65	2.17E-01		4.47E-01
	1085.87	10.24	-1.13E-01		3.91E-01
	1089.74	1.73	-2.31E+00		2.23E+00
	1112.07	13.69	-5.54E-02		3.85E-01
	1212.95	1.43	-4.65E+00		3.35E+00
	1249.94	0.19	2.81E+01		3.87E+01
	1299.14	1.63	-2.46E-01		3.35E+00
	1408.01	21.07	3.89E-03		1.88E-01
	1457.64	0.50	9.65E+01		3.62E+01
	1528.10	0.28	-5.53E+00		1.20E+01
Eu-154	123.07	40.40	-5.27E-03	1.11E-01	1.11E-01
	247.93	6.89	8.89E-02		5.15E-01
	591.76	4.95	3.01E-01		8.34E-01
	692.42	1.78	-2.97E+00		2.51E+00
	723.30	20.06	4.31E-02		2.39E-01
	756.80	4.52	-4.09E-01		7.94E-01

Analysis Report for 18-Jun-19-10016

L1-10221B-FJGS-008SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	873.18	12.08	-1.26E-01	1.11E-01	3.62E-01
	996.29	10.48	1.11E-01		4.36E-01
	1004.76	18.01	2.43E-01		3.18E-01
	1274.43	34.80	1.02E-02		1.89E-01
	1596.48	1.80	-7.81E-01		1.95E+00
Eu-155	45.30	1.31	1.25E+01	2.54E-01	3.02E+01
	60.01	1.22	1.23E+01		3.10E+01
	86.55	30.70	5.52E-02		2.54E-01
	105.31	21.10	-5.63E-02		2.54E-01
Ra-226	186.21	3.64	3.43E-01	1.03E+00	1.03E+00
Pa-231	27.36	10.30	2.07E+00	1.47E+00	3.49E+00
	283.69	1.70	2.72E-01		1.94E+00
	300.07	2.47	-7.01E-01		1.47E+00
	302.65	2.20	3.53E-01		1.67E+00
	330.06	1.40	2.02E+00		2.74E+00
U-235	143.76	10.96	-5.39E-02	6.52E-02	3.66E-01
	163.33	5.08	1.51E-01		7.28E-01
	185.71	57.20	2.15E-02		6.52E-02
	202.11	1.08	7.18E-01		3.34E+00
	205.31	5.01	-1.55E-01		7.25E-01
Am-241	59.54	35.90	6.55E-03	1.08E+00	1.08E+00

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

Apex-Gamma

Analysis Report for 15-Oct-19-10005

L1-10221B-FJGS-009SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 15-Oct-19-10005
Sample Description	: L1-10221B-FJGS-009SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.414E+03 grams
Facility	: Default
Sample Taken On	: 10/14/2019 1:00:00PM
Acquisition Started	: 10/15/2019 9:33:09AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.5 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	: 10/15/2019
Efficiency Calibration Description	:
Sample Number	: 80488
Fill Height	: 1414.13 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/15/2019 9:48:12AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

0602 10-16-19

Analysis Report for 15-Oct-19-10005

L1-10221B-FJGS-009SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.27	307 -	314	309.80	3.40E+01	12.16	5.60E+01	0.65
2	238.63	948 -	959	954.62	1.59E+02	18.16	6.85E+01	0.74
3	295.35	1173 -	1187	1181.31	5.37E+01	12.91	3.93E+01	1.11
4	351.98	1401 -	1416	1407.65	1.02E+02	14.52	3.65E+01	0.45
5	583.38	2325 -	2338	2332.72	4.78E+01	9.02	1.22E+01	0.83
6	609.32	2430 -	2441	2436.46	5.75E+01	10.31	1.95E+01	0.96
7	661.50	2640 -	2652	2645.11	3.89E+01	7.40	6.08E+00	0.70
8	768.50	3069 -	3078	3073.01	1.55E+01	5.70	7.50E+00	0.63
9	910.88	3636 -	3648	3642.46	3.44E+01	7.22	6.59E+00	0.82
10	1460.76	5831 -	5854	5842.87	3.44E+02	19.50	9.05E+00	2.20

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82	*	10.66	8.79E+00	6.28E-01
Cs-137	0.99	661.66	*	85.10	7.23E-02	1.44E-02
Tl-208	0.99	583.19	*	85.00	8.15E-02	1.61E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.88E-01	4.04E-02
		300.09		3.30		
Pb212-XR	0.99	74.82		10.28		

Analysis Report for 15-Oct-19-10005

L1-10221B-FJGS-009SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb212-XR	0.99	77.11	*	17.10	4.17E-01	1.55E-01
		87.35		3.97		
		89.78		1.46		
Bi-214	1.00	609.32	*	45.49	1.89E-01	3.57E-02
		768.36	*	4.89	5.54E-01	2.06E-01
		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	2.60E-01	6.60E-02
		351.93	*	35.60	2.90E-01	4.75E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	7.35E-01	2.75E-01
		87.35		2.24		
		89.78		0.82		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.62E-01	5.62E-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 15-Oct-19-10005

L1-10221B-FJGS-009SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.999	8.79E+00	6.28E-01	
	Cs-137	0.996	7.23E-02	1.44E-02	
	Tl-208	0.994	8.15E-02	1.61E-02	
X	Bi-211	0.876			
	Pb-212	1.000	2.88E-01	4.04E-02	
?	Pb212-XR	0.998	4.17E-01	1.55E-01	
	Bi-214	1.000	1.99E-01	3.52E-02	
	Pb-214	0.999	2.80E-01	3.85E-02	
?	Pb214-XR	0.998	7.35E-01	2.75E-01	
	Ac-228	0.995	2.62E-01	5.62E-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

Analysis Report for 15-Oct-19-10005

L1-10221B-FJGS-009SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/15/2019 9:48:12AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

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

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	1.22E-01	6.82E-02	6.82E-02
	BE-7	477.60		10.44	5.49E-01	5.72E-01	5.72E-01
+	K-40	1460.82	*	10.66	8.79E+00	5.96E-01	5.96E-01
	Mn-54	834.85		99.98	-5.93E-02	5.32E-02	5.32E-02
	Co-60	1173.23		99.85	-1.50E-03	8.43E-02	8.51E-02
		1332.49		99.98	1.02E-01		8.43E-02
	Nb-94	702.65		99.81	1.88E-02	5.35E-02	5.35E-02
		871.09		99.89	-1.06E-02		6.18E-02
	Ag-108m	79.13		6.60	-7.22E-01	5.37E-02	1.92E+00
		433.94		90.50	3.16E-02		5.37E-02
		614.28		89.80	-1.07E-01		7.09E-02
		722.94		90.80	4.62E-04		6.55E-02
	Sb-125	176.31		6.84	-2.13E-01	1.63E-01	6.32E-01
		380.45		1.52	2.50E-01		2.79E+00
		427.87		29.60	-3.89E-02		1.63E-01
		463.36		10.49	4.35E-02		5.03E-01
		600.60		17.65	-1.03E-01		2.72E-01
		606.71		4.98	1.64E+00		1.59E+00
		635.95		11.22	-1.19E-01		4.34E-01

Analysis Report for 15-Oct-19-10005

L1-10221B-FJGS-009SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	1.67E+00	1.63E-01	2.75E+00
	Ba-133	79.61		2.65	-5.55E-02	8.78E-02	4.79E+00
		81.00		32.90	-2.47E-01		3.14E-01
		276.40		7.16	-7.88E-02		6.34E-01
		302.85		18.34	2.20E-01		2.46E-01
		356.01		62.05	-1.05E-02		8.78E-02
		383.85		8.94	1.67E-01		5.24E-01
	Cs-134	475.36		1.48	3.64E+00	6.47E-02	3.96E+00
		563.25		8.34	-7.19E-02		6.01E-01
		569.33		15.37	-1.31E-01		2.97E-01
		604.72		97.62	-3.05E-02		7.37E-02
		795.86		85.46	8.86E-03		6.47E-02
		801.95		8.69	-1.28E-01		4.93E-01
		1038.61		0.99	-2.01E+00		5.94E+00
		1167.97		1.79	-1.09E-01		4.51E+00
		1365.19		3.02	3.92E-01		1.61E+00
+	Cs-137	661.66	*	85.10	7.23E-02	3.04E-02	3.04E-02
	Eu-152	121.78		28.67	-4.44E-02	1.68E-01	1.68E-01
		244.70		7.61	-3.42E-02		6.23E-01
		295.94		0.45	-3.33E+00		1.14E+01
		344.28		26.60	-2.55E-02		1.70E-01
		367.79		0.86	-1.18E+00		4.60E+00
		411.12		2.24	2.40E-01		2.12E+00
		443.96		2.83	-1.44E-01		1.54E+00
		488.68		0.42	7.37E+00		1.09E+01
		563.99		0.49	3.82E+00		1.02E+01
		586.26		0.46	-5.28E+00		1.49E+01
		678.62		0.47	-1.00E+00		1.01E+01
		688.67		0.86	1.44E+00		6.42E+00
		719.35		0.28	1.06E+01		1.69E+01
		778.90		12.96	-4.63E-01		3.79E-01
		810.45		0.32	1.26E+01		1.70E+01
		867.37		4.26	-1.26E+00		1.26E+00
		919.33		0.43	1.77E+00		1.31E+01
		964.08		14.65	5.74E-01		5.76E-01
		1085.87		10.24	-1.54E-01		5.02E-01
		1089.74		1.73	4.49E-01		3.57E+00
		1112.07		13.69	1.80E-01		4.49E-01
		1212.95		1.43	-3.53E+00		5.22E+00
		1249.94		0.19	1.87E+01		4.27E+01
		1299.14		1.63	1.51E+00		3.39E+00
		1408.01		21.07	-9.90E-02		2.45E-01
		1457.64		0.50	1.93E+02		5.08E+01
		1528.10		0.28	6.01E+00		1.46E+01
	Eu-154	123.07		40.40	1.99E-02	1.22E-01	1.22E-01
		247.93		6.89	4.53E-02		6.09E-01
		591.76		4.95	3.64E-01		9.48E-01
		692.42		1.78	-1.79E-01		3.15E+00
		723.30		20.06	1.90E-01		3.11E-01
		756.80		4.52	-2.27E-01		1.10E+00
		873.18		12.08	7.97E-02		5.18E-01

Analysis Report for 15-Oct-19-10005

L1-10221B-FJGS-009SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	3.35E-01	1.22E-01	5.90E-01
	1004.76	18.01	-2.36E-01		2.84E-01
	1274.43	34.80	-2.17E-01		1.90E-01
	1596.48	1.80	-2.64E+00		2.03E+00
Eu-155	45.30	1.31	-9.72E-01	2.96E-01	3.39E+01
	60.01	1.22	3.76E+00		3.46E+01
	86.55	30.70	8.83E-02		3.00E-01
	105.31	21.10	-4.80E-02		2.96E-01
Ra-226	186.21	3.64	6.30E-01	1.28E+00	1.28E+00
Pa-231	27.36	10.30	2.49E+00	1.86E+00	3.54E+00
	283.69	1.70	1.07E+00		2.38E+00
	300.07	2.47	4.17E-01		1.86E+00
	302.65	2.20	1.28E+00		2.04E+00
	330.06	1.40	2.26E+00		3.09E+00
U-235	143.76	10.96	-7.07E-02	8.03E-02	4.29E-01
	163.33	5.08	8.49E-01		9.45E-01
	185.71	57.20	7.71E-03		8.03E-02
	202.11	1.08	-2.84E+00		3.87E+00
	205.31	5.01	-7.36E-01		8.53E-01
Am-241	59.54	35.90	2.15E-01	1.23E+00	1.23E+00

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

Apex-Gamma

Analysis Report for 16-Oct-19-10005
L1-10221B-FJGS-009SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 16-Oct-19-10005
Sample Description	: L1-10221B-FJGS-009SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.414E+03 grams
Facility	: Default
Sample Taken On	: 10/14/2019 1:00:00PM
Acquisition Started	: 10/16/2019 8:25:14AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 1800.0 seconds
Real Time	: 1803.1 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	: 10/16/2019
Efficiency Calibration Description	:
Sample Number	: 80503
Fill Height	: 1414.13 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/16/2019 8:55:21AM

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

Data Validated
0630 10-17-19

Analysis Report for 16-Oct-19-10005
L1-10221B-FJGS-009SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	74.60	296 -	303	299.14	3.94E+01	16.64	1.18E+02	0.72
M	2	238.69	948 -	973	954.85	4.22E+02	22.04	1.09E+02	0.98
m	3	241.86	948 -	973	967.53	7.98E+01	11.12	9.04E+01	0.99
	4	295.27	1172 -	1188	1180.98	8.80E+01	22.65	1.36E+02	0.44
	5	338.45	1348 -	1361	1353.57	5.85E+01	17.11	8.45E+01	0.68
	6	351.99	1400 -	1416	1407.69	2.04E+02	21.08	7.65E+01	1.29
	7	477.44	1904 -	1915	1909.18	4.21E+01	12.71	4.69E+01	0.94
	8	583.23	2325 -	2340	2332.14	1.39E+02	15.30	3.16E+01	1.01
	9	609.34	2430 -	2445	2436.55	1.47E+02	15.19	2.83E+01	1.52
	10	661.68	2638 -	2654	2645.83	7.11E+01	12.70	2.89E+01	1.37
	11	911.13	3635 -	3653	3643.49	9.32E+01	11.53	1.18E+01	2.13
	12	968.88	3867 -	3883	3874.51	4.68E+01	10.93	2.33E+01	0.52
	13	1173.34	4686 -	4699	4692.55	4.34E+01	9.29	1.56E+01	1.41
	14	1332.40	5322 -	5336	5329.06	4.76E+01	8.64	9.39E+00	0.65
	15	1460.88	5831 -	5855	5843.34	5.99E+02	25.24	9.29E+00	1.76
	16	1764.47	7052 -	7066	7058.89	2.60E+01	5.65	1.96E+00	1.10

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
BE-7	0.99	477.60	*	10.44	2.61E-01	8.09E-02

Analysis Report for 16-Oct-19-10005

L1-10221B-FJGS-009SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.82	*	10.66	7.65E+00	4.63E-01
Co-60	0.99	1173.23	*	99.85	5.07E-02	1.10E-02
		1332.49	*	99.98	6.04E-02	1.12E-02
Cs-137	1.00	661.66	*	85.10	6.60E-02	1.24E-02
Tl-208	1.00	583.19	*	85.00	1.19E-01	1.49E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	3.83E-01	3.69E-02
		300.09		3.30		
Pb212-XR	0.99	74.82	*	10.28	4.66E-01	2.03E-01
		77.11		17.10		
		87.35		3.97		
		89.78		1.46		
Bi-214	1.00	609.32	*	45.49	2.41E-01	2.88E-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	2.69E-01	5.93E-02
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	4.39E-01	7.06E-02
		295.22	*	18.42	2.13E-01	5.75E-02
		351.93	*	35.60	2.90E-01	3.80E-02
		785.96		1.06		
Pb214-XR	0.99	74.82	*	5.80	8.27E-01	3.61E-01
		77.11		9.70		
		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	2.56E-01	7.77E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	3.55E-01	4.65E-02
		964.77		4.99		
		968.97	*	15.80	3.03E-01	7.22E-02
		1588.20		3.22		

Analysis Report for 16-Oct-19-10005

L1-10221B-FJGS-009SS

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

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	BE-7	0.996	2.61E-01	8.09E-02	
	K-40	1.000	7.65E+00	4.63E-01	
	Co-60	0.998	5.55E-02	7.87E-03	
	Cs-137	1.000	6.60E-02	1.24E-02	
	Tl-208	1.000	1.19E-01	1.49E-02	
X	Bi-211	0.874			
	Pb-212	0.999	3.83E-01	3.69E-02	
?	Pb212-XR	0.998	4.66E-01	2.03E-01	
	Bi-214	1.000	2.46E-01	2.59E-02	
	Pb-214	0.999	2.96E-01	2.89E-02	
?	Pb214-XR	0.998	8.27E-01	3.61E-01	
	Ac-228	0.999	3.23E-01	3.49E-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-Oct-19-10005

L1-10221B-FJGS-009SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/16/2019 8:55:21AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

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

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	5.06E-02	4.59E-02	4.59E-02
+	BE-7	477.60	*	10.44	2.61E-01	2.47E-01	2.47E-01
+	K-40	1460.82	*	10.66	7.65E+00	3.04E-01	3.04E-01
	Mn-54	834.85		99.98	-1.95E-02	4.15E-02	4.15E-02
+	Co-60	1173.23	*	99.85	5.07E-02	2.61E-02	2.93E-02
		1332.49	*	99.98	6.04E-02		2.61E-02
	Nb-94	702.65		99.81	2.06E-04	3.59E-02	3.59E-02
		871.09		99.89	-6.32E-03		3.90E-02
	Ag-108m	79.13		6.60	9.87E-01	3.33E-02	1.37E+00
		433.94		90.50	-3.83E-02		3.33E-02
		614.28		89.80	1.53E-03		5.13E-02
		722.94		90.80	1.72E-02		4.08E-02
	Sb-125	176.31		6.84	2.79E-01	1.10E-01	4.31E-01
		380.45		1.52	5.79E-01		1.86E+00
		427.87		29.60	1.79E-02		1.10E-01
		463.36		10.49	1.06E-01		3.23E-01
		600.60		17.65	8.76E-02		2.00E-01
		606.71		4.98	-5.75E-01		1.10E+00
		635.95		11.22	-1.55E-01		2.87E-01

Analysis Report for 16-Oct-19-10005

L1-10221B-FJGS-009SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	6.65E-01	1.10E-01	1.89E+00
	Ba-133	79.61		2.65	4.52E-01	6.32E-02	3.27E+00
		81.00		32.90	-1.34E-01		2.30E-01
		276.40		7.16	3.04E-01		4.51E-01
		302.85		18.34	4.58E-02		1.64E-01
		356.01		62.05	-4.44E-03		6.32E-02
		383.85		8.94	-1.97E-01		3.09E-01
	Cs-134	475.36		1.48	3.26E+00	4.75E-02	2.73E+00
		563.25		8.34	9.41E-02		4.00E-01
		569.33		15.37	1.26E-02		2.14E-01
		604.72		97.62	-2.96E-02		5.00E-02
		795.86		85.46	-4.61E-03		4.75E-02
		801.95		8.69	-7.59E-02		4.43E-01
		1038.61		0.99	-3.67E+00		4.07E+00
		1167.97		1.79	-2.27E+00		3.46E+00
		1365.19		3.02	1.40E-01		1.27E+00
+	Cs-137	661.66	*	85.10	6.60E-02	3.26E-02	3.26E-02
	Eu-152	121.78		28.67	5.39E-02	1.21E-01	1.25E-01
		244.70		7.61	-1.03E-02		4.37E-01
		295.94		0.45	6.95E+00		8.67E+00
		344.28		26.60	1.09E-02		1.21E-01
		367.79		0.86	-1.01E+00		3.30E+00
		411.12		2.24	-1.58E-02		1.38E+00
		443.96		2.83	-4.16E-01		1.11E+00
		488.68		0.42	-2.39E+00		7.12E+00
		563.99		0.49	2.67E+00		6.72E+00
		586.26		0.46	-9.56E-01		1.14E+01
		678.62		0.47	1.09E-01		7.03E+00
		688.67		0.86	1.85E+00		4.40E+00
		719.35		0.28	4.22E+00		1.20E+01
		778.90		12.96	-1.14E-01		2.75E-01
		810.45		0.32	-4.24E-01		1.13E+01
		867.37		4.26	-1.67E-01		9.39E-01
		919.33		0.43	-3.33E+00		8.96E+00
		964.08		14.65	5.80E-02		3.79E-01
		1085.87		10.24	2.90E-01		4.39E-01
		1089.74		1.73	-3.87E-01		2.47E+00
		1112.07		13.69	2.09E-02		3.69E-01
		1212.95		1.43	-2.04E-01		3.74E+00
		1249.94		0.19	-3.94E+00		2.39E+01
		1299.14		1.63	-1.05E+00		2.66E+00
		1408.01		21.07	1.38E-01		1.80E-01
		1457.64		0.50	1.60E+02		3.30E+01
		1528.10		0.28	-9.76E+00		8.23E+00
	Eu-154	123.07		40.40	-2.01E-02	8.50E-02	8.50E-02
		247.93		6.89	1.13E-01		4.42E-01
		591.76		4.95	-4.31E-02		7.15E-01
		692.42		1.78	-1.49E-03		2.06E+00
		723.30		20.06	4.81E-02		1.84E-01
		756.80		4.52	1.97E-02		7.90E-01
		873.18		12.08	-1.84E-02		3.14E-01

Analysis Report for 16-Oct-19-10005

L1-10221B-FJGS-009SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	6.68E-02	8.50E-02	4.23E-01
	1004.76	18.01	-4.77E-02		2.37E-01
	1274.43	34.80	2.51E-02		1.37E-01
	1596.48	1.80	-1.48E+00		1.84E+00
Eu-155	45.30	1.31	7.95E+00	2.03E-01	2.42E+01
	60.01	1.22	-4.53E+00		2.41E+01
	86.55	30.70	-1.30E-02		2.03E-01
	105.31	21.10	-9.88E-02		2.04E-01
Ra-226	186.21	3.64	1.64E-01	8.73E-01	8.73E-01
Pa-231	27.36	10.30	1.83E+00	1.26E+00	2.48E+00
	283.69	1.70	-1.35E+00		1.55E+00
	300.07	2.47	4.19E-01		1.26E+00
	302.65	2.20	-5.94E-01		1.34E+00
	330.06	1.40	-5.97E-01		2.32E+00
U-235	143.76	10.96	4.02E-02	5.62E-02	3.05E-01
	163.33	5.08	-3.70E-02		6.27E-01
	185.71	57.20	3.29E-02		5.62E-02
	202.11	1.08	2.42E-01		2.70E+00
	205.31	5.01	-2.46E-01		5.68E-01
Am-241	59.54	35.90	-3.19E-01	8.38E-01	8.38E-01

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

Apex-Gamma

Analysis Report for 15-Oct-19-10006

L1-10221B-QJGS-009SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 15-Oct-19-10006
Sample Description	: L1-10221B-QJGS-009SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.301E+03 grams
Facility	: Default
Sample Taken On	: 10/14/2019 1:00:00PM
Acquisition Started	: 10/15/2019 10:02:00AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.5 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	: 10/15/2019
Efficiency Calibration Description	:
Sample Number	: 80489
Fill Height	: 1300.53 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/15/2019 10:17:04AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

0603 15-Oct-19

Analysis Report for 15-Oct-19-10006

L1-10221B-QJGS-009SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.68	946 -	960	954.82	1.36E+02	19.13	8.03E+01	1.08
2	295.40	1173 -	1186	1181.50	6.40E+01	12.21	3.10E+01	0.88
3	338.42	1349 -	1358	1353.47	3.25E+01	9.03	2.15E+01	0.83
4	352.05	1400 -	1415	1407.94	1.08E+02	14.20	3.05E+01	0.63
5	609.31	2428 -	2443	2436.41	7.82E+01	11.22	1.58E+01	1.89
6	661.66	2641 -	2651	2645.74	2.23E+01	8.04	1.77E+01	1.37
7	910.97	3636 -	3650	3642.85	5.30E+01	7.68	1.98E+00	0.40
8	1460.94	5831 -	5855	5843.59	3.56E+02	18.87	0.00E+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	9.38E+00	6.43E-01
Cs-137	1.00	661.66	*	85.10	4.25E-02	1.55E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.52E-01	4.10E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	2.63E-01	4.10E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		

Analysis Report for 15-Oct-19-10006

L1-10221B-QJGS-009SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	3.18E-01	6.57E-02
		351.93	*	35.60	3.14E-01	4.85E-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	2.91E-01	8.43E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	4.15E-01	6.28E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

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

INTERFERENCE CORRECTED REPORT

Analysis Report for 15-Oct-19-10006

L1-10221B-QJGS-009SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.998	9.38E+00	6.43E-01	
	Cs-137	1.000	4.25E-02	1.55E-02	
X	Bi-211	0.857			
	Pb-212	1.000	2.52E-01	4.10E-02	
	Bi-214	1.000	2.63E-01	4.10E-02	
	Pb-214	0.997	3.15E-01	3.90E-02	
	Ac-228	0.997	3.71E-01	5.04E-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 15-Oct-19-10006

L1-10221B-QJGS-009SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/15/2019 10:17:04AM
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	7.58E-02	6.49E-02	6.49E-02
	BE-7	477.60		10.44	4.54E-01	5.73E-01	5.73E-01
+	K-40	1460.82	*	10.66	9.38E+00	7.58E-02	7.58E-02
	Mn-54	834.85		99.98	-1.96E-02	6.03E-02	6.03E-02
	Co-60	1173.23		99.85	6.92E-02	6.64E-02	8.60E-02
		1332.49		99.98	9.22E-03		6.64E-02
	Nb-94	702.65		99.81	5.88E-02	5.53E-02	5.94E-02
		871.09		99.89	1.22E-02		5.53E-02
	Ag-108m	79.13		6.60	7.78E-01	4.53E-02	2.24E+00
		433.94		90.50	-6.10E-02		4.53E-02
		614.28		89.80	-5.77E-02		7.38E-02
		722.94		90.80	-3.88E-02		6.01E-02
	Sb-125	176.31		6.84	1.24E-02	1.58E-01	6.32E-01
		380.45		1.52	8.16E-02		3.16E+00
		427.87		29.60	3.23E-02		1.58E-01
		463.36		10.49	8.72E-02		5.26E-01
		600.60		17.65	1.48E-01		2.95E-01
		606.71		4.98	2.43E+00		1.64E+00
		635.95		11.22	7.77E-02		4.62E-01

Analysis Report for 15-Oct-19-10006

L1-10221B-QJGS-009SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-1.48E+00	1.58E-01	2.71E+00
	Ba-133	79.61		2.65	-1.68E+00	9.62E-02	5.19E+00
		81.00		32.90	-5.62E-01		3.52E-01
		276.40		7.16	3.14E-01		6.70E-01
		302.85		18.34	1.95E-01		2.44E-01
		356.01		62.05	-1.27E-02		9.62E-02
		383.85		8.94	-1.15E-01		5.40E-01
	Cs-134	475.36		1.48	-1.11E+00	6.65E-02	3.78E+00
		563.25		8.34	-1.92E-02		5.98E-01
		569.33		15.37	5.52E-02		3.34E-01
		604.72		97.62	-1.14E-02		7.40E-02
		795.86		85.46	3.30E-02		6.65E-02
		801.95		8.69	-1.07E-02		5.18E-01
		1038.61		0.99	4.95E-01		6.21E+00
		1167.97		1.79	-1.62E+00		4.59E+00
		1365.19		3.02	3.60E-01		1.59E+00
+	Cs-137	661.66	*	85.10	4.25E-02	4.75E-02	4.75E-02
	Eu-152	121.78		28.67	-4.49E-03	1.76E-01	1.76E-01
		244.70		7.61	-1.93E-01		6.05E-01
		295.94		0.45	-4.41E-01		1.15E+01
		344.28		26.60	4.47E-02		1.76E-01
		367.79		0.86	6.28E-01		4.18E+00
		411.12		2.24	-5.40E-01		2.16E+00
		443.96		2.83	-1.39E+00		1.61E+00
		488.68		0.42	-2.27E+00		1.19E+01
		563.99		0.49	7.50E+00		1.07E+01
		586.26		0.46	1.91E+01		1.49E+01
		678.62		0.47	4.34E-01		9.56E+00
		688.67		0.86	3.46E+00		6.59E+00
		719.35		0.28	-5.46E+00		1.71E+01
		778.90		12.96	-5.20E-02		4.20E-01
		810.45		0.32	-1.05E+01		1.64E+01
		867.37		4.26	-6.63E-01		1.31E+00
		919.33		0.43	7.96E+00		1.34E+01
		964.08		14.65	5.12E-01		5.66E-01
		1085.87		10.24	-5.51E-02		6.49E-01
		1089.74		1.73	2.66E+00		4.23E+00
		1112.07		13.69	-2.36E-01		5.08E-01
		1212.95		1.43	-1.97E+00		5.38E+00
		1249.94		0.19	-3.03E+01		3.62E+01
		1299.14		1.63	-3.99E+00		4.01E+00
		1408.01		21.07	1.24E-01		2.70E-01
		1457.64		0.50	1.95E+02		5.23E+01
		1528.10		0.28	7.22E+00		1.61E+01
	Eu-154	123.07		40.40	7.45E-03	1.27E-01	1.27E-01
		247.93		6.89	2.60E-01		6.36E-01
		591.76		4.95	2.71E-01		1.06E+00
		692.42		1.78	-9.14E-01		2.83E+00
		723.30		20.06	3.87E-02		2.89E-01
		756.80		4.52	-3.53E-01		1.09E+00
		873.18		12.08	1.94E-01		4.66E-01

Analysis Report for 15-Oct-19-10006

L1-10221B-QJGS-009SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-3.78E-01	1.27E-01	5.41E-01
	1004.76	18.01	-7.61E-02		3.75E-01
	1274.43	34.80	-1.14E-01		2.09E-01
	1596.48	1.80	-3.00E+00		3.02E+00
Eu-155	45.30	1.31	-2.41E+01	2.86E-01	3.34E+01
	60.01	1.22	-1.69E-01		3.27E+01
	86.55	30.70	-6.95E-02		3.03E-01
	105.31	21.10	-2.65E-01		2.86E-01
Ra-226	186.21	3.64	1.09E+00	1.38E+00	1.38E+00
Pa-231	27.36	10.30	5.05E+00	1.77E+00	4.05E+00
	283.69	1.70	-4.82E-01		2.52E+00
	300.07	2.47	-1.46E+00		1.77E+00
	302.65	2.20	6.52E-01		1.99E+00
	330.06	1.40	2.43E+00		3.28E+00
U-235	143.76	10.96	-1.96E-01	8.90E-02	4.44E-01
	163.33	5.08	-1.05E-02		8.93E-01
	185.71	57.20	8.65E-02		8.90E-02
	202.11	1.08	-5.73E-02		3.81E+00
	205.31	5.01	-1.33E-01		8.54E-01
Am-241	59.54	35.90	3.49E-01	1.19E+00	1.19E+00

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

Apex-Gamma

Analysis Report for 16-Oct-19-10006

L1-10221B-QJGS-009SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 16-Oct-19-10006
Sample Description	: L1-10221B-QJGS-009SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.301E+03 grams
Facility	: Default
Sample Taken On	: 10/14/2019 1:00:00PM
Acquisition Started	: 10/16/2019 9:25:29AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 1800.0 seconds
Real Time	: 1803.0 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	: 10/16/2019
Efficiency Calibration Description	:
Sample Number	: 80504
Fill Height	: 1300.53 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/16/2019 9:55:42AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

0630 10-17-19

Analysis Report for 16-Oct-19-10006

L1-10221B-QJGS-009SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.91	294 -	315	300.37	4.51E+01	19.67	1.34E+02	0.60
m	2	77.15	294 -	315	309.33	8.38E+01	33.87	1.35E+02	0.60
	3	238.65	949 -	960	954.70	3.39E+02	26.64	1.48E+02	1.07
M	4	295.24	1174 -	1208	1180.86	1.57E+02	38.91	5.33E+01	1.22
m	5	300.19	1174 -	1208	1200.66	5.78E+01	15.77	7.26E+01	1.22
	6	338.33	1349 -	1362	1353.09	6.14E+01	14.62	5.36E+01	0.35
	7	352.00	1399 -	1415	1407.74	2.15E+02	21.63	8.07E+01	1.01
	8	477.56	1906 -	1916	1909.67	5.31E+01	10.87	2.69E+01	0.84
	9	510.44	2037 -	2051	2041.12	8.19E+01	13.96	3.91E+01	1.24
	10	583.27	2324 -	2340	2332.28	1.15E+02	15.75	4.25E+01	0.43
	11	609.35	2428 -	2446	2436.56	1.64E+02	16.07	2.80E+01	1.07
	12	661.60	2639 -	2653	2645.51	5.84E+01	11.66	2.66E+01	1.38
	13	911.17	3636 -	3653	3643.65	9.41E+01	11.64	1.29E+01	1.02
	14	968.82	3867 -	3881	3874.27	4.75E+01	10.90	2.45E+01	0.86
	15	1120.29	4474 -	4486	4480.28	2.58E+01	10.13	2.93E+01	0.69
	16	1238.45	4948 -	4959	4953.10	1.42E+01	8.33	2.18E+01	0.33
	17	1460.73	5830 -	5856	5842.75	6.67E+02	26.40	6.75E+00	1.97

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty

Analysis Report for 16-Oct-19-10006

L1-10221B-QJGS-009SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.95	511.00	*	100.00	5.69E-02	1.04E-02
BE-7	1.00	477.60	*	10.44	3.37E-01	7.31E-02
K-40	0.99	1460.82	*	10.66	8.79E+00	5.16E-01
Cs-137	1.00	661.66	*	85.10	5.57E-02	1.16E-02
Tl-208	0.99	583.19	*	85.00	1.00E-01	1.50E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	3.15E-01	3.55E-02
		300.09	*	3.30	8.09E-01	2.30E-01
Pb212-XR	0.99	74.82	*	10.28	5.30E-01	2.37E-01
		77.11	*	17.10	5.23E-01	2.18E-01
		87.35		3.97		
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	2.76E-01	3.17E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	2.01E-01	7.95E-02
		1155.21		1.63		
		1238.12	*	5.83	3.03E-01	1.78E-01
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	1.00	241.99		7.25		
		295.22	*	18.42	3.90E-01	1.01E-01
		351.93	*	35.60	3.14E-01	4.04E-02
		785.96		1.06		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	2.75E-01	6.92E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	3.69E-01	4.83E-02
		964.77		4.99		
		968.97	*	15.80	3.17E-01	7.41E-02
		1588.20		3.22		
Pa-231	1.00	27.36		10.30		
		283.69		1.70		
		300.07	*	2.47	1.08E+00	3.15E-01
		302.65		2.20		
		330.06		1.40		

Analysis Report for 16-Oct-19-10006

L1-10221B-QJGS-009SS

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

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.952	5.69E-02	1.04E-02	
	BE-7	1.000	3.37E-01	7.31E-02	
	K-40	0.999	8.79E+00	5.16E-01	
	Cs-137	1.000	5.57E-02	1.16E-02	
	Tl-208	0.999	1.00E-01	1.50E-02	
X	Bi-211	0.870			
	Pb-212	1.000	3.15E-01	3.53E-02	
	Pb212-XR	0.999	5.26E-01	1.61E-01	
	Bi-214	0.999	2.67E-01	2.91E-02	
	Pb-214	1.000	3.25E-01	3.75E-02	
X	Pb214-XR	0.999			
	Ac-228	0.999	3.33E-01	3.49E-02	
	Pa-231	1.000	6.60E-01	3.11E-01	

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

Errors quoted at 1.000sigma

Analysis Report for 16-Oct-19-10006

L1-10221B-QJGS-009SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/16/2019 9:55:42AM
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	5.69E-02	2.70E-02	2.70E-02
+	BE-7	477.60	*	10.44	3.37E-01	1.92E-01	1.92E-01
+	K-40	1460.82	*	10.66	8.79E+00	2.81E-01	2.81E-01
	Mn-54	834.85		99.98	-3.49E-02	3.97E-02	3.97E-02
	Co-60	1173.23		99.85	-2.30E-02	4.95E-02	5.31E-02
		1332.49		99.98	2.71E-02		4.95E-02
	Nb-94	702.65		99.81	2.65E-02	3.59E-02	3.59E-02
		871.09		99.89	1.08E-02		3.80E-02
	Ag-108m	79.13		6.60	1.35E-02	3.11E-02	1.35E+00
		433.94		90.50	-2.06E-02		3.11E-02
		614.28		89.80	-4.17E-03		5.20E-02
		722.94		90.80	-1.90E-02		4.47E-02
	Sb-125	176.31		6.84	-1.66E-01	9.64E-02	4.34E-01
		380.45		1.52	-2.25E-01		1.87E+00
		427.87		29.60	-5.68E-02		9.64E-02
		463.36		10.49	1.38E-01		3.20E-01
		600.60		17.65	-1.94E-02		2.00E-01
		606.71		4.98	4.76E-02		1.19E+00
		635.95		11.22	-2.99E-02		2.90E-01

Analysis Report for 16-Oct-19-10006

L1-10221B-QJGS-009SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	4.98E-01	9.64E-02	2.02E+00
	Ba-133	79.61		2.65	5.21E-01	6.63E-02	3.24E+00
		81.00		32.90	-4.24E-02		2.21E-01
		276.40		7.16	-5.64E-03		4.10E-01
		302.85		18.34	4.36E-02		1.82E-01
		356.01		62.05	2.51E-02		6.63E-02
		383.85		8.94	1.01E-01		3.19E-01
	Cs-134	475.36		1.48	1.65E+00	4.91E-02	2.56E+00
		563.25		8.34	2.24E-01		4.20E-01
		569.33		15.37	2.78E-02		2.29E-01
		604.72		97.62	-6.52E-03		5.40E-02
		795.86		85.46	1.72E-02		4.91E-02
		801.95		8.69	3.16E-01		4.37E-01
		1038.61		0.99	2.35E+00		4.12E+00
		1167.97		1.79	8.56E-01		2.92E+00
		1365.19		3.02	3.98E-01		1.27E+00
+	Cs-137	661.66	*	85.10	5.57E-02	3.12E-02	3.12E-02
	Eu-152	121.78		28.67	3.44E-02	1.10E-01	1.20E-01
		244.70		7.61	4.64E-01		4.68E-01
		295.94		0.45	-1.42E+00		8.60E+00
		344.28		26.60	5.97E-02		1.10E-01
		367.79		0.86	7.17E-01		3.40E+00
		411.12		2.24	-1.93E-02		1.40E+00
		443.96		2.83	-7.67E-01		1.10E+00
		488.68		0.42	4.86E+00		7.50E+00
		563.99		0.49	8.61E+00		7.35E+00
		586.26		0.46	-1.49E+00		1.12E+01
		678.62		0.47	1.59E+00		7.67E+00
		688.67		0.86	-1.94E-01		4.18E+00
		719.35		0.28	3.15E+00		1.25E+01
		778.90		12.96	-2.09E-02		2.87E-01
		810.45		0.32	1.84E+00		1.04E+01
		867.37		4.26	-8.53E-01		8.95E-01
		919.33		0.43	-1.81E+00		1.02E+01
		964.08		14.65	1.26E-02		4.09E-01
		1085.87		10.24	2.13E-01		4.98E-01
		1089.74		1.73	-1.92E+00		2.75E+00
		1112.07		13.69	9.07E-02		3.59E-01
		1212.95		1.43	1.24E+00		3.68E+00
		1249.94		0.19	6.97E+00		2.79E+01
		1299.14		1.63	2.25E+00		2.83E+00
		1408.01		21.07	1.91E-01		2.05E-01
		1457.64		0.50	-1.76E+00		3.59E+01
		1528.10		0.28	2.61E+00		9.69E+00
	Eu-154	123.07		40.40	1.23E-02	8.47E-02	8.47E-02
		247.93		6.89	-1.95E-01		4.35E-01
		591.76		4.95	-3.13E-01		6.61E-01
		692.42		1.78	-2.67E-01		1.87E+00
		723.30		20.06	4.63E-02		2.06E-01
		756.80		4.52	-3.33E-01		7.75E-01
		873.18		12.08	-8.52E-02		3.17E-01

Analysis Report for 16-Oct-19-10006

L1-10221B-QJGS-009SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	3.18E-01	8.47E-02	4.47E-01
		1004.76		18.01	8.74E-02		2.67E-01
		1274.43		34.80	-7.48E-02		1.41E-01
		1596.48		1.80	5.51E-03		1.99E+00
	Eu-155	45.30		1.31	1.27E+01	2.13E-01	2.36E+01
		60.01		1.22	1.56E+01		2.43E+01
		86.55		30.70	8.72E-02		2.13E-01
		105.31		21.10	-3.07E-02		2.18E-01
	Ra-226	186.21		3.64	3.05E-01	9.01E-01	9.01E-01
+	Pa-231	27.36		10.30	3.56E+00	8.18E-01	2.61E+00
		283.69		1.70	4.51E-01		1.76E+00
		300.07	*	2.47	1.08E+00		8.18E-01
		302.65		2.20	1.18E-01		1.51E+00
		330.06		1.40	1.50E+00		2.35E+00
	U-235	143.76		10.96	-3.82E-03	5.77E-02	3.12E-01
		163.33		5.08	1.39E-01		6.25E-01
		185.71		57.20	4.52E-02		5.77E-02
		202.11		1.08	1.49E-01		2.83E+00
		205.31		5.01	-5.89E-01		6.03E-01
	Am-241	59.54		35.90	-4.06E-02	8.46E-01	8.46E-01

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

Apex-Gamma

Analysis Report for 24-Jun-19-10008
L1-10221B-FIGS-100SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 24-Jun-19-10008
Sample Description	: L1-10221B-FIGS-100SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.499E+03 grams
Facility	: Default
Sample Taken On	: 6/20/2019 9:55:00AM
Acquisition Started	: 6/24/2019 8:02:02AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.3 seconds
Dead Time	: 0.15 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/29/2019
Efficiency Calibration Used Done On	: 6/24/2019
Efficiency Calibration Description	:
Sample Number	: 77575
Fill Height	: 1499.36 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/24/2019 8:17:06AM

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

Data Validated
0700 6-26-19

Analysis Report for 24-Jun-19-10008

L1-10221B-FIGS-100SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.45	948 -	959	953.88	1.26E+02	15.41	4.38E+01	0.95
2	295.11	1174 -	1184	1180.33	4.74E+01	10.29	2.46E+01	0.98
3	351.72	1397 -	1411	1406.61	8.13E+01	13.43	3.38E+01	1.20
4	582.75	2325 -	2335	2330.20	4.44E+01	8.67	1.26E+01	1.41
5	609.02	2429 -	2443	2435.24	5.31E+01	10.71	2.09E+01	0.32
6	661.26	2636 -	2652	2644.15	1.15E+02	12.37	1.24E+01	0.99
7	910.70	3636 -	3647	3641.75	2.91E+01	6.71	5.94E+00	1.29
8	1459.73	5827 -	5849	5838.76	2.40E+02	15.49	0.00E+00	1.02

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Cs-137	0.97	661.66	*	85.10	2.09E-01	2.58E-02
Tl-208	0.96	583.19	*	85.00	7.44E-02	1.52E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	2.26E-01	3.31E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.71E-01	3.61E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		

Analysis Report for 24-Jun-19-10008

L1-10221B-FIGS-100SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	2.27E-01	5.25E-02
		351.93	*	35.60	2.28E-01	4.19E-02
		785.96		1.06		
Ac-228	0.98	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.18E-01	5.11E-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 24-Jun-19-10008

L1-10221B-FIGS-100SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	Cs-137	0.976	2.09E-01	2.58E-02	
	Tl-208	0.969	7.44E-02	1.52E-02	
X	Bi-211	0.935			
	Pb-212	0.995	2.26E-01	3.31E-02	
	Bi-214	0.994	1.71E-01	3.61E-02	
	Pb-214	0.995	2.28E-01	3.28E-02	
	Ac-228	0.988	2.18E-01	5.11E-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 24-Jun-19-10008

L1-10221B-FIGS-100SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/24/2019 8:17:06AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
8	1459.73	2.66667E-01	6.45		

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	9.70E-02	6.23E-02	6.23E-02
BE-7	477.60	10.44	-2.92E-01	4.48E-01	4.48E-01
K-40	1460.82	10.66	5.76E+00	1.95E+00	1.95E+00
Mn-54	834.85	99.98	-3.44E-02	5.02E-02	5.02E-02
Co-60	1173.23	99.85	4.71E-02	7.59E-02	8.05E-02
	1332.49	99.98	5.50E-02		7.59E-02
Nb-94	702.65	99.81	2.47E-02	4.85E-02	5.07E-02
	871.09	99.89	2.36E-03		4.85E-02
Ag-108m	79.13	6.60	7.96E-01	5.06E-02	1.90E+00
	433.94	90.50	5.27E-03		5.06E-02
	614.28	89.80	-1.80E-02		5.94E-02
	722.94	90.80	1.45E-02		5.61E-02
Sb-125	176.31	6.84	5.99E-02	1.54E-01	5.49E-01
	380.45	1.52	3.09E+00		2.89E+00
	427.87	29.60	3.44E-02		1.54E-01
	463.36	10.49	7.26E-02		4.47E-01
	600.60	17.65	-2.49E-03		2.55E-01
	606.71	4.98	1.95E+00		1.48E+00

Analysis Report for 24-Jun-19-10008

L1-10221B-FIGS-100SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	635.95		11.22	-1.69E-02	1.54E-01	3.82E-01
		671.44		1.79	9.97E-01		2.78E+00
	Ba-133	79.61		2.65	-4.17E-01	8.04E-02	4.47E+00
		81.00		32.90	-3.33E-01		3.01E-01
		276.40		7.16	2.47E-01		5.71E-01
		302.85		18.34	8.96E-03		2.01E-01
		356.01		62.05	-1.13E-01		8.04E-02
		383.85		8.94	-3.93E-01		4.70E-01
	Cs-134	475.36		1.48	3.13E+00	5.55E-02	3.09E+00
		563.25		8.34	-9.92E-02		5.24E-01
		569.33		15.37	-1.30E-01		2.75E-01
		604.72		97.62	-2.48E-02		7.00E-02
		795.86		85.46	-3.31E-02		5.55E-02
		801.95		8.69	2.21E-01		5.19E-01
		1038.61		0.99	-7.49E-01		5.21E+00
		1167.97		1.79	6.46E-02		4.58E+00
		1365.19		3.02	1.10E+00		2.01E+00
+	Cs-137	661.66	*	85.10	2.09E-01	4.37E-02	4.37E-02
	Eu-152	121.78		28.67	9.96E-02	1.57E-01	1.63E-01
		244.70		7.61	1.05E-01		5.57E-01
		295.94		0.45	8.38E+00		1.05E+01
		344.28		26.60	6.62E-03		1.57E-01
		367.79		0.86	-2.85E+00		4.41E+00
		411.12		2.24	-4.68E-02		1.99E+00
		443.96		2.83	7.27E-01		1.52E+00
		488.68		0.42	2.77E+00		9.98E+00
		563.99		0.49	-3.45E+00		8.52E+00
		586.26		0.46	-7.46E+00		1.42E+01
		678.62		0.47	-7.98E+00		8.68E+00
		688.67		0.86	-2.70E+00		5.42E+00
		719.35		0.28	1.71E+01		1.69E+01
		778.90		12.96	-2.03E-01		3.60E-01
		810.45		0.32	-7.58E+00		1.29E+01
		867.37		4.26	-2.82E-02		1.24E+00
		919.33		0.43	-4.89E+00		1.18E+01
		964.08		14.65	3.83E-01		4.86E-01
		1085.87		10.24	3.21E-01		6.29E-01
		1089.74		1.73	3.15E-02		3.39E+00
		1112.07		13.69	-5.67E-02		4.41E-01
		1212.95		1.43	-2.81E+00		4.64E+00
		1249.94		0.19	-1.81E+01		3.27E+01
		1299.14		1.63	-9.19E-01		2.83E+00
		1408.01		21.07	9.87E-02		2.03E-01
		1457.64		0.50	1.26E+02		4.15E+01
		1528.10		0.28	-1.33E+01		1.23E+01
	Eu-154	123.07		40.40	-2.22E-02	1.11E-01	1.11E-01
		247.93		6.89	9.64E-02		5.41E-01
		591.76		4.95	-6.71E-01		8.49E-01
		692.42		1.78	1.05E+00		2.79E+00
		723.30		20.06	8.08E-02		2.57E-01
		756.80		4.52	6.01E-01		1.08E+00

Analysis Report for 24-Jun-19-10008

L1-10221B-FIGS-100SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	873.18	12.08	-3.40E-01	1.11E-01	3.94E-01
	996.29	10.48	1.34E-01		5.72E-01
	1004.76	18.01	-3.78E-03		2.73E-01
	1274.43	34.80	-1.11E-01		1.53E-01
	1596.48	1.80	1.12E+00		2.48E+00
Eu-155	45.30	1.31	-4.41E+00	2.60E-01	3.00E+01
	60.01	1.22	3.96E+00		2.97E+01
	86.55	30.70	1.61E-01		2.74E-01
	105.31	21.10	6.81E-02		2.60E-01
Ra-226	186.21	3.64	7.44E-01	1.17E+00	1.17E+00
Pa-231	27.36	10.30	4.05E+00	1.51E+00	3.63E+00
	283.69	1.70	-6.34E-01		2.20E+00
	300.07	2.47	-1.64E+00		1.51E+00
	302.65	2.20	6.81E-01		1.71E+00
	330.06	1.40	-1.42E+00		2.84E+00
U-235	143.76	10.96	-3.89E-03	7.56E-02	4.03E-01
	163.33	5.08	-4.48E-02		7.88E-01
	185.71	57.20	4.73E-02		7.56E-02
	202.11	1.08	-1.44E-01		3.82E+00
	205.31	5.01	-4.56E-01		7.55E-01
Am-241	59.54	35.90	8.54E-03	1.08E+00	1.08E+00

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

Apex-Gamma

Analysis Report for 24-Jun-19-10010
L1-10221B-FIGS-101SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 24-Jun-19-10010
Sample Description	: L1-10221B-FIGS-101SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.410E+03 grams
Facility	: Default
Sample Taken On	: 6/20/2019 9:57:00AM
Acquisition Started	: 6/24/2019 8:02:47AM
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	: 6/24/2019
Efficiency Calibration Description	:
Sample Number	: 77578
Fill Height	: 1409.77 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 6/24/2019 8:17:50AM

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

Data Validated
0700 6/26/19

Analysis Report for 24-Jun-19-10010

L1-10221B-FIGS-101SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.80	948 -	961	954.79	1.47E+02	16.22	4.21E+01	1.06
2	583.31	2323 -	2338	2331.34	5.03E+01	8.97	9.67E+00	1.33
3	910.96	3636 -	3648	3641.31	2.47E+01	6.64	7.30E+00	0.47
4	968.46	3867 -	3876	3871.26	1.56E+01	5.52	6.42E+00	0.34
5	1460.51	5828 -	5849	5840.00	2.28E+02	16.10	8.33E+00	2.35

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	5.24E+00	4.35E-01
Tl-208	0.99	583.19	*	85.00	7.74E-02	1.46E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	2.37E-01	3.25E-02
		300.09		3.30		
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		

Analysis Report for 24-Jun-19-10010

L1-10221B-FIGS-101SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Ac-228	0.98	794.95		4.25		
		911.20	*	25.80	1.70E-01	4.62E-02
		964.77		4.99		
		968.97	*	15.80	1.82E-01	6.52E-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

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.985	5.24E+00	4.35E-01	
Tl-208	0.998	7.74E-02	1.46E-02	
Pb-212	0.996	2.37E-01	3.25E-02	
Ac-228	0.989	1.74E-01	3.77E-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 24-Jun-19-10010

L1-10221B-FIGS-101SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/24/2019 8:17:50AM
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	4.75E-02	5.94E-02	5.94E-02
	BE-7	477.60		10.44	3.15E-02	3.29E-01	3.29E-01
+	K-40	1460.82	*	10.66	5.24E+00	5.04E-01	5.04E-01
	Mn-54	834.85		99.98	1.26E-02	4.36E-02	4.36E-02
	Co-60	1173.23		99.85	3.13E-02	3.95E-02	5.24E-02
		1332.49		99.98	-8.59E-03		3.95E-02
	Nb-94	702.65		99.81	-3.21E-02	3.78E-02	3.78E-02
		871.09		99.89	1.50E-02		4.09E-02
	Ag-108m	79.13		6.60	7.48E-01	3.37E-02	1.04E+00
		433.94		90.50	-6.56E-02		3.37E-02
		614.28		89.80	-1.87E-02		4.84E-02
		722.94		90.80	3.17E-02		5.28E-02
	Sb-125	176.31		6.84	3.49E-01	1.13E-01	4.17E-01
		380.45		1.52	8.47E-01		2.07E+00
		427.87		29.60	7.67E-03		1.13E-01
		463.36		10.49	1.11E-01		3.57E-01
		600.60		17.65	-1.19E-02		1.96E-01
		606.71		4.98	-9.47E-02		9.58E-01
		635.95		11.22	-1.30E-01		2.95E-01

Analysis Report for 24-Jun-19-10010

L1-10221B-FIGS-101SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	2.29E-01	1.13E-01	2.09E+00
Ba-133	79.61	2.65	2.60E+00	5.42E-02	2.55E+00
	81.00	32.90	-4.23E-01		1.48E-01
	276.40	7.16	-1.03E-01		4.38E-01
	302.85	18.34	7.86E-02		1.70E-01
	356.01	62.05	-4.84E-02		5.42E-02
	383.85	8.94	-1.84E-02		3.62E-01
Cs-134	475.36	1.48	-2.38E+00	4.07E-02	2.10E+00
	563.25	8.34	-2.27E-01		4.80E-01
	569.33	15.37	1.41E-01		2.29E-01
	604.72	97.62	-4.13E-02		4.42E-02
	795.86	85.46	9.01E-03		4.07E-02
	801.95	8.69	-1.53E-01		3.91E-01
	1038.61	0.99	-3.60E+00		4.22E+00
	1167.97	1.79	-1.09E+00		2.86E+00
	1365.19	3.02	4.40E-01		1.56E+00
Cs-137	661.66	85.10	1.53E-03	4.50E-02	4.50E-02
Eu-152	121.78	28.67	-1.27E-02	9.99E-02	9.99E-02
	244.70	7.61	1.85E-01		4.21E-01
	295.94	0.45	-2.51E+00		7.76E+00
	344.28	26.60	-1.37E-02		1.06E-01
	367.79	0.86	3.55E+00		3.80E+00
	411.12	2.24	-9.79E-01		1.45E+00
	443.96	2.83	-7.08E-01		1.14E+00
	488.68	0.42	2.88E+00		8.14E+00
	563.99	0.49	-7.90E+00		7.35E+00
	586.26	0.46	2.54E-01		1.28E+01
	678.62	0.47	2.87E+00		8.11E+00
	688.67	0.86	1.03E+00		4.24E+00
	719.35	0.28	4.17E+00		1.40E+01
	778.90	12.96	-6.15E-03		2.64E-01
	810.45	0.32	3.74E-01		1.13E+01
	867.37	4.26	-9.03E-01		8.88E-01
	919.33	0.43	5.74E+00		1.12E+01
	964.08	14.65	-1.74E-01		4.59E-01
	1085.87	10.24	9.75E-03		5.14E-01
	1089.74	1.73	-1.19E+00		2.94E+00
	1112.07	13.69	-8.15E-02		3.44E-01
	1212.95	1.43	7.81E-01		4.33E+00
	1249.94	0.19	9.90E+00		3.22E+01
	1299.14	1.63	1.63E+00		3.37E+00
	1408.01	21.07	1.42E-02		2.36E-01
	1457.64	0.50	1.17E+02		3.79E+01
	1528.10	0.28	4.51E+00		1.23E+01
Eu-154	123.07	40.40	-3.39E-02	6.89E-02	6.89E-02
	247.93	6.89	-5.62E-02		4.20E-01
	591.76	4.95	-4.96E-02		5.56E-01
	692.42	1.78	2.93E-01		2.14E+00
	723.30	20.06	1.80E-01		2.42E-01
	756.80	4.52	1.19E-03		9.93E-01
	873.18	12.08	-2.25E-01		3.31E-01

Analysis Report for 24-Jun-19-10010

L1-10221B-FIGS-101SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	2.70E-02	6.89E-02	4.18E-01
	1004.76	18.01	2.31E-02		2.33E-01
	1274.43	34.80	1.34E-02		1.59E-01
	1596.48	1.80	-1.10E+00		1.41E+00
Eu-155	45.30	1.31	-1.15E+00	1.66E-01	9.93E+00
	60.01	1.22	-4.13E+00		1.02E+01
	86.55	30.70	4.92E-02		1.66E-01
	105.31	21.10	6.57E-02		1.81E-01
Ra-226	186.21	3.64	7.44E-01	8.50E-01	8.50E-01
Pa-231	27.36	10.30	3.35E-01	1.02E+00	1.02E+00
	283.69	1.70	2.42E-01		1.80E+00
	300.07	2.47	-1.27E+00		1.15E+00
	302.65	2.20	5.53E-01		1.39E+00
	330.06	1.40	1.79E+00		2.61E+00
U-235	143.76	10.96	-3.88E-03	5.32E-02	2.80E-01
	163.33	5.08	3.83E-01		5.52E-01
	185.71	57.20	2.70E-02		5.32E-02
	202.11	1.08	4.55E-01		2.67E+00
	205.31	5.01	-3.07E-01		5.43E-01
Am-241	59.54	35.90	-6.81E-02	3.61E-01	3.61E-01

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

Apex-Gamma

Analysis Report for 09-Jul-19-10008
L1-10221B-FIGS-102SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 09-Jul-19-10008
Sample Description	: L1-10221B-FIGS-102SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.549E+03 grams
Facility	: Default
Sample Taken On	: 7/8/2019 1:10:00PM
Acquisition Started	: 7/9/2019 8:26:02AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.8 seconds
Dead Time	: 0.20 %
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	: 77816
Fill Height	: 1548.74 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/9/2019 8:41:06AM

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

Data Validated
1530 7/9/19

Analysis Report for 09-Jul-19-10008

L1-10221B-FIGS-102SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.53	946 -	959	954.23	1.20E+02	18.64	8.16E+01	0.86
2	295.08	1176 -	1186	1180.22	3.87E+01	13.28	5.73E+01	0.63
3	338.11	1347 -	1356	1352.20	2.56E+01	9.93	3.24E+01	0.27
4	351.71	1400 -	1413	1406.59	6.89E+01	14.10	4.71E+01	0.65
5	582.90	2324 -	2338	2330.79	4.89E+01	10.06	1.81E+01	1.23
6	608.83	2430 -	2444	2434.49	6.37E+01	10.39	1.53E+01	0.95
7	661.25	2635 -	2653	2644.09	5.26E+02	24.70	2.54E+01	1.09
8	910.70	3636 -	3648	3641.77	4.10E+01	8.26	1.00E+01	1.27
9	1172.52	4680 -	4699	4689.24	1.11E+02	11.34	5.00E+00	0.63
10	1331.64	5318 -	5336	5326.04	7.96E+01	10.27	7.40E+00	1.02
11	1459.86	5828 -	5851	5839.29	2.96E+02	17.52	2.84E+00	1.22

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	0.86	1460.82	*	10.66	7.35E+00	5.40E-01
Co-60	0.90	1173.23	*	99.85	2.52E-01	2.77E-02
		1332.49	*	99.98	1.96E-01	2.65E-02
Cs-137	0.97	661.66	*	85.10	9.51E-01	7.25E-02
Tl-208	0.98	583.19	*	85.00	8.13E-02	1.74E-02
Pb-212	0.99	115.18		0.60		

Analysis Report for 09-Jul-19-10008

L1-10221B-FIGS-102SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb-212	0.99	238.63	*	43.60	2.15E-01	3.75E-02
		300.09		3.30		
Bi-214	0.98	609.32	*	45.49	2.04E-01	3.55E-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	1.84E-01	6.48E-02
		351.93	*	35.60	1.92E-01	4.23E-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	2.19E-01	8.70E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	3.04E-01	6.27E-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 09-Jul-19-10008

L1-10221B-FIGS-102SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.863	7.35E+00	5.40E-01	
	Co-60	0.906	2.23E-01	1.92E-02	
	Cs-137	0.974	9.51E-01	7.25E-02	
	Tl-208	0.986	8.13E-02	1.74E-02	
X	Bi-211	0.936			
	Pb-212	0.999	2.15E-01	3.75E-02	
	Bi-214	0.984	2.04E-01	3.55E-02	
	Pb-214	0.995	1.90E-01	3.54E-02	
	Ac-228	0.987	2.75E-01	5.09E-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-19-10008

L1-10221B-FIGS-102SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/9/2019 8:41:06AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

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

All peaks were identified.

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	5.61E-02	7.03E-02	7.03E-02
	BE-7	477.60		10.44	2.37E-01	5.68E-01	5.68E-01
+	K-40	1460.82	*	10.66	7.35E+00	3.50E-01	3.50E-01
	Mn-54	834.85		99.98	1.54E-02	5.19E-02	5.19E-02
+	Co-60	1173.23	*	99.85	2.52E-01	3.88E-02	3.88E-02
		1332.49	*	99.98	1.96E-01		4.97E-02
	Nb-94	702.65		99.81	5.62E-03	5.34E-02	5.34E-02
		871.09		99.89	3.71E-04		5.41E-02
	Ag-108m	79.13		6.60	5.50E-01	5.85E-02	2.27E+00
		433.94		90.50	1.36E-02		6.03E-02
		614.28		89.80	-1.26E-02		6.17E-02
		722.94		90.80	-2.57E-02		5.85E-02
	Sb-125	176.31		6.84	-6.45E-02	1.89E-01	7.13E-01
		380.45		1.52	-9.88E-01		3.41E+00
		427.87		29.60	-6.40E-02		1.89E-01
		463.36		10.49	3.31E-01		6.22E-01
		600.60		17.65	1.90E-01		3.09E-01
		606.71		4.98	2.04E+00		1.55E+00
		635.95		11.22	1.98E-01		5.10E-01

Analysis Report for 09-Jul-19-10008

L1-10221B-FIGS-102SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	1.88E+00	1.89E-01	3.02E+00
	Ba-133	79.61		2.65	-4.12E+00	8.41E-02	5.21E+00
		81.00		32.90	-3.70E-02		3.80E-01
		276.40		7.16	-2.96E-01		6.08E-01
		302.85		18.34	-4.46E-02		2.65E-01
		356.01		62.05	-3.62E-02		8.41E-02
		383.85		8.94	-8.38E-02		6.16E-01
	Cs-134	475.36		1.48	2.29E+00	6.47E-02	4.00E+00
		563.25		8.34	7.16E-03		5.04E-01
		569.33		15.37	-1.87E-01		2.97E-01
		604.72		97.62	-8.69E-02		7.73E-02
		795.86		85.46	3.17E-02		6.47E-02
		801.95		8.69	2.86E-01		6.15E-01
		1038.61		0.99	-1.02E+00		5.58E+00
		1167.97		1.79	1.16E+00		7.37E+00
		1365.19		3.02	-6.84E-01		1.79E+00
+	Cs-137	661.66	*	85.10	9.51E-01	6.16E-02	6.16E-02
	Eu-152	121.78		28.67	-9.52E-02	1.85E-01	1.85E-01
		244.70		7.61	2.00E-01		6.80E-01
		295.94		0.45	7.29E+00		1.29E+01
		344.28		26.60	2.23E-02		1.90E-01
		367.79		0.86	1.34E+00		5.48E+00
		411.12		2.24	8.99E-01		2.38E+00
		443.96		2.83	3.70E-01		2.06E+00
		488.68		0.42	-6.58E+00		1.34E+01
		563.99		0.49	-5.27E+00		8.57E+00
		586.26		0.46	-6.32E-01		1.51E+01
		678.62		0.47	-4.04E+00		1.03E+01
		688.67		0.86	2.17E+00		6.20E+00
		719.35		0.28	3.23E+00		1.92E+01
		778.90		12.96	-1.01E-01		4.04E-01
		810.45		0.32	-1.54E+01		1.81E+01
		867.37		4.26	-8.06E-01		1.19E+00
		919.33		0.43	6.85E+00		1.56E+01
		964.08		14.65	3.72E-01		5.69E-01
		1085.87		10.24	-8.29E-01		6.23E-01
		1089.74		1.73	1.14E+00		4.05E+00
		1112.07		13.69	-1.44E-01		5.19E-01
		1212.95		1.43	1.08E+00		5.98E+00
		1249.94		0.19	-1.88E+00		3.30E+01
		1299.14		1.63	5.23E-01		4.29E+00
		1408.01		21.07	1.65E-01		2.97E-01
		1457.64		0.50	1.54E+02		4.53E+01
		1528.10		0.28	7.99E-01		1.51E+01
	Eu-154	123.07		40.40	4.83E-02	1.32E-01	1.32E-01
		247.93		6.89	-3.34E-01		6.64E-01
		591.76		4.95	-4.90E-02		1.03E+00
		692.42		1.78	1.48E+00		3.04E+00
		723.30		20.06	-5.23E-04		2.68E-01
		756.80		4.52	-4.11E-01		1.20E+00
		873.18		12.08	1.65E-01		4.75E-01

Analysis Report for 09-Jul-19-10008

L1-10221B-FIGS-102SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	2.43E-02	1.32E-01	6.07E-01
	1004.76	18.01	1.58E-01		3.31E-01
	1274.43	34.80	5.16E-02		2.10E-01
	1596.48	1.80	8.95E-01		3.08E+00
Eu-155	45.30	1.31	-6.41E+00	3.01E-01	3.66E+01
	60.01	1.22	-1.99E+01		3.52E+01
	86.55	30.70	-5.21E-02		3.01E-01
	105.31	21.10	3.14E-02		3.27E-01
Ra-226	186.21	3.64	3.68E-02	1.30E+00	1.30E+00
Pa-231	27.36	10.30	4.07E+00	2.03E+00	4.15E+00
	283.69	1.70	-1.25E+00		2.84E+00
	300.07	2.47	8.13E-01		2.03E+00
	302.65	2.20	-8.75E-01		2.19E+00
	330.06	1.40	8.71E-01		3.71E+00
U-235	143.76	10.96	1.85E-01	8.31E-02	4.70E-01
	163.33	5.08	4.99E-01		9.61E-01
	185.71	57.20	6.49E-04		8.31E-02
	202.11	1.08	-3.00E-01		4.56E+00
	205.31	5.01	-4.93E-01		9.62E-01
Am-241	59.54	35.90	2.33E-01	1.28E+00	1.28E+00

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

Apex-Gamma

Analysis Report for 09-Jul-19-10009
L1-10221B-FIGS-103SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 09-Jul-19-10009
Sample Description	: L1-10221B-FIGS-103SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.640E+03 grams
Facility	: Default
Sample Taken On	: 7/8/2019 1:12:00PM
Acquisition Started	: 7/9/2019 8:26:09AM
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	: 7/9/2019
Efficiency Calibration Description	:
Sample Number	: 77817
Fill Height	: 1639.99 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/9/2019 8:41:11AM

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

Data Validated
1530 7/9/19

Analysis Report for 09-Jul-19-10009

L1-10221B-FIGS-103SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.83	947 - 961		954.90	1.03E+02	20.57	1.10E+02	1.09
2	295.57	1174 - 1188		1181.54	5.08E+01	13.52	4.53E+01	0.71
3	352.10	1401 - 1415		1407.39	8.83E+01	13.73	3.47E+01	1.19
4	382.14	1524 - 1532		1527.45	1.69E+01	6.71	1.31E+01	0.54
5	583.23	2325 - 2338		2331.03	4.66E+01	8.82	1.14E+01	0.55
6	609.28	2428 - 2441		2435.17	6.75E+01	9.90	1.05E+01	1.19
7	661.58	2636 - 2653		2644.23	4.70E+02	23.10	1.97E+01	1.60
8	910.92	3634 - 3647		3641.15	3.18E+01	8.51	1.42E+01	0.30
9	968.71	3867 - 3877		3872.27	2.05E+01	5.79	5.50E+00	0.29
10	1172.86	4680 - 4697		4688.89	7.76E+01	12.27	2.24E+01	1.19
11	1331.99	5317 - 5334		5325.59	9.41E+01	10.81	6.87E+00	1.21
12	1460.49	5828 - 5851		5839.91	2.97E+02	17.92	6.00E+00	1.31

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
K-40	0.98	1460.82	*	10.66	6.54E+00	4.86E-01
Co-60	0.96	1173.23	*	99.85	1.57E-01	2.55E-02
		1332.49	*	99.98	2.06E-01	2.50E-02
Cs-137	0.99	661.66	*	85.10	7.58E-01	5.88E-02
Tl-208	1.00	583.19	*	85.00	6.90E-02	1.37E-02

Analysis Report for 09-Jul-19-10009

L1-10221B-FIGS-103SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.61E-01	3.48E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	1.93E-01	3.05E-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	2.14E-01	5.96E-02
		351.93	*	35.60	2.19E-01	3.84E-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	2.10E-01	5.70E-02
		964.77		4.99		
		968.97	*	15.80	2.30E-01	6.59E-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-19-10009

L1-10221B-FIGS-103SS

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.983	6.54E+00	4.86E-01	
Co-60	0.969	1.82E-01	1.79E-02	
Cs-137	0.999	7.58E-01	5.88E-02	
Tl-208	1.000	6.90E-02	1.37E-02	
Pb-212	0.994	1.61E-01	3.48E-02	
Bi-214	1.000	1.93E-01	3.05E-02	
Pb-214	0.992	2.18E-01	3.23E-02	
Ac-228	0.994	2.19E-01	4.31E-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-19-10009

L1-10221B-FIGS-103SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/9/2019 8:41:11AM
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	382.14	1.88148E-02	39.64		

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	4.53E-02	5.91E-02	5.91E-02
	BE-7	477.60		10.44	4.33E-01	5.35E-01	5.35E-01
+	K-40	1460.82	*	10.66	6.54E+00	4.29E-01	4.29E-01
	Mn-54	834.85		99.98	-6.03E-03	4.47E-02	4.47E-02
+	Co-60	1173.23	*	99.85	1.57E-01	4.16E-02	6.43E-02
		1332.49	*	99.98	2.06E-01		4.16E-02
	Nb-94	702.65		99.81	-2.50E-02	4.59E-02	4.59E-02
		871.09		99.89	-7.03E-03		4.96E-02
	Ag-108m	79.13		6.60	1.22E+00	5.57E-02	1.29E+00
		433.94		90.50	1.02E-02		5.66E-02
		614.28		89.80	-2.06E-02		6.33E-02
		722.94		90.80	-5.49E-03		5.57E-02
	Sb-125	176.31		6.84	2.38E-01	1.64E-01	5.47E-01
		380.45		1.52	1.89E-01		2.71E+00
		427.87		29.60	1.53E-02		1.64E-01
		463.36		10.49	2.13E-01		5.03E-01
		600.60		17.65	1.24E-01		2.78E-01
		606.71		4.98	8.35E-01		1.32E+00

Analysis Report for 09-Jul-19-10009

L1-10221B-FIGS-103SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	635.95		11.22	1.65E-01	1.64E-01	4.13E-01
		671.44		1.79	-1.97E+00		2.39E+00
	Ba-133	79.61		2.65	3.05E+00	7.71E-02	3.12E+00
		81.00		32.90	-2.45E-01		2.10E-01
		276.40		7.16	-5.75E-02		5.64E-01
		302.85		18.34	-1.02E-01		2.16E-01
		356.01		62.05	3.33E-03		7.71E-02
		383.85		8.94	-1.94E-01		4.68E-01
	Cs-134	475.36		1.48	2.08E+00	5.95E-02	3.73E+00
		563.25		8.34	-1.21E+00		5.17E-01
		569.33		15.37	1.44E-01		3.23E-01
		604.72		97.62	-2.33E-02		5.95E-02
		795.86		85.46	5.46E-03		5.97E-02
		801.95		8.69	4.95E-01		6.49E-01
		1038.61		0.99	3.62E-01		5.48E+00
		1167.97		1.79	-1.24E+00		6.08E+00
		1365.19		3.02	7.33E-01		1.59E+00
+	Cs-137	661.66	*	85.10	7.58E-01	4.82E-02	4.82E-02
	Eu-152	121.78		28.67	-2.38E-02	1.42E-01	1.42E-01
		244.70		7.61	3.02E-01		5.78E-01
		295.94		0.45	9.89E+00		1.03E+01
		344.28		26.60	5.57E-02		1.77E-01
		367.79		0.86	1.53E+00		5.07E+00
		411.12		2.24	-8.93E-01		1.97E+00
		443.96		2.83	1.07E+00		1.83E+00
		488.68		0.42	-1.42E+00		1.16E+01
		563.99		0.49	-9.41E+00		8.88E+00
		586.26		0.46	-1.50E+00		1.25E+01
		678.62		0.47	3.15E+00		9.37E+00
		688.67		0.86	-1.45E+00		4.71E+00
		719.35		0.28	-5.33E+00		1.75E+01
		778.90		12.96	-1.71E-01		3.55E-01
		810.45		0.32	-1.33E+01		1.59E+01
		867.37		4.26	-1.94E-01		1.13E+00
		919.33		0.43	-6.18E+00		1.20E+01
		964.08		14.65	-5.42E-02		4.65E-01
		1085.87		10.24	-3.35E-01		6.07E-01
		1089.74		1.73	1.20E+00		4.01E+00
		1112.07		13.69	-7.11E-02		4.83E-01
		1212.95		1.43	-2.69E+00		4.90E+00
		1249.94		0.19	-2.04E+01		2.93E+01
		1299.14		1.63	1.36E+00		3.42E+00
		1408.01		21.07	1.79E-02		2.39E-01
		1457.64		0.50	1.39E+02		4.05E+01
		1528.10		0.28	-1.33E+00		1.26E+01
	Eu-154	123.07		40.40	-1.00E-02	1.01E-01	1.01E-01
		247.93		6.89	-5.57E-02		5.65E-01
		591.76		4.95	8.91E-02		8.44E-01
		692.42		1.78	1.23E-01		2.52E+00
		723.30		20.06	5.00E-02		2.52E-01
		756.80		4.52	2.34E-01		1.04E+00

Analysis Report for 09-Jul-19-10009

L1-10221B-FIGS-103SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	873.18	12.08	-3.73E-01	1.01E-01	4.28E-01
	996.29	10.48	-1.21E-01		5.18E-01
	1004.76	18.01	-4.19E-02		2.95E-01
	1274.43	34.80	-2.43E-02		1.52E-01
	1596.48	1.80	7.60E-01		2.73E+00
Eu-155	45.30	1.31	-4.80E+00	2.05E-01	1.26E+01
	60.01	1.22	5.05E+00		1.43E+01
	86.55	30.70	8.64E-02		2.05E-01
	105.31	21.10	5.33E-02		2.15E-01
Ra-226	186.21	3.64	1.03E+00	1.10E+00	1.10E+00
Pa-231	27.36	10.30	8.44E-01	1.22E+00	1.22E+00
	283.69	1.70	-1.69E-01		2.20E+00
	300.07	2.47	3.88E-01		1.69E+00
	302.65	2.20	-6.52E-01		1.82E+00
	330.06	1.40	-5.68E-01		2.93E+00
U-235	143.76	10.96	-9.32E-02	6.90E-02	3.14E-01
	163.33	5.08	-2.77E-01		7.11E-01
	185.71	57.20	4.02E-02		6.90E-02
	202.11	1.08	-7.83E-01		3.32E+00
	205.31	5.01	-8.32E-01		7.11E-01
Am-241	59.54	35.90	-7.03E-02	4.92E-01	4.92E-01

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

Apex-Gamma

Analysis Report for 09-Jul-19-10010
L1-10221B-FIGS-104SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 09-Jul-19-10010
Sample Description	: L1-10221B-FIGS-104SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.685E+03 grams
Facility	: Default
Sample Taken On	: 7/8/2019 1:14:00PM
Acquisition Started	: 7/9/2019 8:26:16AM
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	: 0.04 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 7/9/2019
Efficiency Calibration Description	:
Sample Number	: 77818
Fill Height	: 1684.54 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/9/2019 8:41:28AM

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

Data Validated
1530 7-9-19

Analysis Report for 09-Jul-19-10010

L1-10221B-FIGS-104SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	86.63	341 -	351	347.76	3.24E+01	12.74	5.46E+01	0.49
2	238.67	947 -	961	955.14	1.36E+02	19.30	8.23E+01	0.65
3	295.28	1176 -	1186	1181.35	3.92E+01	10.30	2.78E+01	0.78
4	351.88	1400 -	1414	1407.51	6.00E+01	13.98	4.70E+01	1.15
5	583.25	2325 -	2341	2332.31	4.55E+01	12.47	3.45E+01	0.80
6	608.98	2428 -	2443	2435.19	4.00E+01	10.59	2.40E+01	0.74
7	661.62	2635 -	2657	2645.67	5.96E+02	26.14	2.26E+01	1.39
8	727.38	2903 -	2914	2908.60	1.26E+01	4.87	4.44E+00	0.69
9	969.34	3871 -	3882	3876.45	1.89E+01	6.24	7.12E+00	0.56
10	1460.69	5832 -	5855	5843.13	2.53E+02	17.48	1.37E+01	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

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82	*	10.66	5.17E+00	4.22E-01
Cs-137	1.00	661.66	*	85.10	9.07E-01	6.75E-02
Eu-155	0.99	45.30		1.31		
		60.01		1.22		
		86.55	*	30.70	1.19E-01	4.83E-02
		105.31		21.10		
Tl-208	0.99	583.19	*	85.00	6.39E-02	1.79E-02

Analysis Report for 09-Jul-19-10010

L1-10221B-FIGS-104SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-212	1.00	39.86		1.06		
		727.33	*	6.67	2.59E-01	1.02E-01
		785.37		1.10		
		1620.50		1.47		
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.09E-01	3.42E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.08E-01	2.93E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	1.00	241.99		7.25		
		295.22	*	18.42	1.61E-01	4.41E-02
		351.93	*	35.60	1.44E-01	3.54E-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		
		964.77		4.99		
		968.97	*	15.80	1.98E-01	6.61E-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-19-10010

L1-10221B-FIGS-104SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.997	5.17E+00	4.22E-01	
	Cs-137	1.000	9.07E-01	6.75E-02	
	Eu-155	0.999	1.19E-01	4.83E-02	
	Tl-208	0.999	6.39E-02	1.79E-02	
X	Bi-211	0.901			
	Bi-212	1.000	2.59E-01	1.02E-01	
	Pb-212	1.000	2.09E-01	3.42E-02	
	Bi-214	0.992	1.08E-01	2.93E-02	
	Pb-214	1.000	1.50E-01	2.76E-02	
	Ac-228	0.996	1.98E-01	6.61E-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-19-10010
L1-10221B-FIGS-104SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/9/2019 8:41:28AM
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	4.50E-02	5.40E-02	5.40E-02
	BE-7	477.60		10.44	-3.71E-02	4.82E-01	4.82E-01
+	K-40	1460.82	*	10.66	5.17E+00	5.58E-01	5.58E-01
	Mn-54	834.85		99.98	-1.22E-02	4.89E-02	4.89E-02
	Co-60	1173.23		99.85	9.25E-02	7.35E-02	7.69E-02
		1332.49		99.98	8.32E-02		7.35E-02
	Nb-94	702.65		99.81	-3.72E-02	3.93E-02	3.99E-02
		871.09		99.89	-4.91E-03		3.93E-02
	Ag-108m	79.13		6.60	-1.63E-02	4.78E-02	1.50E+00
		433.94		90.50	1.20E-02		4.88E-02
		614.28		89.80	-5.31E-03		6.36E-02
		722.94		90.80	-3.00E-02		4.78E-02
	Sb-125	176.31		6.84	1.07E-02	1.47E-01	5.56E-01
		380.45		1.52	3.56E-01		2.71E+00
		427.87		29.60	-6.85E-02		1.47E-01
		463.36		10.49	-2.74E-02		4.63E-01
		600.60		17.65	-6.18E-02		2.51E-01
		606.71		4.98	1.30E+00		1.24E+00
		635.95		11.22	-5.75E-02		3.98E-01

Analysis Report for 09-Jul-19-10010

L1-10221B-FIGS-104SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	1.46E+00	1.47E-01	2.43E+00
	Ba-133	79.61		2.65	5.72E-01	7.82E-02	3.64E+00
		81.00		32.90	-2.02E-01		2.52E-01
		276.40		7.16	-5.19E-02		5.48E-01
		302.85		18.34	-2.58E-02		2.25E-01
		356.01		62.05	-9.10E-03		7.82E-02
		383.85		8.94	-3.27E-01		4.61E-01
	Cs-134	475.36		1.48	4.46E-01	5.27E-02	3.29E+00
		563.25		8.34	-1.63E-03		4.90E-01
		569.33		15.37	-3.50E-01		2.45E-01
		604.72		97.62	1.42E-03		5.96E-02
		795.86		85.46	-2.04E-02		5.27E-02
		801.95		8.69	1.89E-01		4.85E-01
		1038.61		0.99	1.93E-01		5.48E+00
		1167.97		1.79	2.85E-01		4.08E+00
		1365.19		3.02	4.05E-01		1.34E+00
+	Cs-137	661.66	*	85.10	9.07E-01	5.25E-02	5.25E-02
	Eu-152	121.78		28.67	-1.63E-02	1.51E-01	1.51E-01
		244.70		7.61	1.14E-01		5.29E-01
		295.94		0.45	2.89E+00		9.78E+00
		344.28		26.60	2.35E-02		1.66E-01
		367.79		0.86	-3.79E+00		4.26E+00
		411.12		2.24	-1.05E+00		2.03E+00
		443.96		2.83	5.37E-01		1.60E+00
		488.68		0.42	-6.30E+00		1.06E+01
		563.99		0.49	-4.40E-01		8.24E+00
		586.26		0.46	2.05E+01		1.38E+01
		678.62		0.47	3.01E-01		8.01E+00
		688.67		0.86	-2.32E+00		4.51E+00
		719.35		0.28	-7.06E+00		1.43E+01
		778.90		12.96	-8.91E-02		3.38E-01
		810.45		0.32	2.31E+00		1.32E+01
		867.37		4.26	2.81E-01		1.12E+00
		919.33		0.43	-2.26E+01		9.70E+00
		964.08		14.65	-6.78E-02		4.49E-01
		1085.87		10.24	1.02E-01		4.68E-01
		1089.74		1.73	1.53E+00		2.92E+00
		1112.07		13.69	7.13E-02		3.62E-01
		1212.95		1.43	-3.16E+00		4.09E+00
		1249.94		0.19	1.83E+01		2.92E+01
		1299.14		1.63	-1.17E+00		2.93E+00
		1408.01		21.07	1.71E-01		2.28E-01
		1457.64		0.50	1.21E+02		3.59E+01
		1528.10		0.28	7.18E+00		1.38E+01
	Eu-154	123.07		40.40	1.69E-02	1.07E-01	1.07E-01
		247.93		6.89	-3.65E-01		5.02E-01
		591.76		4.95	-1.12E+00		7.89E-01
		692.42		1.78	-1.28E+00		2.28E+00
		723.30		20.06	2.39E-02		2.19E-01
		756.80		4.52	-3.86E-01		8.97E-01
		873.18		12.08	-6.75E-02		3.05E-01

Analysis Report for 09-Jul-19-10010

L1-10221B-FIGS-104SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	-2.41E-01	1.07E-01	4.63E-01
		1004.76		18.01	2.70E-01		2.99E-01
		1274.43		34.80	-1.22E-01		1.35E-01
		1596.48		1.80	-1.56E+00		2.02E+00
+	Eu-155	45.30		1.31	-1.64E-01	1.53E-01	1.99E+01
		60.01		1.22	-7.45E+00		2.32E+01
		86.55	*	30.70	1.19E-01		1.53E-01
		105.31		21.10	-1.14E-01		2.32E-01
	Ra-226	186.21		3.64	9.37E-02	1.15E+00	1.15E+00
	Pa-231	27.36		10.30	2.69E+00	1.66E+00	2.60E+00
		283.69		1.70	-1.14E-01		2.28E+00
		300.07		2.47	-2.76E-02		1.66E+00
		302.65		2.20	-2.36E-01		1.86E+00
		330.06		1.40	-1.19E+00		2.96E+00
	U-235	143.76		10.96	-7.99E-02	7.39E-02	3.79E-01
		163.33		5.08	-4.43E-01		7.19E-01
		185.71		57.20	2.27E-02		7.39E-02
		202.11		1.08	-2.77E-01		3.67E+00
		205.31		5.01	-4.69E-01		7.39E-01
	Am-241	59.54		35.90	3.02E-01	8.40E-01	8.40E-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

Apex-Gamma

Analysis Report for 09-Jul-19-10011

L1-10221B-FIGS-105SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 09-Jul-19-10011
Sample Description	: L1-10221B-FIGS-105SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.583E+03 grams
Facility	: Default
Sample Taken On	: 7/8/2019 1:16:00PM
Acquisition Started	: 7/9/2019 8:45:31AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.3 seconds
Dead Time	: 0.15 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/29/2019
Efficiency Calibration Used Done On	: 7/9/2019
Efficiency Calibration Description	:
Sample Number	: 77819
Fill Height	: 1583.14 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/9/2019 9:00:35AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated 1530 7/9/19

Analysis Report for 09-Jul-19-10011

L1-10221B-FIGS-105SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.58	947 -	959	954.43	1.28E+02	17.53	6.79E+01	1.12
2	295.13	1175 -	1187	1180.41	4.29E+01	11.20	3.11E+01	0.56
3	351.77	1400 -	1415	1406.80	9.15E+01	11.74	1.55E+01	0.84
4	582.87	2326 -	2336	2330.71	4.12E+01	8.32	1.18E+01	0.65
5	608.95	2430 -	2442	2434.98	5.12E+01	9.05	1.18E+01	0.49
6	661.30	2636 -	2651	2644.31	9.69E+01	11.56	1.21E+01	1.10
7	910.58	3635 -	3649	3641.28	4.06E+01	7.48	5.38E+00	1.06
8	1460.01	5830 -	5851	5839.86	2.48E+02	16.53	7.34E+00	1.75

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.89	1460.82	*	10.66	6.11E+00	4.87E-01
Cs-137	0.98	661.66	*	85.10	1.74E-01	2.33E-02
Tl-208	0.98	583.19	*	85.00	6.82E-02	1.44E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.28E-01	3.62E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.63E-01	3.05E-02
		768.36		4.89		
		806.18		1.26		

Analysis Report for 09-Jul-19-10011

L1-10221B-FIGS-105SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	2.03E-01	5.55E-02
		351.93	*	35.60	2.54E-01	3.84E-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	3.00E-01	5.67E-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

INTERFERENCE CORRECTED REPORT

Analysis Report for 09-Jul-19-10011

L1-10221B-FIGS-105SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.899	6.11E+00	4.87E-01	
	Cs-137	0.980	1.74E-01	2.33E-02	
	Tl-208	0.984	6.82E-02	1.44E-02	
X	Bi-211	0.925			
	Pb-212	1.000	2.28E-01	3.62E-02	
	Bi-214	0.991	1.63E-01	3.05E-02	
	Pb-214	0.997	2.38E-01	3.16E-02	
	Ac-228	0.981	3.00E-01	5.67E-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-19-10011

L1-10221B-FIGS-105SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/9/2019 9:00:35AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

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

All peaks were identified.

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	7.93E-02	6.12E-02	6.12E-02
	BE-7	477.60		10.44	-3.04E-01	3.51E-01	3.51E-01
+	K-40	1460.82	*	10.66	6.11E+00	4.95E-01	4.95E-01
	Mn-54	834.85		99.98	2.64E-02	5.16E-02	5.16E-02
	Co-60	1173.23		99.85	4.70E-02	7.47E-02	8.46E-02
		1332.49		99.98	4.97E-02		7.47E-02
	Nb-94	702.65		99.81	-7.83E-03	4.80E-02	4.80E-02
		871.09		99.89	2.49E-02		5.46E-02
	Ag-108m	79.13		6.60	8.80E-01	4.44E-02	1.93E+00
		433.94		90.50	-1.37E-02		4.44E-02
		614.28		89.80	-3.55E-02		5.57E-02
		722.94		90.80	1.88E-02		5.53E-02
	Sb-125	176.31		6.84	-3.12E-02	1.33E-01	5.47E-01
		380.45		1.52	-2.83E-01		2.42E+00
		427.87		29.60	4.12E-02		1.33E-01
		463.36		10.49	1.98E-01		4.62E-01
		600.60		17.65	-1.60E-01		2.48E-01
		606.71		4.98	1.71E+00		1.35E+00
		635.95		11.22	2.32E-01		4.42E-01

Analysis Report for 09-Jul-19-10011

L1-10221B-FIGS-105SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-1.36E+00	1.33E-01	2.15E+00
	Ba-133	79.61		2.65	6.76E-02	7.06E-02	4.58E+00
		81.00		32.90	-5.90E-02		3.24E-01
		276.40		7.16	-4.03E-03		4.95E-01
		302.85		18.34	1.47E-01		2.34E-01
		356.01		62.05	-1.56E-02		7.06E-02
		383.85		8.94	-8.91E-02		4.05E-01
	Cs-134	475.36		1.48	5.97E-01	6.44E-02	2.78E+00
		563.25		8.34	-3.67E-01		4.35E-01
		569.33		15.37	-5.27E-02		2.63E-01
		604.72		97.62	-6.74E-02		6.53E-02
		795.86		85.46	5.24E-02		6.44E-02
		801.95		8.69	3.75E-02		6.44E-01
		1038.61		0.99	-5.59E-01		5.34E+00
		1167.97		1.79	-1.08E+00		4.87E+00
		1365.19		3.02	7.46E-01		1.43E+00
+	Cs-137	661.66	*	85.10	1.74E-01	4.21E-02	4.21E-02
	Eu-152	121.78		28.67	1.75E-02	1.49E-01	1.65E-01
		244.70		7.61	-3.07E-01		5.58E-01
		295.94		0.45	-4.22E+00		1.02E+01
		344.28		26.60	0.00E+00		1.49E-01
		367.79		0.86	-1.09E-01		4.78E+00
		411.12		2.24	4.16E-01		1.78E+00
		443.96		2.83	3.27E-01		1.29E+00
		488.68		0.42	-8.01E+00		1.02E+01
		563.99		0.49	1.45E-01		7.92E+00
		586.26		0.46	-6.65E+00		1.27E+01
		678.62		0.47	5.58E+00		9.92E+00
		688.67		0.86	4.30E+00		5.58E+00
		719.35		0.28	-5.99E+00		1.48E+01
		778.90		12.96	-7.81E-02		3.85E-01
		810.45		0.32	-4.77E+00		1.57E+01
		867.37		4.26	-9.50E-01		1.12E+00
		919.33		0.43	3.47E+00		1.07E+01
		964.08		14.65	3.87E-01		5.20E-01
		1085.87		10.24	-8.81E-02		5.52E-01
		1089.74		1.73	-7.06E-01		3.27E+00
		1112.07		13.69	2.09E-01		3.78E-01
		1212.95		1.43	2.29E+00		5.24E+00
		1249.94		0.19	-1.65E+01		2.89E+01
		1299.14		1.63	3.40E+00		4.26E+00
		1408.01		21.07	5.74E-03		2.10E-01
		1457.64		0.50	1.33E+02		4.21E+01
		1528.10		0.28	7.73E+00		1.59E+01
	Eu-154	123.07		40.40	1.69E-02	1.13E-01	1.13E-01
		247.93		6.89	-8.30E-02		5.56E-01
		591.76		4.95	2.65E-01		8.74E-01
		692.42		1.78	4.52E-01		2.75E+00
		723.30		20.06	4.12E-03		2.50E-01
		756.80		4.52	4.75E-01		1.07E+00
		873.18		12.08	3.44E-01		4.78E-01

Analysis Report for 09-Jul-19-10011

L1-10221B-FIGS-105SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.98E-01	1.13E-01	4.80E-01
	1004.76	18.01	-1.57E-01		2.43E-01
	1274.43	34.80	-9.31E-02		1.59E-01
	1596.48	1.80	1.70E-01		1.76E+00
Eu-155	45.30	1.31	8.20E-01	2.69E-01	3.04E+01
	60.01	1.22	6.99E-01		3.22E+01
	86.55	30.70	-8.45E-02		2.69E-01
	105.31	21.10	6.15E-02		2.81E-01
Ra-226	186.21	3.64	7.70E-01	1.26E+00	1.26E+00
Pa-231	27.36	10.30	2.17E+00	1.68E+00	3.54E+00
	283.69	1.70	8.53E-01		2.47E+00
	300.07	2.47	1.31E-01		1.68E+00
	302.65	2.20	1.75E+00		1.96E+00
	330.06	1.40	1.76E+00		3.05E+00
U-235	143.76	10.96	5.87E-02	8.08E-02	4.13E-01
	163.33	5.08	3.64E-01		7.96E-01
	185.71	57.20	7.07E-02		8.08E-02
	202.11	1.08	6.55E-01		3.80E+00
	205.31	5.01	-4.24E-01		7.91E-01
Am-241	59.54	35.90	-4.56E-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

Apex-Gamma

Analysis Report for 09-Jul-19-10012

L1-10221B-FIGS-106SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 09-Jul-19-10012
Sample Description	: L1-10221B-FIGS-106SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.433E+03 grams
Facility	: Default
Sample Taken On	: 7/8/2019 1:18:00PM
Acquisition Started	: 7/9/2019 8:45:38AM
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	: 77820
Fill Height	: 1432.80 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/9/2019 9:00:40AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
1530 7/9/19

Analysis Report for 09-Jul-19-10012

L1-10221B-FIGS-106SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.42	306 -	316	310.19	4.52E+01	13.61	5.68E+01	0.50
2	186.08	739 -	751	744.21	3.17E+01	11.54	3.83E+01	0.87
3	238.82	950 -	960	954.86	1.02E+02	15.35	5.28E+01	0.96
4	558.45	2226 -	2237	2232.01	2.00E+01	4.47	0.00E+00	0.38
5	583.21	2323 -	2337	2330.94	6.15E+01	9.12	7.48E+00	0.88
6	608.93	2429 -	2442	2433.75	3.79E+01	7.76	8.13E+00	0.71
7	910.73	3634 -	3645	3640.36	2.75E+01	6.24	4.52E+00	0.34
8	1460.24	5829 -	5851	5838.91	2.23E+02	14.93	0.00E+00	1.93

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.94	1460.82	*	10.66	5.11E+00	4.07E-01
Tl-208	1.00	583.19	*	85.00	9.42E-02	1.51E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.64E-01	2.80E-02
		300.09		3.30		
Pb212-XR	0.99	74.82		10.28		
		77.11	*	17.10	3.18E-01	1.01E-01
		87.35		3.97		
		89.78		1.46		

Analysis Report for 09-Jul-19-10012

L1-10221B-FIGS-106SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	609.32	*	45.49	1.12E-01	2.38E-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		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	5.61E-01	1.80E-01
		87.35		2.24		
		89.78		0.82		
Ra-226	0.99	186.21	*	3.64	5.34E-01	2.00E-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	1.88E-01	4.35E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		
U-235	0.98	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	3.40E-02	1.27E-02
		202.11		1.08		
		205.31		5.01		

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

Analysis Report for 09-Jul-19-10012

L1-10221B-FIGS-106SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.948	5.11E+00	4.07E-01	
	Tl-208	1.000	9.42E-02	1.51E-02	
	Pb-212	0.995	1.64E-01	2.80E-02	
?	Pb212-XR	0.992	3.18E-01	1.01E-01	
	Bi-214	0.990	1.12E-01	2.38E-02	
?	Pb214-XR	0.992	5.61E-01	1.80E-01	
?	Ra-226	0.997	5.34E-01	2.00E-01	
	Ac-228	0.989	1.88E-01	4.35E-02	
?	U-235	0.984	3.40E-02	1.27E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 09-Jul-19-10012
L1-10221B-FIGS-106SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/9/2019 9:00:40AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
4	558.45	2.22222E-02	22.36		

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	3.83E-02	5.19E-02	5.19E-02
	BE-7	477.60		10.44	2.82E-01	4.21E-01	4.21E-01
+	K-40	1460.82	*	10.66	5.11E+00	6.58E-02	6.58E-02
	Mn-54	834.85		99.98	-3.26E-02	4.55E-02	4.55E-02
	Co-60	1173.23		99.85	3.57E-02	5.02E-02	6.19E-02
		1332.49		99.98	-6.56E-02		5.02E-02
	Nb-94	702.65		99.81	-3.81E-02	3.83E-02	3.83E-02
		871.09		99.89	2.57E-03		4.34E-02
	Ag-108m	79.13		6.60	-2.46E-01	3.46E-02	1.05E+00
		433.94		90.50	5.55E-03		3.46E-02
		614.28		89.80	-4.32E-02		5.04E-02
		722.94		90.80	4.46E-03		4.98E-02
	Sb-125	176.31		6.84	-2.59E-01	1.13E-01	4.08E-01
		380.45		1.52	-8.35E-01		2.11E+00
		427.87		29.60	-3.35E-02		1.13E-01
		463.36		10.49	2.27E-01		3.47E-01
		600.60		17.65	-2.04E-01		1.98E-01
		606.71		4.98	6.84E-01		1.13E+00

Analysis Report for 09-Jul-19-10012

L1-10221B-FIGS-106SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	635.95	11.22	2.19E-02	1.13E-01	3.37E-01
	671.44	1.79	-2.00E-01		1.81E+00
Ba-133	79.61	2.65	-8.06E-01	6.40E-02	2.50E+00
	81.00	32.90	-2.01E-01		1.64E-01
	276.40	7.16	1.92E-01		4.65E-01
	302.85	18.34	3.16E-02		1.88E-01
	356.01	62.05	-4.17E-02		6.40E-02
	383.85	8.94	-2.93E-01		3.56E-01
Cs-134	475.36	1.48	2.55E+00	4.58E-02	3.04E+00
	563.25	8.34	-7.63E-02		3.63E-01
	569.33	15.37	-1.32E-01		1.89E-01
	604.72	97.62	-2.43E-02		5.21E-02
	795.86	85.46	-9.42E-04		4.58E-02
	801.95	8.69	-4.09E-02		4.91E-01
	1038.61	0.99	-1.46E+00		4.18E+00
	1167.97	1.79	-2.66E+00		3.07E+00
	1365.19	3.02	-5.96E-01		1.05E+00
Cs-137	661.66	85.10	5.71E-02	5.79E-02	5.79E-02
Eu-152	121.78	28.67	-1.76E-02	1.06E-01	1.06E-01
	244.70	7.61	2.87E-02		4.34E-01
	295.94	0.45	2.40E-01		8.84E+00
	344.28	26.60	-5.90E-03		1.08E-01
	367.79	0.86	-9.76E-01		3.36E+00
	411.12	2.24	7.85E-01		1.55E+00
	443.96	2.83	2.44E-01		1.22E+00
	488.68	0.42	-6.25E-01		7.09E+00
	563.99	0.49	-2.37E+00		5.05E+00
	586.26	0.46	-5.16E+00		1.31E+01
	678.62	0.47	-4.72E+00		7.11E+00
	688.67	0.86	-2.16E+00		4.48E+00
	719.35	0.28	3.16E+00		1.45E+01
	778.90	12.96	1.56E-01		3.17E-01
	810.45	0.32	-1.07E+00		1.15E+01
	867.37	4.26	5.45E-01		9.52E-01
	919.33	0.43	1.56E+00		8.91E+00
	964.08	14.65	8.40E-02		3.54E-01
	1085.87	10.24	-5.20E-02		5.30E-01
	1089.74	1.73	-6.68E-01		3.04E+00
	1112.07	13.69	-9.76E-02		3.81E-01
	1212.95	1.43	-1.32E+00		4.50E+00
	1249.94	0.19	-1.76E+00		2.93E+01
	1299.14	1.63	-1.58E+00		2.87E+00
	1408.01	21.07	7.81E-02		2.20E-01
	1457.64	0.50	1.10E+02		3.64E+01
	1528.10	0.28	4.48E+00		1.22E+01
Eu-154	123.07	40.40	-1.04E-02	7.68E-02	7.68E-02
	247.93	6.89	-6.73E-02		3.95E-01
	591.76	4.95	1.70E-01		7.62E-01
	692.42	1.78	5.16E-01		2.33E+00
	723.30	20.06	2.45E-02		2.29E-01
	756.80	4.52	-3.11E-01		7.79E-01

Analysis Report for 09-Jul-19-10012

L1-10221B-FIGS-106SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	873.18		12.08	1.54E-01	7.68E-02	3.74E-01
		996.29		10.48	4.66E-01		4.90E-01
		1004.76		18.01	-7.15E-02		2.55E-01
		1274.43		34.80	2.44E-02		1.40E-01
		1596.48		1.80	1.02E+00		2.27E+00
	Eu-155	45.30		1.31	-8.37E-01	1.75E-01	1.07E+01
		60.01		1.22	-5.01E+00		1.05E+01
		86.55		30.70	2.95E-02		1.75E-01
		105.31		21.10	4.83E-02		1.81E-01
+	Ra-226	186.21	*	3.64	5.34E-01	6.26E-01	6.26E-01
	Pa-231	27.36		10.30	4.10E-01	1.13E+00	1.13E+00
		283.69		1.70	1.07E+00		1.87E+00
		300.07		2.47	-1.13E+00		1.51E+00
		302.65		2.20	-4.60E-01		1.52E+00
		330.06		1.40	9.65E-01		2.53E+00
+	U-235	143.76		10.96	1.72E-02	3.98E-02	2.98E-01
		163.33		5.08	-4.34E-02		5.41E-01
		185.71	*	57.20	3.40E-02		3.98E-02
		202.11		1.08	-9.07E-01		2.89E+00
		205.31		5.01	7.32E-02		6.25E-01
	Am-241	59.54		35.90	-3.47E-02	3.60E-01	3.60E-01

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

Apex-Gamma

Analysis Report for 09-Jul-19-10013
L1-10221B-FIGS-107SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 09-Jul-19-10013
Sample Description	: L1-10221B-FIGS-107SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.595E+03 grams
Facility	: Default
Sample Taken On	: 7/8/2019 1:20:00PM
Acquisition Started	: 7/9/2019 8:45:45AM
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	: 77821
Fill Height	: 1595.34 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/9/2019 9:01:11AM

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

Data Validated
1530 7-9-19

Analysis Report for 09-Jul-19-10013

L1-10221B-FIGS-107SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.68	945 -	961	955.20	1.41E+02	16.80	4.62E+01	0.84
2	295.15	1177 -	1187	1180.83	2.17E+01	8.58	2.13E+01	0.82
3	338.24	1347 -	1360	1353.00	3.34E+01	8.98	1.66E+01	0.38
4	351.92	1401 -	1413	1407.67	5.83E+01	10.24	1.77E+01	0.96
5	583.13	2324 -	2339	2331.84	6.40E+01	10.59	1.60E+01	1.36
6	609.26	2432 -	2443	2436.32	3.32E+01	7.77	9.84E+00	0.55
7	910.96	3637 -	3650	3642.88	3.80E+01	7.18	5.00E+00	0.92
8	1460.58	5830 -	5854	5842.70	2.31E+02	16.02	6.25E+00	1.16

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
K-40	0.99	1460.82	*	10.66	4.77E+00	3.91E-01
Tl-208	0.99	583.19	*	85.00	9.07E-02	1.60E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.19E-01	3.15E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	9.04E-02	2.19E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		

Analysis Report for 09-Jul-19-10013

L1-10221B-FIGS-107SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	1.00	241.99		7.25		
		295.22	*	18.42	8.95E-02	3.61E-02
		351.93	*	35.60	1.41E-01	2.72E-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	2.47E-01	6.96E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.38E-01	4.61E-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 09-Jul-19-10013

L1-10221B-FIGS-107SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.991	4.77E+00	3.91E-01	
	Tl-208	0.999	9.07E-02	1.60E-02	
X	Bi-211	0.891			
	Pb-212	1.000	2.19E-01	3.15E-02	
	Bi-214	1.000	9.04E-02	2.19E-02	
	Pb-214	1.000	1.22E-01	2.17E-02	
	Ac-228	0.997	2.41E-01	3.84E-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-19-10013

L1-10221B-FIGS-107SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/9/2019 9:01:11AM
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	4.00E-02	5.31E-02	5.31E-02
	BE-7	477.60		10.44	-6.30E-02	3.96E-01	3.96E-01
+	K-40	1460.82	*	10.66	4.77E+00	4.16E-01	4.16E-01
	Mn-54	834.85		99.98	2.94E-02	4.51E-02	4.51E-02
	Co-60	1173.23		99.85	5.83E-02	5.23E-02	6.60E-02
		1332.49		99.98	1.73E-03		5.23E-02
	Nb-94	702.65		99.81	-3.90E-04	3.85E-02	3.85E-02
		871.09		99.89	-2.46E-02		3.97E-02
	Ag-108m	79.13		6.60	3.33E-01	3.64E-02	1.23E+00
		433.94		90.50	1.31E-02		3.64E-02
		614.28		89.80	1.17E-02		5.77E-02
		722.94		90.80	4.36E-02		4.83E-02
	Sb-125	176.31		6.84	-5.16E-01	1.05E-01	4.35E-01
		380.45		1.52	-8.81E-01		2.10E+00
		427.87		29.60	-6.22E-02		1.05E-01
		463.36		10.49	1.41E-01		3.39E-01
		600.60		17.65	1.74E-01		2.49E-01
		606.71		4.98	1.28E-01		1.08E+00
		635.95		11.22	-1.27E-01		3.26E-01

Analysis Report for 09-Jul-19-10013

L1-10221B-FIGS-107SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-4.24E-01	1.05E-01	2.09E+00
Ba-133	79.61	2.65	8.70E-01	6.47E-02	3.01E+00
	81.00	32.90	-1.54E-01		2.13E-01
	276.40	7.16	-1.79E-03		4.77E-01
	302.85	18.34	1.49E-01		1.89E-01
	356.01	62.05	-1.69E-02		6.47E-02
	383.85	8.94	3.66E-02		3.58E-01
Cs-134	475.36	1.48	1.13E+00	4.88E-02	2.85E+00
	563.25	8.34	2.47E-01		4.59E-01
	569.33	15.37	-9.52E-02		2.59E-01
	604.72	97.62	-8.76E-02		5.22E-02
	795.86	85.46	-1.34E-03		4.88E-02
	801.95	8.69	-4.09E-01		3.77E-01
	1038.61	0.99	2.38E+00		4.41E+00
	1167.97	1.79	-4.42E-01		3.71E+00
	1365.19	3.02	2.78E-02		9.47E-01
Cs-137	661.66	85.10	2.80E-02	5.45E-02	5.45E-02
Eu-152	121.78	28.67	-8.26E-02	1.10E-01	1.17E-01
	244.70	7.61	-4.49E-02		4.48E-01
	295.94	0.45	2.39E+00		8.56E+00
	344.28	26.60	-6.30E-02		1.10E-01
	367.79	0.86	-9.84E-03		3.68E+00
	411.12	2.24	-5.94E-01		1.59E+00
	443.96	2.83	-7.74E-01		1.17E+00
	488.68	0.42	2.36E+00		8.48E+00
	563.99	0.49	-6.51E-01		7.79E+00
	586.26	0.46	-5.27E+00		1.34E+01
	678.62	0.47	5.97E+00		7.71E+00
	688.67	0.86	-5.60E-01		4.56E+00
	719.35	0.28	-4.27E+00		1.26E+01
	778.90	12.96	-2.80E-01		3.12E-01
	810.45	0.32	7.44E+00		1.03E+01
	867.37	4.26	-4.13E-01		1.05E+00
	919.33	0.43	-2.32E+00		1.04E+01
	964.08	14.65	4.10E-01		4.28E-01
	1085.87	10.24	1.05E-01		4.74E-01
	1089.74	1.73	7.03E-01		2.91E+00
	1112.07	13.69	-1.97E-01		4.02E-01
	1212.95	1.43	8.34E-01		4.57E+00
	1249.94	0.19	4.98E+00		3.48E+01
	1299.14	1.63	-7.51E-01		3.41E+00
	1408.01	21.07	1.12E-01		1.91E-01
	1457.64	0.50	9.76E+01		3.40E+01
	1528.10	0.28	7.59E-01		1.33E+01
Eu-154	123.07	40.40	-5.95E-02	8.29E-02	8.29E-02
	247.93	6.89	3.74E-01		4.57E-01
	591.76	4.95	-5.73E-01		7.88E-01
	692.42	1.78	2.52E-01		2.21E+00
	723.30	20.06	2.01E-01		2.19E-01
	756.80	4.52	-2.11E-02		8.78E-01
	873.18	12.08	-1.24E-01		3.22E-01

Analysis Report for 09-Jul-19-10013

L1-10221B-FIGS-107SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	3.58E-01	8.29E-02	5.42E-01
	1004.76	18.01	1.68E-01		2.99E-01
	1274.43	34.80	-1.66E-02		1.49E-01
	1596.48	1.80	9.19E-01		2.04E+00
Eu-155	45.30	1.31	4.22E+00	1.91E-01	1.91E+01
	60.01	1.22	-1.47E+01		1.98E+01
	86.55	30.70	1.08E-01		2.19E-01
	105.31	21.10	2.21E-02		1.91E-01
Ra-226	186.21	3.64	-1.08E-01	9.17E-01	9.17E-01
Pa-231	27.36	10.30	1.70E+00	1.37E+00	2.21E+00
	283.69	1.70	-1.14E+00		1.99E+00
	300.07	2.47	6.27E-01		1.37E+00
	302.65	2.20	7.26E-01		1.55E+00
	330.06	1.40	4.86E-01		2.35E+00
U-235	143.76	10.96	-1.96E-01	5.99E-02	2.99E-01
	163.33	5.08	2.50E-01		6.64E-01
	185.71	57.20	1.17E-04		5.99E-02
	202.11	1.08	-8.27E-01		3.05E+00
	205.31	5.01	-1.33E-01		6.22E-01
Am-241	59.54	35.90	5.70E-02	7.21E-01	7.21E-01

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

Apex-Gamma

Analysis Report for 09-Jul-19-10014

L1-10221B-FIGS-108SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 09-Jul-19-10014
Sample Description	: L1-10221B-FIGS-108SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.784E+03 grams
Facility	: Default
Sample Taken On	: 7/8/2019 1:22:00PM
Acquisition Started	: 7/9/2019 9:09:55AM
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	: 7/9/2019
Efficiency Calibration Description	:
Sample Number	: 77822
Fill Height	: 1783.76 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/9/2019 9:25:03AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated

1530 7-9-19

Analysis Report for 09-Jul-19-10014

L1-10221B-FIGS-108SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.70	473 -	482	477.59	1.63E+02	20.15	1.06E+02	1.14
2	352.02	699 -	708	703.99	7.48E+01	11.48	2.52E+01	1.23
3	583.15	1162 -	1171	1165.91	5.55E+01	10.45	2.35E+01	1.50
4	609.32	1212 -	1223	1218.21	5.44E+01	9.80	1.66E+01	0.79
5	911.41	1815 -	1828	1822.26	4.78E+01	11.24	2.82E+01	1.50
6	1460.80	2915 -	2928	2921.65	3.62E+02	19.73	1.02E+01	2.00

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.82	*	10.66	6.55E+00	4.56E-01
Tl-208	1.00	583.19	*	85.00	6.94E-02	1.37E-02
Bi-211	0.86	351.07	*	13.02	4.37E-01	7.57E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	2.24E-01	3.30E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	1.31E-01	2.48E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		

Analysis Report for 09-Jul-19-10014

L1-10221B-FIGS-108SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	1.60E-01	2.77E-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	2.63E-01	6.29E-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 09-Jul-19-10014

L1-10221B-FIGS-108SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	1.000	6.55E+00	4.56E-01	
	Tl-208	1.000	6.94E-02	1.37E-02	
?	Bi-211	0.864	4.37E-01	7.57E-02	
	Pb-212	0.999	2.24E-01	3.30E-02	
	Bi-214	1.000	1.31E-01	2.48E-02	
?	Pb-214	0.999	1.60E-01	2.77E-02	
	Ac-228	0.998	2.63E-01	6.29E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 09-Jul-19-10014
L1-10221B-FIGS-108SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/9/2019 9:25:03AM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

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

All peaks were identified.

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	6.47E-02	4.69E-02	4.69E-02
	BE-7	477.60		10.44	-1.07E-01	2.96E-01	2.96E-01
+	K-40	1460.82	*	10.66	6.55E+00	3.75E-01	3.75E-01
	Mn-54	834.85		99.98	-3.88E-03	3.34E-02	3.34E-02
	Co-60	1173.23		99.85	2.43E-02	4.39E-02	5.34E-02
		1332.49		99.98	1.59E-02		4.39E-02
	Nb-94	702.65		99.81	5.41E-03	3.43E-02	3.66E-02
		871.09		99.89	-6.56E-05		3.43E-02
	Ag-108m	79.13		6.60	-4.08E-01	3.69E-02	1.03E+00
		433.94		90.50	2.80E-02		3.69E-02
		614.28		89.80	-5.59E-03		4.38E-02
		722.94		90.80	-1.13E-02		4.09E-02
	Sb-125	176.31		6.84	-1.26E-01	8.28E-02	4.39E-01
		380.45		1.52	-1.60E+00		1.72E+00
		427.87		29.60	-4.69E-02		8.28E-02
		463.36		10.49	6.09E-02		3.06E-01
		600.60		17.65	-5.51E-02		1.74E-01
		606.71		4.98	-6.36E-02		1.01E+00
		635.95		11.22	-1.73E-01		2.74E-01

Analysis Report for 09-Jul-19-10014

L1-10221B-FIGS-108SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-9.03E-01	8.28E-02	1.72E+00
Ba-133	79.61	2.65	-1.23E+00	6.04E-02	2.47E+00
	81.00	32.90	-1.71E-01		1.78E-01
	276.40	7.16	1.31E-01		4.35E-01
	302.85	18.34	5.10E-02		1.78E-01
	356.01	62.05	-3.62E-02		6.04E-02
	383.85	8.94	1.15E-01		3.32E-01
Cs-134	475.36	1.48	2.72E-01	4.47E-02	2.16E+00
	563.25	8.34	3.47E-02		3.74E-01
	569.33	15.37	1.29E-01		2.16E-01
	604.72	97.62	-1.39E-02		4.47E-02
	795.86	85.46	1.65E-02		4.69E-02
	801.95	8.69	-2.80E-01		3.41E-01
	1038.61	0.99	9.35E-01		4.47E+00
	1167.97	1.79	-1.36E+00		3.08E+00
	1365.19	3.02	3.04E-02		1.23E+00
Cs-137	661.66	85.10	2.17E-02	5.04E-02	5.04E-02
Eu-152	121.78	28.67	-2.28E-02	1.08E-01	1.08E-01
	244.70	7.61	-1.17E-01		4.31E-01
	295.94	0.45	4.68E+00		8.55E+00
	344.28	26.60	-8.70E-02		1.09E-01
	367.79	0.86	-4.71E-01		3.52E+00
	411.12	2.24	3.73E-01		1.42E+00
	443.96	2.83	3.63E-01		1.17E+00
	488.68	0.42	-1.06E-01		7.49E+00
	563.99	0.49	1.60E+00		6.62E+00
	586.26	0.46	-2.14E+00		1.17E+01
	678.62	0.47	2.80E+00		7.02E+00
	688.67	0.86	5.53E-01		4.20E+00
	719.35	0.28	-1.20E-01		1.25E+01
	778.90	12.96	-2.71E-02		2.79E-01
	810.45	0.32	9.30E-01		1.08E+01
	867.37	4.26	-4.84E-01		7.67E-01
	919.33	0.43	-3.74E-01		9.87E+00
	964.08	14.65	2.07E-01		4.17E-01
	1085.87	10.24	-1.23E-01		3.60E-01
	1089.74	1.73	-7.84E-01		2.13E+00
	1112.07	13.69	1.83E-01		3.37E-01
	1212.95	1.43	1.55E+00		3.77E+00
	1249.94	0.19	7.10E+00		2.46E+01
	1299.14	1.63	-2.29E-01		2.83E+00
	1408.01	21.07	2.23E-02		1.91E-01
	1457.64	0.50	-3.69E+00		3.68E+01
	1528.10	0.28	-2.76E+00		9.62E+00
Eu-154	123.07	40.40	-7.54E-03	7.75E-02	7.75E-02
	247.93	6.89	-1.77E-01		4.25E-01
	591.76	4.95	3.58E-01		7.60E-01
	692.42	1.78	4.25E-02		2.14E+00
	723.30	20.06	-1.22E-02		1.93E-01
	756.80	4.52	-6.44E-02		7.34E-01
	873.18	12.08	-7.87E-02		2.72E-01

Analysis Report for 09-Jul-19-10014

L1-10221B-FIGS-108SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-2.08E-01	7.75E-02	3.49E-01
	1004.76	18.01	5.65E-02		2.25E-01
	1274.43	34.80	-2.75E-02		1.35E-01
	1596.48	1.80	1.58E-01		1.68E+00
Eu-155	45.30	1.31	8.78E-01	1.76E-01	1.12E+01
	60.01	1.22	-2.27E-01		1.22E+01
	86.55	30.70	4.42E-02		1.76E-01
	105.31	21.10	1.19E-01		1.89E-01
Ra-226	186.21	3.64	2.16E-01	9.63E-01	9.63E-01
Pa-231	27.36	10.30	6.26E-01	1.13E+00	1.13E+00
	283.69	1.70	-4.96E-01		1.70E+00
	300.07	2.47	-1.81E+00		1.27E+00
	302.65	2.20	4.25E-01		1.48E+00
	330.06	1.40	1.38E+00		2.48E+00
U-235	143.76	10.96	-2.70E-03	6.15E-02	2.74E-01
	163.33	5.08	-2.06E-01		6.77E-01
	185.71	57.20	2.96E-02		6.15E-02
	202.11	1.08	4.17E-01		3.15E+00
	205.31	5.01	-3.08E-02		6.53E-01
Am-241	59.54	35.90	-5.38E-02	4.19E-01	4.19E-01

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

Apex-Gamma

Analysis Report for 09-Jul-19-10015
L1-10221B-FIGS-109SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 09-Jul-19-10015
Sample Description	: L1-10221B-FIGS-109SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.645E+03 grams
Facility	: Default
Sample Taken On	: 7/8/2019 1:24:00PM
Acquisition Started	: 7/9/2019 9:10:01AM
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	: 7/9/2019
Efficiency Calibration Description	:
Sample Number	: 77823
Fill Height	: 1645.18 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/9/2019 9:25:05AM

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

Data Validated
1530 7/9/19

Analysis Report for 09-Jul-19-10015

L1-10221B-FIGS-109SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.68	946 -	960	954.81	1.30E+02	18.84	7.73E+01	0.55
2	338.08	1348 -	1357	1352.11	1.97E+01	8.54	2.33E+01	0.33
3	351.79	1400 -	1411	1406.89	3.06E+01	10.10	2.84E+01	0.96
4	582.89	2323 -	2338	2330.75	4.58E+01	8.43	8.19E+00	1.09
5	608.88	2429 -	2441	2434.67	4.52E+01	7.99	6.77E+00	0.91
6	910.84	3635 -	3649	3642.32	3.75E+01	7.69	7.50E+00	1.56
7	1459.86	5829 -	5851	5839.28	2.52E+02	16.18	2.62E+00	2.17

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	0.86	1460.82	*	10.66	6.16E+00	4.77E-01
Tl-208	0.98	583.19	*	85.00	7.52E-02	1.46E-02
Bi-211	0.92	351.07	*	13.02	2.31E-01	7.84E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.29E-01	3.81E-02
		300.09		3.30		
Bi-214	0.98	609.32	*	45.49	1.43E-01	2.66E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		

Analysis Report for 09-Jul-19-10015

L1-10221B-FIGS-109SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.98	1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	8.43E-02	2.87E-02
		785.96		1.06		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	1.67E-01	7.36E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.74E-01	5.75E-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

INTERFERENCE CORRECTED REPORT

Analysis Report for 09-Jul-19-10015

L1-10221B-FIGS-109SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.863	6.16E+00	4.77E-01	
	Tl-208	0.986	7.52E-02	1.46E-02	
?	Bi-211	0.921	2.31E-01	7.84E-02	
	Pb-212	1.000	2.29E-01	3.81E-02	
	Bi-214	0.987	1.43E-01	2.66E-02	
?	Pb-214	0.998	8.43E-02	2.87E-02	
	Ac-228	0.992	2.34E-01	4.53E-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-19-10015

L1-10221B-FIGS-109SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/9/2019 9:25:05AM
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	8.87E-02	6.23E-02	6.23E-02
	BE-7	477.60		10.44	5.59E-02	4.09E-01	4.09E-01
+	K-40	1460.82	*	10.66	6.16E+00	3.26E-01	3.26E-01
	Mn-54	834.85		99.98	-4.57E-02	5.03E-02	5.03E-02
	Co-60	1173.23		99.85	1.61E-02	6.16E-02	7.25E-02
		1332.49		99.98	2.25E-02		6.16E-02
	Nb-94	702.65		99.81	1.03E-02	3.81E-02	4.48E-02
		871.09		99.89	-4.02E-03		3.81E-02
	Ag-108m	79.13		6.60	1.20E+00	4.76E-02	1.79E+00
		433.94		90.50	2.33E-03		4.96E-02
		614.28		89.80	-4.19E-02		4.76E-02
		722.94		90.80	-3.76E-03		5.84E-02
	Sb-125	176.31		6.84	-1.76E-02	1.44E-01	5.09E-01
		380.45		1.52	5.22E-01		2.64E+00
		427.87		29.60	5.33E-02		1.44E-01
		463.36		10.49	-7.83E-02		3.73E-01
		600.60		17.65	-1.01E-02		2.28E-01
		606.71		4.98	1.35E+00		1.24E+00
		635.95		11.22	1.97E-01		3.85E-01

Analysis Report for 09-Jul-19-10015

L1-10221B-FIGS-109SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	9.87E-01	1.44E-01	2.54E+00
Ba-133	79.61	2.65	1.12E+00	6.64E-02	4.16E+00
	81.00	32.90	-1.72E-01		2.82E-01
	276.40	7.16	-5.59E-01		5.03E-01
	302.85	18.34	-4.32E-02		2.23E-01
	356.01	62.05	-5.89E-02		6.64E-02
	383.85	8.94	2.02E-01		4.65E-01
Cs-134	475.36	1.48	8.77E-01	5.69E-02	2.85E+00
	563.25	8.34	-3.44E-01		3.61E-01
	569.33	15.37	1.59E-01		2.48E-01
	604.72	97.62	-3.89E-02		6.09E-02
	795.86	85.46	-4.97E-03		5.69E-02
	801.95	8.69	7.45E-02		4.85E-01
	1038.61	0.99	7.94E-01		5.07E+00
	1167.97	1.79	5.86E-01		4.18E+00
	1365.19	3.02	1.15E+00		1.71E+00
Cs-137	661.66	85.10	5.72E-04	6.58E-02	6.58E-02
Eu-152	121.78	28.67	2.97E-02	1.36E-01	1.56E-01
	244.70	7.61	-2.65E-01		5.42E-01
	295.94	0.45	-4.23E+00		9.54E+00
	344.28	26.60	-2.46E-02		1.36E-01
	367.79	0.86	6.57E-01		4.29E+00
	411.12	2.24	-3.39E-01		1.67E+00
	443.96	2.83	-4.15E-01		1.33E+00
	488.68	0.42	-2.90E-01		9.55E+00
	563.99	0.49	-4.45E+00		6.61E+00
	586.26	0.46	-2.50E+00		1.33E+01
	678.62	0.47	-4.04E+00		8.32E+00
	688.67	0.86	1.00E+00		4.89E+00
	719.35	0.28	6.02E+00		1.58E+01
	778.90	12.96	1.67E-01		3.39E-01
	810.45	0.32	1.49E+00		1.09E+01
	867.37	4.26	-1.25E+00		8.04E-01
	919.33	0.43	-5.55E-01		9.52E+00
	964.08	14.65	1.10E-01		4.55E-01
	1085.87	10.24	1.73E-01		5.57E-01
	1089.74	1.73	1.42E-01		2.86E+00
	1112.07	13.69	-3.90E-01		3.83E-01
	1212.95	1.43	-3.55E-01		5.00E+00
	1249.94	0.19	1.94E+01		3.19E+01
	1299.14	1.63	1.94E+00		3.58E+00
	1408.01	21.07	-7.21E-03		1.64E-01
	1457.64	0.50	1.29E+02		4.13E+01
	1528.10	0.28	9.56E+00		1.73E+01
Eu-154	123.07	40.40	5.87E-04	1.10E-01	1.10E-01
	247.93	6.89	-3.41E-02		5.48E-01
	591.76	4.95	4.73E-01		8.43E-01
	692.42	1.78	1.37E+00		2.79E+00
	723.30	20.06	6.64E-02		2.64E-01
	756.80	4.52	-3.53E-01		8.96E-01
	873.18	12.08	2.43E-01		3.34E-01

Analysis Report for 09-Jul-19-10015

L1-10221B-FIGS-109SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	4.86E-02	1.10E-01	4.55E-01
	1004.76	18.01	-2.24E-01		2.66E-01
	1274.43	34.80	1.04E-01		1.68E-01
	1596.48	1.80	9.32E-01		2.27E+00
Eu-155	45.30	1.31	4.32E+00	2.65E-01	3.17E+01
	60.01	1.22	-6.92E+00		3.17E+01
	86.55	30.70	2.03E-01		2.69E-01
	105.31	21.10	-8.47E-02		2.65E-01
Ra-226	186.21	3.64	-6.07E-01	1.06E+00	1.06E+00
Pa-231	27.36	10.30	1.61E+00	1.68E+00	3.39E+00
	283.69	1.70	7.54E-01		2.18E+00
	300.07	2.47	-2.95E-01		1.68E+00
	302.65	2.20	4.19E-01		1.87E+00
	330.06	1.40	1.31E+00		3.00E+00
U-235	143.76	10.96	-1.71E-01	6.99E-02	3.84E-01
	163.33	5.08	-5.63E-02		7.57E-01
	185.71	57.20	1.28E-02		6.99E-02
	202.11	1.08	-7.12E-01		3.17E+00
	205.31	5.01	-6.84E-01		6.80E-01
Am-241	59.54	35.90	1.44E-01	1.12E+00	1.12E+00

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

Apex-Gamma

Analysis Report for 31-Jul-19-10011

L1-10221B-FSGS-004SB

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 31-Jul-19-10011
Sample Description	: L1-10221B-FSGS-004SB
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.546E+03 grams
Facility	: Default
Sample Taken On	: 7/29/2019 2:35:00PM
Acquisition Started	: 7/31/2019 9:36:15AM
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	: 78341
Fill Height	: 1545.72 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/31/2019 9:51:17AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
0703 8/[illegible]/19

Analysis Report for 31-Jul-19-10011

L1-10221B-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	949 -	961	954.75	1.32E+02	15.99	4.63E+01	1.13
2	352.06	1401 -	1415	1407.24	6.14E+01	12.12	2.96E+01	0.36
3	583.05	2326 -	2336	2330.31	1.84E+01	8.70	2.36E+01	0.49
4	911.22	3637 -	3648	3642.34	2.78E+01	7.32	1.02E+01	0.39
5	1460.34	5828 -	5850	5839.30	2.06E+02	15.12	5.75E+00	1.15

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.96	1460.82	*	10.66	4.61E+00	3.93E-01
Tl-208	0.99	583.19	*	85.00	2.76E-02	1.32E-02
Bi-211	0.85	351.07	*	13.02	4.22E-01	8.99E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	2.09E-01	3.04E-02
		300.09		3.30		
Pb-214	0.99	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	1.54E-01	3.29E-02
		785.96		1.06		
Ac-228	1.00	129.07		2.42		
		209.25		3.89		

Analysis Report for 31-Jul-19-10011

L1-10221B-FSGS-004SB

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Ac-228	1.00	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	1.86E-01	4.97E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

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

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.964	4.61E+00	3.93E-01	
	Tl-208	0.997	2.76E-02	1.32E-02	
?	Bi-211	0.856	4.22E-01	8.99E-02	
	Pb-212	0.996	2.09E-01	3.04E-02	
?	Pb-214	0.999	1.54E-01	3.29E-02	
	Ac-228	1.000	1.86E-01	4.97E-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

Analysis Report for 31-Jul-19-10011

L1-10221B-FSGS-004SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/31/2019 9:51:17AM
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	4.14E-02	4.81E-02	4.81E-02
	BE-7	477.60		10.44	-1.07E-01	2.98E-01	2.98E-01
+	K-40	1460.82	*	10.66	4.61E+00	4.24E-01	4.24E-01
	Mn-54	834.85		99.98	2.08E-02	4.23E-02	4.23E-02
	Co-60	1173.23		99.85	1.48E-02	4.34E-02	4.87E-02
		1332.49		99.98	2.67E-02		4.34E-02
	Nb-94	702.65		99.81	-6.26E-03	3.20E-02	3.20E-02
		871.09		99.89	-7.87E-03		4.34E-02
	Ag-108m	79.13		6.60	5.25E-01	3.63E-02	1.03E+00
		433.94		90.50	-2.32E-02		3.63E-02
		614.28		89.80	-3.31E-02		5.22E-02
		722.94		90.80	3.69E-03		4.29E-02
	Sb-125	176.31		6.84	-1.51E-01	1.07E-01	4.51E-01
		380.45		1.52	6.40E-01		1.95E+00
		427.87		29.60	-2.87E-02		1.07E-01
		463.36		10.49	1.86E-01		3.67E-01
		600.60		17.65	9.97E-03		1.80E-01
		606.71		4.98	9.01E-01		1.13E+00
		635.95		11.22	-1.03E-01		3.30E-01

Analysis Report for 31-Jul-19-10011

L1-10221B-FSGS-004SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-4.58E-01	1.07E-01	1.53E+00
Ba-133	79.61	2.65	2.36E+00	5.82E-02	2.55E+00
	81.00	32.90	-3.07E-01		1.60E-01
	276.40	7.16	2.65E-01		4.42E-01
	302.85	18.34	1.17E-02		1.82E-01
	356.01	62.05	-1.41E-02		5.82E-02
	383.85	8.94	9.33E-03		3.11E-01
Cs-134	475.36	1.48	1.31E-01	4.94E-02	2.12E+00
	563.25	8.34	-1.51E-01		4.91E-01
	569.33	15.37	-1.14E-01		2.27E-01
	604.72	97.62	-1.17E-02		4.94E-02
	795.86	85.46	2.91E-02		5.05E-02
	801.95	8.69	7.30E-04		4.90E-01
	1038.61	0.99	3.29E+00		4.94E+00
	1167.97	1.79	7.13E-01		2.65E+00
	1365.19	3.02	2.40E-01		1.30E+00
Cs-137	661.66	85.10	-3.89E-03	4.98E-02	4.98E-02
Eu-152	121.78	28.67	-3.01E-02	1.08E-01	1.08E-01
	244.70	7.61	1.98E-03		4.32E-01
	295.94	0.45	4.01E+00		8.70E+00
	344.28	26.60	3.80E-02		1.22E-01
	367.79	0.86	2.61E+00		3.83E+00
	411.12	2.24	-1.12E-01		1.45E+00
	443.96	2.83	-1.37E+00		1.14E+00
	488.68	0.42	1.89E+00		6.68E+00
	563.99	0.49	-8.88E+00		7.52E+00
	586.26	0.46	9.19E+00		1.12E+01
	678.62	0.47	2.71E+00		6.25E+00
	688.67	0.86	2.02E+00		4.22E+00
	719.35	0.28	2.65E+00		1.31E+01
	778.90	12.96	-2.61E-01		2.78E-01
	810.45	0.32	7.97E+00		1.29E+01
	867.37	4.26	8.62E-01		9.95E-01
	919.33	0.43	-1.83E+00		9.44E+00
	964.08	14.65	2.35E-01		4.30E-01
	1085.87	10.24	3.23E-01		4.30E-01
	1089.74	1.73	-2.39E+00		2.35E+00
	1112.07	13.69	-1.05E-01		3.35E-01
	1212.95	1.43	2.45E+00		4.21E+00
	1249.94	0.19	9.87E+00		2.80E+01
	1299.14	1.63	-1.34E+00		2.89E+00
	1408.01	21.07	-2.24E-02		2.22E-01
	1457.64	0.50	1.03E+02		3.52E+01
	1528.10	0.28	1.75E+00		8.46E+00
Eu-154	123.07	40.40	-3.13E-02	7.67E-02	7.67E-02
	247.93	6.89	6.74E-02		4.34E-01
	591.76	4.95	1.98E-01		6.48E-01
	692.42	1.78	6.81E-01		2.01E+00
	723.30	20.06	5.17E-02		1.91E-01
	756.80	4.52	3.37E-01		9.06E-01
	873.18	12.08	-3.00E-01		4.05E-01

Analysis Report for 31-Jul-19-10011

L1-10221B-FSGS-004SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	2.67E-01	7.67E-02	4.71E-01
	1004.76	18.01	-1.76E-01		2.66E-01
	1274.43	34.80	5.12E-02		1.54E-01
	1596.48	1.80	1.28E+00		2.46E+00
Eu-155	45.30	1.31	-3.90E+00	1.57E-01	9.89E+00
	60.01	1.22	-2.82E+00		1.20E+01
	86.55	30.70	6.28E-02		1.64E-01
	105.31	21.10	-9.07E-02		1.57E-01
Ra-226	186.21	3.64	-2.17E-01	8.19E-01	8.19E-01
Pa-231	27.36	10.30	1.00E+00	1.11E+00	1.11E+00
	283.69	1.70	6.93E-01		1.75E+00
	300.07	2.47	-1.61E+00		1.42E+00
	302.65	2.20	5.79E-01		1.54E+00
	330.06	1.40	1.78E+00		2.47E+00
U-235	143.76	10.96	-2.29E-01	5.23E-02	2.59E-01
	163.33	5.08	5.30E-02		6.02E-01
	185.71	57.20	-3.85E-03		5.23E-02
	202.11	1.08	-3.20E+00		2.62E+00
	205.31	5.01	-8.21E-03		5.77E-01
Am-241	59.54	35.90	-9.68E-02	4.19E-01	4.19E-01

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

Apex-Gamma

Analysis Report for 31-Jul-19-10012

L1-10221B-FSGS-011SB

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 31-Jul-19-10012
Sample Description	: L1-10221B-FSGS-011SB
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.781E+03 grams
Facility	: Default
Sample Taken On	: 7/29/2019 2:55:00PM
Acquisition Started	: 7/31/2019 9:36:31AM
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	: 7/31/2019
Efficiency Calibration Description	:
Sample Number	: 78342
Fill Height	: 1780.97 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/31/2019 9:51:35AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
0700 8/7/19

Analysis Report for 31-Jul-19-10012

L1-10221B-FSGS-011SB

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	77.18	306 -	317	310.02	5.01E+01	14.45	6.19E+01	0.90
M	2	238.67	946 -	975	955.14	2.33E+02	35.10	5.33E+01	1.07
m	3	241.81	946 -	975	967.71	5.53E+01	11.26	5.54E+01	1.07
	4	295.20	1174 -	1188	1181.02	7.12E+01	12.77	3.08E+01	0.64
	5	338.15	1346 -	1359	1352.63	5.19E+01	10.50	2.11E+01	0.57
	6	351.94	1400 -	1415	1407.77	1.41E+02	14.79	2.59E+01	1.22
	7	583.23	2325 -	2340	2332.25	8.00E+01	11.43	1.70E+01	0.44
	8	609.24	2427 -	2444	2436.24	8.49E+01	12.95	2.51E+01	1.00
	9	911.23	3636 -	3652	3643.96	5.83E+01	9.91	1.28E+01	0.78
	10	968.84	3867 -	3880	3874.45	3.13E+01	7.43	8.69E+00	0.83
	11	1460.82	5831 -	5854	5843.64	2.00E+02	14.56	2.99E+00	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
K-40	1.00	1460.82	*	10.66	4.03E+00	3.42E-01
Tl-208	1.00	583.19	*	85.00	1.11E-01	1.72E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	3.57E-01	6.10E-02
		300.09		3.30		
Pb212-XR	1.00	74.82		10.28		

Analysis Report for 31-Jul-19-10012

L1-10221B-FSGS-011SB

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb212-XR	1.00	77.11	*	17.10	4.61E-01	1.41E-01
		87.35		3.97		
		89.78		1.46		
Bi-214	1.00	609.32	*	45.49	2.27E-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	5.13E-01	1.12E-01
		295.22	*	18.42	2.89E-01	5.68E-02
		351.93	*	35.60	3.35E-01	4.42E-02
		785.96		1.06		
Pb214-XR	1.00	74.82		5.80		
		77.11	*	9.70	8.13E-01	2.52E-01
		87.35		2.24		
		89.78		0.82		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	3.79E-01	8.26E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	3.56E-01	6.25E-02
		964.77		4.99		
		968.97	*	15.80	3.25E-01	7.85E-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 31-Jul-19-10012

L1-10221B-FSGS-011SB

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	1.000	4.03E+00	3.42E-01	
	Tl-208	1.000	1.11E-01	1.72E-02	
X	Bi-211	0.885			
	Pb-212	1.000	3.57E-01	6.10E-02	
?	Pb212-XR	1.000	4.61E-01	1.41E-01	
	Bi-214	1.000	2.27E-01	3.72E-02	
	Pb-214	0.999	3.35E-01	3.33E-02	
?	Pb214-XR	1.000	8.13E-01	2.52E-01	
	Ac-228	0.999	3.53E-01	4.21E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 31-Jul-19-10012

L1-10221B-FSGS-011SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/31/2019 9:51:35AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

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

All peaks were identified.

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	4.66E-02	5.31E-02	5.31E-02
	BE-7	477.60		10.44	-1.94E-02	3.74E-01	3.74E-01
+	K-40	1460.82	*	10.66	4.03E+00	2.94E-01	2.94E-01
	Mn-54	834.85		99.98	3.63E-03	4.01E-02	4.01E-02
	Co-60	1173.23		99.85	-2.44E-02	3.47E-02	4.99E-02
		1332.49		99.98	-1.46E-02		3.47E-02
	Nb-94	702.65		99.81	-8.68E-03	4.33E-02	4.33E-02
		871.09		99.89	-3.88E-03		4.60E-02
	Ag-108m	79.13		6.60	3.75E-01	3.84E-02	1.46E+00
		433.94		90.50	-1.01E-03		3.84E-02
		614.28		89.80	2.66E-03		7.63E-02
		722.94		90.80	3.51E-02		5.29E-02
	Sb-125	176.31		6.84	3.07E-02	1.22E-01	5.20E-01
		380.45		1.52	-2.14E-01		2.39E+00
		427.87		29.60	-1.97E-02		1.22E-01
		463.36		10.49	1.75E-01		4.20E-01
		600.60		17.65	1.27E-01		2.37E-01
		606.71		4.98	2.13E+00		1.45E+00
		635.95		11.22	-2.42E-02		3.35E-01

Analysis Report for 31-Jul-19-10012

L1-10221B-FSGS-011SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-2.38E+00	1.22E-01	2.08E+00
Ba-133	79.61	2.65	-2.02E+00	8.54E-02	3.54E+00
	81.00	32.90	-2.08E-02		2.47E-01
	276.40	7.16	2.19E-01		5.35E-01
	302.85	18.34	8.91E-02		1.99E-01
	356.01	62.05	-2.44E-02		8.54E-02
	383.85	8.94	2.11E-01		4.26E-01
Cs-134	475.36	1.48	-2.14E-02	5.49E-02	2.67E+00
	563.25	8.34	8.14E-02		4.71E-01
	569.33	15.37	1.48E-01		2.52E-01
	604.72	97.62	-1.00E-02		6.93E-02
	795.86	85.46	1.76E-03		5.49E-02
	801.95	8.69	-5.24E-01		5.23E-01
	1038.61	0.99	7.07E-01		4.83E+00
	1167.97	1.79	5.43E-01		2.46E+00
	1365.19	3.02	8.83E-01		1.37E+00
Cs-137	661.66	85.10	2.69E-02	5.12E-02	5.12E-02
Eu-152	121.78	28.67	-6.49E-02	1.34E-01	1.43E-01
	244.70	7.61	1.74E-02		5.85E-01
	295.94	0.45	1.17E+01		1.05E+01
	344.28	26.60	-4.20E-02		1.34E-01
	367.79	0.86	-2.87E+00		3.92E+00
	411.12	2.24	-5.43E-02		1.71E+00
	443.96	2.83	-3.70E-01		1.26E+00
	488.68	0.42	1.02E+00		8.32E+00
	563.99	0.49	-1.65E+00		7.73E+00
	586.26	0.46	2.27E+01		1.39E+01
	678.62	0.47	-7.59E-01		8.29E+00
	688.67	0.86	-1.07E+00		4.97E+00
	719.35	0.28	-1.30E+00		1.41E+01
	778.90	12.96	-2.09E-01		3.10E-01
	810.45	0.32	7.82E-01		1.37E+01
	867.37	4.26	-2.24E-04		1.19E+00
	919.33	0.43	-3.68E+00		9.41E+00
	964.08	14.65	1.75E-01		5.20E-01
	1085.87	10.24	2.55E-01		4.87E-01
	1089.74	1.73	4.57E-01		3.07E+00
	1112.07	13.69	-2.97E-01		3.18E-01
	1212.95	1.43	-6.37E-01		4.15E+00
	1249.94	0.19	5.36E+00		2.43E+01
	1299.14	1.63	1.39E+00		3.70E+00
	1408.01	21.07	1.99E-01		2.42E-01
	1457.64	0.50	8.49E+01		3.08E+01
	1528.10	0.28	2.02E+00		1.30E+01
Eu-154	123.07	40.40	8.80E-03	1.00E-01	1.00E-01
	247.93	6.89	-1.09E-02		5.37E-01
	591.76	4.95	-1.92E-01		6.70E-01
	692.42	1.78	1.00E+00		2.52E+00
	723.30	20.06	1.07E-01		2.37E-01
	756.80	4.52	2.91E-01		9.41E-01
	873.18	12.08	-7.18E-02		3.53E-01

Analysis Report for 31-Jul-19-10012

L1-10221B-FSGS-011SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-1.58E-01	1.00E-01	4.58E-01
	1004.76	18.01	-4.56E-02		2.51E-01
	1274.43	34.80	-8.39E-02		1.45E-01
	1596.48	1.80	1.19E-01		2.66E+00
Eu-155	45.30	1.31	7.77E+00	2.33E-01	2.15E+01
	60.01	1.22	2.72E-01		2.44E+01
	86.55	30.70	-1.14E-01		2.35E-01
	105.31	21.10	-1.01E-01		2.33E-01
Ra-226	186.21	3.64	4.39E-01	1.17E+00	1.17E+00
Pa-231	27.36	10.30	3.20E+00	1.64E+00	2.58E+00
	283.69	1.70	-2.70E-01		2.12E+00
	300.07	2.47	-5.57E-02		1.64E+00
	302.65	2.20	4.70E-01		1.67E+00
	330.06	1.40	7.23E-01		2.60E+00
U-235	143.76	10.96	-1.14E-01	7.45E-02	3.42E-01
	163.33	5.08	-4.29E-02		7.54E-01
	185.71	57.20	2.96E-02		7.45E-02
	202.11	1.08	-2.92E+00		3.53E+00
	205.31	5.01	-7.02E-01		7.39E-01
Am-241	59.54	35.90	-3.06E-01	8.39E-01	8.39E-01

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

Apex-Gamma

Analysis Report for 31-Jul-19-10014

L1-10221B-FIGS-100SB

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 31-Jul-19-10014
Sample Description	: L1-10221B-FIGS-100SB
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.535E+03 grams
Facility	: Default
Sample Taken On	: 7/30/2019 10:13:00AM
Acquisition Started	: 7/31/2019 10:03:17AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.1 seconds
Dead Time	: 0.12 %
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	: 7/31/2019
Efficiency Calibration Description	:
Sample Number	: 78344
Fill Height	: 1534.99 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/31/2019 10:18:23AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
0703 8-1-19

Analysis Report for 31-Jul-19-10014

L1-10221B-FIGS-100SB

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	954.49	9.46E+01	15.57	5.54E+01	1.00
2	352.03	1402 -	1414	1407.83	4.43E+01	9.26	1.57E+01	0.63
3	582.96	2326 -	2336	2331.06	3.13E+01	7.39	9.73E+00	0.60
4	609.32	2431 -	2441	2436.43	2.86E+01	7.78	1.34E+01	0.60
5	910.95	3638 -	3650	3642.77	3.34E+01	6.74	4.61E+00	0.63
6	1460.42	5832 -	5852	5841.52	2.05E+02	14.89	4.81E+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
K-40	0.97	1460.82	*	10.66	5.11E+00	4.32E-01
Tl-208	0.99	583.19	*	85.00	5.22E-02	1.27E-02
Bi-211	0.86	351.07	*	13.02	3.39E-01	7.59E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.69E-01	3.10E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	9.17E-02	2.56E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		

Analysis Report for 31-Jul-19-10014

L1-10221B-FIGS-100SB

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	1.24E-01	2.77E-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	2.49E-01	5.13E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

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

INTERFERENCE CORRECTED REPORT

Analysis Report for 31-Jul-19-10014

L1-10221B-FIGS-100SB

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.975	5.11E+00	4.32E-01	
	Tl-208	0.992	5.22E-02	1.27E-02	
?	Bi-211	0.864	3.39E-01	7.59E-02	
	Pb-212	1.000	1.69E-01	3.10E-02	
	Bi-214	1.000	9.17E-02	2.56E-02	
?	Pb-214	0.999	1.24E-01	2.77E-02	
	Ac-228	0.997	2.49E-01	5.13E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 31-Jul-19-10014

L1-10221B-FIGS-100SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/31/2019 10:18:23AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

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

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	7.95E-02	5.89E-02	5.89E-02
	BE-7	477.60		10.44	1.38E-01	3.44E-01	3.44E-01
+	K-40	1460.82	*	10.66	5.11E+00	4.15E-01	4.15E-01
	Mn-54	834.85		99.98	1.07E-02	4.60E-02	4.60E-02
	Co-60	1173.23		99.85	5.47E-02	4.28E-02	6.01E-02
		1332.49		99.98	-9.28E-03		4.28E-02
	Nb-94	702.65		99.81	1.09E-03	4.22E-02	4.41E-02
		871.09		99.89	-1.02E-02		4.22E-02
	Ag-108m	79.13		6.60	2.72E-01	4.56E-02	1.69E+00
		433.94		90.50	2.85E-02		4.56E-02
		614.28		89.80	-3.22E-02		5.11E-02
		722.94		90.80	2.49E-02		5.86E-02
	Sb-125	176.31		6.84	3.22E-01	1.14E-01	5.48E-01
		380.45		1.52	1.46E+00		2.31E+00
		427.87		29.60	-4.93E-02		1.14E-01
		463.36		10.49	1.33E-01		3.51E-01
		600.60		17.65	1.06E-02		2.24E-01
		606.71		4.98	1.28E+00		1.23E+00
		635.95		11.22	-4.63E-04		3.85E-01

Analysis Report for 31-Jul-19-10014

L1-10221B-FIGS-100SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.06E+00	1.14E-01	2.43E+00
Ba-133	79.61	2.65	-2.33E+00	6.87E-02	3.94E+00
	81.00	32.90	-2.23E-01		2.82E-01
	276.40	7.16	-6.69E-02		5.00E-01
	302.85	18.34	3.80E-02		2.02E-01
	356.01	62.05	-3.24E-03		6.87E-02
	383.85	8.94	1.15E-01		3.71E-01
Cs-134	475.36	1.48	1.56E-01	5.09E-02	2.36E+00
	563.25	8.34	4.44E-01		5.26E-01
	569.33	15.37	1.29E-01		2.11E-01
	604.72	97.62	-1.48E-02		6.01E-02
	795.86	85.46	-1.38E-02		5.09E-02
	801.95	8.69	3.04E-02		4.35E-01
	1038.61	0.99	3.23E+00		5.90E+00
	1167.97	1.79	-4.87E+00		3.08E+00
	1365.19	3.02	3.82E-01		1.57E+00
Cs-137	661.66	85.10	-1.07E-02	5.13E-02	5.13E-02
Eu-152	121.78	28.67	1.73E-02	1.29E-01	1.46E-01
	244.70	7.61	-4.71E-02		5.46E-01
	295.94	0.45	-1.88E+00		9.44E+00
	344.28	26.60	2.32E-02		1.29E-01
	367.79	0.86	1.52E+00		3.78E+00
	411.12	2.24	7.77E-02		1.65E+00
	443.96	2.83	1.58E-02		1.38E+00
	488.68	0.42	-3.11E+00		8.57E+00
	563.99	0.49	2.01E+00		8.59E+00
	586.26	0.46	-2.20E+00		1.29E+01
	678.62	0.47	-4.12E+00		7.35E+00
	688.67	0.86	-3.16E-02		4.40E+00
	719.35	0.28	1.13E+01		1.83E+01
	778.90	12.96	2.41E-01		3.44E-01
	810.45	0.32	2.62E+00		1.18E+01
	867.37	4.26	-4.13E-02		9.34E-01
	919.33	0.43	5.65E+00		9.96E+00
	964.08	14.65	5.79E-02		4.42E-01
	1085.87	10.24	-7.38E-02		5.13E-01
	1089.74	1.73	7.30E-02		2.91E+00
	1112.07	13.69	-9.04E-02		4.15E-01
	1212.95	1.43	4.54E-01		4.61E+00
	1249.94	0.19	1.73E+01		3.12E+01
	1299.14	1.63	-2.62E-01		2.81E+00
	1408.01	21.07	1.38E-02		1.79E-01
	1457.64	0.50	9.88E+01		3.85E+01
	1528.10	0.28	4.88E+00		1.33E+01
Eu-154	123.07	40.40	-5.40E-02	9.75E-02	9.75E-02
	247.93	6.89	2.62E-01		5.66E-01
	591.76	4.95	-1.75E-01		8.31E-01
	692.42	1.78	1.26E+00		2.73E+00
	723.30	20.06	2.27E-01		2.66E-01
	756.80	4.52	2.06E-01		1.02E+00
	873.18	12.08	-2.47E-02		3.75E-01

Analysis Report for 31-Jul-19-10014

L1-10221B-FIGS-100SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	2.09E-01	9.75E-02	5.50E-01
	1004.76	18.01	-2.91E-01		2.83E-01
	1274.43	34.80	9.74E-02		2.10E-01
	1596.48	1.80	1.11E+00		2.47E+00
Eu-155	45.30	1.31	-1.87E+00	2.42E-01	2.47E+01
	60.01	1.22	-1.30E+01		2.67E+01
	86.55	30.70	-4.16E-02		2.42E-01
	105.31	21.10	9.17E-02		2.56E-01
Ra-226	186.21	3.64	6.75E-01	1.04E+00	1.04E+00
Pa-231	27.36	10.30	2.31E+00	1.55E+00	3.45E+00
	283.69	1.70	1.89E+00		2.12E+00
	300.07	2.47	-9.31E-01		1.55E+00
	302.65	2.20	2.18E-01		1.70E+00
	330.06	1.40	1.57E-01		2.65E+00
U-235	143.76	10.96	2.09E-02	6.63E-02	3.98E-01
	163.33	5.08	2.93E-01		7.27E-01
	185.71	57.20	1.04E-02		6.63E-02
	202.11	1.08	-9.01E-01		3.25E+00
	205.31	5.01	-3.81E-01		7.21E-01
Am-241	59.54	35.90	6.04E-01	1.03E+00	1.03E+00

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

Apex-Gamma

Analysis Report for 01-Aug-19-10032

L1-10221B-FIGS-100SB

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 01-Aug-19-10032
Sample Description	: L1-10221B-FIGS-100SB
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.535E+03 grams
Facility	: Default
Sample Taken On	: 7/30/2019 10:13:00AM
Acquisition Started	: 8/1/2019 11:14:14AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 1800.0 seconds
Real Time	: 1802.3 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	: 8/1/2019
Efficiency Calibration Description	:
Sample Number	: 78429
Fill Height	: 1534.99 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/1/2019 11:44:20AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

1530 8/1/19

Analysis Report for 01-Aug-19-10032

L1-10221B-FIGS-100SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.14	306 -	315	309.27	3.96E+01	15.93	9.34E+01	0.90
2	238.64	949 -	960	954.65	1.83E+02	21.40	1.09E+02	0.89
3	295.31	1173 -	1186	1181.15	7.39E+01	14.92	5.41E+01	1.33
4	351.86	1399 -	1414	1407.19	1.41E+02	15.98	3.80E+01	1.42
5	583.13	2327 -	2339	2331.74	5.81E+01	11.09	2.39E+01	0.73
6	609.20	2429 -	2442	2435.97	7.94E+01	11.07	1.56E+01	0.99
7	910.99	3635 -	3650	3642.93	4.29E+01	9.90	1.81E+01	1.17
8	969.01	3869 -	3883	3875.01	2.78E+01	7.94	1.22E+01	1.16
9	1460.54	5830 -	5853	5842.00	4.95E+02	22.25	0.00E+00	1.94

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	6.16E+00	3.85E-01
Tl-208	1.00	583.19	*	85.00	4.84E-02	9.70E-03
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.64E-01	2.32E-02
		300.09		3.30		
Pb212-XR	1.00	74.82		10.28		
		77.11	*	17.10	2.42E-01	1.00E-01
		87.35		3.97		

Analysis Report for 01-Aug-19-10032

L1-10221B-FIGS-100SB

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb212-XR	1.00	89.78		1.46		
Bi-214	0.99	609.32	*	45.49	1.27E-01	1.93E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	1.76E-01	3.82E-02
		351.93	*	35.60	1.97E-01	2.74E-02
		785.96		1.06		
Pb214-XR	1.00	74.82		5.80		
		77.11	*	9.70	4.26E-01	1.78E-01
		87.35		2.24		
		89.78		0.82		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	1.60E-01	3.75E-02
		964.77		4.99		
		968.97	*	15.80	1.76E-01	5.09E-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 01-Aug-19-10032

L1-10221B-FIGS-100SB

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.988	6.16E+00	3.85E-01	
	Tl-208	1.000	4.84E-02	9.70E-03	
X	Bi-211	0.904			
	Pb-212	1.000	1.64E-01	2.32E-02	
?	Pb212-XR	1.000	2.42E-01	1.00E-01	
	Bi-214	0.999	1.27E-01	1.93E-02	
	Pb-214	0.999	1.90E-01	2.22E-02	
?	Pb214-XR	1.000	4.26E-01	1.78E-01	
	Ac-228	0.998	1.66E-01	3.02E-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-Aug-19-10032
L1-10221B-FIGS-100SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/1/2019 11:44:20AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

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

All peaks were identified.

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	4.94E-02	3.99E-02	3.99E-02
	BE-7	477.60		10.44	-1.12E-01	2.51E-01	2.51E-01
+	K-40	1460.82	*	10.66	6.16E+00	3.58E-02	3.58E-02
	Mn-54	834.85		99.98	-8.90E-03	3.18E-02	3.18E-02
	Co-60	1173.23		99.85	3.21E-02	3.14E-02	4.07E-02
		1332.49		99.98	-3.59E-02		3.14E-02
	Nb-94	702.65		99.81	-2.77E-02	2.77E-02	2.77E-02
		871.09		99.89	-1.74E-02		3.23E-02
	Ag-108m	79.13		6.60	-1.39E-01	2.75E-02	1.09E+00
		433.94		90.50	-1.06E-02		2.75E-02
		614.28		89.80	-3.07E-02		3.66E-02
		722.94		90.80	1.59E-03		3.47E-02
	Sb-125	176.31		6.84	2.63E-02	8.86E-02	3.89E-01
		380.45		1.52	5.87E-01		1.61E+00
		427.87		29.60	1.94E-02		8.86E-02
		463.36		10.49	1.94E-02		2.64E-01
		600.60		17.65	-6.09E-02		1.63E-01
		606.71		4.98	6.91E-01		8.43E-01
		635.95		11.22	-1.70E-02		2.52E-01

Analysis Report for 01-Aug-19-10032

L1-10221B-FIGS-100SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	6.68E-01	8.86E-02	1.69E+00
Ba-133	79.61	2.65	-4.99E-01	4.89E-02	2.54E+00
	81.00	32.90	7.73E-03		1.80E-01
	276.40	7.16	-2.03E-01		3.52E-01
	302.85	18.34	-6.80E-03		1.35E-01
	356.01	62.05	-1.41E-02		4.89E-02
	383.85	8.94	3.33E-02		2.76E-01
Cs-134	475.36	1.48	6.33E-01	3.48E-02	1.77E+00
	563.25	8.34	-1.40E-01		2.97E-01
	569.33	15.37	1.03E-02		1.72E-01
	604.72	97.62	-1.84E-02		4.13E-02
	795.86	85.46	1.03E-03		3.48E-02
	801.95	8.69	-2.38E-01		3.29E-01
	1038.61	0.99	1.54E+00		3.68E+00
	1167.97	1.79	-9.38E-01		2.25E+00
	1365.19	3.02	2.65E-01		9.48E-01
Cs-137	661.66	85.10	-4.36E-04	3.37E-02	3.37E-02
Eu-152	121.78	28.67	2.25E-02	9.19E-02	1.07E-01
	244.70	7.61	-6.76E-02		3.82E-01
	295.94	0.45	3.89E+00		6.79E+00
	344.28	26.60	-1.03E-01		9.19E-02
	367.79	0.86	-7.99E-01		2.53E+00
	411.12	2.24	4.63E-02		1.08E+00
	443.96	2.83	6.07E-01		9.10E-01
	488.68	0.42	-3.14E+00		6.34E+00
	563.99	0.49	-1.49E+00		4.95E+00
	586.26	0.46	1.22E+01		8.61E+00
	678.62	0.47	-1.13E+00		5.78E+00
	688.67	0.86	-1.72E+00		3.34E+00
	719.35	0.28	4.75E+00		1.04E+01
	778.90	12.96	-1.35E-01		1.97E-01
	810.45	0.32	7.55E-01		8.96E+00
	867.37	4.26	-9.49E-01		7.47E-01
	919.33	0.43	1.38E+00		7.67E+00
	964.08	14.65	-1.20E-01		2.99E-01
	1085.87	10.24	-1.77E-01		2.78E-01
	1089.74	1.73	1.20E+00		1.91E+00
	1112.07	13.69	1.06E-01		2.72E-01
	1212.95	1.43	-1.80E+00		2.65E+00
	1249.94	0.19	6.03E+00		2.13E+01
	1299.14	1.63	3.41E-01		2.34E+00
	1408.01	21.07	9.80E-02		1.35E-01
	1457.64	0.50	1.28E+02		2.92E+01
	1528.10	0.28	-1.17E+00		8.02E+00
Eu-154	123.07	40.40	-1.80E-02	7.48E-02	7.48E-02
	247.93	6.89	8.84E-02		3.97E-01
	591.76	4.95	-1.21E-01		5.56E-01
	692.42	1.78	-1.07E+00		1.62E+00
	723.30	20.06	-9.48E-02		1.57E-01
	756.80	4.52	8.24E-01		7.44E-01
	873.18	12.08	-3.44E-02		2.73E-01

Analysis Report for 01-Aug-19-10032

L1-10221B-FIGS-100SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	4.00E-02	7.48E-02	3.34E-01
	1004.76	18.01	1.25E-02		1.78E-01
	1274.43	34.80	7.16E-03		1.07E-01
	1596.48	1.80	-3.92E-01		1.49E+00
Eu-155	45.30	1.31	-1.17E+01	1.75E-01	1.88E+01
	60.01	1.22	5.63E+00		2.07E+01
	86.55	30.70	2.22E-03		1.75E-01
	105.31	21.10	3.23E-03		1.76E-01
Ra-226	186.21	3.64	2.48E-01	6.97E-01	6.97E-01
Pa-231	27.36	10.30	2.93E+00	1.00E+00	2.45E+00
	283.69	1.70	1.12E+00		1.54E+00
	300.07	2.47	-1.28E+00		1.00E+00
	302.65	2.20	1.71E-01		1.14E+00
	330.06	1.40	-2.81E-01		1.88E+00
U-235	143.76	10.96	9.77E-02	4.49E-02	2.60E-01
	163.33	5.08	-1.37E-01		5.37E-01
	185.71	57.20	1.60E-02		4.49E-02
	202.11	1.08	-8.19E-01		2.33E+00
	205.31	5.01	-6.46E-03		5.10E-01
Am-241	59.54	35.90	3.43E-01	7.48E-01	7.48E-01

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

Apex-Gamma

Analysis Report for 31-Jul-19-10013

L1-10221B-FIGS-101SB

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 31-Jul-19-10013
Sample Description	: L1-10221B-FIGS-101SB
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.639E+03 grams
Facility	: Default
Sample Taken On	: 7/29/2019 2:15:00PM
Acquisition Started	: 7/31/2019 10:03:02AM
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	: 7/31/2019
Efficiency Calibration Description	:
Sample Number	: 78343
Fill Height	: 1638.78 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/31/2019 10:18:05AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated
0703 8-1-19

Analysis Report for 31-Jul-19-10013

L1-10221B-FIGS-101SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.68	473 -	481	477.54	1.17E+02	18.15	9.41E+01	1.33
2	351.73	698 -	708	703.40	6.01E+01	11.35	2.89E+01	1.43
3	583.22	1161 -	1170	1166.04	5.78E+01	9.71	1.62E+01	1.32
4	609.30	1213 -	1223	1218.19	4.06E+01	8.53	1.34E+01	1.04
5	1460.64	2914 -	2928	2921.33	2.57E+02	16.03	0.00E+00	1.73

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82	*	10.66	4.74E+00	3.60E-01
Tl-208	1.00	583.19	*	85.00	7.35E-02	1.31E-02
Bi-211	0.93	351.07	*	13.02	3.55E-01	7.30E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.62E-01	2.84E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	9.92E-02	2.17E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		

Analysis Report for 31-Jul-19-10013

L1-10221B-FIGS-101SB

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	1.30E-01	2.67E-02
		785.96		1.06		

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

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.995	4.74E+00	3.60E-01	
	Tl-208	1.000	7.35E-02	1.31E-02	
?	Bi-211	0.933	3.55E-01	7.30E-02	
	Pb-212	1.000	1.62E-01	2.84E-02	
	Bi-214	1.000	9.92E-02	2.17E-02	
?	Pb-214	0.996	1.30E-01	2.67E-02	

Analysis Report for 31-Jul-19-10013

L1-10221B-FIGS-101SB

? = 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-19-10013

L1-10221B-FIGS-101SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/31/2019 10:18:05AM
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	6.57E-02	5.13E-02	5.13E-02
	BE-7	477.60		10.44	2.05E-01	3.32E-01	3.32E-01
+	K-40	1460.82	*	10.66	4.74E+00	5.31E-02	5.31E-02
	Mn-54	834.85		99.98	-7.68E-03	3.81E-02	3.81E-02
	Co-60	1173.23		99.85	-8.69E-03	4.17E-02	4.39E-02
		1332.49		99.98	1.33E-03		4.17E-02
	Nb-94	702.65		99.81	-6.92E-03	3.01E-02	3.22E-02
		871.09		99.89	4.30E-03		3.01E-02
	Ag-108m	79.13		6.60	8.85E-01	3.44E-02	1.03E+00
		433.94		90.50	-1.28E-02		3.44E-02
		614.28		89.80	-1.01E-02		4.27E-02
		722.94		90.80	-1.25E-02		4.44E-02
	Sb-125	176.31		6.84	-5.98E-02	1.04E-01	4.34E-01
		380.45		1.52	-6.31E-01		1.86E+00
		427.87		29.60	4.99E-02		1.04E-01
		463.36		10.49	1.25E-01		2.94E-01
		600.60		17.65	-3.43E-02		1.82E-01
		606.71		4.98	-4.46E-02		9.52E-01
		635.95		11.22	3.65E-02		2.97E-01

Analysis Report for 31-Jul-19-10013

L1-10221B-FIGS-101SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-2.48E-01	1.04E-01	1.61E+00
Ba-133	79.61	2.65	1.34E+00	5.31E-02	2.39E+00
	81.00	32.90	-2.02E-01		1.52E-01
	276.40	7.16	6.99E-02		4.03E-01
	302.85	18.34	5.14E-02		1.54E-01
	356.01	62.05	-8.74E-03		5.31E-02
	383.85	8.94	8.06E-02		3.43E-01
Cs-134	475.36	1.48	-6.89E-01	4.23E-02	2.08E+00
	563.25	8.34	-2.97E-02		3.80E-01
	569.33	15.37	-1.71E-02		2.05E-01
	604.72	97.62	4.02E-03		4.47E-02
	795.86	85.46	2.04E-03		4.23E-02
	801.95	8.69	-1.52E-01		3.81E-01
	1038.61	0.99	2.14E+00		4.27E+00
	1167.97	1.79	-1.02E+00		2.25E+00
	1365.19	3.02	8.16E-02		1.02E+00
Cs-137	661.66	85.10	2.22E-02	4.42E-02	4.42E-02
Eu-152	121.78	28.67	3.57E-02	9.91E-02	1.07E-01
	244.70	7.61	-1.96E-01		4.10E-01
	295.94	0.45	1.42E+00		7.35E+00
	344.28	26.60	-9.41E-02		9.91E-02
	367.79	0.86	-5.80E-01		3.13E+00
	411.12	2.24	-1.34E-01		1.24E+00
	443.96	2.83	-4.95E-01		9.43E-01
	488.68	0.42	2.57E+00		7.15E+00
	563.99	0.49	-3.03E-01		6.55E+00
	586.26	0.46	-5.90E+00		1.09E+01
	678.62	0.47	-1.86E+00		5.57E+00
	688.67	0.86	-2.15E+00		3.01E+00
	719.35	0.28	8.82E+00		1.31E+01
	778.90	12.96	-6.15E-03		2.34E-01
	810.45	0.32	-1.25E+00		9.19E+00
	867.37	4.26	-4.00E-02		7.24E-01
	919.33	0.43	-3.00E+00		7.70E+00
	964.08	14.65	-1.14E-01		3.40E-01
	1085.87	10.24	-1.25E-01		3.57E-01
	1089.74	1.73	1.02E+00		2.33E+00
	1112.07	13.69	-5.06E-03		3.27E-01
	1212.95	1.43	-6.56E-01		3.26E+00
	1249.94	0.19	-1.67E+00		2.17E+01
	1299.14	1.63	-9.31E-01		2.09E+00
	1408.01	21.07	1.09E-01		1.77E-01
	1457.64	0.50	-4.05E+00		3.13E+01
	1528.10	0.28	5.05E+00		1.12E+01
Eu-154	123.07	40.40	-6.57E-04	7.35E-02	7.35E-02
	247.93	6.89	-5.01E-02		4.02E-01
	591.76	4.95	1.53E-01		6.23E-01
	692.42	1.78	9.93E-01		1.92E+00
	723.30	20.06	-1.20E-02		2.13E-01
	756.80	4.52	1.64E-01		7.60E-01
	873.18	12.08	2.66E-02		2.42E-01

Analysis Report for 31-Jul-19-10013

L1-10221B-FIGS-101SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	2.51E-01	7.35E-02	3.92E-01
	1004.76	18.01	1.43E-02		1.94E-01
	1274.43	34.80	-7.76E-02		1.38E-01
	1596.48	1.80	-1.03E+00		1.71E+00
Eu-155	45.30	1.31	1.11E+00	1.52E-01	9.90E+00
	60.01	1.22	-9.46E+00		1.02E+01
	86.55	30.70	6.81E-02		1.59E-01
	105.31	21.10	-3.07E-02		1.52E-01
Ra-226	186.21	3.64	-2.37E-01	8.52E-01	8.52E-01
Pa-231	27.36	10.30	8.94E-01	1.13E+00	1.13E+00
	283.69	1.70	-2.41E-01		1.57E+00
	300.07	2.47	-9.44E-01		1.16E+00
	302.65	2.20	4.28E-01		1.29E+00
	330.06	1.40	1.07E+00		2.16E+00
U-235	143.76	10.96	1.34E-02	5.36E-02	2.59E-01
	163.33	5.08	-3.81E-01		6.02E-01
	185.71	57.20	-2.46E-02		5.36E-02
	202.11	1.08	2.69E+00		3.11E+00
	205.31	5.01	-1.59E-01		6.25E-01
Am-241	59.54	35.90	-1.76E-01	3.75E-01	3.75E-01

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

ATTACHMENT 8
EBERLINE ANALYTICAL REPORTS

EBERLINE ANALYTICAL

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

EBS-OR-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.

CLIENT ID	LAB ID	CLIENT ID	LAB ID
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

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

Eberline Analytical
Final Report of Analysis

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

Work Order Details:
SDG: 19-09012
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	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

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
19-09012-01	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-FIGS-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-FIGS-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-FIGS-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-FIGS-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-FIGS-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-FIGS-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-FIGS-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-FIGS-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-FIGS-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-FIGS-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-FIGS-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-FIGS-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-FIGS-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-FIGS-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

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
19-09012-01	LCS	KNOWN	09/05/19 00:00	9/3/2019	10/2/2019	19-09012	Strontium-90	ElChroM 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	ElChroM 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	ElChroM 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	ElChroM 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	ElChroM 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	ElChroM 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	ElChroM 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	ElChroM 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	ElChroM 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	ElChroM 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	ElChroM 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	ElChroM 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	ElChroM 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	ElChroM 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	ElChroM 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	ElChroM 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	ElChroM 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	ElChroM 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	ElChroM 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	ElChroM 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
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
19-09012-02	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
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
19-09012-03	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

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
19-09012-04	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
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
19-09012-05	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
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
19-09012-06	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
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	Thorium-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

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
19-09012-08	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	Thorium-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

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
19-09012-09	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
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
19-09012-10	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
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
19-09012-11	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		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		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		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		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		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		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		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

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
19-09012-12	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

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
19-09012-13	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

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
19-09012-14	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

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
19-09012-15	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

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
19-09012-16	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		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		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		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		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		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		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		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		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
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
19-09012-17	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

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
19-09012-18	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

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
19-09012-19	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	Thorium-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

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
4 L1-10221A-FJGS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/17/2019	0846	5 ROC HTD	NA	771.65g
5 L1-10221A-FJGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/17/2019	0844	5 ROC HTD	NA	707.40g
6 L1-10221A-FIGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/13/2019	0745	5 ROC HTD	NA	774.76g
7 L1-10221A-FIGS-006-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/13/2019	0747	5 ROC HTD	NA	783.08g
8 L1-10221A-FIGS-007-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/13/2019	0749	5 ROC HTD	NA	708.49g
9 L1-10221A-FIGS-008-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/13/2019	0751	5 ROC HTD	NA	794.16g
10 L1-10221A-FIGS-009-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/13/2019	0753	5 ROC HTD	NA	774.52g

REC BS 9-4-19 @ 1000

11	L1-10221B-FIGS-100-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/20/2019	0955	5 ROC HTD	NA	627.14g
12	L1-10221C-FIGS-103-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/8/2019	1247	5 ROC HTD	NA	860.24g
13	L1-10221B-FIGS-102-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/8/2019	1310	5 ROC HTD	NA	680.87g
14	L1-10221B-FIGS-103-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/8/2019	1312	5 ROC HTD	NA	723.59g
15	L1-10221B-FIGS-104-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/8/2019	1314	5 ROC HTD	NA	824.34g
16	L1-10221B-FIGS-105-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/8/2019	1316	5 ROC HTD	NA	703.93g
17	L1-10221D-FIGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/8/2019	1230	5 ROC HTD	NA	626.47g
18	L1-10221D-FIGS-006-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/8/2019	1232	5 ROC HTD	NA	649.53g
19	L1-10221D-FIGS-007-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/8/2019	1234	5 ROC HTD	NA	485.57g
	L1-10221D-FIGS-008-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/8/2019	1236	5 ROC HTD	NA	530.46g
	L1-10221C-AJGS-109-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/5/2019	1236	FULL SUITE	NA	920.33g
	L1-10221C-AJGS-102-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/5/2019	1222	FULL SUITE	NA	868.46g
	L1-10209C-AJGS-110-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/6/2019	0738	FULL SUITE	NA	730.63g
	L1-10209C-AJGS-109-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/6/2019	0736	FULL SUITE	NA	782.82g
	L1-10209C-AJGS-108-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/6/2019	0734	FULL SUITE	NA	897.48g
	L1-10209C-AJGS-107-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/6/2019	0732	FULL SUITE	NA	654.16g
	L1-10209C-AJGS-104-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/6/2019	0726	FULL SUITE	NA	782.70g
	L1-10209C-AJGS-103-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/6/2019	0724	FULL SUITE	NA	806.24g
	L1-10209C-AJGS-102-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	6/6/2019	0722	FULL SUITE	NA	787.15g

Rec YBS 9-3-19 @ 1000

ZIONSOLUTIONS LLC
An EnergySolutions Company

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

Relinquished by:	Date (mm/dd/yyyy):	Time:	Received by:	Date: (mm/dd/yyyy):	
Jack Mucia	8/28/19	0748	Richard 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):	
			Randolph Spencer	09/03/2019	1000
Relinquished by:	Date (mm/dd/yyyy):	Time:	Received by:	Date: (mm/dd/yyyy):	

Comments

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