ZION SOLUTIONS LLC
An EnergySolutions Company

ZION STATION RESTORATION PROJECT
FINAL STATUS SURVEY RELEASE RECORD

NE CORNER OF EXCLUSION AREA

SURVEY UNIT 10213A

REVISION 1

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LIST OF ACRONYMS AND ABBREVIATIONS

ALARA	As Low As Reasonably Achievable
AMCG	Average Member of the Critical Group
BcDCGL	Base Case DCGLs
BcSOF	Base Case Sum of Fractions
C/LT	Characterization/License Termination
cpm	Counts per minute
DQO	Data Quality Objective
DCGL	Derived Concentration Guideline Level
FSS	Final Status Survey
GPS	Global Positioning System
HTD	Hard-to-Detect
HSA	Historical Site Assessment
IC	Insignificant Contributor
LBGR	Lower Bound of the Gray Region
LTP	License Termination Plan
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	Minimum Detectable Concentration
NAD	North American Datum
NaI	Sodium Iodide
OpDCGL	Operational Derived Concentration Guideline Level
OpSOF	Operational Sum of Fractions
QC	Quality Control
RA	Radiological Assessment
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 10213A, "NE Corner of Exclusion Area," has been generated for the Zion Station Restoration Project (ZSRP) in accordance with Zion*Solutions* procedure ZS-LT-300-001-005, *"Final Status Survey Data Reporting"* (Reference 1) and satisfies the requirements of Section 5.11 of the *"Zion Station Restoration Project License Termination Plan"* (LTP) (Reference 2).

An FSS package (L2-10213A-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 two. 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 approximately 55% of the total surface area in the survey unit. No areas of elevated activity were detected during the scans. The analytical results for all soil samples taken in survey unit 10213A indicate that the Sum of Fractions (SOF) for each sample, when compared to the Operational Derived Concentration Guideline Levels (OpDCGL), was less than 1.0. The maximum Operational SOF (OpSOF) was 0.188 with a mean OpSOF of 0.081. The mean Base Case SOF (BcSOF), when the analytical results were compared to the Base Case DCGLs (BcDCGL), was 0.021, which results in a dose assigned to the survey unit of 0.519 mrem/year Total Effective Dose Equivalent (TEDE). Therefore, the null hypothesis is rejected and survey unit 10213A is acceptable for unrestricted release.

2. SURVEY UNIT DESCRIPTION

Survey unit 10213A, "NE Corner of Exclusion Area," is a Class 2 open land survey unit and is 5,730 m^2 in size. It is bounded on the west by survey units 10214D and 10214E, the east by survey unit 10212A, the north by survey unit 10212B and the south by survey unit 10213B.

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

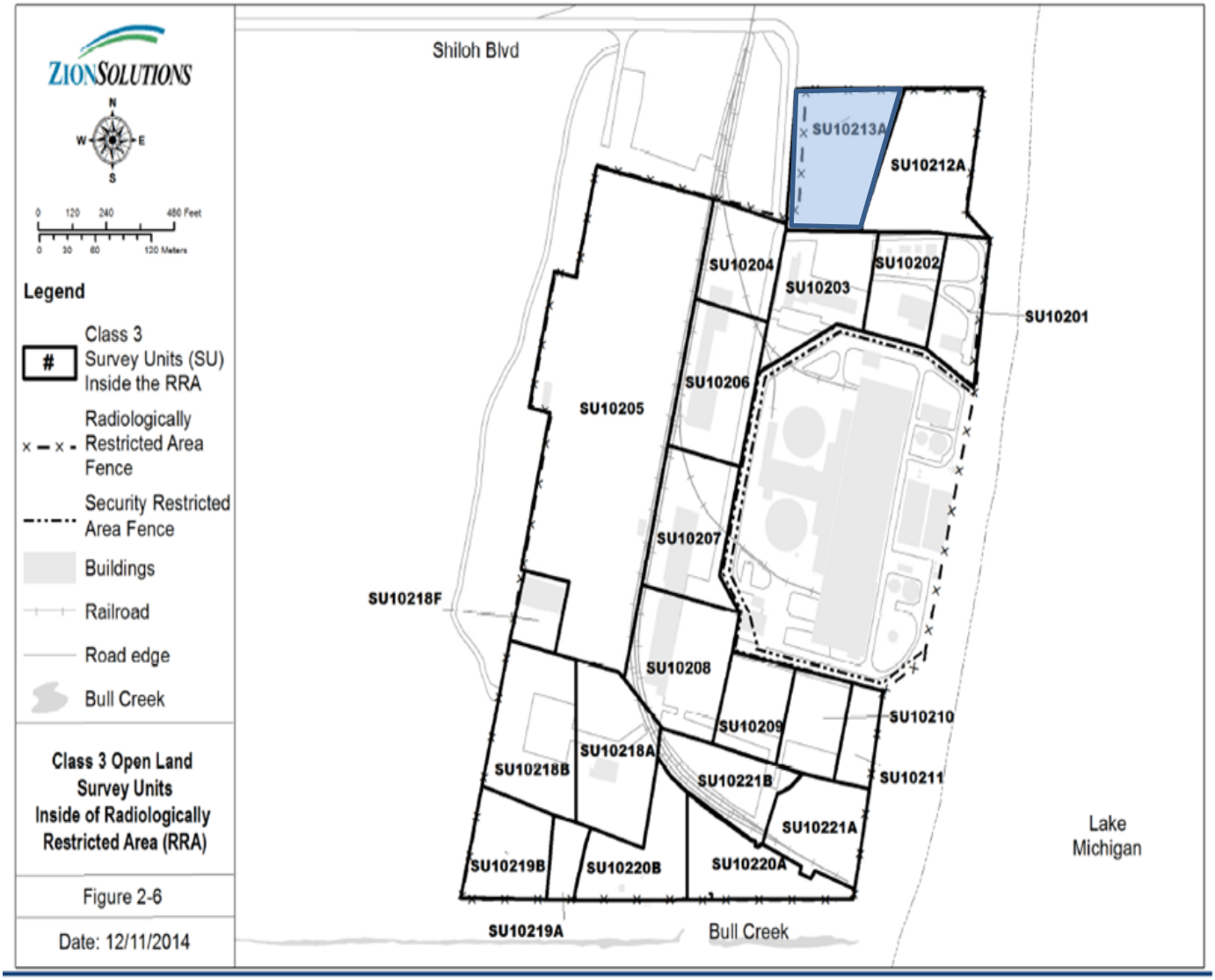
The boundary of the survey unit was defined using a Global Positioning System (GPS) based on the Illinois State Plane System North American Datum (NAD) 1983 East. The reference coordinates associated with the sample locations in this survey unit are presented in Table 8.

3. CLASSIFICATION BASIS

Survey unit 10213A 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 in the *"Zion Station Historical Site Assessment"* (HSA) (Reference 6) as the "Power House Area" and was located within survey unit 10213 as identified in Figure 4 of the HSA. This area was also described as the "Power House Area" (survey unit 10213) in Table 2-29 of the ZSRP LTP which is represented in Figure 2-6 of the LTP and replicated below as Figure 1.

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



The HSA states that this area contained the Power House and includes a reference to a Corporate Visitor Center. It also mentions that in 1997, 264 improperly controlled items were found outside of the Radiologically Protected Area having measurable fixed and/or removable contamination from 1000 to 25,000 dpm/100 cm^2. A significant proportion (about 19%) of improperly controlled items were found in proximity to the Corporate Visitor Center.

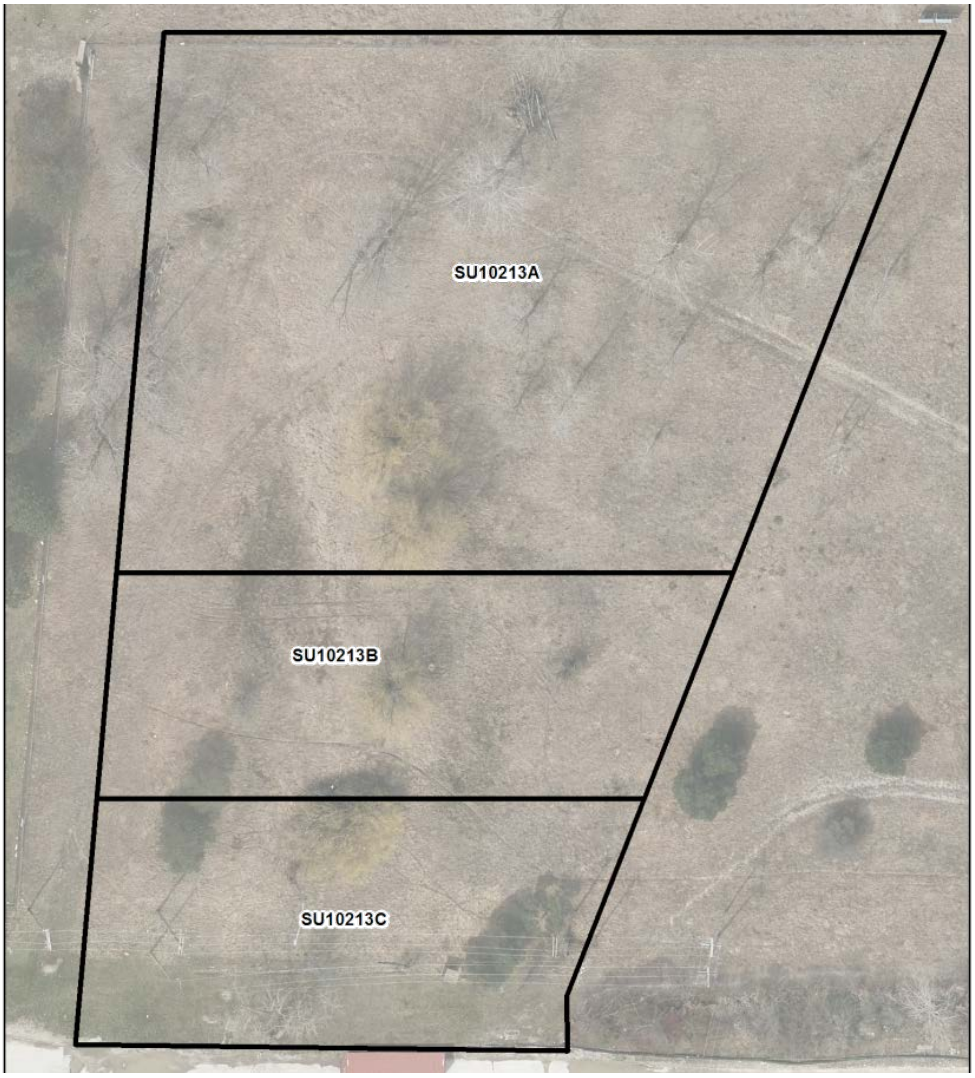
The HSA does not comment on the function of this area during facility operation. The HSA classified this area as non-impacted. Subsequently, during LTP development, the area was re-classified as a Class 3 survey unit due to decommissioning activities impacting the area.

FSS was performed in March and April of 2016. Sodium iodide (NaI) walkover scans were performed on approximately 5% of the survey unit and sixteen (16) surface soil samples were obtained: fourteen (14) random and two (2) investigation. Six (6) of the sixteen (16) samples were positively detected at concentrations exceeding the instrument Minimum Detectable Concentration (MDC) for Cs-137 with the highest observed concentration of 0.349 pCi/g.

FSS was performed of Class 3 survey unit 10213 concluding on April 19, 2016 and was originally included in the Phase 1 scope. However, following the initial submittal of the Phase 1 Final Report to the NRC, it was discovered that additional subgrade piping systems in the survey unit required removal and the original FSS was nullified. Gamma scans performed in November of 2018, during the pipe removal, showed no activity above the MDC_{scan} of the instrument.

FSS was performed again in December of 2018. The analysis of the surface soil samples indicated positive activity for Cs-137 at concentrations greater than the MDC of the instrument in all sixteen (16) of the random sample locations with the highest observed activity for Cs-137 of 5.260 pCi/g. One (1) of the random samples indicated positive activity for Co-60 with an activity of 0.059 pCi/g. The analysis of the one (1) investigation sample indicated positive activity for both Cs-137 and Co-60 with activities of 2.850 pCi/g and 0.067 pCi/g, respectively. Since the OpSOF for four (4) of the aforementioned samples was greater than 0.5 (0.544, 0.622, 0.881 and 1.535), the Class 3 survey unit 10213A failed the FSS. As a corrective action, survey unit 10213A was divided into two Class 1 survey units (10213B and 10212C) which encompassed the elevated area and one Class 2 survey unit (10213A), which provided a buffer between the newly created Class 1 survey units and the adjacent Class 3 survey unit. Figure 2 below shows the boundaries of the survey units.

Figure 2 - The Two Class 1 and One Class 2 Open Land Survey Units Created from the Original Class 3 Survey Unit 10213A



An FSS readiness survey was performed in April of 2019 in survey unit 10213A under a Radiological Assessment (RA). Nine (9) of the fourteen (14) surface soil samples collected indicated positive activity for Cs-137 at concentrations greater than the MDC with the highest observed concentration of 0.192 pCi/g.

Additional surface soil samples were collected under an RA in July of 2019. The samples were collected at a location identified during the previously discussed FSS of the Class 3 survey unit 10213A where the OpSOF was 0.544. Five (5) samples were collected in this area. All five (5) samples indicated positive activity for Cs-137 at concentrations greater than the MDC with a highest observed concentration of 0.374 pCi/g. A gamma scan was also performed on 25 m^2 of the area encompassing the location which showed no activity above the MDC_{scan} of the instrument.

A Radiological Engineer and a Characterization/License Termination (C/LT) Supervisor performed a visual inspection and walk-down of the survey unit on July 16, 2019, prior to performing FSS. The purpose of the walk-down was to assess the physical condition of the survey unit, evaluate access points and travel paths and identify potentially hazardous conditions. A final classification assessment was performed in accordance with ZS-LT-300-001-002, as part of the survey design for FSS. The assessment confirmed that survey unit 10213A was correctly classified as Class 2.

4. DATA QUALITY OBJECTIVES

FSS planning and design hinges on coherence with the Data Quality Objective (DQO) process to ensure, through compliance with explicitly defined inputs and boundaries, that the primary objective of the survey is satisfied. The DQO process 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 10213A does not exceed the release criteria specified in the LTP and that the potential dose from residual radioactivity is As Low As Reasonably Achievable (ALARA).

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

Zion*Solutions* TSD 14-019, *"Radionuclides of Concern for Soil and Basement Fill Model Source Terms"* (Reference 8), was written to refine the initial selection of ROC for decommissioning at ZSRP. The list of ROC was evaluated using Containment Building(s) and Auxiliary Building concrete core analysis data to evaluate the dose significance of each radionuclide in the end state model. Section 4.4 of TSD 14-019 evaluated the results of the characterization data of surveys taken of soils. The following conclusion was reached: *"The results of surface and subsurface soil characterization in the impacted area surrounding Zion indicate that there is minimal*

residual radioactivity in soil. Essentially all of the soil results were reported as non-detectable. Other than Cs-137 at very low levels, and Co-60 at a concentration of 0.24 pCi/g in one sample, the results for all radionuclides were less than MDC. Therefore, the direct determination of radionuclide mixture fractions for initial suite radionuclides in soil is not technically feasible due to the MDC biasing issues discussed above. Based on a generalized assumption that the contaminated water that caused concrete contamination would be similar to the source of soil contamination, the ROC and radionuclide mixture derived for the Auxiliary Building concrete was considered to be reasonably representative of soils for FSS planning and implementation."

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

Table 1 - Dose Significant Radionuclides and Mixture

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Instrument DQOs included a verification of the ability of the survey instrument to detect the radiation(s) of interest at the required scan MDC, which for Class 2 open land survey units, is less than or 50% of the applicable OpDCGL. 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 less than 50% of the applicable OpDCGL.

5. SURVEY DESIGN

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

The DQO process determined that Co-60, Ni-63, Sr-90, Cs-134 and Cs-137 would be the ROC in survey unit 10213A. 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 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 10213A, the surrogate OpDCGLs for Co-60 and Cs-137 were computed based on the maximum ratios from Table 6.

The equation for calculating a surrogate DCGL is as follows:

Equation 1

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

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

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

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

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

Equation 2

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

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

Equation 3

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

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

The surrogate OpDCGL for Co-60 while inferring Ni-63 is 0.898 pCi/g, the surrogate OpDCGL for Cs-137 while inferring Sr-90 is 3.622 pCi/g and the OpDCGL for Cs-134 is 1.733 pCi/g. Using the normalized mixture for gamma-emitting ROC from Table 1, the surrogate adjusted gamma DCGL is then calculated as follows:

Equation 4

$$Surrogate_{DCGL\ (gamma)} = \frac{1}{\left[\left(\frac{0.012}{0.898_{(Co-60)}}\right) + \left(\frac{0.0001}{1.733_{Cs-134}}\right) + \left(\frac{0.988}{3.622_{(Cs-137)}}\right)\right]} = 3.494\ pCi/g$$

The surrogate adjusted gamma DCGL that was used in this survey unit is 3.494 pCi/g.

For this Class 2 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 in Table 7.

Table 7 - Investigation Levels

Classification	Scan Investigation Levels	Direct Investigation Levels
Class 2	>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 3,000 counts per minute (cpm)
- scan speed of 0.5 m/sec
- distance from detector to surface of 2 inches
- isotopic mix of 95% Cs-137 and 5% Co-60

The calculated MDC_{scan} value was 2.90 pCi/g, which is less than the surrogate adjusted gamma DCGL calculated above. However, as a conservative measure, 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. A conservative estimate of the sample variability of 0.30 was used as the coefficient of variation to calculate Δ/σ.

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

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

The calculated MDC_{scan}, 2.90 pCi/g, is less than the surrogate adjusted gamma DCGL calculated above, therefore, the spacing of the statistical systematic sampling and measurement locations was adequate. No adjustment to the sample number was required.

The implementation of quality control (QC) measures as referenced by LTP, Section 5.9 and Zion*Solutions* procedure ZS-LT-01, "*Quality Assurance Project Plan (for Characterization and FSS)*" (QAPP) (Reference 12) includes the collection of a soil sample for "split sample" analysis on 5% of the soil samples taken in a survey unit with the locations selected at random. One (1) surface soil sample (L2-10213A-FQGS-005-SS) was selected randomly for split sample analysis for the FSS of this survey unit.

ZS-LT-01 also requires that replicate surveys be performed on 5% of all scan locations chosen at random. This requirement is being met by performing QC replicate scans on 5% of the total area scanned in Class 2 open land areas. A replicate measurement is an independent direct measurement performed by a qualified technician, other than the one who obtained the original measurement, with a separate but similar instrument. Rows 31 and 32 were chosen at random for QC replicate scans. These rows represent approximately 6% of the total area scanned is this survey unit (189 m^2 of 3,132 m^2 total area scanned).

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

Table 8 - Systematic Sample Measurement Locations

MEASUREMENT ID	NORTHING (meters)	EASTING (meters)
L2-10213A-FSGS-001-SS	642068.73	343660.18
L2-10213A-FSGS-002-SS	642068.73	343679.91
L2-10213A-FSGS-003-SS	642068.73	343699.64
L2-10213A-FSGS-004-SS	642068.73	343719.37
L2-10213A-FSGS-005-SS	642085.81	343670.04
L2-10213A-FSGS-006-SS	642085.81	343689.77
L2-10213A-FSGS-007-SS	642085.81	343709.50
L2-10213A-FSGS-008-SS	642085.81	343729.23
L2-10213A-FSGS-009-SS	642102.90	343660.18

Table 8 (continued) - Systematic Sample Measurement Locations

MEASUREMENT ID	NORTHING (meters)	EASTING (meters)
L2-10213A-FSGS-010-SS	642102.90	343679.91
L2-10213A-FSGS-011-SS	642102.90	343699.64
L2-10213A-FSGS-012-SS	642102.90	343719.37
L2-10213A-FSGS-013-SS	642102.90	343739.09
L2-10213A-FSGS-014-SS	642119.99	343670.04
L2-10213A-FSGS-015-SS	642119.99	343689.77
L2-10213A-FSGS-016-SS	642119.99	343709.50
L2-10213A-FSGS-017-SS	642119.99	343729.23

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

In addition, LTP, Section 5.1 states that if levels of residual gamma radioactivity in an individual soil sample exceed an OpSOF of 0.1, then the sample(s) will be analyzed for HTD ROC. Five (5) samples: L2-10213A-FSGS-001-SS, L2-10213A-FSGS-003-SS, L2-10213A-FSGS-004-SS, L2-10213A-FSGS-006-SS and L2-10213A-FSGS-008-SS exceeded an OpSOF of 0.1 during the FSS of survey unit 10213A.

These samples satisfy the requirement that 10% of the samples collected for the FSS of survey unit 10213A be analyzed for HTD ROC. Each sample was sent off-site (Eberline Analytical) for analysis of the HTD ROC as specified in LTP, Section 5.1. Eberline analytical reports are provided in Attachment 8.

Table 9 provides a synopsis of the survey design for survey unit 10213A.

Table 9 - Synopsis of Survey Design

FEATURE	DESIGN CRITERIA	BASIS
Survey Unit Area	5,730 m^2	GPS measurements of area
Number of Surface Soil Samples	17 (Systematic)	• $\sigma = 0.30$ • UBGR = SOF of 1 • LBGR = SOF of 0.5 • Type I error = 0.05 • Type II error = 0.05 • $\Delta/\sigma = 1.67$ (MARSSIM Table 5.5)
Grid Spacing	19.7 m	(LTP, Section 5.6.4.5.2)
DCGLs	• Co-60 – 1.091 pCi/g • Cs-134 – 1.733 pCi/g • Cs-137 – 3.630 pCi/g • Ni-63 – 914.458 pCi/g • Sr-90 – 3.095 pCi/g	Operational DCGLs for Surface Soils, (LTP, Table 5-7)
HTD ROC Analysis	A minimum of two (2) soil samples selected for HTD ROC analysis	(LTP, Section 5.1)
Measurement Investigation Level	Operational DCGL	(LTP, Table 5-25)
Scan Survey Area Coverage	50% Replicate scans of rows 31 and 32	(LTP, Table 5-24)
QC	One (1) surface soil sample selected randomly for split sample analysis	(LTP, Section 5.9)

6. SURVEY IMPLEMENTATION

Survey instructions for this FSS were incorporated into and performed in accordance with FSS sample plan L2-10213A-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 10213A, 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, if during the performance of FSS, the analysis of a surface soil sample, or the results of a surface gamma scan indicated the potential presence of residual radioactivity at a concentration of 75% of the subsurface OpDCGL, then a biased subsurface soil sample(s) would have been taken to the appropriate depth within the area of concern as part of the investigation. This threshold was not encountered during the FSS of survey unit 10213A.

Gamma scans were performed under RA sample plan RA-10213A-X01 to the same rigor specified in FSS Sample Plan L2-10213A-F, and the data was deemed acceptable for the FSS. Surface soil samples were collected under the FSS sample plan. 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 eight (8) 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 July 16, 2019, and concluding on July 29, 2019. The QC replicate scan surveys were performed on July 17, 2019.

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

Gamma scans were performed on approximately 55% (3,132 m^2) of the surface area of the survey unit (5,730 m^2) 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 of the ground and was moved at a scan speed of approximately 0.5 meters per second. No areas of elevated activity were detected on the scans.

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

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

Table 10 - Instruments and Detectors

Instrument/Detector Type	Serial #	Calibration Due Date
Ludlum 2350-1/Ludlum 44-10	266668/PR363489	12/19/2019(1)
Ludlum 2350-1/Ludlum 44-10	266657/PR308037	05/13/2020(1)
Ludlum 2350-1/Ludlum 44-10	266669/PR311756	12/12/2019(1)
Ludlum 2350-1/Ludlum 44-10	216173/ES0118	12/06/2019(1)
Ludlum 2350-1/Ludlum 44-10	95361/PR372150	12/05/2019(1)
Ludlum 2350-1/Ludlum 44-10	304712/PR372143	12/18/2019(1)
Ludlum 2350-1/Ludlum 44-10	304718/PR363311	12/13/2019(1)
Ludlum 2350-1/Ludlum 44-10	304730/PR375273	01/16/2020(1)
Ludlum 2350-1/Ludlum 44-10	216188/PR372152	12/03/2019(1)
Ludlum 2350-1/Ludlum 44-10	304726/PR363452	09/06/2019(1)
Ludlum 2350-1/Ludlum 44-10	266656/PR311750	01/08/2020(1)
Ludlum 2350-1/Ludlum 44-10	304730/PR375273	01/16/2020(2)
Ludlum 2350-1/Ludlum 44-10	304712/PR372143	12/18/2019(2)

(1) Instruments used for the initial FSS scans
(2) Instruments used for the QC replicate scans

In accordance with the survey design, seventeen (17) surface soil samples were collected at the designated systematic sample points.

Five (5) samples (L2-10213A-FSGS-001-SS, L2-10213A-FSGS-003-SS, L2-10213A-FSGS-004-SS, L2-10213A-FSGS-006-SS and L2-10213A-FSGS-008-SS) were selected for HTD radionuclide analysis.

7. SURVEY RESULTS

Approximately 55% (3,132 m^2) of the surface area of the survey unit (5,730 m^2) was scanned for elevated radiation levels. Thirty-seven (37) 1-meter wide scan rows, as shown on the map in Attachment 1, were marked in the field and scanned with the 2350-1/44-10 using latching mode. Readings were recorded at approximately 10-meter intervals during the scans. No elevated measurement locations were identified by surface scan. Table 11 provides an overview of the scan results. Complete scan results are provided in Attachment 2.

Table 11 - Synopsis of Scan Results

Scan Area	Highest Logged Reading (cpm)	Action Level[1] (cpm)	# of Scan Alarms	Investigation Samples
Row 1	2631	2649	None	None
Row 2	2586	2649	None	None
Row 3	2444	2649	None	None
Row 4	2178	2396	None	None
Row 5	2099	2238	None	None
Row 6	2043	2238	None	None
Row 7	2032	2238	None	None
Row 8	2220	2396	None	None
Row 9	2212	2299	None	None
Row 10	2074	2299	None	None
Row 11	2128	2471	None	None
Row 12	2109	2471	None	None
Row 13	1867	2161	None	None
Row 14	2036	2161	None	None
Row 15	2059	2341	None	None
Row 16	2073	2341	None	None
Row 17	1911	2157	None	None
Row 18	2063	2297	None	None
Row 19	2103	2297	None	None
Row 20	1965	2153	None	None
Row 21	2174	2321	None	None
Row 22	1972	2321	None	None
Row 23	1434	1639	None	None
Row 24	1539	1639	None	None
Row 25	1501	1639	None	None
Row 26	2211	2338	None	None
Row 27	2147	2338	None	None
Row 28	2293	2354	None	None
Row 29	2241	2385	None	None
Row 30	2292	2385	None	None
Row 31	2270	2373	None	None
Row 32	2291	2528	None	None
Row 33	2335	2528	None	None
Row 34	2274	2528	None	None
Row 35	2396	2627	None	None
Row 36	2238	2627	None	None
Row 37	2454	2573	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 were analyzed using the on-site gamma spectroscopy system. Summaries of the sample analysis results are provided in Table 12. The basic statistics for the systematic sample population are summarized in Table 17. For the systematic samples, the gamma spectroscopy results revealed fourteen (14) samples with activity levels above MDC for Cs-137 and no samples with activity levels above MDC for Co-60 or Cs-134. The concentrations for Ni-63 and Sr-90 were inferred based on the maximum ratios as specified in Table 6. The mean of the gamma spectroscopic analysis results for the 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)
L2-10213A-FSGS-001-SS	6.61E-04	3.26E-03	**4.08E-01**	1.19E-01	8.16E-04
L2-10213A-FSGS-002-SS	2.72E-02	1.88E-02	**9.42E-02**	4.91E+00	1.88E-04
L2-10213A-FSGS-003-SS	2.90E-02	5.23E-02	**4.54E-01**	5.23E+00	9.08E-04
L2-10213A-FSGS-004-SS	4.71E-02	1.92E-02	**3.33E-01**	8.50E+00	6.66E-04
L2-10213A-FSGS-005-SS	5.99E-03	9.57E-03	**8.51E-02**	1.08E+00	1.70E-04
L2-10213A-FSGS-006-SS	4.61E-02	3.96E-02	**2.86E-01**	8.32E+00	5.72E-04
L2-10213A-FSGS-007-SS	1.68E-02	1.68E-02	**1.18E-01**	3.03E+00	2.36E-04
L2-10213A-FSGS-008-SS	7.02E-02	0.00E+00	**1.05E-01**	1.27E+01	2.10E-04
L2-10213A-FSGS-009-SS	6.40E-03	1.27E-02	**2.23E-01**	1.15E+00	4.46E-04
L2-10213A-FSGS-010-SS	0.00E+00	0.00E+00	**1.36E-01**	0.00E+00	2.72E-04
L2-10213A-FSGS-011-SS	1.31E-02	9.14E-03	**5.28E-02**	2.36E+00	1.06E-04
L2-10213A-FSGS-012-SS	2.67E-02	0.00E+00	**4.10E-02**	4.82E+00	8.20E-05
L2-10213A-FSGS-013-SS	3.06E-02	4.99E-03	**9.27E-02**	5.52E+00	1.85E-04
L2-10213A-FSGS-014-SS	4.07E-02	0.00E+00	**1.15E-01**	7.34E+00	2.30E-04
L2-10213A-FSGS-015-SS	4.24E-02	0.00E+00	2.62E-02	7.65E+00	5.24E-05
L2-10213A-FSGS-016-SS	2.18E-02	0.00E+00	2.01E-02	3.93E+00	4.02E-05
L2-10213A-FSGS-017-SS	4.52E-02	3.38E-02	4.58E-02	8.16E+00	9.16E-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 five (5) samples selected for HTD ROC analysis as specified in the survey design. Samples L2-10213A-FSGS-001-SS-A, L2-10213A-FSGS-003-SS-A, L2-10213A-FSGS-004-SS-A, L2-10213A-FSGS-006-SS-A and L2-10213A-FSGS-008-SS-A were selected. Only HTD radionuclides included as ROC (Ni-63 and Sr-90 for soils) were included in the analysis. All analyses met the required MDC. Only Cs-137 and Co-60 were positively detected in the samples at a concentration greater than MDC. Consequently, comparison of existing ratios versus the maximum ratios from Table 6 was not required. The off-site analysis results are provided in Table 13.

Table 13 - Off-Site Analysis Results

Sample # L2-10213A-FSGS-001-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	4.12E-02	8.78E-02	1.25E-01	No
Cs-134	1.09E-02	4.19E-02	1.32E-01	No
Cs-137	6.58E-01	1.51E-01	1.62E-01	Yes
Ni-63	1.47E+00	2.01E+00	3.39E+00	No
Sr-90	3.46E-01	3.09E-01	7.45E-01	No

Sample # L2-10213A-FSGS-003-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	4.28E-01	6.31E-02	9.66E-02	Yes
Cs-134	2.40E-03	1.52E-02	4.88E-02	No
Cs-137	8.68E-02	5.74E-02	9.12E-02	No
Ni-63	-1.36E+00	1.90E+00	3.34E+00	No
Sr-90	3.79E-01	3.32E-01	8.00E-01	No

Sample # L2-10213A-FSGS-004-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	6.90E-02	6.32E-02	1.15E-01	No
Cs-134	-9.16E-03	2.97E-02	8.40E-02	No
Cs-137	5.88E-01	1.06E-01	1.02E-01	Yes
Ni-63	8.73E-01	1.90E+00	3.22E+00	No
Sr-90	3.20E-01	2.49E-01	5.92E-01	No

Table 13 (continued) - Off-Site Analysis Results

Sample # L2-10213A-FSGS-006-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	3.31E-02	9.71E-02	1.51E-01	No
Cs-134	-5.25E-03	4.79E-02	1.54E-01	No
Cs-137	6.09E-01	1.65E-01	1.99E-01	Yes
Ni-63	5.60E-01	2.02E+00	3.45E+00	No
Sr-90	-8.86E-03	2.77E-01	7.17E-01	No

Sample # L2-10213A-FSGS-008-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	3.27E-02	4.78E-02	7.29E-02	No
Cs-134	1.07E-02	1.98E-02	4.74E-02	No
Cs-137	1.36E-01	6.82E-02	1.04E-01	Yes
Ni-63	-7.77E-01	2.06E+00	3.59E+00	No
Sr-90	3.77E-02	3.47E-01	8.85E-01	No

The implementation of survey specific QC measures included the collection of one (1) systematic sample (L2-10213A-FQGS-005-SS) for "split sample" analysis. The on-site laboratory analyzed the designated QC sample using the on-site gamma spectroscopy system. Gamma spectroscopy results are summarized in Table 14. The concentrations for Ni-63 and Sr-90 were inferred based on the maximum ratios as specified in Table 6.

Table 14 - 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)
L2-10213A-FQGS-005-SS	2.74E-02	8.43E-03	6.60E-02	4.94E+00	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.

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 5

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

Where: C_n = concentration of radionuclide *n*

$DCGL_n$ = DCGL of radionuclide *n*.

The results of the unity rule calculations for the ROC in the systematic sample population when compared against the OpDCGLs for surface soils for survey unit 10213A are presented in Table 15. The results of the unity rule calculations for the ROC for the QC surface sample is presented in Table 16.

Table 15 - Sum of Fractions for Individual Surface Soil Samples, when compared to the OpDCGLs (Systematic)

MEASUREMENT ID	Fraction of the OpDCGLs for Surface Soils					OpSOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L2-10213A-FSGS-001-SS	6.06E-04	1.88E-03	1.12E-01	1.30E-04	2.64E-04	0.115
L2-10213A-FSGS-002-SS	2.49E-02	1.08E-02	2.60E-02	5.37E-03	6.09E-05	0.067
L2-10213A-FSGS-003-SS	2.66E-02	3.02E-02	1.25E-01	5.72E-03	2.93E-04	0.188
L2-10213A-FSGS-004-SS	4.32E-02	1.11E-02	9.17E-02	9.29E-03	2.15E-04	0.155
L2-10213A-FSGS-005-SS	5.49E-03	5.52E-03	2.34E-02	1.18E-03	5.50E-05	0.036
L2-10213A-FSGS-006-SS	4.23E-02	2.29E-02	7.88E-02	9.10E-03	1.85E-04	0.153
L2-10213A-FSGS-007-SS	1.54E-02	9.69E-03	3.25E-02	3.32E-03	7.63E-05	0.061
L2-10213A-FSGS-008-SS	6.43E-02	0.00E+00	2.89E-02	1.39E-02	6.79E-05	0.107
L2-10213A-FSGS-009-SS	5.87E-03	7.33E-03	6.14E-02	1.26E-03	1.44E-04	0.076
L2-10213A-FSGS-010-SS	0.00E+00	0.00E+00	3.75E-02	0.00E+00	8.79E-05	0.038
L2-10213A-FSGS-011-SS	1.20E-02	5.27E-03	1.45E-02	2.59E-03	3.41E-05	0.034
L2-10213A-FSGS-012-SS	2.45E-02	0.00E+00	1.13E-02	5.27E-03	2.65E-05	0.041
L2-10213A-FSGS-013-SS	2.80E-02	2.88E-03	2.55E-02	6.04E-03	5.99E-05	0.063
L2-10213A-FSGS-014-SS	3.73E-02	0.00E+00	3.17E-02	8.03E-03	7.43E-05	0.077
L2-10213A-FSGS-015-SS	3.89E-02	0.00E+00	7.22E-03	8.37E-03	1.69E-05	0.054
L2-10213A-FSGS-016-SS	2.00E-02	0.00E+00	5.54E-03	4.30E-03	1.30E-05	0.030
L2-10213A-FSGS-017-SS	4.14E-02	1.95E-02	1.26E-02	8.92E-03	2.96E-05	0.082

Systematic Measurements

Number of Systematic Measurements =	17
# of Systematic Measurements with OpSOF ≥ 1 =	0
# of Systematic Measurements with OpSOF > 0.1 (HTD Assessment) =	5
Max Individual Systematic Measurement OpSOF =	0.188
Mean Systematic Measurement OpSOF =	0.081

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

MEASUREMENT ID	Fraction of the OpDCGLs for Surface soils					OpSOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L2-10213A-FQGS-005-SS	2.51E-02	4.86E-03	1.82E-02	5.41E-03	4.26E-05	0.054

Table 17 - Basic Statistical Properties of Systematic Sample Population

ROC	Mean (pCi/g)	Median (pCi/g)	Max (pCi/g)	Min (pCi/g)	Std. Dev. (pCi/g)	BcDCGL (pCi/g)	Avg. SOF per ROC	Avg. Dose Per ROC
Co-60	2.76E-02	2.72E-02	7.02E-02	0.00E+00	0.019	4.26	6.49E-03	1.62E-01
Cs-134	1.30E-02	9.14E-03	5.23E-02	0.00E+00	0.016	6.77	1.91E-03	4.78E-02
Cs-137	1.55E-01	1.05E-01	4.54E-01	2.01E-02	0.136	14.18	1.09E-02	2.73E-01
Ni-63	4.99E+00	4.91E+00	1.27E+01	0.00E+00	3.498	3572.1	1.40E-03	3.49E-02
Sr-90	3.10E-04	2.10E-04	9.08E-04	4.02E-05	0.000	12.09	2.56E-05	6.41E-04

The mean BcSOF for survey unit 10213A is 0.021, which equates to a dose of 0.519 mrem/year TEDE.

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

8. QUALITY CONTROL

The on-site laboratory processed one (1) split sample, L2-10213A-FQGS-005-SS, using gamma spectroscopy analysis. The data was evaluated using acceptance criteria specified in ZS-LT-01. There was acceptable agreement between field split results. Refer to Attachment 5 for data and QC analysis results.

QC Replicate scans were performed in rows 31 and 32 of the survey unit. These rows represent approximately 6% of the total area scanned in this survey unit (189 m^2 of 3,132 m^2 total area scanned). The results were evaluated using acceptance criteria specified in the ZS-LT-01. The QC replicate scans were in agreement with the original scans. No elevated measurement locations were identified in either the original survey or the replicate survey in these rows. Complete QC replicate scan results are provided in Attachment 2.

9. INVESTIGATIONS AND RESULTS

No investigations were performed in survey unit 10213A.

10. REMEDIATION AND RESULTS

No remediation was performed in Class 2 open land survey unit 10213A. In accordance with LTP Chapter 5, Section 5.6.4.6.1, if contamination is present in a Class 2 open land survey unit in excess of the OpDCGL, then all or part of the survey unit will be reclassified as Class 1 and

the survey strategy for that survey unit will be redesigned as discussed above for Class 1. This threshold was not encountered during the FSS of survey unit 10213A.

11. CHANGES FROM THE SURVEY PLAN

There were no addendums to the FSS plan.

12. DATA QUALITY ASSESSMENT

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

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

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

The preliminary data review consisted of calculating basic statistical quantities (e.g., mean, median, standard deviation). All data were 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

A 1-meter radius was not scanned around the following systematic sample locations as prescribed in the FSS plan: sample points #9 through #17. This was an oversight on behalf of FSS supervision and the survey technicians assigned to collect the samples. However, this did not adversely affect the quality of the data collected during the FSS of this survey unit and was deemed acceptable.

14. CONCLUSION

Survey unit 10213A has met the DQOs of the FSS plan. The ALARA criteria for soils as specified in Chapter 4 of the LTP were achieved.

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

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

The mean BcSOF, when the analytical results were compared to the BcDCGLs, was 0.021, which results in a dose contribution from soil in survey unit 10213A of 0.519 mrem/year TEDE, based on the average concentration of the ROC in samples used for non-parametric statistical sampling.

The conclusion of this Release Record is that survey unit 10213A is acceptable for unrestricted release.

15. REFERENCES

1. Zion*Solutions* procedure ZS-LT-300-001-005, "Final Status Survey Data Reporting"
2. Zion Station Restoration Project License Termination Plan
3. Zion*Solutions* procedure ZS-LT-300-001-001, "Final Status Survey Package Development"
4. NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual"
5. Zion*Solutions* procedure ZS-LT-300-001-002, "Survey Unit Classification"
6. "Zion Station Historical Site Assessment"
7. Zion*Solutions* TSD 11-001, "Technical Support Document for Potential Radionuclides of Concern During the Decommissioning of the Zion Station"
8. Zion*Solutions* TSD 14-019, "Radionuclides of Concern for Soil and Basement Fill Model Source Terms"
9. Zion*Solutions* TSD 14-011, "Soil Area Factors"
10. Zion*Solutions* TSD 17-004, "Operational Derived Concentration Guideline Levels for Final Status Survey"
11. Zion*Solutions* TSD 11-004, "Ludlum Model 44-10 Detector Sensitivity"
12. Zion*Solutions* procedure ZS-LT-01, "Quality Assurance Project Plan (for Characterization and FSS)"

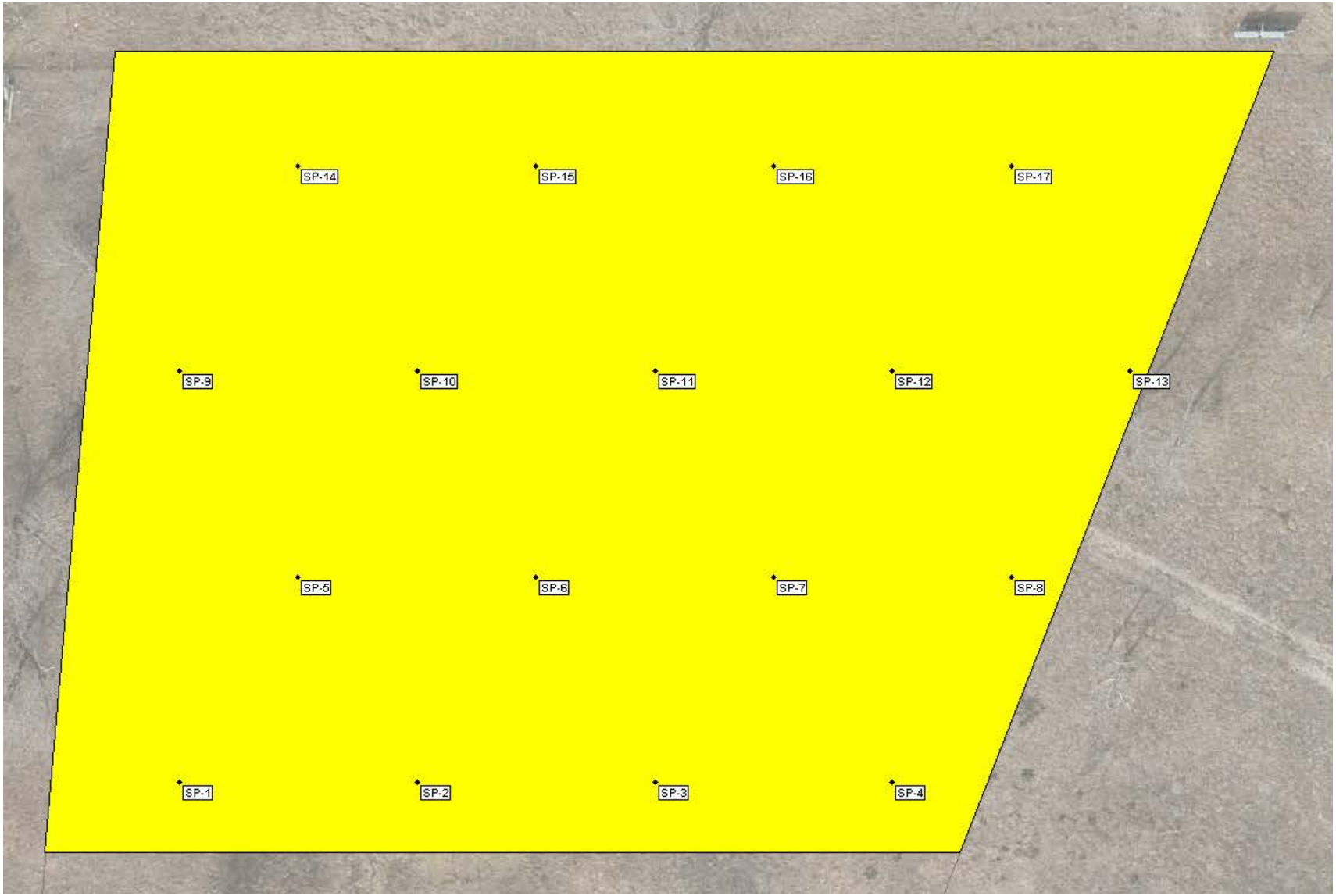
13. Zion*Solutions* procedure ZS-LT-300-001-003, "Isolation and Control for Final Status Survey"
14. Zion*Solutions* procedure ZS-RP-108-004-011, "Operation of the Ludlum Model 2350-1 Data Logger"
15. Zion*Solutions* TSD 13-004, "Examination of Cs-137 Global Fallout In Soils At Zion Station"
16. Zion*Solutions* procedure ZS-LT-300-001-004, "Final Status Survey Data Assessment"

16. ATTACHMENTS

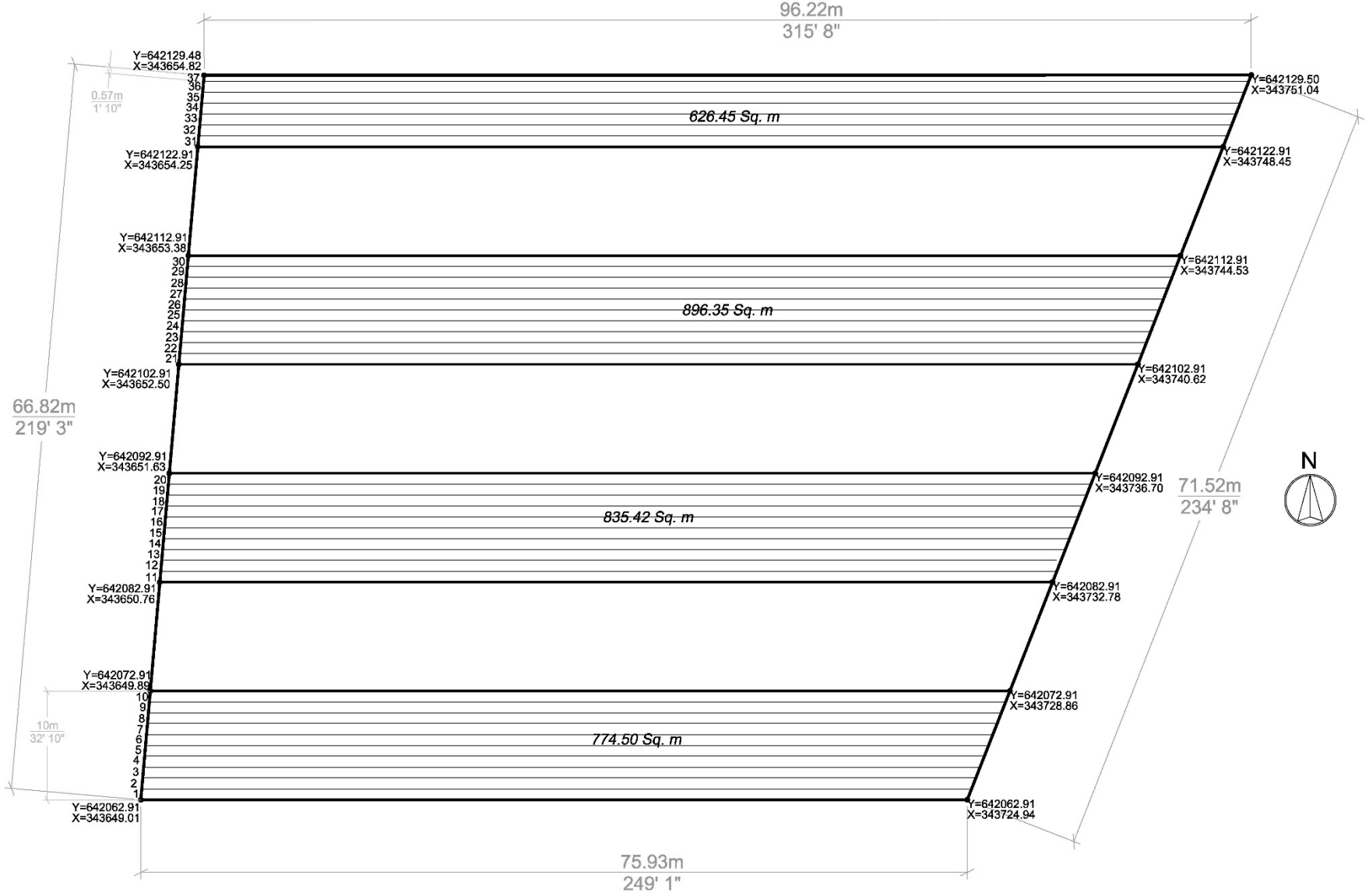
1. Attachment 1 - Figure and Map
2. Attachment 2 - Scan Data
3. Attachment 3 - Consultation Triggers for Residential and Commercial/Industrial Soil Contamination
4. Attachment 4 - Sign Test
5. Attachment 5 - QC Sample Assessment
6. Attachment 6 - Graphical Presentations
7. Attachment 7 - Sample Analytical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

ATTACHMENT 1
FIGURE AND MAP

Survey Unit 10213A Final Status Survey Boundaries and Systematic Sample Points



Survey Unit 10213A 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
ORIGINAL SCANS									
44-10	PR372150	95361	10213A	GS020	7/16/2019 13:29	1965	1556	2153	No
44-10	PR372150	95361	10213A	GS020	7/16/2019 13:32	1939	1556	2153	No
44-10	PR372150	95361	10213A	GS020	7/16/2019 13:34	1714	1556	2153	No
44-10	PR372150	95361	10213A	GS020	7/16/2019 13:36	1704	1556	2153	No
44-10	PR372150	95361	10213A	GS020	7/16/2019 13:38	1748	1556	2153	No
44-10	PR372150	95361	10213A	GS020	7/16/2019 13:44	1720	1556	2153	No
44-10	PR372150	95361	10213A	GS020	7/16/2019 13:47	1714	1556	2153	No
44-10	PR372150	95361	10213A	GS020	7/16/2019 13:49	1684	1556	2153	No
44-10	PR372150	95361	10213A	GS020	7/16/2019 13:51	1624	1556	2153	No
44-10	PR372150	95361	10213A	GS020	7/16/2019 13:53	1799	1556	2153	No
44-10	PR363452	304726	10213A	GS013	7/16/2019 13:33	1867	1564	2161	No
44-10	PR363452	304726	10213A	GS013	7/16/2019 13:35	1847	1564	2161	No
44-10	PR363452	304726	10213A	GS013	7/16/2019 13:37	1713	1564	2161	No
44-10	PR363452	304726	10213A	GS013	7/16/2019 13:40	1745	1564	2161	No
44-10	PR363452	304726	10213A	GS013	7/16/2019 13:43	1759	1564	2161	No
44-10	PR363452	304726	10213A	GS013	7/16/2019 13:48	1776	1564	2161	No
44-10	PR363452	304726	10213A	GS013	7/16/2019 13:50	1757	1564	2161	No
44-10	PR363452	304726	10213A	GS013	7/16/2019 13:52	1795	1564	2161	No
44-10	PR363452	304726	10213A	GS013	7/16/2019 13:55	1734	1564	2161	No
44-10	PR363452	304726	10213A	GS014	7/16/2019 13:59	1785	1564	2161	No
44-10	PR363452	304726	10213A	GS014	7/16/2019 14:02	1671	1564	2161	No
44-10	PR363452	304726	10213A	GS014	7/16/2019 14:04	1787	1564	2161	No
44-10	PR363452	304726	10213A	GS014	7/16/2019 14:06	1714	1564	2161	No
44-10	PR363452	304726	10213A	GS014	7/16/2019 14:09	1750	1564	2161	No
44-10	PR363452	304726	10213A	GS014	7/16/2019 14:12	1758	1564	2161	No
44-10	PR363452	304726	10213A	GS014	7/16/2019 14:14	1719	1564	2161	No
44-10	PR363452	304726	10213A	GS014	7/16/2019 14:17	1785	1564	2161	No
44-10	PR363452	304726	10213A	GS014	7/16/2019 14:19	2036	1564	2161	No
44-10	ES0118	216173	10213A	GS009	7/16/2019 13:35	1843	1679	2299	No
44-10	ES0118	216173	10213A	GS009	7/16/2019 13:38	2081	1679	2299	No
44-10	ES0118	216173	10213A	GS009	7/16/2019 13:40	2102	1679	2299	No
44-10	ES0118	216173	10213A	GS009	7/16/2019 13:43	2212	1679	2299	No
44-10	ES0118	216173	10213A	GS009	7/16/2019 13:45	2134	1679	2299	No
44-10	ES0118	216173	10213A	GS009	7/16/2019 13:47	2000	1679	2299	No
44-10	ES0118	216173	10213A	GS009	7/16/2019 13:49	1790	1679	2299	No
44-10	ES0118	216173	10213A	GS009	7/16/2019 13:51	1842	1679	2299	No
44-10	ES0118	216173	10213A	GS010	7/16/2019 13:53	1889	1679	2299	No
44-10	ES0118	216173	10213A	GS010	7/16/2019 13:55	1895	1679	2299	No
44-10	ES0118	216173	10213A	GS010	7/16/2019 13:57	1989	1679	2299	No
44-10	ES0118	216173	10213A	GS010	7/16/2019 14:01	2074	1679	2299	No
44-10	ES0118	216173	10213A	GS010	7/16/2019 14:03	1866	1679	2299	No
44-10	ES0118	216173	10213A	GS010	7/16/2019 14:05	1953	1679	2299	No
44-10	ES0118	216173	10213A	GS010	7/16/2019 14:07	2055	1679	2299	No
44-10	ES0118	216173	10213A	GS010	7/16/2019 14:09	2000	1679	2299	No
44-10	ES0118	216173	10213A	GS011	7/16/2019 14:12	1797	1679	2299	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	10213A	GS011	7/16/2019 14:14	1889	1679	2299	No
44-10	ES0118	216173	10213A	GS011	7/16/2019 14:18	1830	1679	2299	No
44-10	ES0118	216173	10213A	GS011	7/16/2019 14:20	1754	1679	2299	No
44-10	ES0118	216173	10213A	GS011	7/16/2019 14:22	1756	1679	2299	No
44-10	ES0118	216173	10213A	GS011	7/16/2019 14:24	1800	1679	2299	No
44-10	PR311756	266669	10213A	GS005	7/16/2019 13:28	1840	1628	2238	No
44-10	PR311756	266669	10213A	GS005	7/16/2019 13:32	1966	1628	2238	No
44-10	PR311756	266669	10213A	GS005	7/16/2019 13:41	2099	1628	2238	No
44-10	PR311756	266669	10213A	GS005	7/16/2019 13:45	1912	1628	2238	No
44-10	PR311756	266669	10213A	GS005	7/16/2019 13:49	1778	1628	2238	No
44-10	PR311756	266669	10213A	GS005	7/16/2019 13:51	1713	1628	2238	No
44-10	PR311756	266669	10213A	GS005	7/16/2019 13:55	1686	1628	2238	No
44-10	PR311756	266669	10213A	GS005	7/16/2019 13:58	1778	1628	2238	No
44-10	PR311756	266669	10213A	GS006	7/16/2019 14:00	1766	1628	2238	No
44-10	PR311756	266669	10213A	GS006	7/16/2019 14:02	1780	1628	2238	No
44-10	PR311756	266669	10213A	GS006	7/16/2019 14:04	1735	1628	2238	No
44-10	PR311756	266669	10213A	GS006	7/16/2019 14:07	1821	1628	2238	No
44-10	PR311756	266669	10213A	GS006	7/16/2019 14:09	2043	1628	2238	No
44-10	PR311756	266669	10213A	GS006	7/16/2019 14:11	1963	1628	2238	No
44-10	PR311756	266669	10213A	GS006	7/16/2019 14:14	1894	1628	2238	No
44-10	PR311756	266669	10213A	GS006	7/16/2019 14:16	1822	1628	2238	No
44-10	PR311756	266669	10213A	GS007	7/16/2019 14:19	2032	1628	2238	No
44-10	PR311756	266669	10213A	GS007	7/16/2019 14:22	1926	1628	2238	No
44-10	PR311756	266669	10213A	GS007	7/16/2019 14:24	2010	1628	2238	No
44-10	PR311756	266669	10213A	GS007	7/16/2019 14:30	1821	1628	2238	No
44-10	PR311756	266669	10213A	GS007	7/16/2019 14:32	1666	1628	2238	No
44-10	PR311756	266669	10213A	GS007	7/16/2019 14:34	1618	1628	2238	No
44-10	PR311756	266669	10213A	GS007	7/16/2019 14:36	1675	1628	2238	No
44-10	PR311756	266669	10213A	GS007	7/16/2019 14:39	1730	1628	2238	No
44-10	PR311750	266656	10213A	GS023	7/16/2019 13:03	1250	1131	1639	No
44-10	PR311750	266656	10213A	GS023	7/16/2019 13:05	1290	1131	1639	No
44-10	PR311750	266656	10213A	GS023	7/16/2019 13:08	1147	1131	1639	No
44-10	PR311750	266656	10213A	GS023	7/16/2019 13:11	1217	1131	1639	No
44-10	PR311750	266656	10213A	GS023	7/16/2019 13:14	1305	1131	1639	No
44-10	PR311750	266656	10213A	GS023	7/16/2019 13:17	1309	1131	1639	No
44-10	PR311750	266656	10213A	GS023	7/16/2019 13:20	1279	1131	1639	No
44-10	PR311750	266656	10213A	GS023	7/16/2019 13:23	1318	1131	1639	No
44-10	PR311750	266656	10213A	GS023	7/16/2019 13:26	1434	1131	1639	No
44-10	PR311750	266656	10213A	GS024	7/16/2019 13:33	1268	1131	1639	No
44-10	PR311750	266656	10213A	GS024	7/16/2019 13:35	1300	1131	1639	No
44-10	PR311750	266656	10213A	GS024	7/16/2019 13:37	1199	1131	1639	No
44-10	PR311750	266656	10213A	GS024	7/16/2019 13:41	1277	1131	1639	No
44-10	PR311750	266656	10213A	GS024	7/16/2019 13:43	1350	1131	1639	No
44-10	PR311750	266656	10213A	GS024	7/16/2019 13:45	1312	1131	1639	No
44-10	PR311750	266656	10213A	GS024	7/16/2019 13:48	1292	1131	1639	No
44-10	PR311750	266656	10213A	GS024	7/16/2019 13:52	1371	1131	1639	No

Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	PR311750	266656	10213A	GS024	7/16/2019 13:55	1517	1131	1639	No
44-10	PR311750	266656	10213A	GS024	7/16/2019 13:58	1539	1131	1639	No
44-10	PR311750	266656	10213A	GS025	7/16/2019 14:03	1163	1131	1639	No
44-10	PR311750	266656	10213A	GS025	7/16/2019 14:05	1312	1131	1639	No
44-10	PR311750	266656	10213A	GS025	7/16/2019 14:07	1213	1131	1639	No
44-10	PR311750	266656	10213A	GS025	7/16/2019 14:10	1312	1131	1639	No
44-10	PR311750	266656	10213A	GS025	7/16/2019 14:13	1282	1131	1639	No
44-10	PR311750	266656	10213A	GS025	7/16/2019 14:16	1388	1131	1639	No
44-10	PR311750	266656	10213A	GS025	7/16/2019 14:19	1313	1131	1639	No
44-10	PR311750	266656	10213A	GS025	7/16/2019 14:21	1464	1131	1639	No
44-10	PR311750	266656	10213A	GS025	7/16/2019 14:23	1501	1131	1639	No
44-10	PR311750	266656	10213A	GS025	7/16/2019 14:25	1480	1131	1639	No
44-10	PR363311	304718	10213A	GS029	7/16/2019 13:38	1781	1752	2385	No
44-10	PR363311	304718	10213A	GS029	7/16/2019 13:43	2039	1752	2385	No
44-10	PR363311	304718	10213A	GS029	7/16/2019 13:45	1887	1752	2385	No
44-10	PR363311	304718	10213A	GS029	7/16/2019 13:47	1863	1752	2385	No
44-10	PR363311	304718	10213A	GS029	7/16/2019 13:49	1976	1752	2385	No
44-10	PR363311	304718	10213A	GS029	7/16/2019 13:51	2140	1752	2385	No
44-10	PR363311	304718	10213A	GS029	7/16/2019 13:53	2050	1752	2385	No
44-10	PR363311	304718	10213A	GS029	7/16/2019 13:55	2222	1752	2385	No
44-10	PR363311	304718	10213A	GS029	7/16/2019 13:57	2199	1752	2385	No
44-10	PR363311	304718	10213A	GS029	7/16/2019 13:59	2241	1752	2385	No
44-10	PR363311	304718	10213A	GS030	7/16/2019 14:03	2175	1752	2385	No
44-10	PR363311	304718	10213A	GS030	7/16/2019 14:05	2292	1752	2385	No
44-10	PR363311	304718	10213A	GS030	7/16/2019 14:07	2123	1752	2385	No
44-10	PR363311	304718	10213A	GS030	7/16/2019 14:09	2052	1752	2385	No
44-10	PR363311	304718	10213A	GS030	7/16/2019 14:11	2122	1752	2385	No
44-10	PR363311	304718	10213A	GS030	7/16/2019 14:13	2096	1752	2385	No
44-10	PR363311	304718	10213A	GS030	7/16/2019 14:15	1916	1752	2385	No
44-10	PR363311	304718	10213A	GS030	7/16/2019 14:17	1954	1752	2385	No
44-10	PR363311	304718	10213A	GS030	7/16/2019 14:19	2013	1752	2385	No
44-10	PR363311	304718	10213A	GS030	7/16/2019 14:21	1839	1752	2385	No
44-10	PR363489	266668	10213A	GS026	7/16/2019 13:39	1788	1712	2338	No
44-10	PR363489	266668	10213A	GS026	7/16/2019 13:42	1843	1712	2338	No
44-10	PR363489	266668	10213A	GS026	7/16/2019 13:44	1818	1712	2338	No
44-10	PR363489	266668	10213A	GS026	7/16/2019 13:51	1886	1712	2338	No
44-10	PR363489	266668	10213A	GS026	7/16/2019 13:53	2083	1712	2338	No
44-10	PR363489	266668	10213A	GS026	7/16/2019 13:55	2026	1712	2338	No
44-10	PR363489	266668	10213A	GS026	7/16/2019 13:58	2211	1712	2338	No
44-10	PR363489	266668	10213A	GS026	7/16/2019 14:00	2141	1712	2338	No
44-10	PR363489	266668	10213A	GS027	7/16/2019 14:06	1777	1712	2338	No
44-10	PR363489	266668	10213A	GS027	7/16/2019 14:08	1780	1712	2338	No
44-10	PR363489	266668	10213A	GS027	7/16/2019 14:10	1822	1712	2338	No
44-10	PR363489	266668	10213A	GS027	7/16/2019 14:13	1886	1712	2338	No
44-10	PR363489	266668	10213A	GS027	7/16/2019 14:15	1840	1712	2338	No
44-10	PR363489	266668	10213A	GS027	7/16/2019 14:17	1991	1712	2338	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	10213A	GS027	7/16/2019 14:20	2147	1712	2338	No
44-10	PR363489	266668	10213A	GS027	7/16/2019 14:22	2146	1712	2338	No
44-10	PR363489	266668	10213A	GS027	7/16/2019 14:24	1978	1712	2338	No
44-10	PR372152	216188	10213A	GS017	7/16/2019 13:29	1733	1560	2157	No
44-10	PR372152	216188	10213A	GS017	7/16/2019 13:32	1539	1560	2157	No
44-10	PR372152	216188	10213A	GS017	7/16/2019 13:39	1818	1560	2157	No
44-10	PR372152	216188	10213A	GS017	7/16/2019 13:41	1692	1560	2157	No
44-10	PR372152	216188	10213A	GS017	7/16/2019 13:43	1637	1560	2157	No
44-10	PR372152	216188	10213A	GS017	7/16/2019 13:45	1823	1560	2157	No
44-10	PR372152	216188	10213A	GS017	7/16/2019 13:47	1725	1560	2157	No
44-10	PR372152	216188	10213A	GS017	7/16/2019 13:50	1911	1560	2157	No
44-10	PR372152	216188	10213A	GS017	7/16/2019 13:54	1766	1560	2157	No
44-10	PR375273	304730	10213A	GD032	7/16/2019 13:14	1955	1874	2528	No
44-10	PR375273	304730	10213A	GD032	7/16/2019 13:16	1980	1874	2528	No
44-10	PR375273	304730	10213A	GD032	7/16/2019 13:18	2084	1874	2528	No
44-10	PR375273	304730	10213A	GD032	7/16/2019 13:20	2017	1874	2528	No
44-10	PR375273	304730	10213A	GD032	7/16/2019 13:22	2159	1874	2528	No
44-10	PR375273	304730	10213A	GD032	7/16/2019 13:24	2159	1874	2528	No
44-10	PR375273	304730	10213A	GD032	7/16/2019 13:26	2237	1874	2528	No
44-10	PR375273	304730	10213A	GD032	7/16/2019 13:28	2291	1874	2528	No
44-10	PR375273	304730	10213A	GD032	7/16/2019 13:30	2033	1874	2528	No
44-10	PR375273	304730	10213A	GD032	7/16/2019 13:32	2178	1874	2528	No
44-10	PR375273	304730	10213A	GD033	7/16/2019 13:34	2223	1874	2528	No
44-10	PR375273	304730	10213A	GD033	7/16/2019 13:36	2123	1874	2528	No
44-10	PR375273	304730	10213A	GD033	7/16/2019 13:38	2274	1874	2528	No
44-10	PR375273	304730	10213A	GD033	7/16/2019 13:40	2335	1874	2528	No
44-10	PR375273	304730	10213A	GD033	7/16/2019 13:42	2245	1874	2528	No
44-10	PR375273	304730	10213A	GD033	7/16/2019 13:44	2231	1874	2528	No
44-10	PR375273	304730	10213A	GD033	7/16/2019 13:46	2085	1874	2528	No
44-10	PR375273	304730	10213A	GD033	7/16/2019 13:49	2252	1874	2528	No
44-10	PR375273	304730	10213A	GD033	7/16/2019 13:51	2137	1874	2528	No
44-10	PR375273	304730	10213A	GD033	7/16/2019 13:53	2019	1874	2528	No
44-10	PR375273	304730	10213A	GD034	7/16/2019 13:56	1974	1874	2528	No
44-10	PR375273	304730	10213A	GD034	7/16/2019 13:58	2073	1874	2528	No
44-10	PR375273	304730	10213A	GD034	7/16/2019 14:00	2062	1874	2528	No
44-10	PR375273	304730	10213A	GD034	7/16/2019 14:02	2107	1874	2528	No
44-10	PR375273	304730	10213A	GD034	7/16/2019 14:04	2064	1874	2528	No
44-10	PR375273	304730	10213A	GD034	7/16/2019 14:06	2274	1874	2528	No
44-10	PR375273	304730	10213A	GD034	7/16/2019 14:08	2171	1874	2528	No
44-10	PR375273	304730	10213A	GD034	7/16/2019 14:10	2082	1874	2528	No
44-10	PR375273	304730	10213A	GD034	7/16/2019 14:12	2201	1874	2528	No
44-10	PR375273	304730	10213A	GD034	7/16/2019 14:14	2178	1874	2528	No
44-10	PR308037	266657	10213A	GS001	7/16/2019 13:27	2631	1977	2649	No
44-10	PR308037	266657	10213A	GS001	7/16/2019 13:32	2513	1977	2649	No
44-10	PR308037	266657	10213A	GS001	7/16/2019 13:35	2379	1977	2649	No
44-10	PR308037	266657	10213A	GS001	7/16/2019 13:42	2618	1977	2649	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	10213A	GS001	7/16/2019 13:44	2309	1977	2649	No
44-10	PR308037	266657	10213A	GS001	7/16/2019 13:47	2335	1977	2649	No
44-10	PR308037	266657	10213A	GS001	7/16/2019 13:50	2209	1977	2649	No
44-10	PR308037	266657	10213A	GS001	7/16/2019 13:52	2174	1977	2649	No
44-10	PR308037	266657	10213A	GS002	7/16/2019 13:55	2586	1977	2649	No
44-10	PR308037	266657	10213A	GS002	7/16/2019 13:58	2269	1977	2649	No
44-10	PR308037	266657	10213A	GS002	7/16/2019 14:00	2434	1977	2649	No
44-10	PR308037	266657	10213A	GS002	7/16/2019 14:02	2575	1977	2649	No
44-10	PR308037	266657	10213A	GS002	7/16/2019 14:04	2509	1977	2649	No
44-10	PR308037	266657	10213A	GS002	7/16/2019 14:06	2446	1977	2649	No
44-10	PR308037	266657	10213A	GS002	7/16/2019 14:08	2482	1977	2649	No
44-10	PR308037	266657	10213A	GS002	7/16/2019 14:10	2365	1977	2649	No
44-10	PR308037	266657	10213A	GS003	7/16/2019 14:15	2132	1977	2649	No
44-10	PR308037	266657	10213A	GS003	7/16/2019 14:17	2402	1977	2649	No
44-10	PR308037	266657	10213A	GS003	7/16/2019 14:20	2443	1977	2649	No
44-10	PR308037	266657	10213A	GS003	7/16/2019 14:22	2366	1977	2649	No
44-10	PR308037	266657	10213A	GS003	7/16/2019 14:24	2296	1977	2649	No
44-10	PR308037	266657	10213A	GS003	7/16/2019 14:29	2444	1977	2649	No
44-10	PR308037	266657	10213A	GS003	7/16/2019 14:31	2337	1977	2649	No
44-10	PR308037	266657	10213A	GS003	7/16/2019 14:34	2127	1977	2649	No
44-10	PR372143	304712	10213A	GS035	7/16/2019 13:15	2008	1958	2627	No
44-10	PR372143	304712	10213A	GS035	7/16/2019 13:18	2117	1958	2627	No
44-10	PR372143	304712	10213A	GS035	7/16/2019 13:21	2226	1958	2627	No
44-10	PR372143	304712	10213A	GS035	7/16/2019 13:24	2145	1958	2627	No
44-10	PR372143	304712	10213A	GS035	7/16/2019 13:27	1991	1958	2627	No
44-10	PR372143	304712	10213A	GS035	7/16/2019 13:30	2185	1958	2627	No
44-10	PR372143	304712	10213A	GS035	7/16/2019 13:33	2232	1958	2627	No
44-10	PR372143	304712	10213A	GS035	7/16/2019 13:36	2396	1958	2627	No
44-10	PR372143	304712	10213A	GS035	7/16/2019 13:40	2031	1958	2627	No
44-10	PR372143	304712	10213A	GS035	7/16/2019 13:43	2092	1958	2627	No
44-10	PR372143	304712	10213A	GS036	7/16/2019 13:47	2175	1958	2627	No
44-10	PR372143	304712	10213A	GS036	7/16/2019 13:50	2011	1958	2627	No
44-10	PR372143	304712	10213A	GS036	7/16/2019 14:01	2217	1958	2627	No
44-10	PR372143	304712	10213A	GS036	7/16/2019 14:05	2149	1958	2627	No
44-10	PR372143	304712	10213A	GS036	7/16/2019 14:08	2100	1958	2627	No
44-10	PR372143	304712	10213A	GS036	7/16/2019 14:15	2196	1958	2627	No
44-10	PR372143	304712	10213A	GS036	7/16/2019 14:19	2237	1958	2627	No
44-10	PR372143	304712	10213A	GS036	7/16/2019 14:22	2238	1958	2627	No
44-10	PR372143	304712	10213A	GS036	7/16/2019 14:25	1938	1958	2627	No
44-10	PR372143	304712	10213A	GS036	7/16/2019 14:28	1985	1958	2627	No
44-10	PR372150	95361	10213A	GS021	7/17/2019 7:56	2174	1698	2321	No
44-10	PR372150	95361	10213A	GS021	7/17/2019 7:59	2031	1698	2321	No
44-10	PR372150	95361	10213A	GS021	7/17/2019 8:02	1826	1698	2321	No
44-10	PR372150	95361	10213A	GS021	7/17/2019 8:05	1759	1698	2321	No
44-10	PR372150	95361	10213A	GS021	7/17/2019 8:08	1794	1698	2321	No
44-10	PR372150	95361	10213A	GS021	7/17/2019 8:11	1889	1698	2321	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	PR372150	95361	10213A	GS021	7/17/2019 8:14	1965	1698	2321	No
44-10	PR372150	95361	10213A	GS021	7/17/2019 8:17	1902	1698	2321	No
44-10	PR372150	95361	10213A	GS021	7/17/2019 8:19	1969	1698	2321	No
44-10	PR372150	95361	10213A	GS022	7/17/2019 8:34	1482	1698	2321	No
44-10	PR372150	95361	10213A	GS022	7/17/2019 8:36	1436	1698	2321	No
44-10	PR372150	95361	10213A	GS022	7/17/2019 8:39	1455	1698	2321	No
44-10	PR372150	95361	10213A	GS022	7/17/2019 8:42	1524	1698	2321	No
44-10	PR372150	95361	10213A	GS022	7/17/2019 8:44	1704	1698	2321	No
44-10	PR372150	95361	10213A	GS022	7/17/2019 8:47	1690	1698	2321	No
44-10	PR372150	95361	10213A	GS022	7/17/2019 8:50	1681	1698	2321	No
44-10	PR372150	95361	10213A	GS022	7/17/2019 8:52	1972	1698	2321	No
44-10	PR372150	95361	10213A	GS022	7/17/2019 8:55	1890	1698	2321	No
44-10	PR363452	304726	10213A	GS015	7/17/2019 8:05	2059	1715	2341	No
44-10	PR363452	304726	10213A	GS015	7/17/2019 8:08	1917	1715	2341	No
44-10	PR363452	304726	10213A	GS015	7/17/2019 8:10	1944	1715	2341	No
44-10	PR363452	304726	10213A	GS015	7/17/2019 8:13	1786	1715	2341	No
44-10	PR363452	304726	10213A	GS015	7/17/2019 8:15	1883	1715	2341	No
44-10	PR363452	304726	10213A	GS015	7/17/2019 8:18	1767	1715	2341	No
44-10	PR363452	304726	10213A	GS015	7/17/2019 8:20	1867	1715	2341	No
44-10	PR363452	304726	10213A	GS015	7/17/2019 8:23	1860	1715	2341	No
44-10	PR363452	304726	10213A	GS015	7/17/2019 8:25	1855	1715	2341	No
44-10	PR363452	304726	10213A	GS016	7/17/2019 8:28	1923	1715	2341	No
44-10	PR363452	304726	10213A	GS016	7/17/2019 8:31	1921	1715	2341	No
44-10	PR363452	304726	10213A	GS016	7/17/2019 8:33	1796	1715	2341	No
44-10	PR363452	304726	10213A	GS016	7/17/2019 8:35	1837	1715	2341	No
44-10	PR363452	304726	10213A	GS016	7/17/2019 8:38	1808	1715	2341	No
44-10	PR363452	304726	10213A	GS016	7/17/2019 8:41	1865	1715	2341	No
44-10	PR363452	304726	10213A	GS016	7/17/2019 8:49	1884	1715	2341	No
44-10	PR363452	304726	10213A	GS016	7/17/2019 8:53	1976	1715	2341	No
44-10	PR363452	304726	10213A	GS016	7/17/2019 8:55	2073	1715	2341	No
44-10	PR308037	266657	10213A	GS004	7/17/2019 7:59	2102	1762	2396	No
44-10	PR308037	266657	10213A	GS004	7/17/2019 8:01	2047	1762	2396	No
44-10	PR308037	266657	10213A	GS004	7/17/2019 8:03	2178	1762	2396	No
44-10	PR308037	266657	10213A	GS004	7/17/2019 8:05	1965	1762	2396	No
44-10	PR308037	266657	10213A	GS004	7/17/2019 8:07	1853	1762	2396	No
44-10	PR308037	266657	10213A	GS004	7/17/2019 8:09	1800	1762	2396	No
44-10	PR308037	266657	10213A	GS004	7/17/2019 8:11	1832	1762	2396	No
44-10	PR308037	266657	10213A	GS004	7/17/2019 8:13	2044	1762	2396	No
44-10	PR308037	266657	10213A	GS008	7/17/2019 8:17	1999	1762	2396	No
44-10	PR308037	266657	10213A	GS008	7/17/2019 8:19	1871	1762	2396	No
44-10	PR308037	266657	10213A	GS008	7/17/2019 8:22	1867	1762	2396	No
44-10	PR308037	266657	10213A	GS008	7/17/2019 8:24	1828	1762	2396	No
44-10	PR308037	266657	10213A	GS008	7/17/2019 8:26	1905	1762	2396	No
44-10	PR308037	266657	10213A	GS008	7/17/2019 8:28	2044	1762	2396	No
44-10	PR308037	266657	10213A	GS008	7/17/2019 8:31	2220	1762	2396	No
44-10	PR308037	266657	10213A	GS008	7/17/2019 8:36	2117	1762	2396	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	PR372143	304712	10213A	GS037	7/17/2019 7:49	2340	1912	2573	No
44-10	PR372143	304712	10213A	GS037	7/17/2019 7:52	2116	1912	2573	No
44-10	PR372143	304712	10213A	GS037	7/17/2019 7:55	2454	1912	2573	No
44-10	PR372143	304712	10213A	GS037	7/17/2019 7:58	2354	1912	2573	No
44-10	PR372143	304712	10213A	GS037	7/17/2019 8:01	2252	1912	2573	No
44-10	PR372143	304712	10213A	GS037	7/17/2019 8:04	2264	1912	2573	No
44-10	PR372143	304712	10213A	GS037	7/17/2019 8:07	2309	1912	2573	No
44-10	PR372143	304712	10213A	GS037	7/17/2019 8:10	2276	1912	2573	No
44-10	PR372143	304712	10213A	GS037	7/17/2019 8:13	2142	1912	2573	No
44-10	PR372143	304712	10213A	GS037	7/17/2019 8:16	2353	1912	2573	No
44-10	ES0118	216173	10213A	GS010	7/17/2019 8:07	1945	1825	2471	No
44-10	ES0118	216173	10213A	GS011	7/17/2019 8:09	2128	1825	2471	No
44-10	ES0118	216173	10213A	GS011	7/17/2019 8:11	2022	1825	2471	No
44-10	ES0118	216173	10213A	GS012	7/17/2019 8:13	2087	1825	2471	No
44-10	ES0118	216173	10213A	GS012	7/17/2019 8:15	2092	1825	2471	No
44-10	ES0118	216173	10213A	GS012	7/17/2019 8:17	1938	1825	2471	No
44-10	ES0118	216173	10213A	GS012	7/17/2019 8:19	1891	1825	2471	No
44-10	ES0118	216173	10213A	GS012	7/17/2019 8:21	1911	1825	2471	No
44-10	ES0118	216173	10213A	GS012	7/17/2019 8:24	1833	1825	2471	No
44-10	ES0118	216173	10213A	GS012	7/17/2019 8:26	2109	1825	2471	No
44-10	ES0118	216173	10213A	GS012	7/17/2019 8:28	2063	1825	2471	No
44-10	PR363311	304718	10213A	GS031	7/17/2019 8:13	1878	1742	2373	No
44-10	PR363311	304718	10213A	GS031	7/17/2019 8:15	1921	1742	2373	No
44-10	PR363311	304718	10213A	GS031	7/17/2019 8:17	2112	1742	2373	No
44-10	PR363311	304718	10213A	GS031	7/17/2019 8:19	2138	1742	2373	No
44-10	PR363311	304718	10213A	GS031	7/17/2019 8:21	2123	1742	2373	No
44-10	PR363311	304718	10213A	GS031	7/17/2019 8:23	2182	1742	2373	No
44-10	PR363311	304718	10213A	GS031	7/17/2019 8:25	2254	1742	2373	No
44-10	PR363311	304718	10213A	GS031	7/17/2019 8:27	2194	1742	2373	No
44-10	PR363311	304718	10213A	GS031	7/17/2019 8:29	2270	1742	2373	No
44-10	PR363311	304718	10213A	GS031	7/17/2019 8:31	2201	1742	2373	No
44-10	PR363489	266668	10213A	GS026	7/17/2019 8:02	1819	1726	2354	No
44-10	PR363489	266668	10213A	GS027	7/17/2019 8:04	1805	1726	2354	No
44-10	PR363489	266668	10213A	GS028	7/17/2019 8:07	1915	1726	2354	No
44-10	PR363489	266668	10213A	GS028	7/17/2019 8:09	1847	1726	2354	No
44-10	PR363489	266668	10213A	GS028	7/17/2019 8:12	1918	1726	2354	No
44-10	PR363489	266668	10213A	GS028	7/17/2019 8:14	1996	1726	2354	No
44-10	PR363489	266668	10213A	GS028	7/17/2019 8:16	1958	1726	2354	No
44-10	PR363489	266668	10213A	GS028	7/17/2019 8:19	2019	1726	2354	No
44-10	PR363489	266668	10213A	GS028	7/17/2019 8:21	2054	1726	2354	No
44-10	PR363489	266668	10213A	GS028	7/17/2019 8:23	2199	1726	2354	No
44-10	PR363489	266668	10213A	GS028	7/17/2019 8:28	2189	1726	2354	No
44-10	PR363489	266668	10213A	GS028	7/17/2019 8:34	2293	1726	2354	No
44-10	PR372152	216188	10213A	GS018	7/17/2019 8:03	2063	1677	2297	No
44-10	PR372152	216188	10213A	GS018	7/17/2019 8:05	1915	1677	2297	No
44-10	PR372152	216188	10213A	GS018	7/17/2019 8:08	1854	1677	2297	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	PR372152	216188	10213A	GS018	7/17/2019 8:10	2052	1677	2297	No
44-10	PR372152	216188	10213A	GS018	7/17/2019 8:13	1871	1677	2297	No
44-10	PR372152	216188	10213A	GS018	7/17/2019 8:16	1912	1677	2297	No
44-10	PR372152	216188	10213A	GS018	7/17/2019 8:18	1913	1677	2297	No
44-10	PR372152	216188	10213A	GS018	7/17/2019 8:21	1914	1677	2297	No
44-10	PR372152	216188	10213A	GS019	7/17/2019 8:23	1870	1677	2297	No
44-10	PR372152	216188	10213A	GS019	7/17/2019 8:26	2042	1677	2297	No
44-10	PR372152	216188	10213A	GS019	7/17/2019 8:28	1990	1677	2297	No
44-10	PR372152	216188	10213A	GS019	7/17/2019 8:31	1996	1677	2297	No
44-10	PR372152	216188	10213A	GS019	7/17/2019 8:33	1905	1677	2297	No
44-10	PR372152	216188	10213A	GS019	7/17/2019 8:36	1834	1677	2297	No
44-10	PR372152	216188	10213A	GS019	7/17/2019 8:38	1819	1677	2297	No
44-10	PR372152	216188	10213A	GS019	7/17/2019 8:42	1817	1677	2297	No
44-10	PR372152	216188	10213A	GS019	7/17/2019 8:45	2019	1677	2297	No
44-10	PR372152	216188	10213A	GS019	7/17/2019 8:47	2103	1677	2297	No
44-10	PR363489	266668	10213A	GS026	7/22/2019 8:00	1893	1553	2149	No
44-10	ES0118	216173	10213A	GS011	7/22/2019 7:51	1596	1497	2082	No
44-10	ES0118	216173	10213A	GS012	7/22/2019 7:55	1589	1497	2082	No
44-10	PR372152	216188	10213A	GS018	7/23/2019 7:45	1600	1485	2067	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
QC REPLICATE SCANS									
44-10	PR372143	304712	10213A	GS032	7/17/2019 8:19	2255	1912	2573	No
44-10	PR372143	304712	10213A	GS032	7/17/2019 8:22	2315	1912	2573	No
44-10	PR372143	304712	10213A	GS032	7/17/2019 8:25	2366	1912	2573	No
44-10	PR372143	304712	10213A	GS032	7/17/2019 8:28	2313	1912	2573	No
44-10	PR372143	304712	10213A	GS032	7/17/2019 8:31	2318	1912	2573	No
44-10	PR372143	304712	10213A	GS032	7/17/2019 8:34	2173	1912	2573	No
44-10	PR372143	304712	10213A	GS032	7/17/2019 8:37	2119	1912	2573	No
44-10	PR372143	304712	10213A	GS032	7/17/2019 8:40	2243	1912	2573	No
44-10	PR372143	304712	10213A	GS032	7/17/2019 8:44	2052	1912	2573	No
44-10	PR372143	304712	10213A	GS032	7/17/2019 8:48	2188	1912	2573	No
44-10	PR375273	304730	10213A	GS031	7/17/2019 8:38	1966	1815	2459	No
44-10	PR375273	304730	10213A	GS031	7/17/2019 8:40	2128	1815	2459	No
44-10	PR375273	304730	10213A	GS031	7/17/2019 8:42	2064	1815	2459	No
44-10	PR375273	304730	10213A	GS031	7/17/2019 8:44	2402	1815	2459	No
44-10	PR375273	304730	10213A	GS031	7/17/2019 8:46	2288	1815	2459	No
44-10	PR375273	304730	10213A	GS031	7/17/2019 8:48	2290	1815	2459	No
44-10	PR375273	304730	10213A	GS031	7/17/2019 8:50	2355	1815	2459	No
44-10	PR375273	304730	10213A	GS031	7/17/2019 8:52	2245	1815	2459	No
44-10	PR375273	304730	10213A	GS031	7/17/2019 8:54	2209	1815	2459	No
44-10	PR375273	304730	10213A	GS031	7/17/2019 8:56	2216	1815	2459	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. 10213A **Description:** NE Corner of Exclusion Area
Classification: 2 **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			
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	(as applicable)			
1	6.06E-04	1.88E-03	1.12E-01	1.30E-04	2.64E-04	SOF	0.115	0.885	+
2	2.49E-02	1.08E-02	2.60E-02	5.37E-03	6.09E-05	SOF	0.067	0.933	+
3	2.66E-02	3.02E-02	1.25E-01	5.72E-03	2.93E-04	SOF	0.188	0.812	+
4	4.32E-02	1.11E-02	9.17E-02	9.29E-03	2.15E-04	SOF	0.155	0.845	+
5	5.49E-03	5.52E-03	2.34E-02	1.18E-03	5.50E-05	SOF	0.036	0.964	+
6	4.23E-02	2.29E-02	7.88E-02	9.10E-03	1.85E-04	SOF	0.153	0.847	+
7	1.54E-02	9.69E-03	3.25E-02	3.32E-03	7.63E-05	SOF	0.061	0.939	+
8	6.43E-02	0.00E+00	2.89E-02	1.39E-02	6.79E-05	SOF	0.107	0.893	+
9	5.87E-03	7.33E-03	6.14E-02	1.26E-03	1.44E-04	SOF	0.076	0.924	+
10	0.00E+00	0.00E+00	3.75E-02	0.00E+00	8.79E-05	SOF	0.038	0.962	+
11	1.20E-02	5.27E-03	1.45E-02	2.59E-03	3.41E-05	SOF	0.034	0.966	+
12	2.45E-02	0.00E+00	1.13E-02	5.27E-03	2.65E-05	SOF	0.041	0.959	+
13	2.80E-02	2.88E-03	2.55E-02	6.04E-03	5.99E-05	SOF	0.063	0.937	+
14	3.73E-02	0.00E+00	3.17E-02	8.03E-03	7.43E-05	SOF	0.077	0.923	+
15	3.89E-02	0.00E+00	7.22E-03	8.37E-03	1.69E-05	SOF	0.054	0.946	+
16	2.00E-02	0.00E+00	5.54E-03	4.30E-03	1.30E-05	SOF	0.030	0.970	+
17	4.14E-02	1.95E-02	1.26E-02	8.92E-03	2.96E-05	SOF	0.082	0.918	+

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. Mandia (Print Name) / (Signature) 1-21-20 (Date)

Peer Reviewed By (RE): J Grcham (Print Name) / (Signature) 1/21/2020 (Date)

ATTACHMENT 5
QC SAMPLE ASSESSMENT

Duplicate Sample Assessment Form

Survey Area #: 10200	Survey Unit # 10213A	Survey Unit Name: NE Corner of Exclusion Area
Sample Plan#:	L2-10213A-F	

Sample Description: Comparison of split samples collected from surface soil sample location #5 and analyzed using gamma spectroscopy by on-site HPGe system. The standard sample was L2-10213A-FSGS-005SS, the comparison sample was L2-10213A-FQGS-005SS.

STANDARD					COMPARISON			
Radionuclide	Activity Value	Standard Error	Resolution	Agreement Range	Activity Value	Standard Error	Comparison Ratio	Acceptable (Y/N)
Cs-137	8.51E-02	1.52E-02	5.60	0.5-2.0	6.60E-02	1.64E-02	1.29	Y

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

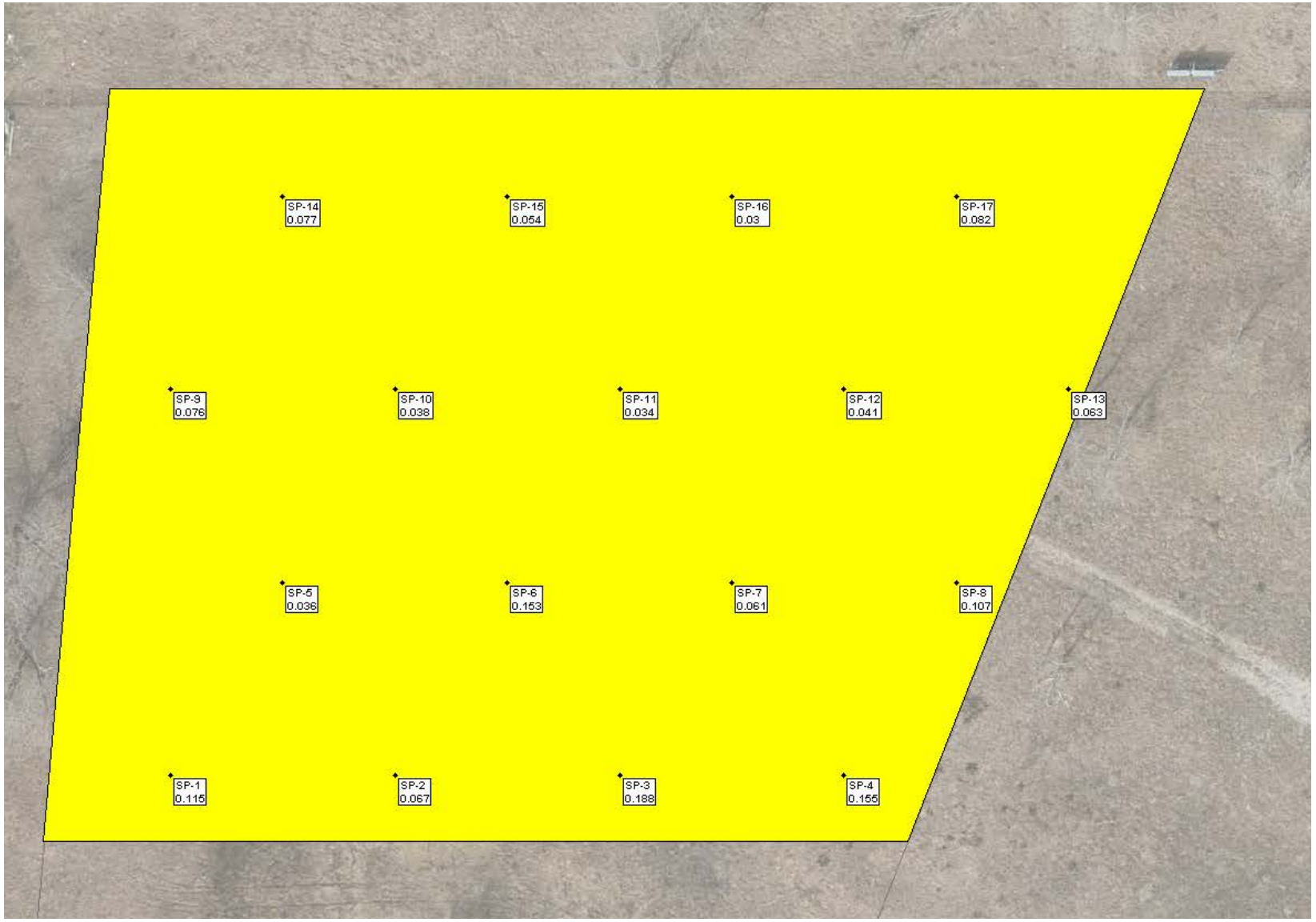
Table 4-1 from the QAPP is reproduced below to show acceptance criteria used to assess split samples.

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	1-21-20	J Brehm	1/21/2020

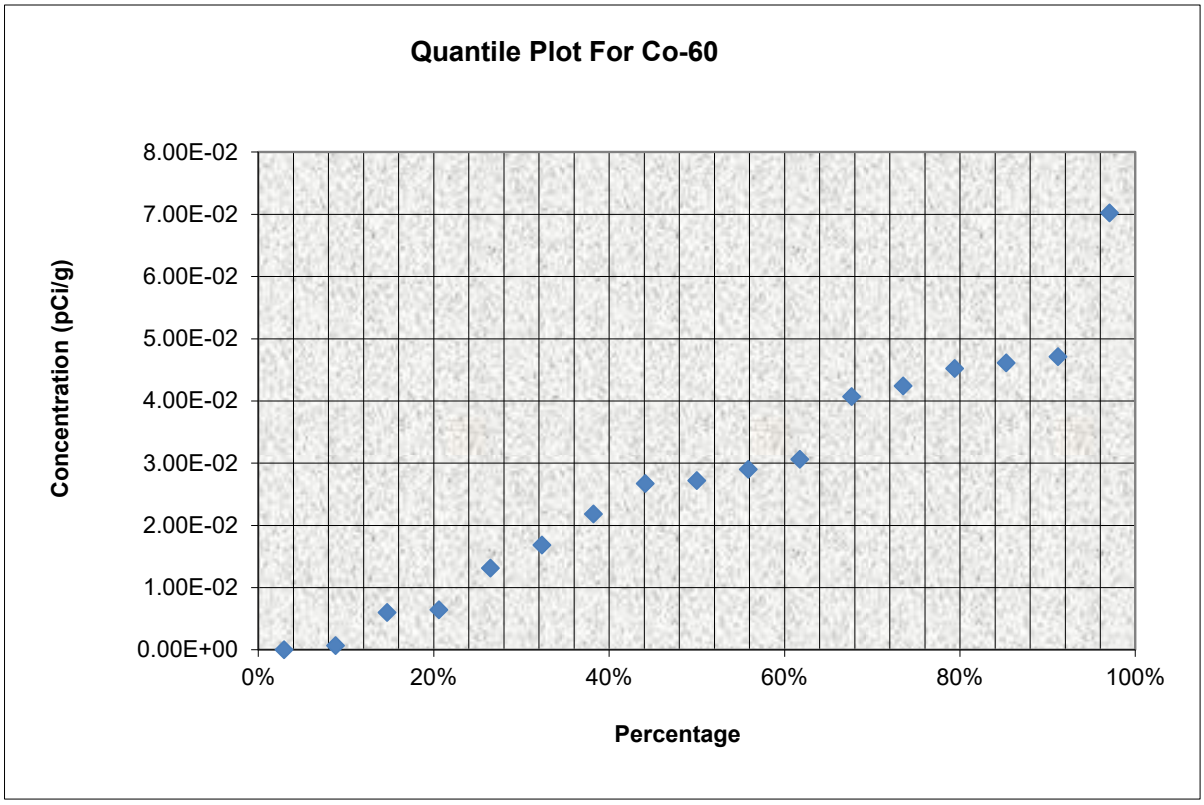
ATTACHMENT 6
GRAPHICAL PRESENTATIONS

Posting Plot



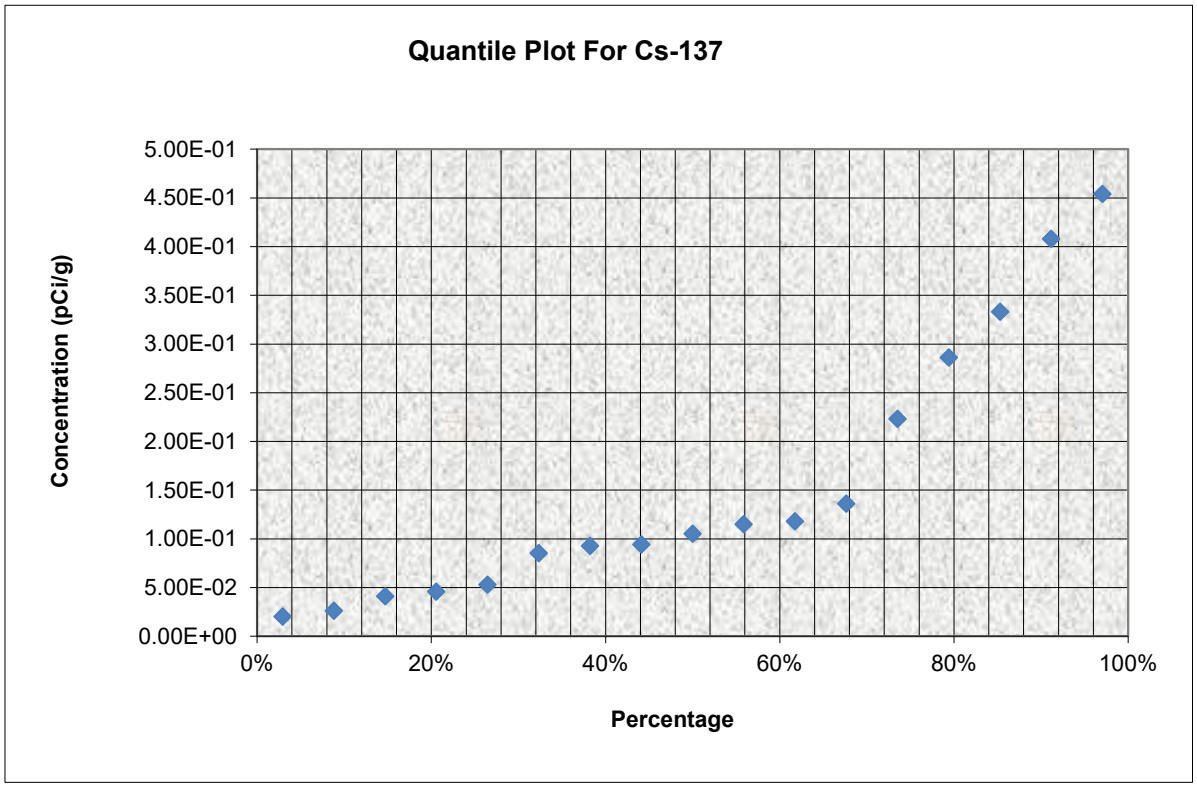
QUANTILE PLOT FOR Co-60

Survey Unit: 10213A
Survey Unit Name: NE Corner of Exclusion Area
Mean: 2.76E-02 pCi/g



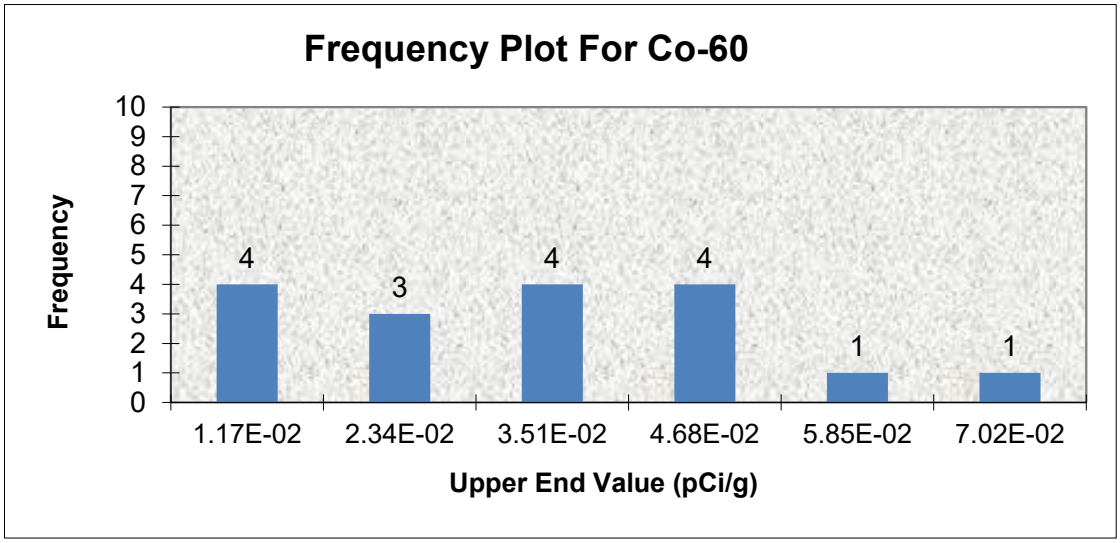
QUANTILE PLOT FOR Cs-137

Survey Unit: 10213A
Survey Unit Name: NE Corner of Exclusion Area
Mean: 1.55E-01 pCi/g



HISTOGRAM FOR Co-60

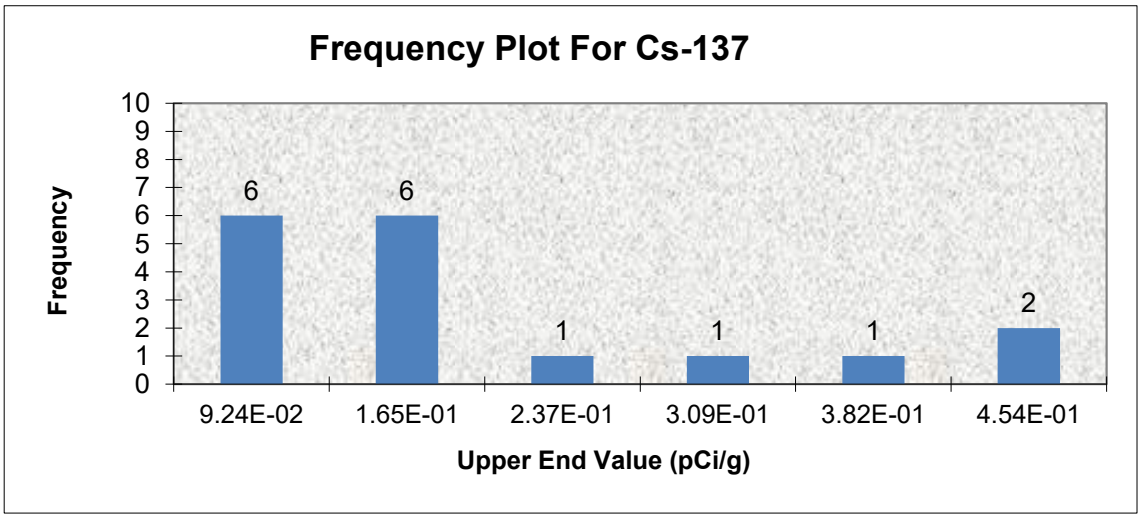
Survey Unit: 10213A
Survey Unit Name: NE Corner of Exclusion Area
Mean: 2.76E-02 pCi/g
Median: 2.72E-02 pCi/g
ST DEV: 0.019
Skew: 0.355



Upper Value	Observation Frequency	Observation %
1.17E-02	4	24%
2.34E-02	3	18%
3.51E-02	4	24%
4.68E-02	4	24%
5.85E-02	1	6%
7.02E-02	1	6%
TOTAL	17	100%

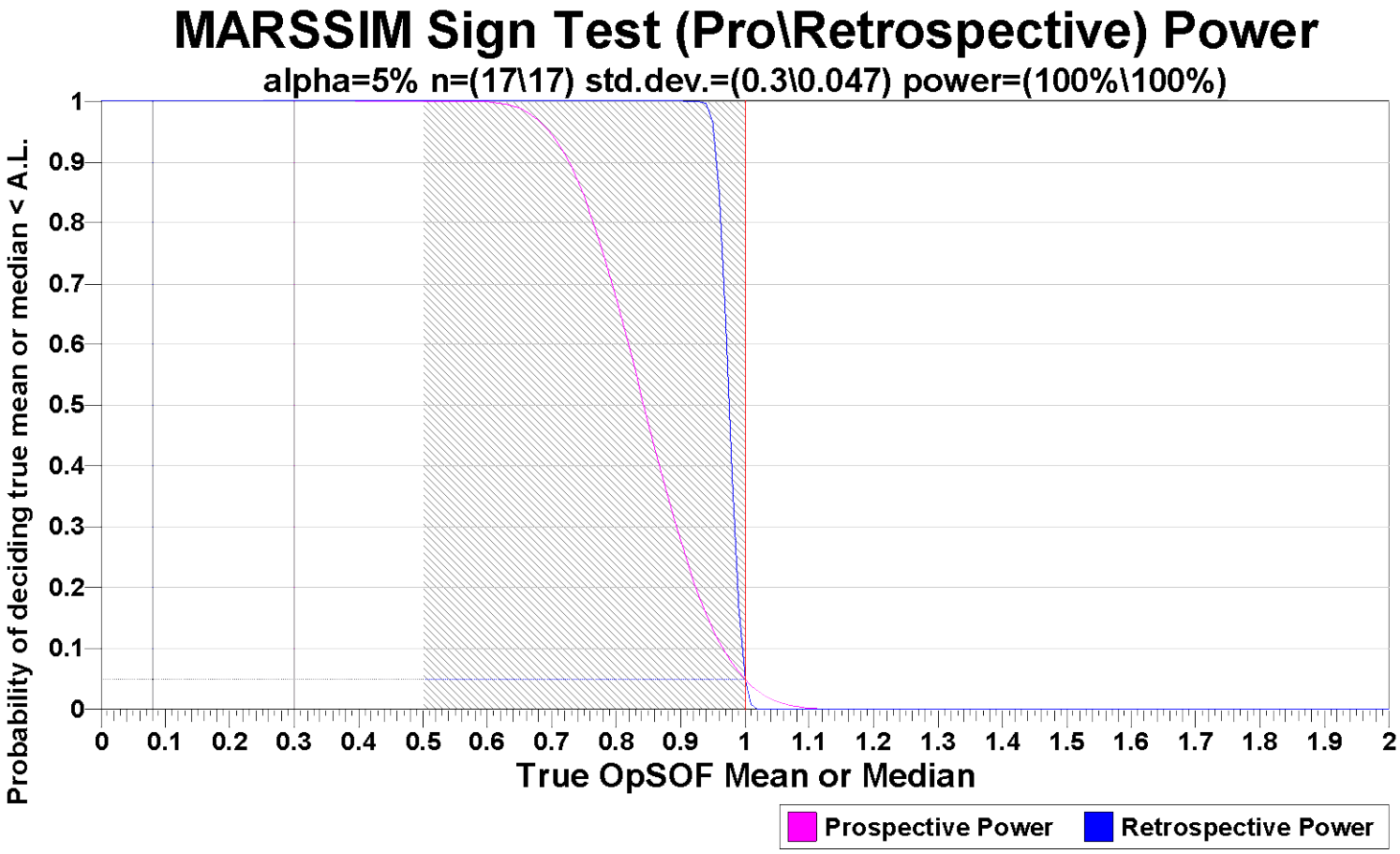
HISTOGRAM FOR Cs-137

Survey Unit: 10213A
Survey Unit Name: NE Corner of Exclusion Area
Mean: 1.55E-01 pCi/g
Median: 1.05E-01 pCi/g
ST DEV: 0.136
Skew: 1.175



Upper Value	Observation Frequency	Observation %
9.24E-02	6	35%
1.65E-01	6	35%
2.37E-01	1	6%
3.09E-01	1	6%
3.82E-01	1	6%
4.54E-01	2	12%
TOTAL	17	100%

Prospective and Retrospective Power Curves for Survey Unit 10213A



ATTACHMENT 7
SAMPLE ANALYTICAL REPORTS

Apex-Gamma

Analysis Report for 30-Jul-19-10009
L2-10213A-FSGS-001SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 30-Jul-19-10009
Sample Description	: L2-10213A-FSGS-001SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.268E+03 grams
Facility	: Default
Sample Taken On	: 7/29/2019 7:30:00AM
Acquisition Started	: 7/30/2019 8:50:09AM
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	: 7/30/2019
Efficiency Calibration Description	:
Sample Number	: 78280
Fill Height	: 1267.84 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/30/2019 9:05:13AM

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

Data Validated
1030 7-31-19

Analysis Report for 30-Jul-19-10009

L2-10213A-FSGS-001SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.69	948 -	959	954.86	1.30E+02	16.61	5.85E+01	0.99
2	294.98	1173 -	1186	1179.81	5.87E+01	12.04	3.13E+01	0.74
3	351.77	1401 -	1415	1406.81	1.14E+02	13.32	2.21E+01	0.93
4	510.41	2035 -	2051	2040.97	4.25E+01	11.21	2.65E+01	0.86
5	583.15	2326 -	2340	2331.82	3.09E+01	10.89	2.91E+01	0.72
6	609.14	2430 -	2442	2435.73	7.47E+01	10.83	1.53E+01	0.89
7	661.49	2637 -	2653	2645.06	2.12E+02	15.69	1.07E+01	1.38
8	911.08	3637 -	3651	3643.28	4.37E+01	7.67	5.32E+00	0.37
9	1460.47	5832 -	5851	5841.72	1.70E+02	13.32	2.31E+00	0.66

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	0.94	511.00	*	100.00	5.90E-02	1.61E-02
K-40	0.98	1460.82	*	10.66	4.51E+00	4.05E-01
Cs-137	0.99	661.66	*	85.10	4.08E-01	3.89E-02
Tl-208	1.00	583.19	*	85.00	5.45E-02	1.95E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	2.42E-01	3.67E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	2.54E-01	3.98E-02

Analysis Report for 30-Jul-19-10009

L2-10213A-FSGS-001SS

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	2.93E-01	6.46E-02
		351.93	*	35.60	3.35E-01	4.75E-02
		785.96		1.06		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	3.45E-01	6.24E-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 30-Jul-19-10009

L2-10213A-FSGS-001SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.945	5.90E-02	1.61E-02	
	K-40	0.981	4.51E+00	4.05E-01	
	Cs-137	0.996	4.08E-01	3.89E-02	
	Tl-208	1.000	5.45E-02	1.95E-02	
X	Bi-211	0.925			
	Pb-212	0.999	2.42E-01	3.67E-02	
	Bi-214	0.998	2.54E-01	3.98E-02	
	Pb-214	0.995	3.20E-01	3.82E-02	
	Ac-228	0.999	3.45E-01	6.24E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 30-Jul-19-10009

L2-10213A-FSGS-001SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/30/2019 9:05:13AM
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	5.90E-02	4.69E-02	4.69E-02
	BE-7	477.60		10.44	7.32E-02	5.19E-01	5.19E-01
+	K-40	1460.82	*	10.66	4.51E+00	3.27E-01	3.27E-01
	Mn-54	834.85		99.98	4.81E-03	4.98E-02	4.98E-02
	Co-60	1173.23		99.85	-4.30E-02	5.33E-02	6.97E-02
		1332.49		99.98	6.61E-04		5.33E-02
	Nb-94	702.65		99.81	-3.08E-03	4.06E-02	4.06E-02
		871.09		99.89	3.36E-02		4.48E-02
	Ag-108m	79.13		6.60	7.09E-01	5.22E-02	2.00E+00
		433.94		90.50	-4.25E-02		5.22E-02
		614.28		89.80	-7.33E-02		7.09E-02
		722.94		90.80	1.43E-02		5.58E-02
	Sb-125	176.31		6.84	-2.39E-02	1.67E-01	6.02E-01
		380.45		1.52	-8.23E-01		2.59E+00
		427.87		29.60	4.14E-02		1.67E-01
		463.36		10.49	2.57E-01		4.68E-01
		600.60		17.65	5.46E-02		2.88E-01
		606.71		4.98	2.72E+00		1.67E+00
		635.95		11.22	-3.19E-01		4.20E-01

Analysis Report for 30-Jul-19-10009

L2-10213A-FSGS-001SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	1.39E-01	1.67E-01	2.30E+00
	Ba-133	79.61		2.65	-4.72E-01	8.62E-02	4.69E+00
		81.00		32.90	-3.65E-01		3.15E-01
		276.40		7.16	3.75E-01		5.93E-01
		302.85		18.34	1.02E-01		2.37E-01
		356.01		62.05	-4.08E-02		8.62E-02
		383.85		8.94	2.62E-01		4.76E-01
	Cs-134	475.36		1.48	1.41E+00	5.52E-02	3.79E+00
		563.25		8.34	1.85E-03		5.70E-01
		569.33		15.37	2.06E-01		3.19E-01
		604.72		97.62	-6.75E-02		7.94E-02
		795.86		85.46	3.26E-03		5.52E-02
		801.95		8.69	3.92E-02		5.34E-01
		1038.61		0.99	-2.82E+00		4.24E+00
		1167.97		1.79	1.66E+00		4.00E+00
		1365.19		3.02	-1.46E+00		1.68E+00
+	Cs-137	661.66	*	85.10	4.08E-01	4.35E-02	4.35E-02
	Eu-152	121.78		28.67	-9.80E-02	1.55E-01	1.70E-01
		244.70		7.61	9.15E-02		6.19E-01
		295.94		0.45	4.10E+00		1.17E+01
		344.28		26.60	-6.78E-02		1.55E-01
		367.79		0.86	9.09E-01		4.79E+00
		411.12		2.24	1.57E-01		2.24E+00
		443.96		2.83	-5.60E-01		1.52E+00
		488.68		0.42	-2.82E+00		1.07E+01
		563.99		0.49	-1.09E+00		9.68E+00
		586.26		0.46	2.26E+00		1.52E+01
		678.62		0.47	3.79E+00		9.48E+00
		688.67		0.86	1.03E+00		5.62E+00
		719.35		0.28	-1.53E+01		1.51E+01
		778.90		12.96	-1.79E-01		3.43E-01
		810.45		0.32	-2.93E-01		1.42E+01
		867.37		4.26	-2.96E-01		1.02E+00
		919.33		0.43	3.18E+00		1.27E+01
		964.08		14.65	1.65E-01		5.08E-01
		1085.87		10.24	-2.16E-01		4.53E-01
		1089.74		1.73	2.00E+00		2.86E+00
		1112.07		13.69	-1.47E-01		3.66E-01
		1212.95		1.43	-2.79E+00		3.73E+00
		1249.94		0.19	6.02E+00		3.90E+01
		1299.14		1.63	5.89E-01		3.53E+00
		1408.01		21.07	-9.81E-03		2.55E-01
		1457.64		0.50	9.45E+01		3.75E+01
		1528.10		0.28	-8.08E+00		1.52E+01
	Eu-154	123.07		40.40	3.85E-02	1.19E-01	1.19E-01
		247.93		6.89	-2.26E-01		5.73E-01
		591.76		4.95	-1.01E+00		9.57E-01
		692.42		1.78	1.73E+00		2.89E+00
		723.30		20.06	1.80E-01		2.68E-01
		756.80		4.52	-4.06E-01		1.09E+00
		873.18		12.08	4.37E-02		3.51E-01

Analysis Report for 30-Jul-19-10009

L2-10213A-FSGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.08E-01	1.19E-01	5.66E-01
	1004.76	18.01	3.03E-02		3.26E-01
	1274.43	34.80	-5.62E-02		1.62E-01
	1596.48	1.80	1.15E-01		2.64E+00
Eu-155	45.30	1.31	1.06E+00	2.74E-01	3.14E+01
	60.01	1.22	-8.08E+00		3.43E+01
	86.55	30.70	-3.67E-02		2.74E-01
	105.31	21.10	-3.34E-02		2.80E-01
Ra-226	186.21	3.64	8.78E-01	1.29E+00	1.29E+00
Pa-231	27.36	10.30	3.92E+00	1.75E+00	3.62E+00
	283.69	1.70	5.51E-02		2.31E+00
	300.07	2.47	-5.70E-01		1.75E+00
	302.65	2.20	5.36E-01		1.96E+00
	330.06	1.40	-1.50E+00		3.05E+00
U-235	143.76	10.96	2.08E-01	8.22E-02	4.72E-01
	163.33	5.08	-3.99E-02		8.48E-01
	185.71	57.20	2.95E-02		8.22E-02
	202.11	1.08	8.32E-01		4.19E+00
	205.31	5.01	-5.12E-01		8.41E-01
Am-241	59.54	35.90	-3.07E-01	1.21E+00	1.21E+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 30-Jul-19-10010
L2-10213A-FSGS-002SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 30-Jul-19-10010
Sample Description	: L2-10213A-FSGS-002SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 9.664E+02 grams
Facility	: Default
Sample Taken On	: 7/29/2019 7:32:00AM
Acquisition Started	: 7/30/2019 8:50:17AM
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	: 78281
Fill Height	: 966.39 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/31/2019 1:06:06PM

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

Analysis Report for 30-Jul-19-10010

L2-10213A-FSGS-002SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.77	948 -	960	954.64	8.76E+01	14.45	4.54E+01	1.00
2	352.04	1399 -	1413	1407.18	8.35E+01	10.25	7.48E+00	0.86
3	583.09	2325 -	2336	2330.48	3.30E+01	7.46	8.99E+00	1.07
4	609.27	2430 -	2442	2435.12	5.89E+01	9.39	1.11E+01	0.67
5	661.59	2637 -	2652	2644.25	4.82E+01	7.30	1.80E+00	0.62
6	1460.35	5829 -	5852	5839.32	1.69E+02	14.26	8.68E+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	0.96	1460.82	*	10.66	4.61E+00	4.37E-01
Cs-137	0.99	661.66	*	85.10	9.42E-02	1.53E-02
Tl-208	0.99	583.19	*	85.00	5.91E-02	1.38E-02
Bi-211	0.86	351.07	*	13.02	6.75E-01	9.91E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.62E-01	2.97E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	2.03E-01	3.46E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		

Analysis Report for 30-Jul-19-10010

L2-10213A-FSGS-002SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.51	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	2.47E-01	3.62E-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	0.964	4.61E+00	4.37E-01	
	Cs-137	0.999	9.42E-02	1.53E-02	
	Tl-208	0.999	5.91E-02	1.38E-02	
?	Bi-211	0.860	6.75E-01	9.91E-02	
	Pb-212	0.997	1.62E-01	2.97E-02	
	Bi-214	1.000	2.03E-01	3.46E-02	
?	Pb-214	0.511	2.47E-01	3.62E-02	

Analysis Report for 30-Jul-19-10010

L2-10213A-FSGS-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 30-Jul-19-10010
L2-10213A-FSGS-002SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/31/2019 1:06:06PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

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

All peaks were identified.

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	3.98E-02	5.95E-02	5.95E-02
	BE-7	477.60		10.44	2.49E-01	4.10E-01	4.10E-01
+	K-40	1460.82	*	10.66	4.61E+00	6.19E-01	6.19E-01
	Mn-54	834.85		99.98	1.32E-02	4.44E-02	4.44E-02
	Co-60	1173.23		99.85	2.72E-02	4.67E-02	7.24E-02
		1332.49		99.98	-1.01E-02		4.67E-02
	Nb-94	702.65		99.81	-1.95E-02	4.04E-02	4.04E-02
		871.09		99.89	9.31E-03		5.01E-02
	Ag-108m	79.13		6.60	1.15E+00	3.45E-02	1.22E+00
		433.94		90.50	-7.07E-03		3.45E-02
		614.28		89.80	-2.49E-02		6.28E-02
		722.94		90.80	-2.47E-03		5.76E-02
	Sb-125	176.31		6.84	-3.93E-01	1.18E-01	4.48E-01
		380.45		1.52	1.57E+00		2.39E+00
		427.87		29.60	-5.51E-02		1.18E-01
		463.36		10.49	-3.08E-02		3.47E-01
		600.60		17.65	-4.09E-03		2.49E-01
		606.71		4.98	2.11E+00		1.54E+00
		635.95		11.22	1.74E-01		3.58E-01

Analysis Report for 30-Jul-19-10010

L2-10213A-FSGS-002SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-1.41E+00	1.18E-01	2.38E+00
	Ba-133	79.61		2.65	2.89E+00	6.90E-02	2.96E+00
		81.00		32.90	-2.62E-01		1.92E-01
		276.40		7.16	3.67E-01		5.05E-01
		302.85		18.34	2.59E-03		1.79E-01
		356.01		62.05	-1.24E-02		6.90E-02
		383.85		8.94	1.66E-01		4.27E-01
	Cs-134	475.36		1.48	6.92E-01	6.36E-02	2.82E+00
		563.25		8.34	-6.76E-01		4.95E-01
		569.33		15.37	8.24E-02		2.09E-01
		604.72		97.62	-8.93E-02		6.69E-02
		795.86		85.46	1.88E-02		6.36E-02
		801.95		8.69	-2.74E-01		5.78E-01
		1038.61		0.99	-1.39E+00		4.16E+00
		1167.97		1.79	-3.66E+00		3.44E+00
		1365.19		3.02	-4.23E-01		1.14E+00
+	Cs-137	661.66	*	85.10	9.42E-02	2.07E-02	2.07E-02
	Eu-152	121.78		28.67	-1.19E-02	1.12E-01	1.12E-01
		244.70		7.61	2.58E-01		5.06E-01
		295.94		0.45	5.42E+00		9.31E+00
		344.28		26.60	5.26E-02		1.32E-01
		367.79		0.86	-2.87E+00		3.89E+00
		411.12		2.24	1.28E+00		1.85E+00
		443.96		2.83	-7.75E-01		1.23E+00
		488.68		0.42	-2.06E+00		8.71E+00
		563.99		0.49	-1.56E+01		7.19E+00
		586.26		0.46	-6.11E+00		1.31E+01
		678.62		0.47	-4.43E+00		9.81E+00
		688.67		0.86	-7.51E+00		3.88E+00
		719.35		0.28	1.41E+00		1.64E+01
		778.90		12.96	-6.47E-02		3.17E-01
		810.45		0.32	5.60E+00		1.51E+01
		867.37		4.26	2.46E-01		1.07E+00
		919.33		0.43	5.39E+00		9.20E+00
		964.08		14.65	-2.29E-01		4.04E-01
		1085.87		10.24	3.66E-01		5.71E-01
		1089.74		1.73	-2.02E+00		3.01E+00
		1112.07		13.69	-5.52E-02		4.69E-01
		1212.95		1.43	-1.56E+00		5.03E+00
		1249.94		0.19	-2.41E+01		3.74E+01
		1299.14		1.63	2.17E+00		3.89E+00
		1408.01		21.07	-1.05E-01		2.09E-01
		1457.64		0.50	1.03E+02		3.91E+01
		1528.10		0.28	-1.59E+01		1.45E+01
	Eu-154	123.07		40.40	-2.08E-02	7.97E-02	7.97E-02
		247.93		6.89	-1.12E-01		4.29E-01
		591.76		4.95	5.20E-01		8.49E-01
		692.42		1.78	1.38E+00		2.24E+00
		723.30		20.06	1.57E-01		2.76E-01
		756.80		4.52	5.53E-01		1.07E+00
		873.18		12.08	1.80E-01		4.24E-01

Analysis Report for 30-Jul-19-10010

L2-10213A-FSGS-002SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	2.39E-01	7.97E-02	5.37E-01
	1004.76	18.01	3.46E-03		2.81E-01
	1274.43	34.80	1.17E-01		1.83E-01
	1596.48	1.80	-1.52E+00		2.36E+00
Eu-155	45.30	1.31	-5.22E+00	1.80E-01	1.02E+01
	60.01	1.22	3.57E+00		1.17E+01
	86.55	30.70	2.22E-02		1.80E-01
	105.31	21.10	3.97E-03		1.83E-01
Ra-226	186.21	3.64	2.65E-01	9.13E-01	9.13E-01
Pa-231	27.36	10.30	7.44E-01	1.22E+00	1.24E+00
	283.69	1.70	-4.72E-01		1.81E+00
	300.07	2.47	-3.61E+00		1.22E+00
	302.65	2.20	6.34E-02		1.51E+00
	330.06	1.40	1.45E+00		2.47E+00
U-235	143.76	10.96	2.30E-01	5.89E-02	3.10E-01
	163.33	5.08	-4.55E-03		5.77E-01
	185.71	57.20	5.90E-02		5.89E-02
	202.11	1.08	-2.63E-01		2.88E+00
	205.31	5.01	-7.83E-02		5.96E-01
Am-241	59.54	35.90	6.66E-02	4.00E-01	4.00E-01

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

Apex-Gamma

Analysis Report for 30-Jul-19-10011

L2-10213A-FSGS-003SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 30-Jul-19-10011
Sample Description	: L2-10213A-FSGS-003SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 9.415E+02 grams
Facility	: Default
Sample Taken On	: 7/29/2019 7:34:00AM
Acquisition Started	: 7/30/2019 8:50:25AM
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	: 7/30/2019
Efficiency Calibration Description	:
Sample Number	: 78282
Fill Height	: 941.49 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/30/2019 9:05:44AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
1030 7-31-19

Analysis Report for 30-Jul-19-10011

L2-10213A-FSGS-003SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.53	948 -	961	954.59	1.09E+02	15.82	5.09E+01	1.06
2	295.02	1176 -	1186	1180.29	2.94E+01	10.01	2.96E+01	0.65
3	351.65	1401 -	1415	1406.60	6.45E+01	11.40	2.25E+01	0.67
4	477.60	1905 -	1915	1909.97	1.80E+01	7.33	1.50E+01	0.61
5	609.34	2430 -	2444	2436.61	5.03E+01	10.34	1.97E+01	0.70
6	661.58	2635 -	2655	2645.52	2.45E+02	18.70	2.88E+01	1.55
7	911.17	3637 -	3651	3643.71	4.59E+01	8.13	7.10E+00	0.49
8	1460.53	5832 -	5854	5842.50	2.05E+02	16.01	1.35E+01	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
BE-7	1.00	477.60	*	10.44	2.21E-01	9.14E-02
K-40	0.98	1460.82	*	10.66	5.24E+00	4.68E-01
Cs-137	0.99	661.66	*	85.10	4.54E-01	4.41E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.99E-01	3.30E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	1.65E-01	3.53E-02
		768.36		4.89		
		806.18		1.26		

Analysis Report for 30-Jul-19-10011

L2-10213A-FSGS-003SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	1.43E-01	5.00E-02
		351.93	*	35.60	1.84E-01	3.58E-02
		785.96		1.06		
Ac-228	1.00	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	3.49E-01	6.36E-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 30-Jul-19-10011

L2-10213A-FSGS-003SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	BE-7	1.000	2.21E-01	9.14E-02	
	K-40	0.987	5.24E+00	4.68E-01	
	Cs-137	0.999	4.54E-01	4.41E-02	
X	Bi-211	0.947			
	Pb-212	0.999	1.99E-01	3.30E-02	
	Bi-214	1.000	1.65E-01	3.53E-02	
	Pb-214	0.991	1.70E-01	2.91E-02	
	Ac-228	1.000	3.49E-01	6.36E-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 30-Jul-19-10011

L2-10213A-FSGS-003SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/30/2019 9:05:44AM
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	3.93E-02	6.22E-02	6.22E-02
+	BE-7	477.60	*	10.44	2.21E-01	2.84E-01	2.84E-01
+	K-40	1460.82	*	10.66	5.24E+00	6.91E-01	6.91E-01
	Mn-54	834.85		99.98	-1.84E-02	4.97E-02	4.97E-02
	Co-60	1173.23		99.85	8.15E-03	5.90E-02	6.89E-02
		1332.49		99.98	2.90E-02		5.90E-02
	Nb-94	702.65		99.81	-2.17E-02	4.31E-02	4.34E-02
		871.09		99.89	-3.34E-02		4.31E-02
	Ag-108m	79.13		6.60	-9.80E-01	4.62E-02	1.57E+00
		433.94		90.50	2.86E-02		4.62E-02
		614.28		89.80	-1.21E-02		7.95E-02
		722.94		90.80	2.03E-02		5.29E-02
	Sb-125	176.31		6.84	2.24E-01	1.43E-01	5.62E-01
		380.45		1.52	-3.37E-01		2.91E+00
		427.87		29.60	-4.15E-02		1.43E-01
		463.36		10.49	1.30E-01		4.54E-01
		600.60		17.65	1.73E-01		2.65E-01
		606.71		4.98	1.96E+00		1.50E+00
		635.95		11.22	2.25E-01		4.17E-01

Analysis Report for 30-Jul-19-10011

L2-10213A-FSGS-003SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-1.19E+00	1.43E-01	2.43E+00
	Ba-133	79.61		2.65	-7.86E-02	7.75E-02	3.81E+00
		81.00		32.90	-3.08E-01		2.71E-01
		276.40		7.16	3.68E-01		5.74E-01
		302.85		18.34	6.41E-02		2.08E-01
		356.01		62.05	-3.05E-02		7.75E-02
		383.85		8.94	3.61E-01		5.25E-01
	Cs-134	475.36		1.48	5.12E-01	5.62E-02	3.47E+00
		563.25		8.34	2.61E-01		5.37E-01
		569.33		15.37	1.38E-01		3.08E-01
		604.72		97.62	-6.27E-02		7.08E-02
		795.86		85.46	5.23E-02		5.62E-02
		801.95		8.69	-7.32E-01		4.69E-01
		1038.61		0.99	5.42E+00		5.82E+00
		1167.97		1.79	1.09E+00		3.66E+00
		1365.19		3.02	-6.22E-01		1.33E+00
+	Cs-137	661.66	*	85.10	4.54E-01	6.96E-02	6.96E-02
	Eu-152	121.78		28.67	1.15E-02	1.33E-01	1.33E-01
		244.70		7.61	3.87E-01		5.48E-01
		295.94		0.45	1.08E+01		1.10E+01
		344.28		26.60	-1.30E-01		1.58E-01
		367.79		0.86	-4.68E+00		4.44E+00
		411.12		2.24	-1.28E+00		2.02E+00
		443.96		2.83	4.84E-01		1.50E+00
		488.68		0.42	1.20E+01		1.22E+01
		563.99		0.49	-1.28E+00		9.24E+00
		586.26		0.46	1.25E+01		1.29E+01
		678.62		0.47	2.27E+00		9.91E+00
		688.67		0.86	7.40E-01		4.49E+00
		719.35		0.28	-3.48E+00		1.58E+01
		778.90		12.96	1.10E-01		3.45E-01
		810.45		0.32	-6.54E-01		1.51E+01
		867.37		4.26	-1.16E+00		9.81E-01
		919.33		0.43	-6.90E+00		9.90E+00
		964.08		14.65	1.79E-01		5.03E-01
		1085.87		10.24	-6.27E-01		4.63E-01
		1089.74		1.73	3.80E-01		3.38E+00
		1112.07		13.69	-6.32E-02		4.32E-01
		1212.95		1.43	9.24E-01		4.48E+00
		1249.94		0.19	6.42E-01		3.51E+01
		1299.14		1.63	-6.58E-02		3.81E+00
		1408.01		21.07	5.23E-04		1.84E-01
		1457.64		0.50	1.24E+02		4.08E+01
		1528.10		0.28	4.16E-02		1.46E+01
	Eu-154	123.07		40.40	1.41E-02	9.22E-02	9.22E-02
		247.93		6.89	-4.27E-01		4.93E-01
		591.76		4.95	3.47E-01		8.21E-01
		692.42		1.78	-2.66E-01		1.96E+00
		723.30		20.06	1.26E-02		2.40E-01
		756.80		4.52	1.75E-01		7.71E-01
		873.18		12.08	2.99E-01		3.75E-01

Analysis Report for 30-Jul-19-10011

L2-10213A-FSGS-003SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	3.03E-01	9.22E-02	5.62E-01
	1004.76	18.01	1.07E-01		2.89E-01
	1274.43	34.80	4.86E-03		1.72E-01
	1596.48	1.80	1.78E+00		3.05E+00
Eu-155	45.30	1.31	4.79E+00	2.34E-01	2.16E+01
	60.01	1.22	2.57E+00		2.13E+01
	86.55	30.70	3.06E-02		2.38E-01
	105.31	21.10	7.22E-02		2.34E-01
Ra-226	186.21	3.64	1.04E+00	1.20E+00	1.20E+00
Pa-231	27.36	10.30	1.03E+00	1.61E+00	2.23E+00
	283.69	1.70	9.05E-01		2.27E+00
	300.07	2.47	-1.48E+00		1.61E+00
	302.65	2.20	5.38E-01		1.75E+00
	330.06	1.40	2.08E-01		3.04E+00
U-235	143.76	10.96	-1.06E-01	7.46E-02	3.59E-01
	163.33	5.08	1.87E-03		7.34E-01
	185.71	57.20	2.92E-02		7.46E-02
	202.11	1.08	4.08E-01		3.91E+00
	205.31	5.01	-8.49E-02		8.56E-01
Am-241	59.54	35.90	2.46E-01	7.57E-01	7.57E-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 30-Jul-19-10012

L2-10213A-FSGS-004SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 30-Jul-19-10012
Sample Description	: L2-10213A-FSGS-004SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.479E+03 grams
Facility	: Default
Sample Taken On	: 7/29/2019 7:36:00AM
Acquisition Started	: 7/30/2019 9:09:07AM
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	: 7/30/2019
Efficiency Calibration Description	:
Sample Number	: 78283
Fill Height	: 1479.43 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/30/2019 9:24:10AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
1030 7-31-19

Analysis Report for 30-Jul-19-10012

L2-10213A-FSGS-004SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.57	946 -	961	954.36	1.01E+02	17.23	6.46E+01	1.07
2	295.11	1176 -	1186	1180.34	3.57E+01	11.18	3.73E+01	0.49
3	351.66	1399 -	1412	1406.39	6.81E+01	12.82	3.49E+01	0.82
4	583.08	2324 -	2338	2331.53	4.62E+01	10.04	1.88E+01	0.40
5	609.14	2427 -	2443	2435.72	6.52E+01	10.58	1.48E+01	0.95
6	661.47	2636 -	2652	2644.99	1.82E+02	15.76	2.13E+01	1.63
7	911.03	3636 -	3650	3643.10	3.73E+01	6.93	3.75E+00	0.83
8	969.04	3870 -	3881	3875.13	1.56E+01	6.31	9.42E+00	1.05
9	1460.35	5829 -	5851	5841.24	2.26E+02	15.77	5.75E+00	1.27

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.96	1460.82	*	10.66	5.70E+00	4.68E-01
Cs-137	0.99	661.66	*	85.10	3.33E-01	3.51E-02
Tl-208	0.99	583.19	*	85.00	7.77E-02	1.75E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.82E-01	3.43E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	2.11E-01	3.66E-02
		768.36		4.89		

Analysis Report for 30-Jul-19-10012

L2-10213A-FSGS-004SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	1.71E-01	5.54E-02
		351.93	*	35.60	1.92E-01	3.93E-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	2.80E-01	5.35E-02
		964.77		4.99		
		968.97	*	15.80	2.00E-01	8.13E-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 30-Jul-19-10012

L2-10213A-FSGS-004SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.965	5.70E+00	4.68E-01	
	Cs-137	0.995	3.33E-01	3.51E-02	
	Tl-208	0.998	7.77E-02	1.75E-02	
X	Bi-211	0.945			
	Pb-212	0.999	1.82E-01	3.43E-02	
	Bi-214	0.998	2.11E-01	3.66E-02	
	Pb-214	0.993	1.85E-01	3.20E-02	
	Ac-228	0.998	2.56E-01	4.47E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 30-Jul-19-10012

L2-10213A-FSGS-004SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/30/2019 9:24:10AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

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

All peaks were identified.

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	7.18E-02	6.47E-02	6.47E-02
	BE-7	477.60		10.44	1.28E-01	4.61E-01	4.61E-01
+	K-40	1460.82	*	10.66	5.70E+00	4.76E-01	4.76E-01
	Mn-54	834.85		99.98	5.76E-03	4.91E-02	4.91E-02
	Co-60	1173.23		99.85	4.71E-02	5.52E-02	6.18E-02
		1332.49		99.98	4.00E-02		5.52E-02
	Nb-94	702.65		99.81	1.93E-02	4.60E-02	4.60E-02
		871.09		99.89	1.83E-02		4.67E-02
	Ag-108m	79.13		6.60	1.34E+00	4.74E-02	2.04E+00
		433.94		90.50	-2.62E-02		4.74E-02
		614.28		89.80	-2.37E-02		6.61E-02
		722.94		90.80	1.07E-02		5.32E-02
	Sb-125	176.31		6.84	-1.11E-01	1.57E-01	6.00E-01
		380.45		1.52	2.02E+00		3.25E+00
		427.87		29.60	-9.75E-04		1.57E-01
		463.36		10.49	2.80E-01		5.07E-01
		600.60		17.65	5.85E-03		2.38E-01
		606.71		4.98	2.51E+00		1.49E+00
		635.95		11.22	-1.08E-01		3.37E-01

Analysis Report for 30-Jul-19-10012

L2-10213A-FSGS-004SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-9.20E-01	1.57E-01	2.57E+00
	Ba-133	79.61		2.65	1.05E+00	7.29E-02	4.82E+00
		81.00		32.90	-1.26E-01		3.35E-01
		276.40		7.16	3.68E-02		5.76E-01
		302.85		18.34	-1.69E-02		2.11E-01
		356.01		62.05	3.39E-03		7.29E-02
		383.85		8.94	2.28E-02		4.86E-01
	Cs-134	475.36		1.48	2.96E+00	5.46E-02	3.42E+00
		563.25		8.34	-2.05E-01		5.17E-01
		569.33		15.37	1.91E-02		2.71E-01
		604.72		97.62	-1.96E-02		6.72E-02
		795.86		85.46	1.92E-02		5.46E-02
		801.95		8.69	2.98E-01		4.98E-01
		1038.61		0.99	-7.76E-02		6.15E+00
		1167.97		1.79	5.16E-01		2.83E+00
		1365.19		3.02	4.14E-01		1.65E+00
+	Cs-137	661.66	*	85.10	3.33E-01	5.60E-02	5.60E-02
	Eu-152	121.78		28.67	-3.42E-02	1.49E-01	1.49E-01
		244.70		7.61	1.06E-01		5.84E-01
		295.94		0.45	5.08E+00		1.11E+01
		344.28		26.60	-3.46E-02		1.58E-01
		367.79		0.86	-2.24E-01		4.66E+00
		411.12		2.24	-1.48E-01		1.99E+00
		443.96		2.83	-1.34E+00		1.48E+00
		488.68		0.42	-2.71E+00		9.89E+00
		563.99		0.49	6.91E-01		8.90E+00
		586.26		0.46	-4.49E+00		1.43E+01
		678.62		0.47	7.57E-01		6.56E+00
		688.67		0.86	-6.00E-01		4.83E+00
		719.35		0.28	-1.48E+00		1.37E+01
		778.90		12.96	-3.67E-01		3.55E-01
		810.45		0.32	-2.48E+00		1.20E+01
		867.37		4.26	-6.92E-01		1.02E+00
		919.33		0.43	-1.76E+00		9.20E+00
		964.08		14.65	-2.66E-01		4.83E-01
		1085.87		10.24	1.60E-02		5.07E-01
		1089.74		1.73	-1.93E+00		3.08E+00
		1112.07		13.69	2.96E-01		4.72E-01
		1212.95		1.43	-2.86E+00		3.92E+00
		1249.94		0.19	-8.06E+00		3.02E+01
		1299.14		1.63	2.42E+00		3.34E+00
		1408.01		21.07	6.84E-02		2.42E-01
		1457.64		0.50	1.26E+02		4.16E+01
		1528.10		0.28	6.57E-01		1.44E+01
	Eu-154	123.07		40.40	2.89E-02	1.10E-01	1.10E-01
		247.93		6.89	-1.32E-02		5.97E-01
		591.76		4.95	-3.07E-01		9.01E-01
		692.42		1.78	-5.21E-01		2.43E+00
		723.30		20.06	1.27E-01		2.48E-01
		756.80		4.52	1.80E-01		8.11E-01
		873.18		12.08	2.75E-03		3.53E-01

Analysis Report for 30-Jul-19-10012

L2-10213A-FSGS-004SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-1.11E-01	1.10E-01	4.34E-01
	1004.76	18.01	-1.56E-01		2.54E-01
	1274.43	34.80	-6.54E-02		1.54E-01
	1596.48	1.80	-1.80E-01		2.34E+00
Eu-155	45.30	1.31	-1.75E+00	2.68E-01	3.30E+01
	60.01	1.22	-1.32E-01		3.42E+01
	86.55	30.70	2.14E-03		2.73E-01
	105.31	21.10	-6.94E-02		2.68E-01
Ra-226	186.21	3.64	6.70E-01	1.16E+00	1.16E+00
Pa-231	27.36	10.30	2.08E+00	1.64E+00	3.48E+00
	283.69	1.70	-1.80E+00		2.16E+00
	300.07	2.47	-7.40E-01		1.64E+00
	302.65	2.20	-1.02E-01		1.76E+00
	330.06	1.40	4.65E-02		2.88E+00
U-235	143.76	10.96	-3.04E-01	7.44E-02	3.62E-01
	163.33	5.08	-1.26E-01		8.46E-01
	185.71	57.20	3.98E-02		7.44E-02
	202.11	1.08	7.54E-01		3.63E+00
	205.31	5.01	-6.38E-01		7.25E-01
Am-241	59.54	35.90	-1.39E-02	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 30-Jul-19-10013

L2-10213A-FSGS-005SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 30-Jul-19-10013
Sample Description	: L2-10213A-FSGS-005SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.031E+03 grams
Facility	: Default
Sample Taken On	: 7/29/2019 7:38:00AM
Acquisition Started	: 7/30/2019 9:09:13AM
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	: 7/30/2019
Efficiency Calibration Description	:
Sample Number	: 78284
Fill Height	: 1030.91 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/30/2019 9:24:15AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
1030 7-31-19

Analysis Report for 30-Jul-19-10013

L2-10213A-FSGS-005SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	238.72	948 -	973	954.46	1.25E+02	11.85	2.68E+01	0.82
m	2	242.39	948 -	973	969.13	1.82E+01	6.20	3.43E+01	0.82
	3	295.26	1175 -	1186	1180.34	3.25E+01	9.83	2.55E+01	0.85
	4	338.52	1348 -	1358	1353.17	4.45E+01	9.16	1.65E+01	0.74
	5	351.96	1399 -	1415	1406.84	6.80E+01	11.82	2.30E+01	0.58
	6	558.71	2229 -	2238	2233.03	2.14E+01	5.85	5.56E+00	0.36
	7	583.17	2324 -	2335	2330.80	3.33E+01	7.42	8.74E+00	0.38
	8	609.18	2428 -	2441	2434.77	2.76E+01	8.38	1.54E+01	1.21
	9	661.83	2638 -	2652	2645.21	4.51E+01	7.55	3.93E+00	0.90
	10	911.16	3636 -	3648	3642.11	3.25E+01	7.04	6.50E+00	1.12
	11	1460.28	5829 -	5850	5839.05	1.76E+02	13.71	2.96E+00	2.15

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	0.95	1460.82	*	10.66	4.63E+00	4.13E-01
Cs-137	0.99	661.66	*	85.10	8.51E-02	1.52E-02
Tl-208	1.00	583.19	*	85.00	5.76E-02	1.33E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	2.23E-01	2.78E-02
		300.09		3.30		

Analysis Report for 30-Jul-19-10013

L2-10213A-FSGS-005SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	609.32	*	45.49	9.20E-02	2.85E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	1.98E-01	6.91E-02
		295.22	*	18.42	1.57E-01	4.92E-02
		351.93	*	35.60	1.95E-01	3.73E-02
		785.96		1.06		
Ac-228	0.74	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	3.91E-01	8.65E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.54E-01	5.60E-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 30-Jul-19-10013

L2-10213A-FSGS-005SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.954	4.63E+00	4.13E-01	
	Cs-137	0.995	8.51E-02	1.52E-02	
	Tl-208	1.000	5.76E-02	1.33E-02	
X	Bi-211	0.882			
	Pb-212	0.999	2.23E-01	2.78E-02	
	Bi-214	0.999	9.20E-02	2.85E-02	
	Pb-214	0.997	1.84E-01	2.73E-02	
	Ac-228	0.746	2.94E-01	4.70E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 30-Jul-19-10013
L2-10213A-FSGS-005SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/30/2019 9:24:15AM
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	558.71	2.38272E-02	27.27		

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	6.34E-02	6.25E-02	6.25E-02
	BE-7	477.60		10.44	1.93E-01	4.38E-01	4.38E-01
+	K-40	1460.82	*	10.66	4.63E+00	3.82E-01	3.82E-01
	Mn-54	834.85		99.98	1.12E-02	5.18E-02	5.18E-02
	Co-60	1173.23		99.85	5.99E-03	5.44E-02	6.55E-02
		1332.49		99.98	-2.70E-02		5.44E-02
	Nb-94	702.65		99.81	3.08E-02	3.93E-02	4.26E-02
		871.09		99.89	5.36E-03		3.93E-02
	Ag-108m	79.13		6.60	4.60E-01	3.89E-02	1.09E+00
		433.94		90.50	-2.66E-02		3.89E-02
		614.28		89.80	-9.65E-05		5.51E-02
		722.94		90.80	4.34E-02		5.40E-02
	Sb-125	176.31		6.84	1.36E-01	1.21E-01	4.56E-01
		380.45		1.52	-1.60E-01		2.34E+00
		427.87		29.60	7.69E-03		1.21E-01
		463.36		10.49	-3.47E-02		3.81E-01
		600.60		17.65	-2.34E-02		2.29E-01
		606.71		4.98	8.62E-01		1.24E+00

Analysis Report for 30-Jul-19-10013

L2-10213A-FSGS-005SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	635.95		11.22	-2.51E-01	1.21E-01	3.32E-01
		671.44		1.79	1.03E+00		2.48E+00
	Ba-133	79.61		2.65	1.14E+00	6.48E-02	2.69E+00
		81.00		32.90	-2.61E-01		1.73E-01
		276.40		7.16	3.03E-01		4.96E-01
		302.85		18.34	3.02E-02		1.72E-01
		356.01		62.05	-2.69E-02		6.48E-02
		383.85		8.94	-1.67E-02		4.22E-01
	Cs-134	475.36		1.48	1.03E+00	5.75E-02	3.08E+00
		563.25		8.34	-1.08E-01		5.52E-01
		569.33		15.37	5.18E-02		2.48E-01
		604.72		97.62	-1.89E-03		5.85E-02
		795.86		85.46	9.57E-03		5.75E-02
		801.95		8.69	-4.34E-01		5.03E-01
		1038.61		0.99	1.74E+00		4.64E+00
		1167.97		1.79	1.63E+00		3.52E+00
		1365.19		3.02	2.21E-02		1.52E+00
+	Cs-137	661.66	*	85.10	8.51E-02	2.76E-02	2.76E-02
	Eu-152	121.78		28.67	-9.64E-03	1.00E-01	1.00E-01
		244.70		7.61	-9.11E-03		4.96E-01
		295.94		0.45	8.87E+00		9.54E+00
		344.28		26.60	-2.40E-03		1.28E-01
		367.79		0.86	-1.64E+00		3.77E+00
		411.12		2.24	-6.24E-01		1.49E+00
		443.96		2.83	-1.09E+00		1.17E+00
		488.68		0.42	-4.79E+00		9.39E+00
		563.99		0.49	-2.13E+00		8.00E+00
		586.26		0.46	-1.08E+01		1.24E+01
		678.62		0.47	-1.79E+00		8.05E+00
		688.67		0.86	1.37E+00		4.78E+00
		719.35		0.28	-3.59E+00		1.45E+01
		778.90		12.96	-2.24E-01		2.98E-01
		810.45		0.32	8.55E+00		1.40E+01
		867.37		4.26	-1.18E+00		9.77E-01
		919.33		0.43	5.75E-01		9.85E+00
		964.08		14.65	1.90E-01		4.64E-01
		1085.87		10.24	7.21E-02		4.76E-01
		1089.74		1.73	-7.46E-01		2.82E+00
		1112.07		13.69	-9.27E-02		3.92E-01
		1212.95		1.43	-7.72E-01		4.18E+00
		1249.94		0.19	-2.25E+01		3.74E+01
		1299.14		1.63	1.46E+00		4.01E+00
		1408.01		21.07	2.20E-01		2.93E-01
		1457.64		0.50	1.02E+02		3.77E+01
		1528.10		0.28	5.15E+00		1.40E+01
	Eu-154	123.07		40.40	7.86E-03	7.23E-02	7.23E-02
		247.93		6.89	-4.74E-01		4.23E-01
		591.76		4.95	3.83E-01		7.62E-01
		692.42		1.78	1.45E+00		2.76E+00
		723.30		20.06	1.99E-01		2.45E-01
		756.80		4.52	4.06E-01		8.62E-01

Analysis Report for 30-Jul-19-10013

L2-10213A-FSGS-005SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	873.18	12.08	-2.91E-01	7.23E-02	3.56E-01
	996.29	10.48	1.38E-01		4.12E-01
	1004.76	18.01	3.29E-02		2.49E-01
	1274.43	34.80	-1.40E-03		1.47E-01
	1596.48	1.80	2.18E-01		2.28E+00
Eu-155	45.30	1.31	6.09E+00	1.75E-01	1.13E+01
	60.01	1.22	-3.41E+00		1.09E+01
	86.55	30.70	4.75E-02		1.85E-01
	105.31	21.10	6.61E-02		1.75E-01
Ra-226	186.21	3.64	6.76E-01	9.60E-01	9.60E-01
Pa-231	27.36	10.30	1.14E+00	1.29E+00	1.30E+00
	283.69	1.70	-1.46E+00		1.90E+00
	300.07	2.47	-5.11E-01		1.29E+00
	302.65	2.20	1.29E-01		1.43E+00
	330.06	1.40	1.77E+00		2.90E+00
U-235	143.76	10.96	1.62E-02	6.16E-02	2.89E-01
	163.33	5.08	-1.52E-01		6.00E-01
	185.71	57.20	5.67E-02		6.16E-02
	202.11	1.08	-2.72E+00		2.62E+00
	205.31	5.01	-1.29E-01		6.08E-01
Am-241	59.54	35.90	1.25E-01	3.90E-01	3.90E-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 30-Jul-19-10014

L2-10213A-FQGS-005SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 30-Jul-19-10014
Sample Description	: L2-10213A-FQGS-005SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 9.485E+02 grams
Facility	: Default
Sample Taken On	: 7/29/2019 7:38:00AM
Acquisition Started	: 7/30/2019 9:27:20AM
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	: 7/30/2019
Efficiency Calibration Description	:
Sample Number	: 78286
Fill Height	: 948.46 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/30/2019 9:42:23AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
1030 7-31-19

Analysis Report for 30-Jul-19-10014

L2-10213A-FQGS-005SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.82	947 -	960	954.85	9.54E+01	15.05	4.76E+01	1.02
2	295.33	1176 -	1187	1180.62	2.78E+01	8.74	1.92E+01	0.80
3	609.40	2428 -	2441	2435.65	4.50E+01	9.14	1.40E+01	1.27
4	661.73	2640 -	2651	2644.83	3.34E+01	8.07	1.26E+01	0.83
5	1460.39	5829 -	5849	5839.48	1.89E+02	15.09	1.05E+01	1.61

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	5.22E+00	4.74E-01
Cs-137	0.99	661.66	*	85.10	6.60E-02	1.64E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.78E-01	3.15E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	1.57E-01	3.32E-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 30-Jul-19-10014

L2-10213A-FQGS-005SS

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		

* = 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	0.970	5.22E+00	4.74E-01	
Cs-137	0.999	6.60E-02	1.64E-02	
Pb-212	0.995	1.78E-01	3.15E-02	
Bi-214	1.000	1.57E-01	3.32E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 30-Jul-19-10014
L2-10213A-FQGS-005SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/30/2019 9:42:23AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
2	295.33	3.08511E-02	31.49	Tol.	Eu-152 Pb-214

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	9.00E-02	6.52E-02	6.52E-02
	BE-7	477.60		10.44	4.66E-01	5.05E-01	5.05E-01
+	K-40	1460.82	*	10.66	5.22E+00	6.58E-01	6.58E-01
	Mn-54	834.85		99.98	-1.07E-02	4.82E-02	4.82E-02
	Co-60	1173.23		99.85	1.25E-02	4.94E-02	6.50E-02
		1332.49		99.98	2.74E-02		4.94E-02
	Nb-94	702.65		99.81	-2.33E-02	3.87E-02	3.87E-02
		871.09		99.89	-1.81E-02		4.62E-02
	Ag-108m	79.13		6.60	2.88E-01	4.12E-02	1.20E+00
		433.94		90.50	-1.91E-02		4.12E-02
		614.28		89.80	-6.91E-02		6.53E-02
		722.94		90.80	2.82E-03		4.68E-02
	Sb-125	176.31		6.84	-2.11E-01	1.38E-01	4.13E-01
		380.45		1.52	1.96E-01		2.58E+00
		427.87		29.60	2.33E-02		1.38E-01
		463.36		10.49	-1.27E-02		3.62E-01
		600.60		17.65	7.71E-02		2.67E-01

Analysis Report for 30-Jul-19-10014

L2-10213A-FQGS-005SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	606.71		4.98	1.30E+00	1.38E-01	1.45E+00
		635.95		11.22	5.10E-02		3.77E-01
		671.44		1.79	-1.35E+00		2.59E+00
	Ba-133	79.61		2.65	1.66E+00	6.81E-02	2.93E+00
		81.00		32.90	-2.25E-01		1.85E-01
		276.40		7.16	3.76E-01		5.10E-01
		302.85		18.34	-1.17E-01		1.99E-01
		356.01		62.05	-7.41E-02		6.81E-02
		383.85		8.94	1.80E-01		4.22E-01
	Cs-134	475.36		1.48	1.01E+00	5.20E-02	3.37E+00
		563.25		8.34	-4.18E-01		5.48E-01
		569.33		15.37	1.19E-01		2.78E-01
		604.72		97.62	-1.70E-02		6.32E-02
		795.86		85.46	8.43E-03		5.20E-02
		801.95		8.69	-1.83E-01		4.88E-01
		1038.61		0.99	4.43E+00		5.55E+00
		1167.97		1.79	1.06E+00		3.40E+00
		1365.19		3.02	-7.05E-01		1.67E+00
+	Cs-137	661.66	*	85.10	6.60E-02	4.34E-02	4.34E-02
	Eu-152	121.78		28.67	-3.69E-02	1.02E-01	1.02E-01
		244.70		7.61	9.36E-02		4.82E-01
		295.94		0.45	6.68E-03		8.93E+00
		344.28		26.60	-2.76E-02		1.35E-01
		367.79		0.86	-3.87E+00		4.33E+00
		411.12		2.24	8.93E-01		1.71E+00
		443.96		2.83	-1.64E-01		1.38E+00
		488.68		0.42	5.07E-01		9.93E+00
		563.99		0.49	-6.20E+00		8.77E+00
		586.26		0.46	2.16E+01		1.56E+01
		678.62		0.47	2.82E+00		8.81E+00
		688.67		0.86	2.51E-01		3.78E+00
		719.35		0.28	-1.39E+01		1.10E+01
		778.90		12.96	3.01E-02		3.61E-01
		810.45		0.32	9.33E+00		1.47E+01
		867.37		4.26	-5.12E-01		1.16E+00
		919.33		0.43	4.21E+00		1.35E+01
		964.08		14.65	-1.83E-01		5.19E-01
		1085.87		10.24	8.51E-02		5.77E-01
		1089.74		1.73	-2.65E+00		3.04E+00
		1112.07		13.69	-8.83E-03		3.90E-01
		1212.95		1.43	-1.30E+00		5.16E+00
		1249.94		0.19	-4.85E+00		3.44E+01
		1299.14		1.63	-1.10E+00		2.86E+00
		1408.01		21.07	-2.40E-01		2.73E-01
		1457.64		0.50	1.20E+02		4.18E+01
		1528.10		0.28	5.40E+00		1.47E+01
	Eu-154	123.07		40.40	-2.37E-02	7.45E-02	7.45E-02
		247.93		6.89	1.66E-01		4.48E-01
		591.76		4.95	-5.65E-01		8.72E-01
		692.42		1.78	9.36E-01		2.21E+00
		723.30		20.06	2.05E-02		2.17E-01

Analysis Report for 30-Jul-19-10014

L2-10213A-FQGS-005SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	756.80	4.52	9.39E-01	7.45E-02	1.15E+00
	873.18	12.08	-1.27E-01		3.62E-01
	996.29	10.48	3.66E-02		4.97E-01
	1004.76	18.01	-1.13E-01		2.84E-01
	1274.43	34.80	-1.27E-01		1.59E-01
	1596.48	1.80	-4.48E+00		1.70E+00
Eu-155	45.30	1.31	2.22E+00	1.69E-01	1.16E+01
	60.01	1.22	2.49E+00		1.19E+01
	86.55	30.70	9.47E-03		1.69E-01
	105.31	21.10	-3.08E-02		1.78E-01
Ra-226	186.21	3.64	6.41E-01	1.03E+00	1.03E+00
Pa-231	27.36	10.30	6.85E-01	1.30E+00	1.30E+00
	283.69	1.70	5.25E-01		2.08E+00
	300.07	2.47	7.69E-01		1.48E+00
	302.65	2.20	-2.89E-01		1.67E+00
	330.06	1.40	1.05E+00		2.92E+00
U-235	143.76	10.96	1.59E-02	6.55E-02	3.10E-01
	163.33	5.08	-3.13E-01		5.62E-01
	185.71	57.20	4.63E-02		6.55E-02
	202.11	1.08	5.45E-01		2.91E+00
	205.31	5.01	1.92E-01		6.11E-01
Am-241	59.54	35.90	8.02E-02	4.12E-01	4.12E-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 30-Jul-19-10015

L2-10213A-FSGS-006SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 30-Jul-19-10015
Sample Description	: L2-10213A-FSGS-006SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.093E+03 grams
Facility	: Default
Sample Taken On	: 7/29/2019 7:40:00AM
Acquisition Started	: 7/30/2019 9:09:22AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 7/30/2019
Efficiency Calibration Description	:
Sample Number	: 78285
Fill Height	: 1092.99 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/30/2019 9:24:40AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
1030 7-31-19

Analysis Report for 30-Jul-19-10015

L2-10213A-FSGS-006SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.66	945 -	961	955.11	1.21E+02	15.99	4.35E+01	1.18
2	295.36	1177 -	1186	1181.65	3.29E+01	7.78	1.21E+01	0.43
3	351.89	1401 -	1415	1407.56	7.86E+01	11.72	2.04E+01	0.88
4	583.28	2326 -	2340	2332.45	4.24E+01	8.42	9.61E+00	0.78
5	609.17	2428 -	2444	2435.93	5.62E+01	9.82	1.28E+01	1.51
6	661.63	2637 -	2655	2645.71	1.66E+02	14.06	9.50E+00	1.39
7	911.29	3637 -	3651	3644.19	4.08E+01	8.19	9.19E+00	1.37
8	1460.81	5830 -	5854	5843.63	2.04E+02	15.58	9.42E+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	1.00	1460.82	*	10.66	4.81E+00	4.24E-01
Cs-137	1.00	661.66	*	85.10	2.86E-01	2.97E-02
Tl-208	0.99	583.19	*	85.00	6.73E-02	1.40E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.08E-01	3.21E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.72E-01	3.17E-02
		768.36		4.89		
		806.18		1.26		

Analysis Report for 30-Jul-19-10015

L2-10213A-FSGS-006SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	1.50E-01	3.74E-02
		351.93	*	35.60	2.10E-01	3.56E-02
		785.96		1.06		
Ac-228	1.00	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.89E-01	5.93E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

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

INTERFERENCE CORRECTED REPORT

Analysis Report for 30-Jul-19-10015

L2-10213A-FSGS-006SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	1.000	4.81E+00	4.24E-01	
	Cs-137	1.000	2.86E-01	2.97E-02	
	Tl-208	0.999	6.73E-02	1.40E-02	
X	Bi-211	0.898			
	Pb-212	1.000	2.08E-01	3.21E-02	
	Bi-214	0.998	1.72E-01	3.17E-02	
	Pb-214	0.999	1.82E-01	2.58E-02	
	Ac-228	1.000	2.89E-01	5.93E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 30-Jul-19-10015

L2-10213A-FSGS-006SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/30/2019 9:24:40AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

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

All peaks were identified.

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	6.74E-02	6.21E-02	6.21E-02
	BE-7	477.60		10.44	9.45E-02	4.40E-01	4.40E-01
+	K-40	1460.82	*	10.66	4.81E+00	5.69E-01	5.69E-01
	Mn-54	834.85		99.98	3.18E-02	5.17E-02	5.17E-02
	Co-60	1173.23		99.85	-4.88E-02	5.91E-02	5.91E-02
		1332.49		99.98	4.61E-02		6.43E-02
	Nb-94	702.65		99.81	8.52E-04	4.26E-02	4.26E-02
		871.09		99.89	5.13E-02		5.08E-02
	Ag-108m	79.13		6.60	-1.06E-01	4.27E-02	1.51E+00
		433.94		90.50	-5.32E-03		4.27E-02
		614.28		89.80	-2.61E-02		7.08E-02
		722.94		90.80	3.66E-02		5.37E-02
	Sb-125	176.31		6.84	-2.72E-01	1.33E-01	4.61E-01
		380.45		1.52	-1.72E+00		2.33E+00
		427.87		29.60	-2.42E-02		1.33E-01
		463.36		10.49	3.76E-01		4.16E-01
		600.60		17.65	8.19E-02		2.31E-01
		606.71		4.98	1.63E+00		1.31E+00
		635.95		11.22	-4.75E-01		3.04E-01

Analysis Report for 30-Jul-19-10015

L2-10213A-FSGS-006SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	1.21E+00	1.33E-01	2.49E+00
	Ba-133	79.61		2.65	1.55E+00	8.02E-02	3.64E+00
		81.00		32.90	-3.04E-01		2.49E-01
		276.40		7.16	-1.87E-01		5.18E-01
		302.85		18.34	1.29E-01		1.88E-01
		356.01		62.05	7.18E-03		8.02E-02
		383.85		8.94	1.16E-01		4.25E-01
	Cs-134	475.36		1.48	-1.04E+00	5.33E-02	2.79E+00
		563.25		8.34	1.00E-01		4.68E-01
		569.33		15.37	-7.42E-02		2.15E-01
		604.72		97.62	-3.94E-03		6.10E-02
		795.86		85.46	3.96E-02		5.33E-02
		801.95		8.69	-4.45E-01		4.89E-01
		1038.61		0.99	2.56E+00		4.90E+00
		1167.97		1.79	-6.51E-01		3.40E+00
		1365.19		3.02	-9.93E-02		1.60E+00
+	Cs-137	661.66	*	85.10	2.86E-01	3.82E-02	3.82E-02
	Eu-152	121.78		28.67	3.11E-02	1.35E-01	1.35E-01
		244.70		7.61	-5.53E-02		5.03E-01
		295.94		0.45	1.44E+00		8.70E+00
		344.28		26.60	3.48E-02		1.39E-01
		367.79		0.86	-1.34E+00		4.50E+00
		411.12		2.24	7.80E-01		1.90E+00
		443.96		2.83	-2.31E-01		1.34E+00
		488.68		0.42	-2.12E+00		9.35E+00
		563.99		0.49	2.87E+00		7.71E+00
		586.26		0.46	1.25E+01		1.23E+01
		678.62		0.47	-1.11E+00		8.51E+00
		688.67		0.86	2.24E-01		4.97E+00
		719.35		0.28	-2.94E+00		1.47E+01
		778.90		12.96	1.59E-02		3.52E-01
		810.45		0.32	-1.25E+01		1.36E+01
		867.37		4.26	-1.05E+00		1.21E+00
		919.33		0.43	-1.01E+01		1.13E+01
		964.08		14.65	3.16E-01		4.35E-01
		1085.87		10.24	3.81E-01		4.76E-01
		1089.74		1.73	1.26E+00		2.76E+00
		1112.07		13.69	-2.78E-02		4.16E-01
		1212.95		1.43	-1.75E+00		4.51E+00
		1249.94		0.19	1.53E+01		3.26E+01
		1299.14		1.63	6.76E-01		3.38E+00
		1408.01		21.07	-6.31E-02		2.35E-01
		1457.64		0.50	1.07E+02		3.72E+01
		1528.10		0.28	2.49E+00		1.60E+01
	Eu-154	123.07		40.40	2.50E-02	9.57E-02	9.57E-02
		247.93		6.89	-1.67E-03		5.00E-01
		591.76		4.95	5.93E-01		8.38E-01
		692.42		1.78	1.95E+00		2.63E+00
		723.30		20.06	1.63E-01		2.40E-01
		756.80		4.52	3.39E-01		1.01E+00
		873.18		12.08	5.13E-02		4.14E-01

Analysis Report for 30-Jul-19-10015

L2-10213A-FSGS-006SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-3.59E-02	9.57E-02	4.19E-01
	1004.76	18.01	-1.46E-01		2.11E-01
	1274.43	34.80	-2.37E-02		1.41E-01
	1596.48	1.80	-8.76E-01		2.59E+00
Eu-155	45.30	1.31	1.82E+00	2.01E-01	2.06E+01
	60.01	1.22	6.41E-01		2.10E+01
	86.55	30.70	8.72E-02		2.42E-01
	105.31	21.10	9.60E-02		2.01E-01
Ra-226	186.21	3.64	1.90E-01	1.01E+00	1.01E+00
Pa-231	27.36	10.30	1.43E+00	1.42E+00	2.20E+00
	283.69	1.70	-8.03E-01		2.08E+00
	300.07	2.47	-4.25E-01		1.42E+00
	302.65	2.20	8.88E-01		1.57E+00
	330.06	1.40	-3.90E-01		2.68E+00
U-235	143.76	10.96	-3.18E-02	6.22E-02	3.28E-01
	163.33	5.08	-2.38E-01		6.24E-01
	185.71	57.20	-2.28E-02		6.22E-02
	202.11	1.08	-6.57E-01		3.32E+00
	205.31	5.01	-3.54E-01		6.88E-01
Am-241	59.54	35.90	2.80E-01	7.41E-01	7.41E-01

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

Apex-Gamma

Analysis Report for 30-Jul-19-10016

L2-10213A-FSGS-007SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 30-Jul-19-10016
Sample Description	: L2-10213A-FSGS-007SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.040E+03 grams
Facility	: Default
Sample Taken On	: 7/29/2019 7:42:00AM
Acquisition Started	: 7/30/2019 9:27:28AM
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	: 7/30/2019
Efficiency Calibration Description	:
Sample Number	: 78287
Fill Height	: 1039.73 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/30/2019 9:42:33AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
1030 7-31-19

Analysis Report for 30-Jul-19-10016

L2-10213A-FSGS-007SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.58	948 -	960	954.40	1.07E+02	14.63	4.06E+01	0.85
2	338.15	1348 -	1356	1352.36	2.10E+01	7.35	1.50E+01	0.69
3	351.71	1401 -	1412	1406.56	4.48E+01	9.12	1.52E+01	0.77
4	510.45	2036 -	2048	2041.16	3.49E+01	8.54	1.41E+01	1.14
5	582.89	2325 -	2336	2330.77	3.78E+01	8.30	1.22E+01	0.63
6	609.13	2430 -	2442	2435.70	3.97E+01	7.87	8.29E+00	0.72
7	661.55	2639 -	2651	2645.31	5.63E+01	8.66	6.67E+00	1.24
8	910.88	3637 -	3647	3642.49	1.98E+01	6.28	8.25E+00	0.58
9	1460.37	5831 -	5852	5841.32	1.71E+02	13.44	2.57E+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
An Pk	0.95	511.00	*	100.00	5.25E-02	1.33E-02
K-40	0.96	1460.82	*	10.66	5.00E+00	4.48E-01
Cs-137	0.99	661.66	*	85.10	1.18E-01	1.94E-02
Tl-208	0.98	583.19	*	85.00	7.24E-02	1.65E-02
Bi-211	0.93	351.07	*	13.02	3.89E-01	8.52E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.16E-01	3.42E-02
		300.09		3.30		

Analysis Report for 30-Jul-19-10016

L2-10213A-FSGS-007SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	609.32	*	45.49	1.47E-01	3.03E-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		
		351.93	*	35.60	1.42E-01	3.11E-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	2.04E-01	7.35E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	1.70E-01	5.47E-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 30-Jul-19-10016

L2-10213A-FSGS-007SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.953	5.25E-02	1.33E-02	
	K-40	0.968	5.00E+00	4.48E-01	
	Cs-137	0.998	1.18E-01	1.94E-02	
	Tl-208	0.986	7.24E-02	1.65E-02	
?	Bi-211	0.937	3.89E-01	8.52E-02	
	Pb-212	1.000	2.16E-01	3.42E-02	
	Bi-214	0.998	1.47E-01	3.03E-02	
?	Pb-214	0.995	1.42E-01	3.11E-02	
	Ac-228	0.994	1.82E-01	4.39E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 30-Jul-19-10016

L2-10213A-FSGS-007SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/30/2019 9:42:33AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

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

All peaks were identified.

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	*	100.00	5.25E-02	3.58E-02	3.58E-02
	BE-7	477.60		10.44	2.05E-01	5.37E-01	5.37E-01
+	K-40	1460.82	*	10.66	5.00E+00	3.85E-01	3.85E-01
	Mn-54	834.85		99.98	2.15E-02	5.10E-02	5.10E-02
	Co-60	1173.23		99.85	1.68E-02	5.22E-02	7.13E-02
		1332.49		99.98	-7.96E-03		5.22E-02
	Nb-94	702.65		99.81	-2.55E-02	4.81E-02	4.81E-02
		871.09		99.89	1.45E-02		5.00E-02
	Ag-108m	79.13		6.60	5.12E-01	4.67E-02	1.85E+00
		433.94		90.50	8.63E-03		4.67E-02
		614.28		89.80	-3.18E-02		6.24E-02
		722.94		90.80	-4.53E-02		4.96E-02
	Sb-125	176.31		6.84	-1.60E-01	1.50E-01	5.44E-01
		380.45		1.52	-3.62E+00		2.09E+00
		427.87		29.60	-3.13E-03		1.50E-01
		463.36		10.49	2.97E-02		4.67E-01
		600.60		17.65	9.23E-02		2.53E-01
		606.71		4.98	2.94E-01		1.38E+00
		635.95		11.22	-4.98E-02		3.84E-01

Analysis Report for 30-Jul-19-10016

L2-10213A-FSGS-007SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-1.62E+00	1.50E-01	2.60E+00
	Ba-133	79.61		2.65	-1.84E+00	6.83E-02	4.33E+00
		81.00		32.90	-1.55E-01		3.05E-01
		276.40		7.16	2.44E-02		5.67E-01
		302.85		18.34	-5.44E-02		2.27E-01
		356.01		62.05	-5.38E-02		6.83E-02
		383.85		8.94	8.08E-02		4.49E-01
	Cs-134	475.36		1.48	4.98E+00	5.89E-02	3.94E+00
		563.25		8.34	-1.51E-01		5.12E-01
		569.33		15.37	8.47E-02		3.08E-01
		604.72		97.62	-3.22E-02		6.96E-02
		795.86		85.46	1.68E-02		5.89E-02
		801.95		8.69	-2.33E-01		4.88E-01
		1038.61		0.99	4.73E+00		6.62E+00
		1167.97		1.79	6.28E-01		3.90E+00
		1365.19		3.02	8.81E-01		1.69E+00
+	Cs-137	661.66	*	85.10	1.18E-01	3.66E-02	3.66E-02
	Eu-152	121.78		28.67	-1.01E-01	1.49E-01	1.49E-01
		244.70		7.61	6.51E-01		6.14E-01
		295.94		0.45	8.37E+00		1.15E+01
		344.28		26.60	-9.61E-03		1.50E-01
		367.79		0.86	4.44E-01		4.35E+00
		411.12		2.24	7.49E-01		1.95E+00
		443.96		2.83	-6.49E-01		1.63E+00
		488.68		0.42	-5.51E+00		1.03E+01
		563.99		0.49	-3.60E+00		8.86E+00
		586.26		0.46	-9.03E+00		1.47E+01
		678.62		0.47	-6.64E+00		8.91E+00
		688.67		0.86	-3.00E+00		4.44E+00
		719.35		0.28	-9.29E+00		1.53E+01
		778.90		12.96	1.48E-01		3.30E-01
		810.45		0.32	1.64E+00		1.62E+01
		867.37		4.26	4.23E-01		1.05E+00
		919.33		0.43	-3.66E+00		1.19E+01
		964.08		14.65	2.92E-01		5.31E-01
		1085.87		10.24	1.40E-02		6.10E-01
		1089.74		1.73	2.82E+00		3.91E+00
		1112.07		13.69	1.71E-01		4.54E-01
		1212.95		1.43	5.90E-01		5.11E+00
		1249.94		0.19	1.62E+01		3.23E+01
		1299.14		1.63	-1.27E+00		3.41E+00
		1408.01		21.07	1.00E-01		2.23E-01
		1457.64		0.50	1.11E+02		4.15E+01
		1528.10		0.28	4.57E+00		1.43E+01
	Eu-154	123.07		40.40	5.11E-03	1.07E-01	1.07E-01
		247.93		6.89	2.68E-01		5.93E-01
		591.76		4.95	4.99E-02		8.26E-01
		692.42		1.78	1.32E+00		2.68E+00
		723.30		20.06	1.72E-01		2.49E-01
		756.80		4.52	3.23E-01		1.00E+00
		873.18		12.08	7.14E-02		4.34E-01

Analysis Report for 30-Jul-19-10016

L2-10213A-FSGS-007SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-2.14E-01	1.07E-01	4.56E-01
	1004.76	18.01	-2.29E-01		2.49E-01
	1274.43	34.80	-5.71E-02		1.57E-01
	1596.48	1.80	-4.99E-01		3.05E+00
Eu-155	45.30	1.31	3.96E+00	2.67E-01	2.87E+01
	60.01	1.22	1.94E+01		3.22E+01
	86.55	30.70	1.64E-01		2.72E-01
	105.31	21.10	2.66E-02		2.67E-01
Ra-226	186.21	3.64	1.60E-02	1.24E+00	1.24E+00
Pa-231	27.36	10.30	2.48E+00	1.80E+00	3.44E+00
	283.69	1.70	-2.10E+00		2.33E+00
	300.07	2.47	-7.65E-01		1.80E+00
	302.65	2.20	-2.02E-01		1.92E+00
	330.06	1.40	-1.20E+00		2.87E+00
U-235	143.76	10.96	-1.49E-01	8.02E-02	3.90E-01
	163.33	5.08	-5.55E-01		8.14E-01
	185.71	57.20	4.53E-02		8.02E-02
	202.11	1.08	-1.78E+00		3.55E+00
	205.31	5.01	3.02E-02		8.35E-01
Am-241	59.54	35.90	-5.48E-02	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 30-Jul-19-10017

L2-10213A-FSGS-008SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 30-Jul-19-10017
Sample Description	: L2-10213A-FSGS-008SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.135E+03 grams
Facility	: Default
Sample Taken On	: 7/29/2019 7:44:00AM
Acquisition Started	: 7/30/2019 9:27:36AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 7/30/2019
Efficiency Calibration Description	:
Sample Number	: 78288
Fill Height	: 1134.54 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/30/2019 9:42:53AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
1030 7-31-19

Analysis Report for 30-Jul-19-10017

L2-10213A-FSGS-008SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	76.74	305 -	313	308.29	1.87E+01	10.18	3.93E+01	0.61
2	238.76	946 -	960	955.50	9.77E+01	16.11	5.63E+01	1.10
3	351.97	1401 -	1413	1407.87	6.50E+01	10.96	2.10E+01	1.06
4	583.09	2325 -	2338	2331.69	3.35E+01	7.08	5.54E+00	0.88
5	609.15	2429 -	2443	2435.86	5.84E+01	10.31	1.66E+01	0.72
6	661.60	2639 -	2651	2645.56	6.16E+01	9.30	9.36E+00	1.37
7	1460.62	5831 -	5853	5842.84	2.37E+02	16.11	5.75E+00	1.72

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82	*	10.66	5.52E+00	4.45E-01
Cs-137	0.99	661.66	*	85.10	1.05E-01	1.70E-02
Tl-208	0.99	583.19	*	85.00	5.24E-02	1.15E-02
Bi-211	0.87	351.07	*	13.02	4.69E-01	8.77E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.65E-01	3.03E-02
		300.09		3.30		
Pb212-XR	0.98	74.82		10.28		
		77.11	*	17.10	1.87E-01	1.04E-01
		87.35		3.97		

Analysis Report for 30-Jul-19-10017

L2-10213A-FSGS-008SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb212-XR	0.98	89.78		1.46		
Bi-214	0.99	609.32	*	45.49	1.76E-01	3.28E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	1.00	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	1.72E-01	3.20E-02
		785.96		1.06		
Pb214-XR	0.98	74.82		5.80		
		77.11	*	9.70	3.30E-01	1.83E-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 30-Jul-19-10017

L2-10213A-FSGS-008SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.993	5.52E+00	4.45E-01	
	Cs-137	0.999	1.05E-01	1.70E-02	
	Tl-208	0.999	5.24E-02	1.15E-02	
?	Bi-211	0.879	4.69E-01	8.77E-02	
	Pb-212	0.998	1.65E-01	3.03E-02	
?	Pb212-XR	0.989	1.87E-01	1.04E-01	
	Bi-214	0.998	1.76E-01	3.28E-02	
?	Pb-214	1.000	1.72E-01	3.20E-02	
?	Pb214-XR	0.989	3.30E-01	1.83E-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 30-Jul-19-10017

L2-10213A-FSGS-008SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/30/2019 9:42:53AM
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	1.78E-02	5.34E-02	5.34E-02
	BE-7	477.60		10.44	1.46E-01	4.34E-01	4.34E-01
+	K-40	1460.82	*	10.66	5.52E+00	4.39E-01	4.39E-01
	Mn-54	834.85		99.98	8.61E-03	4.30E-02	4.30E-02
	Co-60	1173.23		99.85	7.02E-02	3.60E-02	6.47E-02
		1332.49		99.98	-1.39E-02		3.60E-02
	Nb-94	702.65		99.81	-2.36E-02	3.98E-02	3.98E-02
		871.09		99.89	3.84E-02		4.92E-02
	Ag-108m	79.13		6.60	-1.79E-01	3.76E-02	1.27E+00
		433.94		90.50	-1.10E-02		3.76E-02
		614.28		89.80	-4.09E-02		7.42E-02
		722.94		90.80	3.28E-02		5.75E-02
	Sb-125	176.31		6.84	4.88E-01	1.18E-01	4.82E-01
		380.45		1.52	2.63E-01		2.34E+00
		427.87		29.60	3.38E-02		1.18E-01
		463.36		10.49	-2.55E-01		3.52E-01
		600.60		17.65	6.69E-02		2.49E-01
		606.71		4.98	1.93E+00		1.40E+00
		635.95		11.22	-7.02E-02		3.13E-01

Analysis Report for 30-Jul-19-10017

L2-10213A-FSGS-008SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	2.81E-01	1.18E-01	2.45E+00
	Ba-133	79.61		2.65	-8.74E-01	7.65E-02	3.09E+00
		81.00		32.90	-9.38E-02		2.11E-01
		276.40		7.16	5.15E-02		5.13E-01
		302.85		18.34	4.13E-03		1.88E-01
		356.01		62.05	-3.87E-02		7.65E-02
		383.85		8.94	2.74E-02		3.88E-01
	Cs-134	475.36		1.48	1.02E+00	5.15E-02	2.94E+00
		563.25		8.34	-1.23E-01		4.41E-01
		569.33		15.37	4.18E-02		2.52E-01
		604.72		97.62	-6.98E-04		6.62E-02
		795.86		85.46	-3.18E-02		5.15E-02
		801.95		8.69	-5.87E-01		4.91E-01
		1038.61		0.99	5.23E-01		5.51E+00
		1167.97		1.79	-1.21E+00		3.50E+00
		1365.19		3.02	4.27E-01		1.52E+00
+	Cs-137	661.66	*	85.10	1.05E-01	3.36E-02	3.36E-02
	Eu-152	121.78		28.67	-6.50E-02	1.25E-01	1.25E-01
		244.70		7.61	2.54E-01		5.06E-01
		295.94		0.45	-1.75E+00		9.56E+00
		344.28		26.60	-8.91E-03		1.37E-01
		367.79		0.86	1.33E+00		3.90E+00
		411.12		2.24	1.13E+00		1.85E+00
		443.96		2.83	3.51E-01		1.41E+00
		488.68		0.42	-3.06E+00		9.22E+00
		563.99		0.49	2.21E+00		7.72E+00
		586.26		0.46	9.92E+00		1.06E+01
		678.62		0.47	-8.39E-01		8.38E+00
		688.67		0.86	2.03E+00		4.48E+00
		719.35		0.28	1.14E+01		1.65E+01
		778.90		12.96	-2.29E-01		3.22E-01
		810.45		0.32	3.23E+00		1.36E+01
		867.37		4.26	-6.26E-03		1.11E+00
		919.33		0.43	-1.41E+01		1.11E+01
		964.08		14.65	4.19E-01		4.28E-01
		1085.87		10.24	9.61E-02		4.35E-01
		1089.74		1.73	-3.42E-01		2.65E+00
		1112.07		13.69	-6.10E-01		3.64E-01
		1212.95		1.43	1.13E+00		4.30E+00
		1249.94		0.19	3.52E+01		3.42E+01
		1299.14		1.63	-8.81E-01		3.62E+00
		1408.01		21.07	5.55E-02		2.31E-01
		1457.64		0.50	1.25E+02		3.90E+01
		1528.10		0.28	-6.60E+00		1.50E+01
	Eu-154	123.07		40.40	-1.24E-02	8.93E-02	8.93E-02
		247.93		6.89	-3.13E-01		4.86E-01
		591.76		4.95	-5.16E-01		7.29E-01
		692.42		1.78	-4.76E-01		2.13E+00
		723.30		20.06	8.24E-02		2.66E-01
		756.80		4.52	-6.34E-01		9.24E-01
		873.18		12.08	-2.06E-01		3.80E-01

Analysis Report for 30-Jul-19-10017

L2-10213A-FSGS-008SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	6.51E-02	8.93E-02	5.23E-01
	1004.76	18.01	-5.47E-02		2.96E-01
	1274.43	34.80	-1.14E-01		1.42E-01
	1596.48	1.80	-1.37E+00		1.43E+00
Eu-155	45.30	1.31	-1.57E-01	2.02E-01	1.98E+01
	60.01	1.22	-6.31E+00		1.98E+01
	86.55	30.70	8.78E-02		2.31E-01
	105.31	21.10	-1.01E-02		2.02E-01
Ra-226	186.21	3.64	3.03E-01	9.25E-01	9.25E-01
Pa-231	27.36	10.30	1.62E+00	1.57E+00	2.25E+00
	283.69	1.70	3.34E-01		2.08E+00
	300.07	2.47	-1.98E+00		1.58E+00
	302.65	2.20	-4.96E-01		1.57E+00
	330.06	1.40	5.26E-01		2.54E+00
U-235	143.76	10.96	-2.63E-01	5.79E-02	3.11E-01
	163.33	5.08	4.19E-02		6.51E-01
	185.71	57.20	1.12E-02		5.79E-02
	202.11	1.08	1.14E-01		3.31E+00
	205.31	5.01	-4.28E-01		6.59E-01
Am-241	59.54	35.90	-3.25E-01	6.73E-01	6.73E-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 30-Jul-19-10018

L2-10213A-FSGS-009SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 30-Jul-19-10018
Sample Description	: L2-10213A-FSGS-009SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 8.713E+02 grams
Facility	: Default
Sample Taken On	: 7/29/2019 7:46:00AM
Acquisition Started	: 7/30/2019 9:51:21AM
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	: 7/30/2019
Efficiency Calibration Description	:
Sample Number	: 78289
Fill Height	: 871.32 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/30/2019 10:06:24AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated
1030 7-31-19

Analysis Report for 30-Jul-19-10018

L2-10213A-FSGS-009SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.51	474 -	480	477.21	7.07E+01	15.21	8.13E+01	1.36
2	351.78	698 -	707	703.51	7.62E+01	11.88	2.88E+01	1.31
3	511.04	1017 -	1027	1021.76	3.92E+01	10.83	3.28E+01	1.01
4	583.17	1161 -	1171	1165.94	6.05E+01	9.99	1.65E+01	1.53
5	609.29	1212 -	1223	1218.15	5.44E+01	9.42	1.36E+01	1.61
6	661.51	1318 -	1326	1322.56	1.28E+02	12.31	1.13E+01	1.33
7	1460.63	2915 -	2928	2921.32	1.52E+02	13.26	8.56E+00	2.22

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
An Pk	1.00	511.00	*	100.00	4.97E-02	1.41E-02
K-40	0.99	1460.82	*	10.66	3.67E+00	3.56E-01
Cs-137	0.99	661.66	*	85.10	2.23E-01	2.54E-02
Tl-208	1.00	583.19	*	85.00	9.72E-02	1.71E-02
Bi-211	0.92	351.07	*	13.02	5.61E-01	9.84E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.20E-01	2.77E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	1.68E-01	3.08E-02
		768.36		4.89		

Analysis Report for 30-Jul-19-10018

L2-10213A-FSGS-009SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	2.05E-01	3.59E-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	1.000	4.97E-02	1.41E-02	
	K-40	0.994	3.67E+00	3.56E-01	
	Cs-137	0.997	2.23E-01	2.54E-02	
	Tl-208	1.000	9.72E-02	1.71E-02	
?	Bi-211	0.922	5.61E-01	9.84E-02	
	Pb-212	0.998	1.20E-01	2.77E-02	
	Bi-214	1.000	1.68E-01	3.08E-02	

Analysis Report for 30-Jul-19-10018

L2-10213A-FSGS-009SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
?	Pb-214	0.998	2.05E-01	3.59E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 30-Jul-19-10018

L2-10213A-FSGS-009SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/30/2019 10:06:24AM
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	4.97E-02	4.16E-02	4.16E-02
	BE-7	477.60		10.44	1.95E-01	3.89E-01	3.89E-01
+	K-40	1460.82	*	10.66	3.67E+00	4.64E-01	4.64E-01
	Mn-54	834.85		99.98	-1.68E-02	3.75E-02	3.75E-02
	Co-60	1173.23		99.85	6.40E-03	4.98E-02	5.69E-02
		1332.49		99.98	-1.57E-02		4.98E-02
	Nb-94	702.65		99.81	-7.03E-04	3.24E-02	3.86E-02
		871.09		99.89	-3.77E-03		3.24E-02
	Ag-108m	79.13		6.60	2.09E-01	3.69E-02	1.08E+00
		433.94		90.50	-1.10E-02		3.69E-02
		614.28		89.80	-8.17E-03		5.35E-02
		722.94		90.80	-2.74E-02		5.00E-02
	Sb-125	176.31		6.84	-2.46E-01	1.29E-01	5.09E-01
		380.45		1.52	-4.74E-01		2.32E+00
		427.87		29.60	3.02E-02		1.29E-01
		463.36		10.49	2.50E-02		4.09E-01
		600.60		17.65	-4.89E-02		2.27E-01
		606.71		4.98	-2.61E-01		1.26E+00
		635.95		11.22	-1.87E-01		3.77E-01

Analysis Report for 30-Jul-19-10018

L2-10213A-FSGS-009SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-1.09E+00	1.29E-01	1.90E+00
	Ba-133	79.61		2.65	-9.71E-01	6.96E-02	2.43E+00
		81.00		32.90	-1.62E-01		1.71E-01
		276.40		7.16	1.20E-01		4.95E-01
		302.85		18.34	-7.83E-02		2.01E-01
		356.01		62.05	-6.15E-02		6.96E-02
		383.85		8.94	2.99E-01		4.36E-01
	Cs-134	475.36		1.48	5.45E-01	4.80E-02	2.88E+00
		563.25		8.34	2.84E-01		5.44E-01
		569.33		15.37	1.43E-01		2.55E-01
		604.72		97.62	-1.72E-02		5.61E-02
		795.86		85.46	1.27E-02		4.80E-02
		801.95		8.69	-4.47E-01		3.81E-01
		1038.61		0.99	-4.09E-01		5.08E+00
		1167.97		1.79	2.53E-01		3.10E+00
		1365.19		3.02	-4.44E-01		1.26E+00
+	Cs-137	661.66	*	85.10	2.23E-01	3.40E-02	3.40E-02
	Eu-152	121.78		28.67	1.76E-02	1.18E-01	1.21E-01
		244.70		7.61	6.41E-02		5.09E-01
		295.94		0.45	1.84E-01		9.04E+00
		344.28		26.60	-1.69E-01		1.18E-01
		367.79		0.86	-3.27E-01		4.34E+00
		411.12		2.24	-1.86E-02		1.71E+00
		443.96		2.83	-2.37E-01		1.22E+00
		488.68		0.42	4.49E+00		9.47E+00
		563.99		0.49	4.71E+00		9.14E+00
		586.26		0.46	-1.12E+00		1.45E+01
		678.62		0.47	1.85E+00		7.81E+00
		688.67		0.86	-1.34E+00		4.43E+00
		719.35		0.28	5.21E+00		1.54E+01
		778.90		12.96	-1.35E-01		2.98E-01
		810.45		0.32	6.38E+00		1.40E+01
		867.37		4.26	-3.15E-02		7.24E-01
		919.33		0.43	-4.08E+00		7.85E+00
		964.08		14.65	7.71E-02		4.46E-01
		1085.87		10.24	-3.86E-01		4.49E-01
		1089.74		1.73	-1.04E+00		3.00E+00
		1112.07		13.69	-2.66E-01		2.90E-01
		1212.95		1.43	-1.96E+00		3.56E+00
		1249.94		0.19	9.89E-01		2.60E+01
		1299.14		1.63	5.06E-01		3.19E+00
		1408.01		21.07	-4.44E-02		2.54E-01
		1457.64		0.50	-6.78E+00		3.28E+01
		1528.10		0.28	7.06E-01		1.47E+01
	Eu-154	123.07		40.40	1.16E-02	8.53E-02	8.53E-02
		247.93		6.89	-2.46E-01		4.66E-01
		591.76		4.95	1.50E-01		8.60E-01
		692.42		1.78	2.45E-02		2.19E+00
		723.30		20.06	-1.76E-01		2.23E-01
		756.80		4.52	-1.60E-01		7.51E-01
		873.18		12.08	-1.29E-01		2.68E-01

Analysis Report for 30-Jul-19-10018

L2-10213A-FSGS-009SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-2.28E-01	8.53E-02	3.79E-01
	1004.76	18.01	1.60E-01		2.95E-01
	1274.43	34.80	-8.75E-02		1.30E-01
	1596.48	1.80	-6.11E-02		2.76E+00
Eu-155	45.30	1.31	3.83E-01	1.66E-01	1.14E+01
	60.01	1.22	-2.41E+00		1.08E+01
	86.55	30.70	-2.14E-02		1.66E-01
	105.31	21.10	1.16E-02		1.84E-01
Ra-226	186.21	3.64	8.31E-01	1.15E+00	1.15E+00
Pa-231	27.36	10.30	7.94E-01	1.25E+00	1.25E+00
	283.69	1.70	-1.53E+00		1.80E+00
	300.07	2.47	-4.76E-01		1.49E+00
	302.65	2.20	-6.52E-01		1.67E+00
	330.06	1.40	1.90E+00		2.95E+00
U-235	143.76	10.96	6.15E-02	7.31E-02	3.11E-01
	163.33	5.08	2.12E-01		7.42E-01
	185.71	57.20	4.94E-02		7.31E-02
	202.11	1.08	-1.27E+00		3.32E+00
	205.31	5.01	1.48E-01		7.76E-01
Am-241	59.54	35.90	-1.11E-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

Apex-Gamma

Analysis Report for 30-Jul-19-10019

L2-10213A-FSGS-010SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 30-Jul-19-10019
Sample Description	: L2-10213A-FSGS-010SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 7.745E+02 grams
Facility	: Default
Sample Taken On	: 7/29/2019 7:48:00AM
Acquisition Started	: 7/30/2019 9:51:28AM
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	: 7/30/2019
Efficiency Calibration Description	:
Sample Number	: 78290
Fill Height	: 774.48 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/30/2019 10:06:32AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
1030 7-31-19

Analysis Report for 30-Jul-19-10019

L2-10213A-FSGS-010SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.58	950 -	960	954.40	4.20E+01	12.17	4.40E+01	0.68
2	295.18	1177 -	1185	1180.64	1.61E+01	8.14	2.29E+01	0.72
3	352.01	1401 -	1413	1407.78	4.60E+01	9.68	1.80E+01	0.92
4	583.12	2327 -	2338	2331.70	2.85E+01	6.10	3.54E+00	0.98
5	661.56	2638 -	2651	2645.35	5.37E+01	8.26	5.26E+00	0.99
6	1460.41	5832 -	5851	5841.49	1.26E+02	12.27	7.16E+00	1.06

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.97	1460.82	*	10.66	4.47E+00	4.77E-01
Cs-137	0.99	661.66	*	85.10	1.36E-01	2.24E-02
Tl-208	0.99	583.19	*	85.00	6.58E-02	1.46E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.01E-01	3.03E-02
		300.09		3.30		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	1.04E-01	5.31E-02
		351.93	*	35.60	1.76E-01	3.95E-02
		785.96		1.06		

Analysis Report for 30-Jul-19-10019

L2-10213A-FSGS-010SS

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

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.974	4.47E+00	4.77E-01	
	Cs-137	0.999	1.36E-01	2.24E-02	
	Tl-208	0.999	6.58E-02	1.46E-02	
X	Bi-211	0.868			
	Pb-212	1.000	1.01E-01	3.03E-02	
	Pb-214	0.999	1.50E-01	3.17E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 30-Jul-19-10019

L2-10213A-FSGS-010SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/30/2019 10:06:32AM
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	9.58E-02	8.04E-02	8.04E-02
	BE-7	477.60		10.44	4.87E-01	5.91E-01	5.91E-01
+	K-40	1460.82	*	10.66	4.47E+00	7.02E-01	7.02E-01
	Mn-54	834.85		99.98	3.39E-02	5.75E-02	5.75E-02
	Co-60	1173.23		99.85	-1.45E-02	4.80E-02	7.86E-02
		1332.49		99.98	-3.90E-02		4.80E-02
	Nb-94	702.65		99.81	1.12E-02	4.90E-02	5.46E-02
		871.09		99.89	-5.94E-02		4.90E-02
	Ag-108m	79.13		6.60	4.11E-01	5.34E-02	1.95E+00
		433.94		90.50	-4.13E-02		5.34E-02
		614.28		89.80	-1.00E-01		6.91E-02
		722.94		90.80	-1.73E-02		6.39E-02
	Sb-125	176.31		6.84	-9.71E-02	1.72E-01	6.22E-01
		380.45		1.52	8.17E-01		3.37E+00
		427.87		29.60	1.09E-01		1.72E-01
		463.36		10.49	2.38E-01		4.76E-01
		600.60		17.65	4.15E-02		3.65E-01
		606.71		4.98	1.05E+00		1.53E+00
		635.95		11.22	1.34E-01		4.73E-01

Analysis Report for 30-Jul-19-10019

L2-10213A-FSGS-010SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-5.44E-01	1.72E-01	2.75E+00
	Ba-133	79.61		2.65	-6.41E-02	9.05E-02	4.62E+00
		81.00		32.90	-5.90E-02		3.23E-01
		276.40		7.16	8.25E-03		6.29E-01
		302.85		18.34	9.04E-02		2.66E-01
		356.01		62.05	-1.76E-02		9.05E-02
		383.85		8.94	2.16E-01		5.51E-01
	Cs-134	475.36		1.48	2.96E+00	6.97E-02	4.23E+00
		563.25		8.34	-3.07E-01		6.50E-01
		569.33		15.37	-3.14E-03		3.55E-01
		604.72		97.62	-8.23E-03		7.46E-02
		795.86		85.46	-6.02E-02		6.97E-02
		801.95		8.69	1.26E-01		5.72E-01
		1038.61		0.99	-2.73E+00		5.84E+00
		1167.97		1.79	1.78E+00		4.37E+00
		1365.19		3.02	-1.64E+00		2.24E+00
+	Cs-137	661.66	*	85.10	1.36E-01	3.99E-02	3.99E-02
	Eu-152	121.78		28.67	-2.42E-02	1.67E-01	1.67E-01
		244.70		7.61	6.65E-04		6.54E-01
		295.94		0.45	7.23E+00		1.18E+01
		344.28		26.60	-4.56E-02		1.69E-01
		367.79		0.86	-3.14E+00		4.82E+00
		411.12		2.24	1.46E+00		2.32E+00
		443.96		2.83	-1.30E+00		1.76E+00
		488.68		0.42	-4.62E+00		1.13E+01
		563.99		0.49	4.70E+00		1.16E+01
		586.26		0.46	-7.35E-01		1.46E+01
		678.62		0.47	3.36E+00		1.05E+01
		688.67		0.86	-1.17E+00		5.83E+00
		719.35		0.28	3.53E+00		1.70E+01
		778.90		12.96	-3.01E-03		4.21E-01
		810.45		0.32	-1.10E+00		1.20E+01
		867.37		4.26	4.12E-01		1.42E+00
		919.33		0.43	-5.55E+00		1.19E+01
		964.08		14.65	3.87E-01		5.99E-01
		1085.87		10.24	3.69E-01		6.93E-01
		1089.74		1.73	-3.67E-01		3.69E+00
		1112.07		13.69	-6.24E-02		3.92E-01
		1212.95		1.43	3.30E-01		5.24E+00
		1249.94		0.19	-1.16E+01		3.60E+01
		1299.14		1.63	2.56E+00		4.16E+00
		1408.01		21.07	-2.09E-01		2.18E-01
		1457.64		0.50	9.84E+01		4.47E+01
		1528.10		0.28	-4.64E+00		1.56E+01
	Eu-154	123.07		40.40	-8.38E-02	1.15E-01	1.15E-01
		247.93		6.89	6.94E-01		6.99E-01
		591.76		4.95	-6.19E-01		1.10E+00
		692.42		1.78	-1.20E+00		2.76E+00
		723.30		20.06	2.85E-02		2.95E-01
		756.80		4.52	2.33E-01		1.12E+00
		873.18		12.08	-5.40E-03		4.06E-01

Analysis Report for 30-Jul-19-10019

L2-10213A-FSGS-010SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-4.59E-02	1.15E-01	6.06E-01
	1004.76	18.01	1.37E-01		3.24E-01
	1274.43	34.80	3.81E-02		2.23E-01
	1596.48	1.80	-5.09E-01		2.53E+00
Eu-155	45.30	1.31	-2.06E+01	2.71E-01	2.92E+01
	60.01	1.22	-7.27E+00		3.08E+01
	86.55	30.70	1.98E-02		2.71E-01
	105.31	21.10	5.22E-02		2.77E-01
Ra-226	186.21	3.64	4.03E-01	1.33E+00	1.33E+00
Pa-231	27.36	10.30	1.24E+00	1.89E+00	3.27E+00
	283.69	1.70	-9.74E-01		2.77E+00
	300.07	2.47	-1.51E+00		1.89E+00
	302.65	2.20	-8.99E-02		2.20E+00
	330.06	1.40	-7.54E-02		3.24E+00
U-235	143.76	10.96	4.53E-02	8.64E-02	4.37E-01
	163.33	5.08	4.70E-01		9.07E-01
	185.71	57.20	5.69E-02		8.64E-02
	202.11	1.08	2.07E+00		4.32E+00
	205.31	5.01	-4.93E-01		8.93E-01
Am-241	59.54	35.90	-7.68E-02	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 30-Jul-19-10020

L2-10213A-FSGS-011SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 30-Jul-19-10020
Sample Description	: L2-10213A-FSGS-011SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.247E+03 grams
Facility	: Default
Sample Taken On	: 7/29/2019 7:50:00AM
Acquisition Started	: 7/30/2019 9:51:34AM
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	: 7/31/2019
Efficiency Calibration Description	:
Sample Number	: 78291
Fill Height	: 1246.54 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/31/2019 1:07:59PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
1030 7-31-19

Analysis Report for 30-Jul-19-10020

L2-10213A-FSGS-011SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	239.01	947 -	960	955.63	1.11E+02	15.70	4.92E+01	1.42
2	295.41	1177 -	1188	1180.92	2.64E+01	10.92	3.36E+01	0.48
3	338.50	1347 -	1359	1353.09	2.66E+01	8.38	1.64E+01	0.39
4	352.27	1399 -	1416	1408.07	6.22E+01	12.74	3.08E+01	0.76
5	583.47	2327 -	2337	2332.00	2.10E+01	7.71	1.60E+01	0.72
6	609.52	2427 -	2442	2436.11	7.29E+01	9.89	8.12E+00	1.11
7	661.49	2638 -	2649	2643.86	3.03E+01	7.19	7.70E+00	0.74
8	911.30	3638 -	3649	3642.67	1.40E+01	7.24	1.50E+01	0.55
9	1460.31	5829 -	5852	5839.18	2.34E+02	16.24	8.00E+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
K-40	0.95	1460.82	*	10.66	5.63E+00	4.61E-01
Cs-137	0.99	661.66	*	85.10	5.28E-02	1.29E-02
Tl-208	0.98	583.19	*	85.00	3.37E-02	1.25E-02
Pb-212	0.97	115.18		0.60		
		238.63	*	43.60	1.85E-01	3.02E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	2.24E-01	3.33E-02
		768.36		4.89		

Analysis Report for 30-Jul-19-10020

L2-10213A-FSGS-011SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.98	241.99		7.25		
		295.22	*	18.42	1.19E-01	5.01E-02
		351.93	*	35.60	1.65E-01	3.64E-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	2.17E-01	7.06E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	1.00E-01	5.21E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

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

INTERFERENCE CORRECTED REPORT

Analysis Report for 30-Jul-19-10020

L2-10213A-FSGS-011SS

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.959	5.63E+00	4.61E-01	
Cs-137	0.996	5.28E-02	1.29E-02	
Tl-208	0.987	3.37E-02	1.25E-02	
Pb-212	0.979	1.85E-01	3.02E-02	
Bi-214	0.997	2.24E-01	3.33E-02	
Pb-214	0.988	1.49E-01	2.94E-02	
Ac-228	0.999	1.41E-01	4.19E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 30-Jul-19-10020

L2-10213A-FSGS-011SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/31/2019 1:07:59PM
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	1.01E-01	6.35E-02	6.35E-02
	BE-7	477.60		10.44	3.69E-01	3.85E-01	3.85E-01
+	K-40	1460.82	*	10.66	5.63E+00	5.15E-01	5.15E-01
	Mn-54	834.85		99.98	-2.14E-02	4.05E-02	4.05E-02
	Co-60	1173.23		99.85	2.08E-03	4.13E-02	6.21E-02
		1332.49		99.98	1.31E-02		4.13E-02
	Nb-94	702.65		99.81	3.11E-03	4.01E-02	4.01E-02
		871.09		99.89	1.14E-02		4.06E-02
	Ag-108m	79.13		6.60	9.43E-01	4.27E-02	1.14E+00
		433.94		90.50	-3.92E-03		4.27E-02
		614.28		89.80	-5.84E-02		6.47E-02
		722.94		90.80	3.43E-02		5.43E-02
	Sb-125	176.31		6.84	-5.85E-01	1.21E-01	4.02E-01
		380.45		1.52	8.13E-01		2.39E+00
		427.87		29.60	-3.00E-03		1.21E-01
		463.36		10.49	1.10E-02		3.49E-01
		600.60		17.65	1.47E-01		2.39E-01
		606.71		4.98	2.19E+00		1.43E+00
		635.95		11.22	1.31E-01		3.39E-01

Analysis Report for 30-Jul-19-10020

L2-10213A-FSGS-011SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-1.61E+00	1.21E-01	2.13E+00
	Ba-133	79.61		2.65	2.31E+00	6.92E-02	2.76E+00
		81.00		32.90	-2.12E-01		1.75E-01
		276.40		7.16	-2.19E-01		4.42E-01
		302.85		18.34	-2.34E-02		1.71E-01
		356.01		62.05	-2.19E-02		6.92E-02
		383.85		8.94	-9.00E-02		3.66E-01
	Cs-134	475.36		1.48	-1.71E+00	5.75E-02	2.49E+00
		563.25		8.34	-2.14E-01		5.16E-01
		569.33		15.37	-5.41E-02		2.46E-01
		604.72		97.62	-1.83E-02		5.89E-02
		795.86		85.46	9.14E-03		5.75E-02
		801.95		8.69	-2.10E-01		5.33E-01
		1038.61		0.99	-2.30E-01		4.51E+00
		1167.97		1.79	-3.77E-01		3.67E+00
		1365.19		3.02	-1.35E+00		1.63E+00
+	Cs-137	661.66	*	85.10	5.28E-02	3.23E-02	3.23E-02
	Eu-152	121.78		28.67	-1.62E-02	1.05E-01	1.05E-01
		244.70		7.61	2.57E-01		5.16E-01
		295.94		0.45	4.09E+00		9.60E+00
		344.28		26.60	-1.65E-02		1.32E-01
		367.79		0.86	2.93E-02		3.26E+00
		411.12		2.24	-1.60E-01		1.38E+00
		443.96		2.83	-7.70E-01		1.12E+00
		488.68		0.42	-9.67E-01		8.69E+00
		563.99		0.49	-1.45E+01		7.76E+00
		586.26		0.46	7.92E+00		1.20E+01
		678.62		0.47	5.79E+00		9.04E+00
		688.67		0.86	4.18E+00		5.02E+00
		719.35		0.28	-9.62E-01		1.49E+01
		778.90		12.96	4.90E-02		3.05E-01
		810.45		0.32	2.96E+00		1.32E+01
		867.37		4.26	-4.89E-01		8.46E-01
		919.33		0.43	-7.55E+00		1.13E+01
		964.08		14.65	3.18E-01		3.89E-01
		1085.87		10.24	-1.16E-01		4.84E-01
		1089.74		1.73	1.12E+00		3.00E+00
		1112.07		13.69	-5.43E-01		3.22E-01
		1212.95		1.43	2.45E+00		4.86E+00
		1249.94		0.19	2.51E+01		3.69E+01
		1299.14		1.63	1.64E+00		3.60E+00
		1408.01		21.07	-4.44E-02		2.05E-01
		1457.64		0.50	1.27E+02		4.00E+01
		1528.10		0.28	6.60E+00		1.47E+01
	Eu-154	123.07		40.40	1.31E-02	7.33E-02	7.33E-02
		247.93		6.89	7.89E-02		4.92E-01
		591.76		4.95	-8.09E-01		6.90E-01
		692.42		1.78	1.08E+00		2.19E+00
		723.30		20.06	1.01E-01		2.43E-01
		756.80		4.52	-4.16E-01		9.32E-01
		873.18		12.08	2.47E-01		3.84E-01

Analysis Report for 30-Jul-19-10020

L2-10213A-FSGS-011SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-3.08E-01	7.33E-02	4.26E-01
	1004.76	18.01	1.62E-01		3.01E-01
	1274.43	34.80	1.03E-02		1.62E-01
	1596.48	1.80	1.07E+00		2.38E+00
Eu-155	45.30	1.31	3.56E+00	1.75E-01	1.13E+01
	60.01	1.22	-1.17E+01		1.11E+01
	86.55	30.70	1.60E-02		1.75E-01
	105.31	21.10	3.17E-02		1.80E-01
Ra-226	186.21	3.64	6.12E-01	9.18E-01	9.18E-01
Pa-231	27.36	10.30	1.03E+00	1.21E+00	1.21E+00
	283.69	1.70	9.65E-01		1.75E+00
	300.07	2.47	2.31E-02		1.31E+00
	302.65	2.20	1.10E+00		1.50E+00
	330.06	1.40	-1.15E+00		2.30E+00
U-235	143.76	10.96	8.72E-02	5.88E-02	2.96E-01
	163.33	5.08	6.79E-02		5.84E-01
	185.71	57.20	3.78E-02		5.88E-02
	202.11	1.08	-2.04E-01		2.74E+00
	205.31	5.01	-3.64E-01		5.56E-01
Am-241	59.54	35.90	-1.07E-01	3.93E-01	3.93E-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 30-Jul-19-10021

L2-10213A-FSGS-012SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 30-Jul-19-10021
Sample Description	: L2-10213A-FSGS-012SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.074E+03 grams
Facility	: Default
Sample Taken On	: 7/29/2019 7:52:00AM
Acquisition Started	: 7/30/2019 9:51:40AM
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	: 7/30/2019
Efficiency Calibration Description	:
Sample Number	: 78292
Fill Height	: 1074.46 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/30/2019 10:06:43AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
1030 7-31-19

Analysis Report for 30-Jul-19-10021

L2-10213A-FSGS-012SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	238.76	949 -	972	955.51	1.29E+02	11.82	3.00E+01	1.10
m	2	241.85	949 -	972	967.86	1.84E+01	6.12	2.84E+01	1.10
	3	295.28	1177 -	1188	1181.33	3.64E+01	10.21	2.66E+01	0.84
	4	351.82	1401 -	1413	1407.29	6.38E+01	9.94	1.32E+01	0.62
	5	463.38	1849 -	1858	1853.13	8.27E+00	5.34	7.73E+00	0.40
	6	583.08	2326 -	2337	2331.65	5.39E+01	8.00	4.06E+00	0.55
	7	609.25	2428 -	2444	2436.28	4.41E+01	9.22	1.29E+01	1.63
	8	661.48	2640 -	2651	2645.11	2.36E+01	7.24	1.14E+01	0.47
	9	1460.87	5832 -	5854	5843.86	2.34E+02	16.64	1.13E+01	1.78

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.82	*	10.66	5.57E+00	4.65E-01
Sb-125	1.00	176.31		6.84		
		380.45		1.52		
		427.87		29.60		
		463.36	*	10.49	9.18E-02	5.98E-02
		600.60		17.65		
		606.71		4.98		
		635.95		11.22		

Analysis Report for 30-Jul-19-10021

L2-10213A-FSGS-012SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Sb-125	1.00	671.44		1.79		
Cs-137	0.99	661.66	*	85.10	4.10E-02	1.28E-02
Tl-208	0.99	583.19	*	85.00	8.63E-02	1.38E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	2.22E-01	2.71E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	1.36E-01	2.95E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	1.91E-01	6.56E-02
		295.22	*	18.42	1.67E-01	4.87E-02
		351.93	*	35.60	1.72E-01	3.01E-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	2.19E-01	1.42E-01
		794.95		4.25		
		911.20		25.80		
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

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

Analysis Report for 30-Jul-19-10021

L2-10213A-FSGS-012SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	1.000	5.57E+00	4.65E-01	
?	Sb-125	1.000	9.18E-02	5.98E-02	
	Cs-137	0.995	4.10E-02	1.28E-02	
	Tl-208	0.998	8.63E-02	1.38E-02	
X	Bi-211	0.913			
	Pb-212	0.998	2.22E-01	2.71E-02	
	Bi-214	1.000	1.36E-01	2.95E-02	
	Pb-214	0.998	1.73E-01	2.39E-02	
?	Ac-228	0.999	2.19E-01	1.42E-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 30-Jul-19-10021

L2-10213A-FSGS-012SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/30/2019 10:06:43AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

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

All peaks were identified.

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	5.10E-02	5.84E-02	5.84E-02
	BE-7	477.60		10.44	9.53E-02	3.79E-01	3.79E-01
+	K-40	1460.82	*	10.66	5.57E+00	5.99E-01	5.99E-01
	Mn-54	834.85		99.98	-2.60E-03	4.40E-02	4.40E-02
	Co-60	1173.23		99.85	1.12E-02	5.51E-02	6.63E-02
		1332.49		99.98	2.67E-02		5.51E-02
	Nb-94	702.65		99.81	-2.00E-02	4.24E-02	4.57E-02
		871.09		99.89	-3.01E-02		4.24E-02
	Ag-108m	79.13		6.60	-4.18E-01	4.13E-02	1.46E+00
		433.94		90.50	2.46E-03		4.13E-02
		614.28		89.80	-8.16E-04		6.83E-02
		722.94		90.80	-1.17E-02		5.34E-02
+	Sb-125	176.31		6.84	1.24E-01	1.31E-01	4.41E-01
		380.45		1.52	7.14E-01		2.59E+00
		427.87		29.60	6.11E-02		1.31E-01
		463.36	*	10.49	9.18E-02		2.02E-01
		600.60		17.65	2.30E-01		2.95E-01
		606.71		4.98	9.82E-01		1.28E+00
		635.95		11.22	4.63E-01		4.07E-01

Analysis Report for 30-Jul-19-10021

L2-10213A-FSGS-012SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	1.28E+00	1.31E-01	2.51E+00
	Ba-133	79.61		2.65	3.54E-01	6.97E-02	3.50E+00
		81.00		32.90	-3.89E-01		2.26E-01
		276.40		7.16	4.03E-02		5.21E-01
		302.85		18.34	2.99E-02		1.79E-01
		356.01		62.05	-5.70E-02		6.97E-02
		383.85		8.94	2.48E-01		4.12E-01
	Cs-134	475.36		1.48	3.81E-01	5.36E-02	2.64E+00
		563.25		8.34	2.38E-01		4.72E-01
		569.33		15.37	-4.62E-02		2.76E-01
		604.72		97.62	-1.50E-02		6.14E-02
		795.86		85.46	-8.04E-03		5.36E-02
		801.95		8.69	-5.27E-01		5.74E-01
		1038.61		0.99	5.07E-01		5.73E+00
		1167.97		1.79	1.47E+00		3.69E+00
		1365.19		3.02	-1.74E+00		1.62E+00
+	Cs-137	661.66	*	85.10	4.10E-02	3.66E-02	3.66E-02
	Eu-152	121.78		28.67	-7.75E-02	1.34E-01	1.34E-01
		244.70		7.61	-1.72E-03		4.81E-01
		295.94		0.45	6.26E+00		9.97E+00
		344.28		26.60	-8.07E-02		1.41E-01
		367.79		0.86	-1.90E+00		3.98E+00
		411.12		2.24	2.23E-01		1.70E+00
		443.96		2.83	2.79E-01		1.34E+00
		488.68		0.42	1.34E-01		9.10E+00
		563.99		0.49	-4.74E-01		7.77E+00
		586.26		0.46	1.41E+01		1.26E+01
		678.62		0.47	-2.13E+00		8.72E+00
		688.67		0.86	-1.69E+00		4.49E+00
		719.35		0.28	8.64E+00		1.56E+01
		778.90		12.96	-1.85E-01		3.42E-01
		810.45		0.32	-7.53E+00		1.39E+01
		867.37		4.26	5.32E-01		1.21E+00
		919.33		0.43	-2.36E+01		9.79E+00
		964.08		14.65	6.12E-01		5.14E-01
		1085.87		10.24	-1.55E-02		5.79E-01
		1089.74		1.73	-2.90E+00		3.04E+00
		1112.07		13.69	-7.67E-03		4.19E-01
		1212.95		1.43	1.99E+00		4.68E+00
		1249.94		0.19	-3.06E+00		2.72E+01
		1299.14		1.63	2.86E+00		3.99E+00
		1408.01		21.07	-3.48E-01		1.83E-01
		1457.64		0.50	1.25E+02		3.98E+01
		1528.10		0.28	-9.56E+00		1.27E+01
	Eu-154	123.07		40.40	-2.13E-02	9.63E-02	9.63E-02
		247.93		6.89	-2.95E-01		4.42E-01
		591.76		4.95	-2.44E-01		7.84E-01
		692.42		1.78	4.17E-01		2.43E+00
		723.30		20.06	1.96E-03		2.42E-01
		756.80		4.52	-6.76E-02		9.10E-01
		873.18		12.08	-9.30E-02		3.59E-01

Analysis Report for 30-Jul-19-10021

L2-10213A-FSGS-012SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.31E-01	9.63E-02	4.53E-01
	1004.76	18.01	-1.79E-01		2.98E-01
	1274.43	34.80	-4.00E-02		1.19E-01
	1596.48	1.80	-9.56E-01		2.49E+00
Eu-155	45.30	1.31	4.47E+00	2.16E-01	2.03E+01
	60.01	1.22	5.10E-01		2.00E+01
	86.55	30.70	-5.69E-02		2.16E-01
	105.31	21.10	2.29E-01		2.21E-01
Ra-226	186.21	3.64	9.67E-01	1.10E+00	1.10E+00
Pa-231	27.36	10.30	1.71E+00	1.52E+00	2.23E+00
	283.69	1.70	-7.52E-01		1.93E+00
	300.07	2.47	-8.15E-03		1.52E+00
	302.65	2.20	5.09E-01		1.52E+00
	330.06	1.40	-8.08E-01		2.66E+00
U-235	143.76	10.96	-3.25E-02	6.98E-02	3.41E-01
	163.33	5.08	-4.57E-01		6.51E-01
	185.71	57.20	4.62E-02		6.98E-02
	202.11	1.08	1.20E+00		3.22E+00
	205.31	5.01	1.18E-01		6.86E-01
Am-241	59.54	35.90	-3.77E-01	6.91E-01	6.91E-01

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

Apex-Gamma

Analysis Report for 30-Jul-19-10022

L2-10213A-FSGS-013SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 30-Jul-19-10022
Sample Description	: L2-10213A-FSGS-013SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.129E+03 grams
Facility	: Default
Sample Taken On	: 7/29/2019 7:54:00AM
Acquisition Started	: 7/30/2019 10:15:34AM
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	: 7/30/2019
Efficiency Calibration Description	:
Sample Number	: 78293
Fill Height	: 1128.59 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/30/2019 10:30:37AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated
1030 7-31-19

Analysis Report for 30-Jul-19-10022

L2-10213A-FSGS-013SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.46	473 -	481	477.10	1.16E+02	17.76	9.29E+01	1.21
2	295.26	585 -	594	590.58	5.40E+01	13.76	6.00E+01	0.93
3	338.39	672 -	681	676.74	4.75E+01	10.68	2.95E+01	1.13
4	351.79	700 -	708	703.52	7.84E+01	12.08	3.16E+01	1.20
5	583.21	1161 -	1170	1166.03	4.60E+01	9.06	1.60E+01	1.09
6	609.43	1213 -	1223	1218.43	5.97E+01	11.88	3.43E+01	1.32
7	661.58	1316 -	1328	1322.70	6.03E+01	10.34	1.77E+01	1.17
8	911.14	1818 -	1828	1821.73	2.76E+01	7.59	1.24E+01	0.85
9	968.43	1933 -	1940	1936.32	1.54E+01	7.00	1.66E+01	0.97
10	1460.71	2914 -	2927	2921.47	2.83E+02	17.40	7.11E+00	2.01

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82	*	10.66	5.92E+00	4.46E-01
Cs-137	0.99	661.66	*	85.10	9.27E-02	1.68E-02
Tl-208	1.00	583.19	*	85.00	6.50E-02	1.34E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.76E-01	3.04E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.63E-01	3.38E-02

Analysis Report for 30-Jul-19-10022

L2-10213A-FSGS-013SS

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	2.19E-01	5.85E-02
		351.93	*	35.60	1.87E-01	3.24E-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	3.48E-01	8.32E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	1.74E-01	4.83E-02
		964.77		4.99		
		968.97	*	15.80	1.65E-01	7.52E-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

Analysis Report for 30-Jul-19-10022

L2-10213A-FSGS-013SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.998	5.92E+00	4.46E-01	
	Cs-137	0.999	9.27E-02	1.68E-02	
	Tl-208	1.000	6.50E-02	1.34E-02	
X	Bi-211	0.921			
	Pb-212	0.996	1.76E-01	3.04E-02	
	Bi-214	0.999	1.63E-01	3.38E-02	
	Pb-214	0.998	1.94E-01	2.84E-02	
	Ac-228	0.991	2.05E-01	3.65E-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 30-Jul-19-10022

L2-10213A-FSGS-013SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/30/2019 10:30:37AM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

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

All peaks were identified.

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	9.67E-02	5.88E-02	5.88E-02
	BE-7	477.60		10.44	1.76E-01	3.78E-01	3.78E-01
+	K-40	1460.82	*	10.66	5.92E+00	3.76E-01	3.76E-01
	Mn-54	834.85		99.98	-3.65E-03	4.04E-02	4.04E-02
	Co-60	1173.23		99.85	3.06E-02	5.33E-02	5.33E-02
		1332.49		99.98	1.45E-02		5.39E-02
	Nb-94	702.65		99.81	-4.92E-03	3.65E-02	3.79E-02
		871.09		99.89	1.06E-02		3.65E-02
	Ag-108m	79.13		6.60	2.64E-01	3.39E-02	1.07E+00
		433.94		90.50	-2.00E-02		3.39E-02
		614.28		89.80	-1.95E-02		6.08E-02
		722.94		90.80	2.22E-03		4.46E-02
	Sb-125	176.31		6.84	4.32E-02	1.18E-01	4.98E-01
		380.45		1.52	-1.23E+00		2.03E+00
		427.87		29.60	-2.78E-02		1.18E-01
		463.36		10.49	1.27E-01		3.57E-01
		600.60		17.65	4.00E-02		2.17E-01
		606.71		4.98	1.41E-01		1.36E+00
		635.95		11.22	5.48E-02		3.55E-01

Analysis Report for 30-Jul-19-10022

L2-10213A-FSGS-013SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	2.77E-01	1.18E-01	2.37E+00
	Ba-133	79.61		2.65	7.06E-01	6.95E-02	2.53E+00
		81.00		32.90	-2.35E-01		1.64E-01
		276.40		7.16	-3.29E-02		4.63E-01
		302.85		18.34	-3.25E-02		1.80E-01
		356.01		62.05	-2.12E-02		6.95E-02
		383.85		8.94	-1.67E-02		3.54E-01
	Cs-134	475.36		1.48	1.94E+00	4.66E-02	2.63E+00
		563.25		8.34	-1.76E-01		3.85E-01
		569.33		15.37	8.08E-02		2.31E-01
		604.72		97.62	4.99E-03		5.78E-02
		795.86		85.46	-1.43E-02		4.66E-02
		801.95		8.69	7.99E-02		4.43E-01
		1038.61		0.99	1.80E+00		4.80E+00
		1167.97		1.79	1.20E+00		2.92E+00
		1365.19		3.02	-5.28E-02		1.63E+00
+	Cs-137	661.66	*	85.10	9.27E-02	4.00E-02	4.00E-02
	Eu-152	121.78		28.67	-4.33E-02	1.04E-01	1.04E-01
		244.70		7.61	-1.14E-01		4.48E-01
		295.94		0.45	-1.82E+00		9.73E+00
		344.28		26.60	-8.11E-02		1.10E-01
		367.79		0.86	-3.59E-01		3.63E+00
		411.12		2.24	-1.28E-01		1.47E+00
		443.96		2.83	-1.38E-01		1.24E+00
		488.68		0.42	4.46E+00		8.89E+00
		563.99		0.49	-6.24E-01		6.76E+00
		586.26		0.46	-3.54E+00		1.17E+01
		678.62		0.47	1.78E+00		8.70E+00
		688.67		0.86	2.97E-01		4.56E+00
		719.35		0.28	4.51E+00		1.40E+01
		778.90		12.96	-1.23E-01		2.74E-01
		810.45		0.32	7.07E+00		1.30E+01
		867.37		4.26	-8.10E-02		9.14E-01
		919.33		0.43	-3.01E+00		9.28E+00
		964.08		14.65	-1.78E-01		4.15E-01
		1085.87		10.24	-1.16E-01		4.33E-01
		1089.74		1.73	-9.41E-01		2.73E+00
		1112.07		13.69	-2.64E-02		3.94E-01
		1212.95		1.43	-1.19E+00		4.00E+00
		1249.94		0.19	4.75E+00		2.79E+01
		1299.14		1.63	-1.38E+00		2.86E+00
		1408.01		21.07	-3.35E-02		1.86E-01
		1457.64		0.50	-4.04E+00		3.79E+01
		1528.10		0.28	1.90E+00		1.28E+01
	Eu-154	123.07		40.40	1.78E-02	7.95E-02	7.95E-02
		247.93		6.89	-3.05E-01		4.38E-01
		591.76		4.95	9.29E-02		6.93E-01
		692.42		1.78	6.88E-01		2.37E+00
		723.30		20.06	-3.13E-02		1.99E-01
		756.80		4.52	2.40E-01		8.80E-01
		873.18		12.08	-5.86E-02		2.87E-01

Analysis Report for 30-Jul-19-10022

L2-10213A-FSGS-013SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	7.59E-02	7.95E-02	3.72E-01
	1004.76	18.01	-6.47E-02		2.58E-01
	1274.43	34.80	6.44E-02		1.50E-01
	1596.48	1.80	-2.42E-02		2.50E+00
Eu-155	45.30	1.31	4.60E-01	1.67E-01	1.03E+01
	60.01	1.22	-8.90E+00		1.10E+01
	86.55	30.70	2.43E-02		1.67E-01
	105.31	21.10	-5.18E-02		1.75E-01
Ra-226	186.21	3.64	5.15E-01	1.02E+00	1.02E+00
Pa-231	27.36	10.30	7.15E-01	1.14E+00	1.14E+00
	283.69	1.70	-7.69E-01		1.60E+00
	300.07	2.47	-1.15E+00		1.36E+00
	302.65	2.20	-2.71E-01		1.50E+00
	330.06	1.40	1.21E+00		2.39E+00
U-235	143.76	10.96	6.17E-02	6.59E-02	2.86E-01
	163.33	5.08	5.95E-02		7.03E-01
	185.71	57.20	4.50E-02		6.59E-02
	202.11	1.08	-4.95E-01		3.13E+00
	205.31	5.01	-4.54E-02		7.14E-01
Am-241	59.54	35.90	-1.96E-01	3.98E-01	3.98E-01

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

Apex-Gamma

Analysis Report for 30-Jul-19-10023

L2-10213A-FSGS-014SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 30-Jul-19-10023
Sample Description	: L2-10213A-FSGS-014SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.265E+03 grams
Facility	: Default
Sample Taken On	: 7/29/2019 7:56:00AM
Acquisition Started	: 7/30/2019 10:15:41AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.2 seconds
Dead Time	: 0.13 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/29/2019
Efficiency Calibration Used Done On	: 7/30/2019
Efficiency Calibration Description	:
Sample Number	: 78294
Fill Height	: 1264.69 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/30/2019 10:30:44AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
1030 7-31-19

Analysis Report for 30-Jul-19-10023

L2-10213A-FSGS-014SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.62	949 -	959	954.58	1.03E+02	14.19	4.14E+01	0.96
2	295.03	1176 -	1186	1180.01	4.20E+01	9.75	2.20E+01	0.50
3	351.91	1399 -	1414	1407.36	7.07E+01	12.09	2.43E+01	1.25
4	583.12	2326 -	2337	2331.71	3.50E+01	8.07	1.20E+01	0.44
5	609.26	2428 -	2443	2436.23	5.20E+01	9.05	9.98E+00	0.79
6	661.51	2639 -	2651	2645.15	5.97E+01	9.04	8.26E+00	0.84
7	910.84	3636 -	3648	3642.30	2.79E+01	7.16	8.13E+00	0.51
8	1460.41	5831 -	5852	5841.47	2.22E+02	15.23	2.65E+00	1.84

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.97	1460.82	*	10.66	5.92E+00	4.80E-01
Cs-137	0.99	661.66	*	85.10	1.15E-01	1.87E-02
Tl-208	0.99	583.19	*	85.00	6.18E-02	1.47E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.92E-01	3.08E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	1.77E-01	3.26E-02
		768.36		4.89		
		806.18		1.26		

Analysis Report for 30-Jul-19-10023

L2-10213A-FSGS-014SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	2.10E-01	5.15E-02
		351.93	*	35.60	2.08E-01	3.93E-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	2.21E-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 30-Jul-19-10023

L2-10213A-FSGS-014SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.973	5.92E+00	4.80E-01	
	Cs-137	0.997	1.15E-01	1.87E-02	
	Tl-208	0.999	6.18E-02	1.47E-02	
X	Bi-211	0.894			
	Pb-212	1.000	1.92E-01	3.08E-02	
	Bi-214	1.000	1.77E-01	3.26E-02	
	Pb-214	0.998	2.09E-01	3.13E-02	
	Ac-228	0.993	2.21E-01	5.75E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 30-Jul-19-10023

L2-10213A-FSGS-014SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/30/2019 10:30:44AM
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	1.68E-02	6.12E-02	6.12E-02
	BE-7	477.60		10.44	6.38E-01	4.87E-01	4.87E-01
+	K-40	1460.82	*	10.66	5.92E+00	3.58E-01	3.58E-01
	Mn-54	834.85		99.98	3.37E-03	4.88E-02	4.88E-02
	Co-60	1173.23		99.85	4.07E-02	4.77E-02	6.97E-02
		1332.49		99.98	-2.73E-02		4.77E-02
	Nb-94	702.65		99.81	4.60E-03	5.12E-02	5.41E-02
		871.09		99.89	3.63E-02		5.12E-02
	Ag-108m	79.13		6.60	4.47E-01	4.47E-02	1.79E+00
		433.94		90.50	-1.68E-02		4.47E-02
		614.28		89.80	-3.22E-02		6.55E-02
		722.94		90.80	2.28E-02		5.50E-02
	Sb-125	176.31		6.84	-2.83E-01	1.42E-01	5.67E-01
		380.45		1.52	-2.85E+00		2.43E+00
		427.87		29.60	9.05E-02		1.42E-01
		463.36		10.49	2.61E-02		4.14E-01
		600.60		17.65	6.86E-02		2.37E-01
		606.71		4.98	2.05E+00		1.39E+00
		635.95		11.22	2.05E-01		4.08E-01

Analysis Report for 30-Jul-19-10023

L2-10213A-FSGS-014SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	1.06E+00	1.42E-01	2.74E+00
	Ba-133	79.61		2.65	-1.62E+00	7.62E-02	4.18E+00
		81.00		32.90	-2.59E-01		2.78E-01
		276.40		7.16	-3.56E-01		4.77E-01
		302.85		18.34	1.13E-01		2.25E-01
		356.01		62.05	-2.02E-02		7.62E-02
		383.85		8.94	-1.74E-02		4.51E-01
	Cs-134	475.36		1.48	-3.07E-01	6.17E-02	3.21E+00
		563.25		8.34	-2.47E-01		4.81E-01
		569.33		15.37	2.28E-01		2.92E-01
		604.72		97.62	-1.41E-03		6.17E-02
		795.86		85.46	-2.85E-02		6.25E-02
		801.95		8.69	-1.63E-01		5.68E-01
		1038.61		0.99	-2.05E+00		3.90E+00
		1167.97		1.79	-1.52E+00		3.63E+00
		1365.19		3.02	6.63E-01		1.80E+00
+	Cs-137	661.66	*	85.10	1.15E-01	3.62E-02	3.62E-02
	Eu-152	121.78		28.67	-6.27E-02	1.44E-01	1.44E-01
		244.70		7.61	1.44E-02		5.51E-01
		295.94		0.45	4.18E+00		1.05E+01
		344.28		26.60	-5.81E-02		1.44E-01
		367.79		0.86	-1.28E+00		4.40E+00
		411.12		2.24	-1.67E-01		1.89E+00
		443.96		2.83	-4.32E-01		1.44E+00
		488.68		0.42	5.83E+00		1.05E+01
		563.99		0.49	-5.23E-01		8.16E+00
		586.26		0.46	-3.53E+00		1.37E+01
		678.62		0.47	2.30E+00		9.66E+00
		688.67		0.86	1.45E+00		5.36E+00
		719.35		0.28	-7.94E+00		1.51E+01
		778.90		12.96	-2.83E-01		3.86E-01
		810.45		0.32	-5.98E+00		1.49E+01
		867.37		4.26	-1.43E+00		1.17E+00
		919.33		0.43	-3.60E+00		1.03E+01
		964.08		14.65	4.56E-01		5.08E-01
		1085.87		10.24	-6.07E-01		5.47E-01
		1089.74		1.73	9.67E-01		3.17E+00
		1112.07		13.69	5.47E-02		4.25E-01
		1212.95		1.43	-1.17E+00		5.07E+00
		1249.94		0.19	-8.37E+00		4.02E+01
		1299.14		1.63	-1.84E+00		3.33E+00
		1408.01		21.07	1.57E-01		2.55E-01
		1457.64		0.50	1.16E+02		4.24E+01
		1528.10		0.28	7.30E+00		1.62E+01
	Eu-154	123.07		40.40	3.48E-02	1.02E-01	1.02E-01
		247.93		6.89	3.66E-01		5.58E-01
		591.76		4.95	1.48E-01		8.93E-01
		692.42		1.78	1.41E+00		2.77E+00
		723.30		20.06	2.78E-01		2.61E-01
		756.80		4.52	4.20E-03		1.09E+00
		873.18		12.08	-5.65E-02		4.24E-01

Analysis Report for 30-Jul-19-10023

L2-10213A-FSGS-014SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	9.91E-02	1.02E-01	4.57E-01
	1004.76	18.01	-5.26E-02		2.60E-01
	1274.43	34.80	-6.21E-03		1.75E-01
	1596.48	1.80	-9.60E-01		1.90E+00
Eu-155	45.30	1.31	1.28E+01	2.45E-01	3.39E+01
	60.01	1.22	-2.99E+01		2.89E+01
	86.55	30.70	2.30E-01		2.73E-01
	105.31	21.10	-7.85E-02		2.45E-01
Ra-226	186.21	3.64	-1.72E-01	1.12E+00	1.12E+00
Pa-231	27.36	10.30	1.96E+00	1.53E+00	3.26E+00
	283.69	1.70	1.27E+00		2.45E+00
	300.07	2.47	-6.04E-01		1.53E+00
	302.65	2.20	1.14E+00		1.88E+00
	330.06	1.40	-1.15E+00		2.95E+00
U-235	143.76	10.96	-1.73E-01	7.14E-02	3.81E-01
	163.33	5.08	5.23E-01		8.45E-01
	185.71	57.20	-1.30E-02		7.14E-02
	202.11	1.08	1.02E+00		3.57E+00
	205.31	5.01	-6.67E-01		7.50E-01
Am-241	59.54	35.90	-7.36E-01	1.04E+00	1.04E+00

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

Apex-Gamma

Analysis Report for 30-Jul-19-10024

L2-10213A-FSGS-015SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 30-Jul-19-10024
Sample Description	: L2-10213A-FSGS-015SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.294E+03 grams
Facility	: Default
Sample Taken On	: 7/29/2019 7:58:00AM
Acquisition Started	: 7/30/2019 10:15:48AM
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	: 7/30/2019
Efficiency Calibration Description	:
Sample Number	: 78295
Fill Height	: 1293.88 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/30/2019 10:31:01AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
1030 7-31-19

Analysis Report for 30-Jul-19-10024

L2-10213A-FSGS-015SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.84	948 -	961	954.94	8.18E+01	15.47	5.62E+01	0.97
2	295.37	1176 -	1186	1180.76	2.71E+01	9.73	2.79E+01	0.62
3	352.07	1399 -	1413	1407.27	6.71E+01	11.91	2.59E+01	1.11
4	405.33	1616 -	1626	1620.08	1.30E+01	5.58	7.00E+00	0.79
5	582.97	2323 -	2336	2329.98	3.14E+01	7.82	1.06E+01	0.47
6	609.26	2429 -	2443	2435.07	4.50E+01	9.43	1.50E+01	1.63
7	911.18	3636 -	3648	3642.18	3.02E+01	6.11	2.79E+00	0.93
8	1460.42	5828 -	5852	5839.63	2.77E+02	17.68	8.88E+00	1.39

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.97	1460.82	*	10.66	6.58E+00	5.07E-01
Tl-208	0.99	583.19	*	85.00	4.95E-02	1.27E-02
Pb-211	0.98	404.85	*	3.78	3.57E-01	1.56E-01
		427.09		1.76		
		832.01		3.52		
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.35E-01	2.78E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	1.37E-01	2.98E-02

Analysis Report for 30-Jul-19-10024

L2-10213A-FSGS-015SS

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	1.21E-01	4.44E-02
		351.93	*	35.60	1.76E-01	3.43E-02
		785.96		1.06		
Ac-228	1.00	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.14E-01	4.42E-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 30-Jul-19-10024

L2-10213A-FSGS-015SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.975	6.58E+00	5.07E-01	
	Tl-208	0.992	4.95E-02	1.27E-02	
X	Bi-211	0.853			
	Pb-211	0.985	3.57E-01	1.56E-01	
	Pb-212	0.994	1.35E-01	2.78E-02	
	Bi-214	1.000	1.37E-01	2.98E-02	
	Pb-214	0.997	1.55E-01	2.72E-02	
	Ac-228	1.000	2.14E-01	4.42E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 30-Jul-19-10024

L2-10213A-FSGS-015SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/30/2019 10:31:01AM
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	5.46E-02	5.64E-02	5.64E-02
	BE-7	477.60		10.44	2.97E-02	3.80E-01	3.80E-01
+	K-40	1460.82	*	10.66	6.58E+00	5.48E-01	5.48E-01
	Mn-54	834.85		99.98	1.14E-02	5.02E-02	5.02E-02
	Co-60	1173.23		99.85	3.01E-03	5.48E-02	6.41E-02
		1332.49		99.98	4.24E-02		5.48E-02
	Nb-94	702.65		99.81	2.22E-02	4.01E-02	4.46E-02
		871.09		99.89	-1.01E-02		4.01E-02
	Ag-108m	79.13		6.60	1.95E-01	3.29E-02	1.12E+00
		433.94		90.50	-2.68E-02		3.29E-02
		614.28		89.80	8.50E-03		5.85E-02
		722.94		90.80	1.07E-02		5.36E-02
	Sb-125	176.31		6.84	-7.18E-02	1.03E-01	3.79E-01
		380.45		1.52	-3.06E-01		2.17E+00
		427.87		29.60	-5.24E-02		1.03E-01
		463.36		10.49	1.06E-01		3.45E-01
		600.60		17.65	-9.83E-02		2.46E-01
		606.71		4.98	-4.89E-01		1.28E+00
		635.95		11.22	-4.54E-01		2.88E-01

Analysis Report for 30-Jul-19-10024

L2-10213A-FSGS-015SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	8.47E-01	1.03E-01	2.01E+00
Ba-133	79.61	2.65	5.28E-01	6.75E-02	2.76E+00
	81.00	32.90	-3.01E-01		1.85E-01
	276.40	7.16	-4.11E-01		4.05E-01
	302.85	18.34	-3.50E-02		1.56E-01
	356.01	62.05	-3.73E-02		6.75E-02
	383.85	8.94	1.23E-01		3.87E-01
Cs-134	475.36	1.48	-1.39E+00	5.04E-02	2.58E+00
	563.25	8.34	-7.38E-01		4.22E-01
	569.33	15.37	5.58E-02		2.54E-01
	604.72	97.62	-4.35E-02		5.73E-02
	795.86	85.46	-1.51E-02		5.04E-02
	801.95	8.69	-3.29E-01		4.58E-01
	1038.61	0.99	-8.86E+00		4.45E+00
	1167.97	1.79	2.22E+00		3.46E+00
	1365.19	3.02	2.44E-01		1.71E+00
Cs-137	661.66	85.10	2.62E-02	5.02E-02	5.02E-02
Eu-152	121.78	28.67	-1.97E-02	1.08E-01	1.08E-01
	244.70	7.61	1.67E-02		4.74E-01
	295.94	0.45	1.03E+01		9.01E+00
	344.28	26.60	6.58E-02		1.22E-01
	367.79	0.86	-8.97E-01		2.90E+00
	411.12	2.24	6.33E-01		1.37E+00
	443.96	2.83	2.99E-01		1.21E+00
	488.68	0.42	8.15E-01		7.58E+00
	563.99	0.49	-8.88E+00		6.77E+00
	586.26	0.46	-2.46E+00		1.15E+01
	678.62	0.47	-1.74E+00		6.58E+00
	688.67	0.86	-2.33E+00		3.87E+00
	719.35	0.28	-6.94E+00		1.49E+01
	778.90	12.96	8.15E-02		3.79E-01
	810.45	0.32	-2.71E+00		1.22E+01
	867.37	4.26	-9.51E-01		9.61E-01
	919.33	0.43	-9.81E-01		1.07E+01
	964.08	14.65	-1.08E-01		3.94E-01
	1085.87	10.24	1.78E-01		5.58E-01
	1089.74	1.73	2.79E+00		3.47E+00
	1112.07	13.69	-2.36E-01		4.10E-01
	1212.95	1.43	2.33E-01		4.24E+00
	1249.94	0.19	1.19E+00		2.91E+01
	1299.14	1.63	3.09E+00		4.09E+00
	1408.01	21.07	-1.64E-01		2.35E-01
	1457.64	0.50	1.36E+02		4.24E+01
	1528.10	0.28	8.36E+00		1.60E+01
Eu-154	123.07	40.40	1.91E-03	7.80E-02	7.80E-02
	247.93	6.89	2.71E-01		4.44E-01
	591.76	4.95	5.05E-01		8.22E-01
	692.42	1.78	-2.82E+00		1.88E+00
	723.30	20.06	3.30E-02		2.43E-01
	756.80	4.52	-5.65E-02		9.01E-01
	873.18	12.08	2.40E-01		3.72E-01

Analysis Report for 30-Jul-19-10024

L2-10213A-FSGS-015SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-8.47E-02	7.80E-02	4.20E-01
	1004.76	18.01	-1.71E-01		2.52E-01
	1274.43	34.80	1.45E-01		1.86E-01
	1596.48	1.80	-1.38E+00		2.48E+00
Eu-155	45.30	1.31	1.25E+00	1.65E-01	1.11E+01
	60.01	1.22	-1.05E+01		1.11E+01
	86.55	30.70	5.56E-02		1.72E-01
	105.31	21.10	-2.07E-01		1.65E-01
Ra-226	186.21	3.64	5.92E-01	8.96E-01	8.96E-01
Pa-231	27.36	10.30	1.17E+00	1.19E+00	1.28E+00
	283.69	1.70	1.89E-01		1.90E+00
	300.07	2.47	-8.07E-01		1.19E+00
	302.65	2.20	-5.62E-01		1.30E+00
	330.06	1.40	-1.56E-01		2.30E+00
U-235	143.76	10.96	-6.85E-02	5.64E-02	2.76E-01
	163.33	5.08	-5.93E-04		5.63E-01
	185.71	57.20	2.51E-02		5.64E-02
	202.11	1.08	1.25E+00		2.84E+00
	205.31	5.01	-2.41E-01		5.38E-01
Am-241	59.54	35.90	-8.68E-02	4.09E-01	4.09E-01

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

Apex-Gamma

Analysis Report for 30-Jul-19-10025

L2-10213A-FSGS-016SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 30-Jul-19-10025
Sample Description	: L2-10213A-FSGS-016SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 9.760E+02 grams
Facility	: Default
Sample Taken On	: 7/29/2019 8:00:00AM
Acquisition Started	: 7/30/2019 10:15:56AM
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	: 7/30/2019
Efficiency Calibration Description	:
Sample Number	: 78296
Fill Height	: 975.99 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/30/2019 10:30:59AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
1030 7-31-19

Analysis Report for 30-Jul-19-10025

L2-10213A-FSGS-016SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	186.03	736 -	749	744.83	4.28E+01	13.14	4.72E+01	0.45
2	238.67	946 -	960	955.15	1.38E+02	16.67	4.89E+01	0.90
3	295.32	1175 -	1187	1181.52	5.30E+01	11.61	3.10E+01	1.41
4	352.05	1400 -	1416	1408.21	9.68E+01	13.24	2.52E+01	0.81
5	510.82	2037 -	2050	2042.77	3.83E+01	9.37	1.77E+01	0.45
6	583.11	2325 -	2340	2331.74	4.83E+01	10.46	1.87E+01	1.25
7	609.27	2428 -	2443	2436.33	5.96E+01	10.57	1.64E+01	0.71
8	911.11	3637 -	3651	3643.50	3.28E+01	6.82	4.24E+00	1.25
9	1460.83	5831 -	5855	5843.67	2.55E+02	17.50	1.25E+01	1.50

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

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.99	511.00	*	100.00	5.05E-02	1.28E-02
K-40	1.00	1460.82	*	10.66	6.37E+00	5.18E-01
Tl-208	0.99	583.19	*	85.00	8.07E-02	1.81E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.47E-01	3.59E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	1.92E-01	3.59E-02
		768.36		4.89		

Analysis Report for 30-Jul-19-10025

L2-10213A-FSGS-016SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	2.54E-01	5.91E-02
		351.93	*	35.60	2.72E-01	4.31E-02
		785.96		1.06		
Ra-226	0.99	186.21	*	3.64	8.15E-01	2.59E-01
Ac-228	1.00	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.44E-01	5.20E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		
U-235	0.98	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	5.19E-02	1.65E-02
		202.11		1.08		
		205.31		5.01		

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

Analysis Report for 30-Jul-19-10025

L2-10213A-FSGS-016SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.995	5.05E-02	1.28E-02	
	K-40	1.000	6.37E+00	5.18E-01	
	Tl-208	0.999	8.07E-02	1.81E-02	
X	Bi-211	0.857			
	Pb-212	1.000	2.47E-01	3.59E-02	
	Bi-214	1.000	1.92E-01	3.59E-02	
	Pb-214	0.998	2.66E-01	3.48E-02	
?	Ra-226	0.995	8.15E-01	2.59E-01	
	Ac-228	1.000	2.44E-01	5.20E-02	
?	U-235	0.989	5.19E-02	1.65E-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 30-Jul-19-10025

L2-10213A-FSGS-016SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/30/2019 10:30:59AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

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

All peaks were identified.

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	*	100.00	5.05E-02	3.53E-02	3.53E-02
	BE-7	477.60		10.44	1.55E-01	4.56E-01	4.56E-01
+	K-40	1460.82	*	10.66	6.37E+00	6.81E-01	6.81E-01
	Mn-54	834.85		99.98	-7.38E-03	4.79E-02	4.79E-02
	Co-60	1173.23		99.85	-8.40E-02	6.35E-02	6.35E-02
		1332.49		99.98	2.18E-02		6.44E-02
	Nb-94	702.65		99.81	-2.41E-02	4.44E-02	4.64E-02
		871.09		99.89	2.23E-02		4.44E-02
	Ag-108m	79.13		6.60	-8.97E-01	3.95E-02	1.59E+00
		433.94		90.50	-3.45E-02		3.95E-02
		614.28		89.80	-8.19E-03		8.09E-02
		722.94		90.80	1.92E-02		6.01E-02
	Sb-125	176.31		6.84	6.03E-02	1.36E-01	5.34E-01
		380.45		1.52	6.98E-01		2.50E+00
		427.87		29.60	-1.11E-02		1.36E-01
		463.36		10.49	-2.75E-02		4.14E-01
		600.60		17.65	1.74E-01		2.85E-01
		606.71		4.98	2.24E+00		1.50E+00
		635.95		11.22	-2.29E-01		3.80E-01

Analysis Report for 30-Jul-19-10025

L2-10213A-FSGS-016SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.27E+00	1.36E-01	2.30E+00
Ba-133	79.61	2.65	1.01E+00	9.18E-02	3.87E+00
	81.00	32.90	-4.58E-01		2.61E-01
	276.40	7.16	-4.72E-02		5.36E-01
	302.85	18.34	1.39E-01		2.25E-01
	356.01	62.05	-1.59E-02		9.18E-02
	383.85	8.94	-5.06E-02		4.04E-01
Cs-134	475.36	1.48	1.14E+00	5.71E-02	3.11E+00
	563.25	8.34	-4.76E-03		5.66E-01
	569.33	15.37	9.04E-02		2.73E-01
	604.72	97.62	-1.26E-02		7.22E-02
	795.86	85.46	-1.69E-02		5.71E-02
	801.95	8.69	2.59E-01		6.09E-01
	1038.61	0.99	1.02E+00		5.50E+00
	1167.97	1.79	2.07E+00		3.71E+00
	1365.19	3.02	2.16E-01		1.80E+00
Cs-137	661.66	85.10	2.01E-02	6.76E-02	6.76E-02
Eu-152	121.78	28.67	-4.33E-02	1.30E-01	1.30E-01
	244.70	7.61	5.91E-01		5.79E-01
	295.94	0.45	1.00E+01		1.13E+01
	344.28	26.60	-7.85E-02		1.41E-01
	367.79	0.86	-1.15E+00		3.84E+00
	411.12	2.24	8.04E-01		2.06E+00
	443.96	2.83	6.10E-01		1.45E+00
	488.68	0.42	-3.30E+00		9.38E+00
	563.99	0.49	2.89E+00		9.71E+00
	586.26	0.46	2.63E+01		1.48E+01
	678.62	0.47	4.43E+00		9.12E+00
	688.67	0.86	-2.39E+00		4.40E+00
	719.35	0.28	-1.62E+00		1.74E+01
	778.90	12.96	2.48E-02		3.83E-01
	810.45	0.32	-8.95E+00		1.37E+01
	867.37	4.26	3.07E-01		1.17E+00
	919.33	0.43	1.56E+00		9.99E+00
	964.08	14.65	4.27E-01		5.55E-01
	1085.87	10.24	2.71E-01		5.88E-01
	1089.74	1.73	1.98E+00		3.60E+00
	1112.07	13.69	-3.89E-01		4.61E-01
	1212.95	1.43	1.14E+00		4.70E+00
	1249.94	0.19	-2.54E+01		3.56E+01
	1299.14	1.63	1.52E-01		3.82E+00
	1408.01	21.07	9.16E-02		2.72E-01
	1457.64	0.50	1.39E+02		4.36E+01
	1528.10	0.28	2.03E+00		1.52E+01
Eu-154	123.07	40.40	2.92E-02	9.43E-02	9.43E-02
	247.93	6.89	-7.04E-02		5.01E-01
	591.76	4.95	-5.69E-02		9.74E-01
	692.42	1.78	-5.26E-01		2.14E+00
	723.30	20.06	2.32E-01		2.72E-01
	756.80	4.52	-9.38E-02		9.32E-01
	873.18	12.08	3.60E-02		3.68E-01

Analysis Report for 30-Jul-19-10025

L2-10213A-FSGS-016SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	1.35E-01	9.43E-02	5.34E-01
		1004.76		18.01	-6.28E-02		2.78E-01
		1274.43		34.80	-4.96E-02		1.49E-01
		1596.48		1.80	-2.67E+00		2.47E+00
	Eu-155	45.30		1.31	7.92E+00	2.18E-01	2.09E+01
		60.01		1.22	-6.07E+00		2.12E+01
		86.55		30.70	-1.02E-01		2.35E-01
		105.31		21.10	-7.59E-02		2.18E-01
+	Ra-226	186.21	*	3.64	8.15E-01	7.91E-01	7.91E-01
	Pa-231	27.36		10.30	2.45E+00	1.85E+00	2.47E+00
		283.69		1.70	4.02E-01		2.35E+00
		300.07		2.47	-1.13E+00		1.85E+00
		302.65		2.20	7.48E-01		1.87E+00
		330.06		1.40	2.52E+00		2.97E+00
+	U-235	143.76		10.96	-1.27E-01	5.03E-02	3.37E-01
		163.33		5.08	-3.63E-01		6.16E-01
		185.71	*	57.20	5.19E-02		5.03E-02
		202.11		1.08	-1.66E+00		3.23E+00
		205.31		5.01	-2.93E-01		7.13E-01
	Am-241	59.54		35.90	5.66E-01	7.94E-01	7.94E-01

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

Apex-Gamma

Analysis Report for 30-Jul-19-10026

L2-10213A-FSGS-017SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 30-Jul-19-10026
Sample Description	: L2-10213A-FSGS-017SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.118E+03 grams
Facility	: Default
Sample Taken On	: 7/29/2019 8:02:00AM
Acquisition Started	: 7/30/2019 10:37:53AM
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	: 7/30/2019
Efficiency Calibration Description	:
Sample Number	: 78297
Fill Height	: 1117.94 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 7/30/2019 10:52:55AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated
1030 7-31-19

Analysis Report for 30-Jul-19-10026

L2-10213A-FSGS-017SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.64	473 -	481	477.47	1.36E+02	20.06	1.22E+02	1.15
2	295.22	585 -	595	590.49	6.86E+01	15.09	6.64E+01	1.21
3	338.34	671 -	681	676.66	3.25E+01	12.96	5.65E+01	0.71
4	351.89	700 -	708	703.72	1.20E+02	15.05	4.98E+01	1.41
5	609.27	1212 -	1223	1218.13	1.04E+02	12.34	1.95E+01	1.56
6	911.20	1815 -	1828	1821.85	5.47E+01	9.05	9.29E+00	1.89
7	968.82	1933 -	1941	1937.10	2.47E+01	7.44	1.43E+01	1.25
8	1120.44	2237 -	2245	2240.43	2.26E+01	7.32	1.44E+01	1.34
9	1460.61	2914 -	2928	2921.28	3.67E+02	19.44	3.66E+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	0.99	1460.82	*	10.66	7.73E+00	5.29E-01
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.06E-01	3.48E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	2.83E-01	3.77E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		

Analysis Report for 30-Jul-19-10026

L2-10213A-FSGS-017SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	1120.29	*	14.92	2.83E-01	9.24E-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	1.00	241.99		7.25		
		295.22	*	18.42	2.79E-01	6.54E-02
		351.93	*	35.60	2.88E-01	4.27E-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	2.38E-01	9.71E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	3.45E-01	5.90E-02
		964.77		4.99		
		968.97	*	15.80	2.65E-01	8.07E-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 30-Jul-19-10026

L2-10213A-FSGS-017SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.993	7.73E+00	5.29E-01	
X	Bi-211	0.899			
	Pb-212	1.000	2.06E-01	3.48E-02	
	Bi-214	0.999	2.83E-01	3.49E-02	
	Pb-214	1.000	2.85E-01	3.58E-02	
	Ac-228	0.999	3.02E-01	4.28E-02	

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

Errors quoted at 1.000sigma

Analysis Report for 30-Jul-19-10026

L2-10213A-FSGS-017SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 7/30/2019 10:52:55AM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

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

All peaks were identified.

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	7.83E-02	5.74E-02	5.74E-02
	BE-7	477.60		10.44	1.96E-01	3.93E-01	3.93E-01
+	K-40	1460.82	*	10.66	7.73E+00	2.91E-01	2.91E-01
	Mn-54	834.85		99.98	1.05E-02	4.68E-02	4.68E-02
	Co-60	1173.23		99.85	4.52E-02	5.20E-02	6.02E-02
		1332.49		99.98	2.54E-02		5.20E-02
	Nb-94	702.65		99.81	2.70E-03	3.87E-02	3.87E-02
		871.09		99.89	5.29E-03		4.24E-02
	Ag-108m	79.13		6.60	4.36E-01	3.49E-02	1.20E+00
		433.94		90.50	-1.90E-02		3.49E-02
		614.28		89.80	-3.69E-02		5.94E-02
		722.94		90.80	-2.42E-02		5.10E-02
	Sb-125	176.31		6.84	-1.66E-01	1.15E-01	5.18E-01
		380.45		1.52	8.97E-01		2.25E+00
		427.87		29.60	1.16E-02		1.15E-01
		463.36		10.49	-4.75E-02		3.41E-01
		600.60		17.65	5.88E-02		2.29E-01
		606.71		4.98	-2.00E-01		1.44E+00
		635.95		11.22	-2.70E-01		3.22E-01

Analysis Report for 30-Jul-19-10026

L2-10213A-FSGS-017SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.12E+00	1.15E-01	2.32E+00
Ba-133	79.61	2.65	-6.91E-02	8.05E-02	2.80E+00
	81.00	32.90	-2.86E-01		1.84E-01
	276.40	7.16	-2.01E-01		4.80E-01
	302.85	18.34	1.09E-01		2.00E-01
	356.01	62.05	-4.24E-02		8.05E-02
	383.85	8.94	7.55E-04		3.63E-01
Cs-134	475.36	1.48	6.01E-01	5.78E-02	2.59E+00
	563.25	8.34	-1.20E-01		4.25E-01
	569.33	15.37	5.37E-05		2.45E-01
	604.72	97.62	-9.97E-03		6.20E-02
	795.86	85.46	3.38E-02		5.78E-02
	801.95	8.69	-1.00E-01		4.45E-01
	1038.61	0.99	1.75E+00		4.91E+00
	1167.97	1.79	1.09E+00		3.52E+00
	1365.19	3.02	-4.06E-01		1.43E+00
Cs-137	661.66	85.10	4.58E-02	6.08E-02	6.08E-02
Eu-152	121.78	28.67	-8.04E-04	1.15E-01	1.15E-01
	244.70	7.61	5.45E-03		4.86E-01
	295.94	0.45	-4.58E-01		1.03E+01
	344.28	26.60	-2.39E-02		1.36E-01
	367.79	0.86	4.55E-01		4.05E+00
	411.12	2.24	1.74E-01		1.59E+00
	443.96	2.83	-5.66E-01		1.15E+00
	488.68	0.42	-5.16E+00		7.96E+00
	563.99	0.49	-2.24E+00		7.11E+00
	586.26	0.46	1.73E+01		1.28E+01
	678.62	0.47	1.10E+00		9.62E+00
	688.67	0.86	-3.12E-01		4.85E+00
	719.35	0.28	5.12E+00		1.58E+01
	778.90	12.96	-1.83E-01		2.56E-01
	810.45	0.32	1.98E+00		1.28E+01
	867.37	4.26	-3.56E-02		1.03E+00
	919.33	0.43	1.23E+00		8.89E+00
	964.08	14.65	-6.45E-02		4.17E-01
	1085.87	10.24	2.70E-01		5.36E-01
	1089.74	1.73	1.02E+00		3.48E+00
	1112.07	13.69	-1.14E-01		3.84E-01
	1212.95	1.43	-1.27E+00		3.89E+00
	1249.94	0.19	-1.43E+01		2.75E+01
	1299.14	1.63	9.16E-01		3.28E+00
	1408.01	21.07	3.78E-03		2.09E-01
	1457.64	0.50	-2.34E+00		4.27E+01
	1528.10	0.28	-7.64E-01		1.28E+01
Eu-154	123.07	40.40	-5.87E-03	8.07E-02	8.07E-02
	247.93	6.89	-4.88E-02		4.53E-01
	591.76	4.95	-4.63E-01		7.70E-01
	692.42	1.78	1.99E+00		2.38E+00
	723.30	20.06	9.95E-02		2.49E-01
	756.80	4.52	-6.99E-01		8.23E-01
	873.18	12.08	-2.36E-01		3.25E-01

Analysis Report for 30-Jul-19-10026

L2-10213A-FSGS-017SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-1.45E-01	8.07E-02	4.19E-01
	1004.76	18.01	7.96E-02		2.55E-01
	1274.43	34.80	-1.31E-02		1.68E-01
	1596.48	1.80	-6.98E-01		2.41E+00
Eu-155	45.30	1.31	-4.37E+00	1.87E-01	1.12E+01
	60.01	1.22	-4.13E+00		1.23E+01
	86.55	30.70	5.08E-02		1.87E-01
	105.31	21.10	5.11E-02		1.94E-01
Ra-226	186.21	3.64	1.33E+00	1.17E+00	1.17E+00
Pa-231	27.36	10.30	5.80E-01	1.25E+00	1.25E+00
	283.69	1.70	6.57E-01		2.03E+00
	300.07	2.47	2.32E-01		1.47E+00
	302.65	2.20	9.10E-01		1.66E+00
	330.06	1.40	9.96E-01		2.74E+00
U-235	143.76	10.96	-2.49E-02	7.47E-02	2.97E-01
	163.33	5.08	-1.84E-01		7.12E-01
	185.71	57.20	8.09E-02		7.47E-02
	202.11	1.08	1.82E+00		3.29E+00
	205.31	5.01	-2.84E-01		6.80E-01
Am-241	59.54	35.90	-7.66E-03	4.46E-01	4.46E-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

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-46368

November 19, 2019

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

CASE NARRATIVE
Work Order # 19-09132-OR

SAMPLE RECEIPT

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

CLIENT ID	LAB ID	CLIENT ID	LAB ID
L1-10209C-FQGS-001-SS-A	19-09132-04	L2-10212A-FSGS-004-SS-A	19-09132-12
L1-10209C-FIGS-004-SS-A	19-09132-05	L2-10212A-FQGS-005-SS-A	19-09132-13
L1-10209C-FIGS-006-SB-A	19-09132-06	L1-10209A-FSGS-015-SS-A	19-09132-14
L2-10213A-FSGS-001-SS-A	19-09132-07	L1-10209A-FIGS-003-SS-A	19-09132-15
L2-10213A-FSGS-003-SS-A	19-09132-08	L1-10209A-FIGS-005-SS-A	19-09132-16
L2-10213A-FSGS-004-SS-A	19-09132-09	L1-10209B-FSGS-012-SS-A	19-09132-17
L2-10213A-FSGS-006-SS-A	19-09132-10	L1-10209B-FSGS-015-SS-A	19-09132-18
L2-10213A-FSGS-008-SS-A	19-09132-11		

ANALYTICAL METHODS

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

Laboratory qualifiers are as follows:

U - Result is less than the MDA.

ANALYTICAL RESULTS

Combined Standard Uncertainty is reported at 1-sigma value.

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

ANALYTICAL RESULTS CONTINUED

TOTAL STRONTIUM

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

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

TRITIUM

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

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

NICKEL-63

A representative aliquot of each sample was prepared by leaching in acids. Aliquots were placed into appropriately sized beakers. Stable elemental Nickel carrier was added to each sample prior to digestion. Samples were digested in concentrated Nitric acid. After digestion, each 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 Bismuth-214, Cesium-137 and Potassium-40 replicate demonstrated an acceptable relative percent difference and normalized difference. Results for the Cobalt-60 and Cesium-137 laboratory control sample demonstrated an acceptable percent recovery.

CERTIFICATION OF ACCURACY

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

M.R. McDougall
Laboratory Manager

Date: 11/19/2019

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: 19-09132
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
19-09132-01	LCS	KNOWN	09/24/19 00:00	9/23/2019	10/26/2019	19-09132	Tritium	LANL ER-210 Modified	2.07E+02	7.44E+00				pCi/g
19-09132-01	LCS	SPIKE	09/24/19 00:00	9/23/2019	10/26/2019	19-09132	Tritium	LANL ER-210 Modified	2.00E+02	7.74E+00	1.36E+01	5.84E+00		pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/26/2019	19-09132	Tritium	LANL ER-210 Modified	-2.11E+00	3.34E+00	3.34E+00	5.93E+00	U	pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/26/2019	19-09132	Tritium	LANL ER-210 Modified	-2.26E+00	3.27E+00	3.27E+00	5.82E+00	U	pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/26/2019	19-09132	Tritium	LANL ER-210 Modified	-1.68E+00	3.27E+00	3.27E+00	5.78E+00	U	pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/26/2019	19-09132	Tritium	LANL ER-210 Modified	-2.71E+00	3.12E+00	3.12E+00	5.58E+00	U	pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/26/2019	19-09132	Tritium	LANL ER-210 Modified	0.00E+00	3.27E+00	3.27E+00	5.68E+00	U	pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/26/2019	19-09132	Tritium	LANL ER-210 Modified	-9.47E-01	3.34E+00	3.34E+00	5.85E+00	U	pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/26/2019	19-09132	Tritium	LANL ER-210 Modified	-7.30E-01	3.23E+00	3.23E+00	5.64E+00	U	pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/26/2019	19-09132	Tritium	LANL ER-210 Modified	-2.26E+00	3.28E+00	3.28E+00	5.83E+00	U	pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/26/2019	19-09132	Tritium	LANL ER-210 Modified	-1.29E+00	3.23E+00	3.23E+00	5.68E+00	U	pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/26/2019	19-09132	Tritium	LANL ER-210 Modified	0.00E+00	3.32E+00	3.32E+00	5.75E+00	U	pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/26/2019	19-09132	Tritium	LANL ER-210 Modified	-1.80E+00	3.15E+00	3.15E+00	5.57E+00	U	pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/26/2019	19-09132	Tritium	LANL ER-210 Modified	-2.52E+00	3.11E+00	3.11E+00	5.55E+00	U	pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/26/2019	19-09132	Tritium	LANL ER-210 Modified	1.80E-01	3.21E+00	3.21E+00	5.55E+00	U	pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/26/2019	19-09132	Tritium	LANL ER-210 Modified	-1.67E+00	3.24E+00	3.24E+00	5.72E+00	U	pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/26/2019	19-09132	Tritium	LANL ER-210 Modified	-3.53E-01	3.13E+00	3.13E+00	5.45E+00	U	pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/26/2019	19-09132	Tritium	LANL ER-210 Modified	-1.48E+00	3.24E+00	3.25E+00	5.72E+00	U	pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/26/2019	19-09132	Tritium	LANL ER-210 Modified	-4.08E+00	3.31E+00	3.32E+00	6.00E+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: 19-09132
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
19-09132-01	LCS	KNOWN	09/24/19 00:00	9/23/2019	10/26/2019	19-09132	Nickel-63	ASTM 3500-Ni Modified	1.47E+03	4.41E+01				pCi/g
19-09132-01	LCS	SPIKE	09/24/19 00:00	9/23/2019	10/26/2019	19-09132	Nickel-63	ASTM 3500-Ni Modified	1.49E+03	1.31E+01	8.87E+01	3.23E+00		pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/26/2019	19-09132	Nickel-63	ASTM 3500-Ni Modified	0.00E+00	1.87E+00	1.87E+00	3.22E+00	U	pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/26/2019	19-09132	Nickel-63	ASTM 3500-Ni Modified	-3.48E-01	1.85E+00	1.85E+00	3.21E+00	U	pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/26/2019	19-09132	Nickel-63	ASTM 3500-Ni Modified	-4.33E-01	1.84E+00	1.84E+00	3.19E+00	U	pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/26/2019	19-09132	Nickel-63	ASTM 3500-Ni Modified	-6.42E-01	1.94E+00	1.94E+00	3.39E+00	U	pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/26/2019	19-09132	Nickel-63	ASTM 3500-Ni Modified	-8.02E-01	1.88E+00	1.89E+00	3.29E+00	U	pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/26/2019	19-09132	Nickel-63	ASTM 3500-Ni Modified	1.47E+00	2.01E+00	2.01E+00	3.39E+00	U	pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/26/2019	19-09132	Nickel-63	ASTM 3500-Ni Modified	-1.36E+00	1.90E+00	1.90E+00	3.34E+00	U	pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/26/2019	19-09132	Nickel-63	ASTM 3500-Ni Modified	8.73E-01	1.90E+00	1.90E+00	3.22E+00	U	pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/26/2019	19-09132	Nickel-63	ASTM 3500-Ni Modified	5.60E-01	2.02E+00	2.02E+00	3.45E+00	U	pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/26/2019	19-09132	Nickel-63	ASTM 3500-Ni Modified	-7.77E-01	2.06E+00	2.06E+00	3.59E+00	U	pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/26/2019	19-09132	Nickel-63	ASTM 3500-Ni Modified	-1.07E+00	2.25E+00	2.25E+00	3.93E+00	U	pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/26/2019	19-09132	Nickel-63	ASTM 3500-Ni Modified	-5.06E-01	1.79E+00	1.79E+00	3.11E+00	U	pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/26/2019	19-09132	Nickel-63	ASTM 3500-Ni Modified	-3.65E-01	1.94E+00	1.94E+00	3.37E+00	U	pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/26/2019	19-09132	Nickel-63	ASTM 3500-Ni Modified	9.76E-01	2.12E+00	2.12E+00	3.60E+00	U	pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/26/2019	19-09132	Nickel-63	ASTM 3500-Ni Modified	-4.38E-01	1.86E+00	1.86E+00	3.23E+00	U	pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/26/2019	19-09132	Nickel-63	ASTM 3500-Ni Modified	1.79E-01	1.92E+00	1.92E+00	3.31E+00	U	pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/26/2019	19-09132	Nickel-63	ASTM 3500-Ni Modified	-1.42E+00	1.85E+00	1.86E+00	3.27E+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: 19-09132
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
19-09132-01	LCS	KNOWN	09/24/19 00:00	9/23/2019	10/28/2019	19-09132	Strontium-90	ElChroM SRW01 Modified	5.02E+01	2.81E-01				pCi/g
19-09132-01	LCS	SPIKE	09/24/19 00:00	9/23/2019	10/28/2019	19-09132	Strontium-90	ElChroM SRW01 Modified	5.29E+01	1.44E+00	1.84E+01	8.49E-01		pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/28/2019	19-09132	Strontium-90	ElChroM SRW01 Modified	1.33E-01	4.01E-01	4.03E-01	1.01E+00	U	pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/28/2019	19-09132	Strontium-90	ElChroM SRW01 Modified	-9.97E-02	3.37E-01	3.39E-01	8.78E-01	U	pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/28/2019	19-09132	Strontium-90	ElChroM SRW01 Modified	3.05E-02	2.86E-01	2.86E-01	7.28E-01	U	pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/28/2019	19-09132	Strontium-90	ElChroM SRW01 Modified	3.58E-01	2.53E-01	2.82E-01	6.00E-01	U	pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/28/2019	19-09132	Strontium-90	ElChroM SRW01 Modified	2.46E-01	2.92E-01	3.04E-01	7.16E-01	U	pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/28/2019	19-09132	Strontium-90	ElChroM SRW01 Modified	3.46E-01	3.09E-01	3.31E-01	7.45E-01	U	pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/28/2019	19-09132	Strontium-90	ElChroM SRW01 Modified	3.79E-01	3.32E-01	3.57E-01	8.00E-01	U	pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/28/2019	19-09132	Strontium-90	ElChroM SRW01 Modified	3.20E-01	2.49E-01	2.73E-01	5.92E-01	U	pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/28/2019	19-09132	Strontium-90	ElChroM SRW01 Modified	-8.86E-03	2.77E-01	2.77E-01	7.17E-01	U	pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/28/2019	19-09132	Strontium-90	ElChroM SRW01 Modified	3.77E-02	3.47E-01	3.47E-01	8.85E-01	U	pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/28/2019	19-09132	Strontium-90	ElChroM SRW01 Modified	1.63E-01	2.81E-01	2.86E-01	6.99E-01	U	pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/28/2019	19-09132	Strontium-90	ElChroM SRW01 Modified	2.02E-01	3.18E-01	3.26E-01	7.90E-01	U	pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/28/2019	19-09132	Strontium-90	ElChroM SRW01 Modified	-8.99E-03	3.01E-01	3.01E-01	7.75E-01	U	pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/28/2019	19-09132	Strontium-90	ElChroM SRW01 Modified	5.58E-01	2.80E-01	3.41E-01	6.41E-01	U	pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/28/2019	19-09132	Strontium-90	ElChroM SRW01 Modified	7.75E-02	3.44E-01	3.45E-01	8.73E-01	U	pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/28/2019	19-09132	Strontium-90	ElChroM SRW01 Modified	2.17E-01	3.34E-01	3.43E-01	8.29E-01	U	pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/28/2019	19-09132	Strontium-90	ElChroM SRW01 Modified	-1.49E-01	3.59E-01	3.62E-01	9.44E-01	U	pCi/g
19-09132-01	LCS	KNOWN	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Cobalt-60	EPA 901.1 Modified	1.31E+02	5.10E+00				pCi/g
19-09132-01	LCS	KNOWN	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Cesium-137	EPA 901.1 Modified	8.26E+01	3.39E+00				pCi/g
19-09132-01	LCS	SPIKE	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Cobalt-60	EPA 901.1 Modified	1.31E+02	8.49E+00	1.08E+01	1.17E+00		pCi/g
19-09132-01	LCS	SPIKE	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Cesium-137	EPA 901.1 Modified	8.65E+01	9.50E+00	1.05E+01	1.79E+00		pCi/g

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Eberline Analytical
Final Report of Analysis

Report To:	Work Order Details:	
Patricia Giza	SDG:	19-09132
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
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Actinium-228	EPA 901.1 Modified	2.94E-02	7.77E-02	7.77E-02	1.35E-01	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Silver-108m	EPA 901.1 Modified	-7.05E-03	1.72E-02	1.72E-02	2.23E-02	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Americium-241	EPA 901.1 Modified	3.85E-03	3.77E-02	3.77E-02	5.22E-02	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Barium-133	EPA 901.1 Modified	-9.86E-03	3.03E-02	3.03E-02	3.91E-02	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Bismuth-214	EPA 901.1 Modified	5.02E-02	4.50E-02	4.51E-02	7.21E-02	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Cobalt-60	EPA 901.1 Modified	-2.03E-02	3.17E-02	3.17E-02	2.23E-02	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Cesium-134	EPA 901.1 Modified	-1.96E-04	9.47E-03	9.47E-03	1.96E-02	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Cesium-137	EPA 901.1 Modified	1.45E-02	1.99E-02	1.99E-02	3.69E-02	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Europium-152	EPA 901.1 Modified	9.22E-03	8.04E-02	8.04E-02	7.90E-02	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Europium-154	EPA 901.1 Modified	0.00E+00	5.60E-02	5.60E-02	4.00E-02	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Europium-155	EPA 901.1 Modified	8.30E-03	3.97E-02	3.97E-02	5.11E-02	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Holmium-166m	EPA 901.1 Modified	-2.24E-02	3.85E-02	3.85E-02	3.35E-02	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Iodine-129	EPA 901.1 Modified	3.47E+00	1.43E+01	1.43E+01	1.01E+00	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Potassium-40	EPA 901.1 Modified	-7.01E-02	2.89E-01	2.89E-01	3.29E-01	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Manganese-54	EPA 901.1 Modified	1.35E-02	1.74E-02	1.74E-02	3.37E-02	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Molybdenum-93	EPA 901.1 Modified	3.18E-03	1.40E-02	1.40E-02	2.48E-02	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Niobium-94	EPA 901.1 Modified	8.35E-03	1.66E-02	1.66E-02	3.04E-02	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Lead-210	EPA 901.1 Modified	2.47E-01	5.67E-01	5.67E-01	9.50E-01	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Lead-212	EPA 901.1 Modified	4.59E-02	5.02E-02	5.03E-02	8.35E-02	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Lead-214	EPA 901.1 Modified	3.92E-02	4.95E-02	4.96E-02	7.80E-02	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Promethium-145	EPA 901.1 Modified	1.63E-01	2.38E-01	2.38E-01	3.06E-01	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Radium-226	EPA 901.1 Modified	5.02E-02	4.50E-02	4.51E-02	7.21E-02	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Antimony-125	EPA 901.1 Modified	-1.27E-02	3.91E-02	3.91E-02	6.43E-02	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Thorium-234	EPA 901.1 Modified	4.34E-01	3.49E-01	3.50E-01	5.49E-01	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Thallium-208	EPA 901.1 Modified	3.75E-02	5.10E-02	5.10E-02	9.96E-02	U	pCi/g
19-09132-02	MBL	BLANK	09/24/19 00:00	9/23/2019	10/10/2019	19-09132	Uranium-235	EPA 901.1 Modified	8.30E-02	1.29E-01	1.29E-01	1.89E-01	U	pCi/g

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

Eberline Analytical
Final Report of Analysis

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

Work Order Details:
SDG: 19-09132
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
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Actinium-228	EPA 901.1 Modified	1.61E-01	1.93E-01	1.94E-01	3.43E-01	U	pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Silver-108m	EPA 901.1 Modified	-1.00E-02	2.82E-02	2.82E-02	6.41E-02	U	pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Americium-241	EPA 901.1 Modified	1.78E-03	6.63E-02	6.63E-02	9.59E-02	U	pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Barium-133	EPA 901.1 Modified	-3.27E-02	7.78E-02	7.79E-02	9.34E-02	U	pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Bismuth-214	EPA 901.1 Modified	2.71E-01	1.11E-01	1.12E-01	1.67E-01		pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Cobalt-60	EPA 901.1 Modified	7.55E-02	7.09E-02	7.10E-02	1.30E-01	U	pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Cesium-134	EPA 901.1 Modified	1.40E-02	2.53E-02	2.53E-02	7.91E-02	U	pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Cesium-137	EPA 901.1 Modified	2.16E-01	6.60E-02	6.69E-02	8.48E-02		pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Europium-152	EPA 901.1 Modified	2.20E-02	7.42E-02	7.42E-02	1.44E-01	U	pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Europium-154	EPA 901.1 Modified	3.97E-02	1.80E-01	1.80E-01	7.55E-02	U	pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Europium-155	EPA 901.1 Modified	3.28E-02	5.90E-02	5.90E-02	1.15E-01	U	pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Holmium-166m	EPA 901.1 Modified	-2.18E-03	8.00E-02	8.00E-02	5.69E-02	U	pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Iodine-129	EPA 901.1 Modified	-1.87E-02	1.70E-01	1.70E-01	2.48E-01	U	pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Potassium-40	EPA 901.1 Modified	1.02E+01	2.25E+00	2.31E+00	1.52E+00		pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Manganese-54	EPA 901.1 Modified	-2.44E-03	5.68E-02	5.68E-02	9.14E-02	U	pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Molybdenum-93	EPA 901.1 Modified	-2.47E-02	4.21E-02	4.21E-02	5.89E-02	U	pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Niobium-94	EPA 901.1 Modified	5.43E-04	2.11E-02	2.11E-02	7.16E-02	U	pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Lead-210	EPA 901.1 Modified	7.25E-01	7.45E-01	7.46E-01	1.24E+00	U	pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Lead-212	EPA 901.1 Modified	3.25E-01	8.25E-02	8.41E-02	1.75E-01		pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Lead-214	EPA 901.1 Modified	3.83E-01	8.87E-02	9.08E-02	2.94E-01		pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Promethium-145	EPA 901.1 Modified	-5.54E-02	1.11E-01	1.11E-01	1.58E-01	U	pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Radium-226	EPA 901.1 Modified	2.71E-01	1.11E-01	1.12E-01	1.67E-01		pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Antimony-125	EPA 901.1 Modified	1.92E-02	6.38E-02	6.38E-02	2.17E-01	U	pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Thorium-234	EPA 901.1 Modified	4.58E-02	6.23E-01	6.23E-01	9.16E-01	U	pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Thallium-208	EPA 901.1 Modified	3.86E-01	1.82E-01	1.83E-01	2.83E-01		pCi/g
19-09132-03	DUP	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Uranium-235	EPA 901.1 Modified	1.47E-01	2.02E-01	2.02E-01	3.13E-01	U	pCi/g

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Eberline Analytical
Final Report of Analysis

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

Work Order Details:
SDG: 19-09132
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
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Actinium-228	EPA 901.1 Modified	2.62E-01	1.94E-01	1.94E-01	4.05E-01	U	pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Silver-108m	EPA 901.1 Modified	5.80E-03	4.57E-02	4.57E-02	5.69E-02	U	pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Americium-241	EPA 901.1 Modified	-9.18E-02	7.17E-02	7.18E-02	9.45E-02	U	pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Barium-133	EPA 901.1 Modified	7.93E-03	2.53E-02	2.53E-02	9.02E-02	U	pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Bismuth-214	EPA 901.1 Modified	2.29E-01	1.17E-01	1.18E-01	1.86E-01		pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Cobalt-60	EPA 901.1 Modified	1.29E-01	6.54E-02	6.57E-02	1.48E-01	U	pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Cesium-134	EPA 901.1 Modified	1.46E-02	3.01E-02	3.01E-02	7.35E-02	U	pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Cesium-137	EPA 901.1 Modified	1.76E-01	6.70E-02	6.76E-02	9.47E-02		pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Europium-152	EPA 901.1 Modified	-7.58E-02	1.70E-01	1.70E-01	1.39E-01	U	pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Europium-154	EPA 901.1 Modified	-3.59E-03	1.75E-01	1.75E-01	7.26E-02	U	pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Europium-155	EPA 901.1 Modified	5.13E-02	6.44E-02	6.44E-02	1.36E-01	U	pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Holmium-166m	EPA 901.1 Modified	2.58E-03	7.20E-02	7.20E-02	5.86E-02	U	pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Iodine-129	EPA 901.1 Modified	7.12E-02	1.67E-01	1.67E-01	2.48E-01	U	pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Potassium-40	EPA 901.1 Modified	1.21E+01	2.47E+00	2.55E+00	1.16E+00		pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Manganese-54	EPA 901.1 Modified	1.53E-02	4.96E-02	4.96E-02	8.47E-02	U	pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Molybdenum-93	EPA 901.1 Modified	8.58E-03	3.64E-02	3.64E-02	6.10E-02	U	pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Niobium-94	EPA 901.1 Modified	3.62E-02	4.48E-02	4.48E-02	6.80E-02	U	pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Lead-210	EPA 901.1 Modified	1.03E+00	6.05E-01	6.07E-01	9.68E-01		pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Lead-212	EPA 901.1 Modified	4.29E-01	1.30E-01	1.32E-01	1.92E-01		pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Lead-214	EPA 901.1 Modified	2.47E-01	8.64E-02	8.73E-02	2.69E-01	U	pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Promethium-145	EPA 901.1 Modified	-8.07E-02	1.15E-01	1.15E-01	1.62E-01	U	pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Radium-226	EPA 901.1 Modified	2.29E-01	1.17E-01	1.18E-01	1.86E-01		pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Antimony-125	EPA 901.1 Modified	2.00E-02	1.27E-01	1.27E-01	1.83E-01	U	pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Thorium-234	EPA 901.1 Modified	8.83E-01	6.09E-01	6.10E-01	9.41E-01	U	pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Thallium-208	EPA 901.1 Modified	2.63E-01	1.56E-01	1.56E-01	2.47E-01		pCi/g
19-09132-04	DO	L1-10209C-FQGS-001-SS-A	07/25/19 13:00	9/23/2019	10/10/2019	19-09132	Uranium-235	EPA 901.1 Modified	-2.60E-02	2.08E-01	2.08E-01	3.02E-01	U	pCi/g

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

Eberline Analytical
Final Report of Analysis

Report To:

Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:

SDG: **19-09132**
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
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Actinium-228	EPA 901.1 Modified	4.07E-01	2.08E-01	2.09E-01	3.58E-01		pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Silver-108m	EPA 901.1 Modified	-2.74E-02	3.66E-02	3.66E-02	7.35E-02	U	pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Americium-241	EPA 901.1 Modified	1.47E-02	2.96E-02	2.96E-02	1.14E-01	U	pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Barium-133	EPA 901.1 Modified	-1.16E-02	3.27E-02	3.27E-02	1.30E-01	U	pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Bismuth-214	EPA 901.1 Modified	4.78E-01	1.24E-01	1.26E-01	9.29E-02		pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Cobalt-60	EPA 901.1 Modified	-3.74E-02	7.74E-02	7.74E-02	1.15E-01	U	pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Cesium-134	EPA 901.1 Modified	1.91E-02	3.64E-02	3.64E-02	1.01E-01	U	pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Cesium-137	EPA 901.1 Modified	1.26E-01	6.90E-02	6.93E-02	1.21E-01	U	pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Europium-152	EPA 901.1 Modified	-3.74E-01	2.26E-01	2.27E-01	1.86E-01	U	pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Europium-154	EPA 901.1 Modified	-6.32E-02	1.09E-01	1.09E-01	9.79E-02	U	pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Europium-155	EPA 901.1 Modified	3.31E-02	9.85E-02	9.85E-02	1.46E-01	U	pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Holmium-166m	EPA 901.1 Modified	-8.80E-02	1.16E-01	1.16E-01	6.96E-02	U	pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Iodine-129	EPA 901.1 Modified	-9.67E-03	6.20E-02	6.20E-02	9.04E-02	U	pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Potassium-40	EPA 901.1 Modified	7.98E+00	1.43E+00	1.49E+00	8.52E-01		pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Manganese-54	EPA 901.1 Modified	4.28E-02	6.34E-02	6.34E-02	1.13E-01	U	pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Molybdenum-93	EPA 901.1 Modified	2.86E-03	5.68E-02	5.68E-02	7.77E-02	U	pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Niobium-94	EPA 901.1 Modified	-2.43E-02	5.46E-02	5.46E-02	8.08E-02	U	pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Lead-210	EPA 901.1 Modified	6.49E-01	6.21E-01	6.22E-01	1.03E+00	U	pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Lead-212	EPA 901.1 Modified	3.73E-01	8.66E-02	8.87E-02	1.49E-01		pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Lead-214	EPA 901.1 Modified	4.23E-01	1.22E-01	1.24E-01	2.20E-01		pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Promethium-145	EPA 901.1 Modified	1.88E-02	7.33E-02	7.33E-02	1.10E-01	U	pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Radium-226	EPA 901.1 Modified	4.78E-01	1.24E-01	1.26E-01	9.29E-02		pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Antimony-125	EPA 901.1 Modified	1.20E-01	1.52E-01	1.52E-01	2.31E-01	U	pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Thorium-234	EPA 901.1 Modified	5.79E-01	7.69E-01	7.69E-01	1.16E+00	U	pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Thallium-208	EPA 901.1 Modified	3.74E-01	1.41E-01	1.42E-01	5.78E-02		pCi/g
19-09132-05	TRG	L1-10209C-FIGS-004-SS-A	07/25/19 13:06	9/23/2019	10/10/2019	19-09132	Uranium-235	EPA 901.1 Modified	-5.86E-02	2.58E-01	2.58E-01	3.71E-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: **19-09132**
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
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Actinium-228	EPA 901.1 Modified	4.39E-01	1.87E-01	1.88E-01	3.60E-01	U	pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Silver-108m	EPA 901.1 Modified	-1.08E-02	3.36E-02	3.36E-02	4.94E-02	U	pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Americium-241	EPA 901.1 Modified	8.76E-02	9.65E-02	9.66E-02	1.35E-01	U	pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Barium-133	EPA 901.1 Modified	1.24E-02	3.01E-02	3.01E-02	6.41E-02	U	pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Bismuth-214	EPA 901.1 Modified	4.57E-01	1.06E-01	1.08E-01	1.55E-01		pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Cobalt-60	EPA 901.1 Modified	3.18E-02	4.92E-02	4.92E-02	7.70E-02	U	pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Cesium-134	EPA 901.1 Modified	3.03E-03	1.55E-02	1.55E-02	5.16E-02	U	pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Cesium-137	EPA 901.1 Modified	7.64E-02	5.34E-02	5.36E-02	8.43E-02	U	pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Europium-152	EPA 901.1 Modified	1.41E-02	1.06E-01	1.06E-01	1.70E-01	U	pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Europium-154	EPA 901.1 Modified	-7.49E-03	1.19E-01	1.19E-01	8.72E-02	U	pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Europium-155	EPA 901.1 Modified	1.02E-01	9.81E-02	9.83E-02	1.33E-01	U	pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Holmium-166m	EPA 901.1 Modified	-1.73E-02	7.49E-02	7.49E-02	6.72E-02	U	pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Iodine-129	EPA 901.1 Modified	3.45E+00	1.44E+01	1.44E+01	2.19E+00	U	pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Potassium-40	EPA 901.1 Modified	1.16E+01	1.67E+00	1.77E+00	6.67E-01		pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Manganese-54	EPA 901.1 Modified	2.08E-02	4.02E-02	4.02E-02	6.76E-02	U	pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Molybdenum-93	EPA 901.1 Modified	-4.53E-03	2.59E-02	2.59E-02	5.07E-02	U	pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Niobium-94	EPA 901.1 Modified	-3.00E-02	4.06E-02	4.06E-02	5.45E-02	U	pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Lead-210	EPA 901.1 Modified	1.36E+00	1.59E+00	1.59E+00	2.64E+00	U	pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Lead-212	EPA 901.1 Modified	4.00E-01	8.87E-02	9.10E-02	1.92E-01		pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Lead-214	EPA 901.1 Modified	4.29E-01	1.14E-01	1.16E-01	1.82E-01		pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Promethium-145	EPA 901.1 Modified	3.03E-01	4.51E-01	4.51E-01	6.72E-01	U	pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Radium-226	EPA 901.1 Modified	4.57E-01	1.06E-01	1.08E-01	1.55E-01		pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Antimony-125	EPA 901.1 Modified	3.01E-02	8.04E-02	8.04E-02	1.44E-01	U	pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Thorium-234	EPA 901.1 Modified	1.67E+00	8.97E-01	9.01E-01	1.31E+00	U	pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Thallium-208	EPA 901.1 Modified	3.10E-01	8.94E-02	9.08E-02	9.63E-02		pCi/g
19-09132-06	TRG	L1-10209C-FIGS-006-SB-A	07/30/19 12:40	9/23/2019	10/10/2019	19-09132	Uranium-235	EPA 901.1 Modified	2.53E-01	2.78E-01	2.78E-01	3.92E-01	U	pCi/g

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Eberline Analytical
Final Report of Analysis

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

Work Order Details:
SDG: 19-09132
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
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Actinium-228	EPA 901.1 Modified	7.13E-01	2.40E-01	2.43E-01	5.16E-01		pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Silver-108m	EPA 901.1 Modified	1.62E-03	4.35E-02	4.35E-02	1.02E-01	U	pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Americium-241	EPA 901.1 Modified	-7.66E-02	1.12E-01	1.12E-01	1.56E-01	U	pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Barium-133	EPA 901.1 Modified	-1.48E-02	4.44E-02	4.44E-02	1.75E-01	U	pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Bismuth-214	EPA 901.1 Modified	4.11E-01	2.39E-01	2.40E-01	4.03E-01		pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Cobalt-60	EPA 901.1 Modified	4.12E-02	8.78E-02	8.78E-02	1.25E-01	U	pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Cesium-134	EPA 901.1 Modified	1.09E-02	4.19E-02	4.19E-02	1.32E-01	U	pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Cesium-137	EPA 901.1 Modified	6.58E-01	1.51E-01	1.55E-01	1.62E-01		pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Europium-152	EPA 901.1 Modified	1.52E-01	2.22E-01	2.22E-01	2.45E-01	U	pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Europium-154	EPA 901.1 Modified	1.33E-01	2.21E-01	2.21E-01	1.30E-01	U	pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Europium-155	EPA 901.1 Modified	4.70E-02	1.35E-01	1.35E-01	1.99E-01	U	pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Holmium-166m	EPA 901.1 Modified	3.91E-02	1.36E-01	1.36E-01	9.93E-02	U	pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Iodine-129	EPA 901.1 Modified	-2.40E-02	8.74E-02	8.74E-02	1.27E-01	U	pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Potassium-40	EPA 901.1 Modified	7.68E+00	1.72E+00	1.77E+00	1.55E+00		pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Manganese-54	EPA 901.1 Modified	1.65E-02	4.89E-02	4.89E-02	1.48E-01	U	pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Molybdenum-93	EPA 901.1 Modified	1.05E-04	6.80E-02	6.80E-02	9.76E-02	U	pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Niobium-94	EPA 901.1 Modified	-2.97E-02	7.51E-02	7.51E-02	1.06E-01	U	pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Lead-210	EPA 901.1 Modified	1.08E+00	1.01E+00	1.01E+00	1.68E+00	U	pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Lead-212	EPA 901.1 Modified	7.03E-01	1.82E-01	1.85E-01	2.62E-01		pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Lead-214	EPA 901.1 Modified	5.62E-01	1.48E-01	1.51E-01	2.54E-01		pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Promethium-145	EPA 901.1 Modified	-2.44E-02	1.02E-01	1.02E-01	1.48E-01	U	pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Radium-226	EPA 901.1 Modified	4.11E-01	2.39E-01	2.40E-01	4.03E-01		pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Antimony-125	EPA 901.1 Modified	4.88E-02	2.30E-01	2.30E-01	3.30E-01	U	pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Thorium-234	EPA 901.1 Modified	1.38E+00	1.30E+00	1.31E+00	2.17E+00	U	pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Thallium-208	EPA 901.1 Modified	4.17E-01	1.55E-01	1.56E-01	8.14E-02		pCi/g
19-09132-07	TRG	L2-10213A-FSGS-001-SS-A	07/29/19 07:30	9/23/2019	10/10/2019	19-09132	Uranium-235	EPA 901.1 Modified	2.30E-01	3.55E-01	3.56E-01	5.47E-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

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Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-09132
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Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Actinium-228	EPA 901.1 Modified	4.64E-01	1.28E-01	1.30E-01	1.79E-01		pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Silver-108m	EPA 901.1 Modified	7.95E-03	3.92E-02	3.92E-02	4.27E-02	U	pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Americium-241	EPA 901.1 Modified	-4.85E-02	8.93E-02	8.93E-02	1.09E-01	U	pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Barium-133	EPA 901.1 Modified	-3.30E-03	2.26E-02	2.26E-02	6.05E-02	U	pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Bismuth-214	EPA 901.1 Modified	3.61E-01	9.51E-02	9.69E-02	1.54E-01		pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Cobalt-60	EPA 901.1 Modified	4.28E-01	6.31E-02	6.68E-02	9.66E-02		pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Cesium-134	EPA 901.1 Modified	2.40E-03	1.52E-02	1.52E-02	4.88E-02	U	pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Cesium-137	EPA 901.1 Modified	8.68E-02	5.74E-02	5.76E-02	9.12E-02	U	pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Europium-152	EPA 901.1 Modified	2.58E-02	1.22E-01	1.22E-01	1.39E-01	U	pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Europium-154	EPA 901.1 Modified	8.15E-02	1.09E-01	1.09E-01	7.32E-02	U	pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Europium-155	EPA 901.1 Modified	1.01E-01	7.95E-02	7.97E-02	1.08E-01	U	pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Holmium-166m	EPA 901.1 Modified	-1.96E-02	6.84E-02	6.84E-02	6.01E-02	U	pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Iodine-129	EPA 901.1 Modified	3.81E+00	1.58E+01	1.58E+01	1.85E+00	U	pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Potassium-40	EPA 901.1 Modified	1.10E+01	1.54E+00	1.64E+00	8.33E-01		pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Manganese-54	EPA 901.1 Modified	1.49E-02	4.56E-02	4.56E-02	7.33E-02	U	pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Molybdenum-93	EPA 901.1 Modified	1.21E-02	3.02E-02	3.02E-02	4.20E-02	U	pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Niobium-94	EPA 901.1 Modified	2.46E-02	3.47E-02	3.48E-02	5.33E-02	U	pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Lead-210	EPA 901.1 Modified	1.08E+00	1.06E+00	1.07E+00	1.73E+00	U	pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Lead-212	EPA 901.1 Modified	3.27E-01	7.95E-02	8.12E-02	1.71E-01		pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Lead-214	EPA 901.1 Modified	3.57E-01	1.03E-01	1.05E-01	1.71E-01		pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Promethium-145	EPA 901.1 Modified	4.22E-01	4.31E-01	4.32E-01	5.95E-01	U	pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Radium-226	EPA 901.1 Modified	3.61E-01	9.51E-02	9.69E-02	1.54E-01		pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Antimony-125	EPA 901.1 Modified	3.21E-02	8.23E-02	8.23E-02	1.44E-01	U	pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Thorium-234	EPA 901.1 Modified	5.83E-01	7.79E-01	7.79E-01	1.06E+00	U	pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Thallium-208	EPA 901.1 Modified	2.35E-01	7.58E-02	7.68E-02	1.12E-01		pCi/g
19-09132-08	TRG	L2-10213A-FSGS-003-SS-A	07/29/19 07:34	9/23/2019	10/10/2019	19-09132	Uranium-235	EPA 901.1 Modified	-1.41E-01	2.54E-01	2.54E-01	3.10E-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:	19-09132
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
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Actinium-228	EPA 901.1 Modified	3.19E-01	2.33E-01	2.33E-01	4.56E-01	U	pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Silver-108m	EPA 901.1 Modified	4.04E-02	2.71E-02	2.72E-02	6.37E-02	U	pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Americium-241	EPA 901.1 Modified	-2.42E-02	7.29E-02	7.29E-02	1.03E-01	U	pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Barium-133	EPA 901.1 Modified	-8.08E-03	3.27E-02	3.27E-02	9.74E-02	U	pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Bismuth-214	EPA 901.1 Modified	2.45E-01	1.27E-01	1.28E-01	2.08E-01		pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Cobalt-60	EPA 901.1 Modified	6.90E-02	6.32E-02	6.33E-02	1.15E-01	U	pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Cesium-134	EPA 901.1 Modified	-9.16E-03	2.97E-02	2.97E-02	8.40E-02	U	pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Cesium-137	EPA 901.1 Modified	5.88E-01	1.06E-01	1.10E-01	1.02E-01		pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Europium-152	EPA 901.1 Modified	-1.78E-02	8.71E-02	8.71E-02	1.55E-01	U	pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Europium-154	EPA 901.1 Modified	4.09E-02	1.73E-01	1.73E-01	7.92E-02	U	pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Europium-155	EPA 901.1 Modified	2.76E-02	7.40E-02	7.40E-02	1.22E-01	U	pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Holmium-166m	EPA 901.1 Modified	5.06E-02	3.65E-02	3.66E-02	8.22E-02	U	pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Iodine-129	EPA 901.1 Modified	3.98E-02	1.88E-01	1.88E-01	2.78E-01	U	pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Potassium-40	EPA 901.1 Modified	8.95E+00	2.06E+00	2.11E+00	1.39E+00		pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Manganese-54	EPA 901.1 Modified	8.16E-03	3.68E-02	3.68E-02	7.55E-02	U	pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Molybdenum-93	EPA 901.1 Modified	2.96E-02	3.77E-02	3.77E-02	6.07E-02	U	pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Niobium-94	EPA 901.1 Modified	1.40E-02	2.19E-02	2.20E-02	5.98E-02	U	pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Lead-210	EPA 901.1 Modified	1.07E+00	8.43E-01	8.44E-01	1.39E+00	U	pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Lead-212	EPA 901.1 Modified	3.33E-01	8.38E-02	8.55E-02	1.79E-01		pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Lead-214	EPA 901.1 Modified	3.98E-01	1.22E-01	1.23E-01	1.68E-01		pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Promethium-145	EPA 901.1 Modified	-5.72E-02	1.26E-01	1.26E-01	1.78E-01	U	pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Radium-226	EPA 901.1 Modified	2.45E-01	1.27E-01	1.28E-01	2.08E-01		pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Antimony-125	EPA 901.1 Modified	-2.20E-02	9.74E-02	9.74E-02	2.20E-01	U	pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Thorium-234	EPA 901.1 Modified	5.91E-01	6.62E-01	6.62E-01	1.01E+00	U	pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Thallium-208	EPA 901.1 Modified	3.13E-01	1.99E-01	1.99E-01	3.28E-01	U	pCi/g
19-09132-09	TRG	L2-10213A-FSGS-004-SS-A	07/29/19 07:36	9/23/2019	10/10/2019	19-09132	Uranium-235	EPA 901.1 Modified	1.40E-01	2.21E-01	2.21E-01	3.38E-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: 19-09132
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
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Actinium-228	EPA 901.1 Modified	6.97E-01	3.31E-01	3.33E-01	7.52E-01	U	pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Silver-108m	EPA 901.1 Modified	6.39E-02	7.64E-02	7.65E-02	1.18E-01	U	pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Americium-241	EPA 901.1 Modified	-1.22E-01	1.33E-01	1.33E-01	1.84E-01	U	pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Barium-133	EPA 901.1 Modified	1.68E-01	1.42E-01	1.43E-01	2.05E-01	U	pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Bismuth-214	EPA 901.1 Modified	6.48E-01	2.28E-01	2.30E-01	3.68E-01		pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Cobalt-60	EPA 901.1 Modified	3.31E-02	9.71E-02	9.72E-02	1.51E-01	U	pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Cesium-134	EPA 901.1 Modified	-5.25E-03	4.79E-02	4.79E-02	1.54E-01	U	pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Cesium-137	EPA 901.1 Modified	6.09E-01	1.65E-01	1.68E-01	1.99E-01		pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Europium-152	EPA 901.1 Modified	-7.90E-03	1.62E-01	1.62E-01	2.95E-01	U	pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Europium-154	EPA 901.1 Modified	5.06E-03	1.63E-01	1.63E-01	1.53E-01	U	pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Europium-155	EPA 901.1 Modified	-1.51E-02	1.58E-01	1.58E-01	2.26E-01	U	pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Holmium-166m	EPA 901.1 Modified	9.81E-02	7.08E-02	7.10E-02	1.43E-01	U	pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Iodine-129	EPA 901.1 Modified	6.44E-02	9.69E-02	9.69E-02	1.49E-01	U	pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Potassium-40	EPA 901.1 Modified	1.24E+01	2.26E+00	2.34E+00	1.29E+00		pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Manganese-54	EPA 901.1 Modified	7.35E-03	1.02E-01	1.02E-01	1.64E-01	U	pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Molybdenum-93	EPA 901.1 Modified	-2.71E-02	8.91E-02	8.91E-02	9.48E-02	U	pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Niobium-94	EPA 901.1 Modified	-3.41E-02	6.70E-02	6.70E-02	1.12E-01	U	pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Lead-210	EPA 901.1 Modified	2.02E+00	1.30E+00	1.31E+00	2.12E+00	U	pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Lead-212	EPA 901.1 Modified	5.08E-01	1.78E-01	1.80E-01	2.69E-01		pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Lead-214	EPA 901.1 Modified	6.04E-01	2.17E-01	2.19E-01	4.46E-01		pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Promethium-145	EPA 901.1 Modified	-4.67E-02	1.21E-01	1.21E-01	1.75E-01	U	pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Radium-226	EPA 901.1 Modified	6.48E-01	2.28E-01	2.30E-01	3.68E-01		pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Antimony-125	EPA 901.1 Modified	3.82E-02	2.64E-01	2.64E-01	3.75E-01	U	pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Thorium-234	EPA 901.1 Modified	1.94E+00	1.90E+00	1.90E+00	3.16E+00	U	pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Thallium-208	EPA 901.1 Modified	4.72E-01	2.44E-01	2.45E-01	3.37E-01		pCi/g
19-09132-10	TRG	L2-10213A-FSGS-006-SS-A	07/29/19 07:40	9/23/2019	10/10/2019	19-09132	Uranium-235	EPA 901.1 Modified	1.02E-01	3.92E-01	3.92E-01	5.93E-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: 19-09132
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
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Actinium-228	EPA 901.1 Modified	3.59E-01	1.94E-01	1.95E-01	3.67E-01	U	pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Silver-108m	EPA 901.1 Modified	-4.82E-02	5.44E-02	5.45E-02	3.95E-02	U	pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Americium-241	EPA 901.1 Modified	7.10E-03	1.03E-01	1.03E-01	1.35E-01	U	pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Barium-133	EPA 901.1 Modified	2.31E-02	2.83E-02	2.83E-02	6.18E-02	U	pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Bismuth-214	EPA 901.1 Modified	5.21E-01	1.15E-01	1.18E-01	1.63E-01		pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Cobalt-60	EPA 901.1 Modified	3.27E-02	4.78E-02	4.78E-02	7.29E-02	U	pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Cesium-134	EPA 901.1 Modified	1.07E-02	1.98E-02	1.98E-02	4.74E-02	U	pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Cesium-137	EPA 901.1 Modified	1.36E-01	6.82E-02	6.86E-02	1.04E-01		pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Europium-152	EPA 901.1 Modified	6.98E-02	1.74E-01	1.74E-01	1.63E-01	U	pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Europium-154	EPA 901.1 Modified	-1.33E-02	1.15E-01	1.15E-01	8.51E-02	U	pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Europium-155	EPA 901.1 Modified	1.88E-01	1.00E-01	1.00E-01	1.34E-01	U	pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Holmium-166m	EPA 901.1 Modified	4.60E-02	5.86E-02	5.86E-02	7.17E-02	U	pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Iodine-129	EPA 901.1 Modified	3.78E+00	1.57E+01	1.57E+01	1.98E+00	U	pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Potassium-40	EPA 901.1 Modified	1.18E+01	1.72E+00	1.83E+00	9.02E-01		pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Manganese-54	EPA 901.1 Modified	1.74E-02	4.53E-02	4.53E-02	7.40E-02	U	pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Molybdenum-93	EPA 901.1 Modified	-1.47E-03	3.61E-02	3.61E-02	5.43E-02	U	pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Niobium-94	EPA 901.1 Modified	-3.27E-03	3.20E-02	3.20E-02	5.00E-02	U	pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Lead-210	EPA 901.1 Modified	3.52E+00	1.75E+00	1.75E+00	2.65E+00		pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Lead-212	EPA 901.1 Modified	4.02E-01	9.23E-02	9.46E-02	2.30E-01		pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Lead-214	EPA 901.1 Modified	4.62E-01	1.18E-01	1.20E-01	1.89E-01		pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Promethium-145	EPA 901.1 Modified	4.38E-01	4.67E-01	4.68E-01	6.54E-01	U	pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Radium-226	EPA 901.1 Modified	5.21E-01	1.15E-01	1.18E-01	1.63E-01		pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Antimony-125	EPA 901.1 Modified	9.60E-02	8.55E-02	8.56E-02	1.63E-01	U	pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Thorium-234	EPA 901.1 Modified	1.48E-01	9.57E-01	9.57E-01	1.25E+00	U	pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Thallium-208	EPA 901.1 Modified	2.50E-01	8.49E-02	8.59E-02	1.30E-01		pCi/g
19-09132-11	TRG	L2-10213A-FSGS-008-SS-A	07/29/19 07:44	9/23/2019	10/10/2019	19-09132	Uranium-235	EPA 901.1 Modified	6.14E-02	2.78E-01	2.78E-01	3.71E-01	U	pCi/g

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Eberline Analytical
Final Report of Analysis

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

Work Order Details:
SDG: 19-09132
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Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Actinium-228	EPA 901.1 Modified	4.26E-01	2.05E-01	2.06E-01	4.27E-01	U	pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Silver-108m	EPA 901.1 Modified	1.11E-02	2.57E-02	2.57E-02	6.06E-02	U	pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Americium-241	EPA 901.1 Modified	-9.46E-02	8.80E-02	8.82E-02	1.20E-01	U	pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Barium-133	EPA 901.1 Modified	1.78E-02	9.99E-02	9.99E-02	1.19E-01	U	pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Bismuth-214	EPA 901.1 Modified	4.22E-01	1.74E-01	1.75E-01	2.59E-01		pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Cobalt-60	EPA 901.1 Modified	-3.49E-03	7.85E-02	7.85E-02	1.21E-01	U	pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Cesium-134	EPA 901.1 Modified	3.21E-03	1.77E-02	1.77E-02	1.01E-01	U	pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Cesium-137	EPA 901.1 Modified	2.90E-01	8.67E-02	8.80E-02	1.13E-01		pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Europium-152	EPA 901.1 Modified	1.72E-01	1.43E-01	1.44E-01	1.69E-01	U	pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Europium-154	EPA 901.1 Modified	4.09E-02	2.14E-01	2.14E-01	8.96E-02	U	pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Europium-155	EPA 901.1 Modified	3.04E-02	9.19E-02	9.19E-02	1.35E-01	U	pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Holmium-166m	EPA 901.1 Modified	7.05E-03	8.87E-02	8.87E-02	8.84E-02	U	pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Iodine-129	EPA 901.1 Modified	6.10E-02	2.02E-01	2.02E-01	3.00E-01	U	pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Potassium-40	EPA 901.1 Modified	1.47E+01	2.96E+00	3.06E+00	1.09E+00		pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Manganese-54	EPA 901.1 Modified	3.70E-02	4.99E-02	4.99E-02	9.30E-02	U	pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Molybdenum-93	EPA 901.1 Modified	-4.22E-02	4.61E-02	4.61E-02	6.44E-02	U	pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Niobium-94	EPA 901.1 Modified	5.72E-02	4.56E-02	4.57E-02	7.48E-02	U	pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Lead-210	EPA 901.1 Modified	2.06E+00	1.12E+00	1.12E+00	1.80E+00		pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Lead-212	EPA 901.1 Modified	5.28E-01	1.04E-01	1.07E-01	2.16E-01		pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Lead-214	EPA 901.1 Modified	5.52E-01	1.26E-01	1.29E-01	1.87E-01		pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Promethium-145	EPA 901.1 Modified	-4.24E-03	1.40E-01	1.40E-01	2.04E-01	U	pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Radium-226	EPA 901.1 Modified	4.22E-01	1.74E-01	1.75E-01	2.59E-01		pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Antimony-125	EPA 901.1 Modified	1.52E-01	1.57E-01	1.58E-01	2.46E-01	U	pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Thorium-234	EPA 901.1 Modified	3.47E-01	7.71E-01	7.71E-01	1.14E+00	U	pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Thallium-208	EPA 901.1 Modified	4.46E-01	1.70E-01	1.71E-01	2.36E-01		pCi/g
19-09132-12	TRG	L2-10212A-FSGS-004-SS-A	07/24/19 09:26	9/23/2019	10/10/2019	19-09132	Uranium-235	EPA 901.1 Modified	6.77E-02	2.35E-01	2.35E-01	3.55E-01	U	pCi/g

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

Eberline Analytical
Final Report of Analysis

Report To:	Work Order Details:	
Patricia Giza	SDG:	19-09132
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
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Actinium-228	EPA 901.1 Modified	4.19E-01	1.42E-01	1.44E-01	2.40E-01		pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Silver-108m	EPA 901.1 Modified	4.70E-03	2.23E-02	2.23E-02	4.75E-02	U	pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Americium-241	EPA 901.1 Modified	8.33E-02	9.09E-02	9.10E-02	1.29E-01	U	pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Barium-133	EPA 901.1 Modified	-9.81E-03	2.43E-02	2.43E-02	6.46E-02	U	pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Bismuth-214	EPA 901.1 Modified	4.09E-01	1.10E-01	1.12E-01	1.74E-01		pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Cobalt-60	EPA 901.1 Modified	-6.46E-03	5.07E-02	5.07E-02	5.75E-02	U	pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Cesium-134	EPA 901.1 Modified	-4.06E-04	2.61E-02	2.61E-02	5.22E-02	U	pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Cesium-137	EPA 901.1 Modified	1.99E-01	5.83E-02	5.92E-02	6.91E-02		pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Europium-152	EPA 901.1 Modified	5.09E-03	7.51E-02	7.51E-02	1.52E-01	U	pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Europium-154	EPA 901.1 Modified	-4.48E-02	1.22E-01	1.22E-01	8.17E-02	U	pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Europium-155	EPA 901.1 Modified	8.44E-02	6.20E-02	6.21E-02	1.22E-01	U	pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Holmium-166m	EPA 901.1 Modified	1.57E-02	5.83E-02	5.83E-02	6.16E-02	U	pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Iodine-129	EPA 901.1 Modified	4.77E+00	1.98E+01	1.98E+01	2.25E+00	U	pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Potassium-40	EPA 901.1 Modified	7.68E+00	1.37E+00	1.42E+00	1.13E+00		pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Manganese-54	EPA 901.1 Modified	-2.82E-02	3.78E-02	3.78E-02	5.07E-02	U	pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Molybdenum-93	EPA 901.1 Modified	3.92E-03	3.60E-02	3.60E-02	5.13E-02	U	pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Niobium-94	EPA 901.1 Modified	1.88E-02	3.20E-02	3.21E-02	5.67E-02	U	pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Lead-210	EPA 901.1 Modified	1.03E+00	1.13E+00	1.13E+00	1.87E+00	U	pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Lead-212	EPA 901.1 Modified	3.75E-01	8.90E-02	9.10E-02	1.63E-01		pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Lead-214	EPA 901.1 Modified	4.35E-01	1.09E-01	1.11E-01	1.79E-01		pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Promethium-145	EPA 901.1 Modified	3.79E-01	4.99E-01	4.99E-01	6.80E-01	U	pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Radium-226	EPA 901.1 Modified	4.09E-01	1.10E-01	1.12E-01	1.74E-01		pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Antimony-125	EPA 901.1 Modified	4.52E-02	8.56E-02	8.56E-02	1.51E-01	U	pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Thorium-234	EPA 901.1 Modified	-3.39E-01	9.33E-01	9.34E-01	1.18E+00	U	pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Thallium-208	EPA 901.1 Modified	2.27E-01	7.99E-02	8.08E-02	9.70E-02		pCi/g
19-09132-13	TRG	L2-10212A-FQGS-005-SS-A	07/24/19 09:28	9/23/2019	10/10/2019	19-09132	Uranium-235	EPA 901.1 Modified	-6.47E-02	1.19E-01	1.19E-01	3.24E-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: 19-09132
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
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Actinium-228	EPA 901.1 Modified	5.84E-01	2.04E-01	2.06E-01	4.31E-01		pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Silver-108m	EPA 901.1 Modified	2.11E-03	2.87E-02	2.87E-02	7.11E-02	U	pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Americium-241	EPA 901.1 Modified	-1.20E-01	8.39E-02	8.41E-02	1.13E-01	U	pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Barium-133	EPA 901.1 Modified	-6.50E-03	4.04E-02	4.04E-02	1.21E-01	U	pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Bismuth-214	EPA 901.1 Modified	4.77E-01	1.47E-01	1.49E-01	2.32E-01		pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Cobalt-60	EPA 901.1 Modified	-7.29E-02	8.97E-02	8.98E-02	1.26E-01	U	pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Cesium-134	EPA 901.1 Modified	2.95E-02	3.52E-02	3.53E-02	1.05E-01	U	pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Cesium-137	EPA 901.1 Modified	1.16E-01	6.98E-02	7.00E-02	1.09E-01		pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Europium-152	EPA 901.1 Modified	-1.41E-01	1.98E-01	1.98E-01	1.65E-01	U	pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Europium-154	EPA 901.1 Modified	-1.19E-01	2.69E-01	2.69E-01	8.62E-02	U	pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Europium-155	EPA 901.1 Modified	6.57E-02	9.08E-02	9.09E-02	1.35E-01	U	pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Holmium-166m	EPA 901.1 Modified	-2.38E-02	9.07E-02	9.07E-02	6.81E-02	U	pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Iodine-129	EPA 901.1 Modified	1.06E-01	1.91E-01	1.91E-01	2.82E-01	U	pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Potassium-40	EPA 901.1 Modified	1.77E+01	3.40E+00	3.52E+00	1.43E+00		pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Manganese-54	EPA 901.1 Modified	8.29E-03	6.56E-02	6.56E-02	1.04E-01	U	pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Molybdenum-93	EPA 901.1 Modified	-1.55E-02	4.72E-02	4.72E-02	7.24E-02	U	pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Niobium-94	EPA 901.1 Modified	-2.98E-02	5.62E-02	5.62E-02	7.31E-02	U	pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Lead-210	EPA 901.1 Modified	1.06E+00	9.96E-01	9.97E-01	1.65E+00	U	pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Lead-212	EPA 901.1 Modified	6.18E-01	1.17E-01	1.22E-01	2.01E-01		pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Lead-214	EPA 901.1 Modified	6.09E-01	1.26E-01	1.29E-01	1.78E-01		pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Promethium-145	EPA 901.1 Modified	3.92E-02	1.25E-01	1.25E-01	1.86E-01	U	pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Radium-226	EPA 901.1 Modified	4.77E-01	1.47E-01	1.49E-01	2.32E-01		pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Antimony-125	EPA 901.1 Modified	-2.03E-02	1.64E-01	1.64E-01	2.22E-01	U	pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Thorium-234	EPA 901.1 Modified	1.06E+00	7.43E-01	7.45E-01	1.13E+00	U	pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Thallium-208	EPA 901.1 Modified	5.35E-01	1.78E-01	1.80E-01	2.52E-01		pCi/g
19-09132-14	TRG	L1-10209A-FSGS-015-SS-A	08/01/19 07:30	9/23/2019	10/10/2019	19-09132	Uranium-235	EPA 901.1 Modified	2.93E-02	2.48E-01	2.48E-01	3.68E-01	U	pCi/g

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Eberline Analytical
Final Report of Analysis

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Zion Solutions
2701 Deborah Ave
Zion, IL 60099

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Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Actinium-228	EPA 901.1 Modified	4.66E-01	2.22E-01	2.24E-01	4.63E-01		pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Silver-108m	EPA 901.1 Modified	5.60E-03	5.10E-02	5.10E-02	6.90E-02	U	pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Americium-241	EPA 901.1 Modified	-2.25E-02	1.01E-01	1.01E-01	2.03E-01	U	pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Barium-133	EPA 901.1 Modified	1.39E-02	5.66E-02	5.66E-02	1.14E-01	U	pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Bismuth-214	EPA 901.1 Modified	7.55E-01	1.84E-01	1.88E-01	2.76E-01		pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Cobalt-60	EPA 901.1 Modified	-4.47E-03	7.54E-02	7.54E-02	1.17E-01	U	pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Cesium-134	EPA 901.1 Modified	6.76E-03	2.07E-02	2.07E-02	7.15E-02	U	pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Cesium-137	EPA 901.1 Modified	1.31E+00	2.00E-01	2.11E-01	1.15E-01		pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Europium-152	EPA 901.1 Modified	3.28E-02	1.56E-01	1.56E-01	2.57E-01	U	pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Europium-154	EPA 901.1 Modified	1.16E-01	2.04E-01	2.04E-01	1.28E-01	U	pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Europium-155	EPA 901.1 Modified	1.55E-01	1.50E-01	1.50E-01	2.30E-01	U	pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Holmium-166m	EPA 901.1 Modified	-1.86E-03	1.12E-01	1.12E-01	1.06E-01	U	pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Iodine-129	EPA 901.1 Modified	5.68E+00	2.38E+01	2.38E+01	3.65E+00	U	pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Potassium-40	EPA 901.1 Modified	1.26E+01	2.10E+00	2.20E+00	1.30E+00		pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Manganese-54	EPA 901.1 Modified	3.84E-02	6.15E-02	6.15E-02	1.06E-01	U	pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Molybdenum-93	EPA 901.1 Modified	-6.23E-03	5.82E-02	5.82E-02	7.79E-02	U	pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Niobium-94	EPA 901.1 Modified	3.19E-02	4.42E-02	4.43E-02	8.24E-02	U	pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Lead-210	EPA 901.1 Modified	5.61E+00	2.89E+00	2.90E+00	4.42E+00	U	pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Lead-212	EPA 901.1 Modified	5.17E-01	1.35E-01	1.37E-01	3.67E-01		pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Lead-214	EPA 901.1 Modified	7.49E-01	1.86E-01	1.90E-01	2.84E-01		pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Promethium-145	EPA 901.1 Modified	1.18E+00	9.46E-01	9.48E-01	1.18E+00	U	pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Radium-226	EPA 901.1 Modified	7.55E-01	1.84E-01	1.88E-01	2.76E-01		pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Antimony-125	EPA 901.1 Modified	5.57E-02	1.70E-01	1.70E-01	2.93E-01	U	pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Thorium-234	EPA 901.1 Modified	1.83E+00	1.76E+00	1.76E+00	2.92E+00	U	pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Thallium-208	EPA 901.1 Modified	3.83E-01	1.25E-01	1.26E-01	1.57E-01		pCi/g
19-09132-15	TRG	L1-10209A-FIGS-003-SS-A	08/01/19 12:34	9/23/2019	10/10/2019	19-09132	Uranium-235	EPA 901.1 Modified	-3.13E-01	4.44E-01	4.44E-01	5.43E-01	U	pCi/g

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Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Actinium-228	EPA 901.1 Modified	5.56E-01	2.13E-01	2.15E-01	4.45E-01		pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Silver-108m	EPA 901.1 Modified	8.10E-03	3.27E-02	3.27E-02	7.60E-02	U	pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Americium-241	EPA 901.1 Modified	-1.51E-01	9.20E-02	9.23E-02	1.19E-01	U	pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Barium-133	EPA 901.1 Modified	-3.66E-03	2.92E-02	2.92E-02	1.12E-01	U	pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Bismuth-214	EPA 901.1 Modified	5.99E-01	1.63E-01	1.66E-01	2.43E-01		pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Cobalt-60	EPA 901.1 Modified	-3.69E-02	8.52E-02	8.52E-02	1.07E-01	U	pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Cesium-134	EPA 901.1 Modified	2.09E-03	1.85E-02	1.85E-02	1.03E-01	U	pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Cesium-137	EPA 901.1 Modified	1.25E-01	7.13E-02	7.16E-02	1.10E-01		pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Europium-152	EPA 901.1 Modified	-2.02E-01	2.14E-01	2.14E-01	1.72E-01	U	pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Europium-154	EPA 901.1 Modified	-2.16E-01	2.19E-01	2.19E-01	8.78E-02	U	pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Europium-155	EPA 901.1 Modified	1.13E-01	1.11E-01	1.11E-01	1.71E-01	U	pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Holmium-166m	EPA 901.1 Modified	-1.23E-02	9.05E-02	9.05E-02	7.31E-02	U	pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Iodine-129	EPA 901.1 Modified	1.43E-01	2.05E-01	2.05E-01	3.02E-01	U	pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Potassium-40	EPA 901.1 Modified	1.89E+01	3.58E+00	3.71E+00	8.93E-01		pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Manganese-54	EPA 901.1 Modified	7.70E-03	6.52E-02	6.52E-02	1.08E-01	U	pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Molybdenum-93	EPA 901.1 Modified	2.18E-02	4.94E-02	4.94E-02	8.31E-02	U	pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Niobium-94	EPA 901.1 Modified	-1.63E-02	5.34E-02	5.34E-02	7.83E-02	U	pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Lead-210	EPA 901.1 Modified	1.03E+00	1.05E+00	1.05E+00	1.74E+00	U	pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Lead-212	EPA 901.1 Modified	5.15E-01	1.07E-01	1.10E-01	2.02E-01		pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Lead-214	EPA 901.1 Modified	5.36E-01	1.16E-01	1.19E-01	1.81E-01		pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Promethium-145	EPA 901.1 Modified	-9.28E-03	1.38E-01	1.38E-01	2.00E-01	U	pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Radium-226	EPA 901.1 Modified	5.99E-01	1.63E-01	1.66E-01	2.43E-01		pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Antimony-125	EPA 901.1 Modified	-7.60E-03	1.56E-01	1.56E-01	2.18E-01	U	pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Thorium-234	EPA 901.1 Modified	1.62E+00	7.88E-01	7.92E-01	1.23E+00	U	pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Thallium-208	EPA 901.1 Modified	2.99E-01	1.79E-01	1.80E-01	2.83E-01		pCi/g
19-09132-16	TRG	L1-10209A-FIGS-005-SS-A	08/01/19 12:38	9/23/2019	10/10/2019	19-09132	Uranium-235	EPA 901.1 Modified	1.27E-01	2.55E-01	2.55E-01	3.87E-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: 19-09132
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
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Actinium-228	EPA 901.1 Modified	2.09E-01	1.65E-01	1.66E-01	3.45E-01	U	pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Silver-108m	EPA 901.1 Modified	2.05E-02	3.15E-02	3.15E-02	4.49E-02	U	pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Americium-241	EPA 901.1 Modified	-2.42E-03	8.71E-02	8.71E-02	1.14E-01	U	pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Barium-133	EPA 901.1 Modified	5.51E-03	2.21E-02	2.22E-02	6.20E-02	U	pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Bismuth-214	EPA 901.1 Modified	3.29E-01	8.09E-02	8.26E-02	1.83E-01		pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Cobalt-60	EPA 901.1 Modified	-2.54E-02	5.02E-02	5.02E-02	7.10E-02	U	pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Cesium-134	EPA 901.1 Modified	-2.24E-02	3.28E-02	3.28E-02	4.68E-02	U	pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Cesium-137	EPA 901.1 Modified	1.26E-01	6.63E-02	6.66E-02	1.02E-01		pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Europium-152	EPA 901.1 Modified	-4.35E-02	1.42E-01	1.42E-01	1.44E-01	U	pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Europium-154	EPA 901.1 Modified	3.32E-02	9.54E-02	9.54E-02	7.55E-02	U	pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Europium-155	EPA 901.1 Modified	8.50E-02	6.14E-02	6.16E-02	9.27E-02	U	pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Holmium-166m	EPA 901.1 Modified	4.30E-02	5.82E-02	5.82E-02	5.69E-02	U	pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Iodine-129	EPA 901.1 Modified	4.92E+00	2.03E+01	2.03E+01	1.96E+00	U	pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Potassium-40	EPA 901.1 Modified	1.04E+01	1.54E+00	1.63E+00	7.96E-01		pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Manganese-54	EPA 901.1 Modified	6.58E-03	3.89E-02	3.89E-02	6.18E-02	U	pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Molybdenum-93	EPA 901.1 Modified	7.05E-03	2.70E-02	2.70E-02	4.19E-02	U	pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Niobium-94	EPA 901.1 Modified	5.55E-03	2.32E-02	2.32E-02	4.87E-02	U	pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Lead-210	EPA 901.1 Modified	1.35E+00	1.44E+00	1.44E+00	2.38E+00	U	pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Lead-212	EPA 901.1 Modified	3.12E-01	7.47E-02	7.64E-02	2.23E-01		pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Lead-214	EPA 901.1 Modified	3.62E-01	1.06E-01	1.08E-01	1.80E-01		pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Promethium-145	EPA 901.1 Modified	1.95E-01	3.77E-01	3.77E-01	5.73E-01	U	pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Radium-226	EPA 901.1 Modified	3.29E-01	8.09E-02	8.26E-02	1.83E-01		pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Antimony-125	EPA 901.1 Modified	1.10E-03	7.40E-02	7.40E-02	1.26E-01	U	pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Thorium-234	EPA 901.1 Modified	9.18E-01	8.08E-01	8.09E-01	1.15E+00	U	pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Thallium-208	EPA 901.1 Modified	2.43E-01	8.02E-02	8.12E-02	1.47E-01		pCi/g
19-09132-17	TRG	L1-10209B-FSGS-012-SS-A	07/31/19 12:52	9/23/2019	10/10/2019	19-09132	Uranium-235	EPA 901.1 Modified	3.70E-02	2.52E-01	2.52E-01	3.33E-01	U	pCi/g

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

Eberline Analytical
Final Report of Analysis

Report To:	Work Order Details:	
Patricia Giza	SDG:	19-09132
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
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Actinium-228	EPA 901.1 Modified	5.29E-01	1.97E-01	1.99E-01	6.49E-01	U	pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Silver-108m	EPA 901.1 Modified	-1.77E-02	6.44E-02	6.44E-02	8.20E-02	U	pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Americium-241	EPA 901.1 Modified	-7.58E-02	9.69E-02	9.70E-02	1.34E-01	U	pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Barium-133	EPA 901.1 Modified	3.00E-02	3.53E-02	3.54E-02	1.32E-01	U	pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Bismuth-214	EPA 901.1 Modified	6.90E-01	1.99E-01	2.02E-01	3.06E-01		pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Cobalt-60	EPA 901.1 Modified	2.13E-02	8.86E-02	8.86E-02	1.49E-01	U	pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Cesium-134	EPA 901.1 Modified	-2.03E-01	1.13E-01	1.13E-01	1.19E-01	U	pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Cesium-137	EPA 901.1 Modified	1.02E-01	8.73E-02	8.74E-02	1.42E-01	U	pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Europium-152	EPA 901.1 Modified	6.37E-02	1.62E-01	1.62E-01	1.93E-01	U	pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Europium-154	EPA 901.1 Modified	-4.95E-02	2.41E-01	2.41E-01	1.00E-01	U	pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Europium-155	EPA 901.1 Modified	2.35E-01	1.12E-01	1.12E-01	1.96E-01		pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Holmium-166m	EPA 901.1 Modified	2.76E-03	9.35E-02	9.35E-02	7.73E-02	U	pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Iodine-129	EPA 901.1 Modified	1.08E-01	2.28E-01	2.28E-01	3.37E-01	U	pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Potassium-40	EPA 901.1 Modified	1.77E+01	3.57E+00	3.69E+00	1.81E+00		pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Manganese-54	EPA 901.1 Modified	1.41E-02	6.07E-02	6.07E-02	1.03E-01	U	pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Molybdenum-93	EPA 901.1 Modified	-5.58E-02	5.49E-02	5.50E-02	7.06E-02	U	pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Niobium-94	EPA 901.1 Modified	4.16E-02	5.59E-02	5.59E-02	8.94E-02	U	pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Lead-210	EPA 901.1 Modified	1.57E+00	1.21E+00	1.21E+00	1.99E+00	U	pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Lead-212	EPA 901.1 Modified	8.09E-01	1.61E-01	1.66E-01	1.98E-01		pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Lead-214	EPA 901.1 Modified	5.77E-01	1.38E-01	1.41E-01	2.16E-01		pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Promethium-145	EPA 901.1 Modified	-4.45E-02	1.49E-01	1.49E-01	2.14E-01	U	pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Radium-226	EPA 901.1 Modified	6.90E-01	1.99E-01	2.02E-01	3.06E-01		pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Antimony-125	EPA 901.1 Modified	1.46E-01	1.76E-01	1.76E-01	2.70E-01	U	pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Thorium-234	EPA 901.1 Modified	5.15E-01	8.46E-01	8.47E-01	1.27E+00	U	pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Thallium-208	EPA 901.1 Modified	5.74E-01	2.22E-01	2.24E-01	3.26E-01		pCi/g
19-09132-18	TRG	L1-10209B-FSGS-015-SS-A	07/31/19 12:58	9/23/2019	10/10/2019	19-09132	Uranium-235	EPA 901.1 Modified	2.30E-02	2.81E-01	2.81E-01	4.16E-01	U	pCi/g

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

ZIONSOLUTIONS LLC
An Energy Solutions Company

19-09132

REC'D SEP 23 2019

ZS-WM-131
Revision 0
Information Use

L1-10203D-FQGS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	4/9/2019	0805	5 ROC HTD	NA	868.92g
L1-10203E-FSGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	4/8/2019	1230	5 ROC HTD	NA	813.36g
L1-10203E-FSGS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	4/8/2019	1235	5 ROC HTD	NA	702.73g
L1-10221A-FIGS-007-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	1025	5 ROC HTD	NA	874.41g
L1-10221A-FSGS-002-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	1400	5 ROC HTD	NA	1109.56g
L1-10221A-FSGS-108-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/23/2019	1244	5 ROC HTD	NA	918.06g
L1-10221A-FSGS-110-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/23/2019	1248	5 ROC HTD	NA	805.48g
L1-10221A-FSGS-112-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/23/2019	1252	5 ROC HTD	NA	1136.57g
L1-10221C-FSGS-013-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	1520	5 ROC HTD	NA	825.45g
L1-10221D-FIGS-010-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/30/2019	0906	5 ROC HTD	NA	599.72g
L1-10209C-FSGS-010-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/5/2019	0820	5 ROC HTD	NA	1051.63g
L1-10209C-FQGS-010-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/5/2019	0820	5 ROC HTD	NA	795.39g
L1-10209C-FSGS-004-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/30/2019	1327	5 ROC HTD	NA	709.07g
4 L1-10209C-FQGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/25/2019	1300	5 ROC HTD	NA	1062.99g
5 L1-10209C-FIGS-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/25/2019	1306	5 ROC HTD	NA	945.02g
6 L1-10209C-FIGS-006-SB-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/30/2019	1240	5 ROC HTD	NA	752.63g
7 L2-10213A-FSGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	0730	5 ROC HTD	NA	663.96g
8 L2-10213A-FSGS-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	0734	5 ROC HTD	NA	865.77g
9 L2-10213A-FSGS-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	0736	5 ROC HTD	NA	773.20g

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10	L2-10213A-FSC S-006-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	0740	5 ROC HTD	NA	557.39g
11	L2-10213A-FSC S-008-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/29/2019	0744	5 ROC HTD	NA	786.34g
12	L2-10212A-FSC S-004-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/24/2019	0926	5 ROC HTD	NA	721.45g
13	L2-10212A-FQC S-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/24/2019	0928	5 ROC HTD	NA	874.00g
14	L1-10209A-FSC S-015-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/1/2019	0730	5 ROC HTD	NA	1030.47g
15	L1-10209A-FIC S-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/1/2019	1234	5 ROC HTD	NA	584.59g
16	L1-10209A-FIC S-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	8/1/2019	1238	5 ROC HTD	NA	824.17g
17	L1-10209B-FSC S-012-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/31/2019	1252	5 ROC HTD	NA	832.32g
18	L1-10209B-FSC S-015-SS-A	NA	NA	SOIL	500	ml	MARINELLI	1	7/31/2019	1258	5 ROC HTD	NA	819.48g

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Rec'd 9-23-19 @ 1045

ZIONSOLUTIONS LLC
An EnergySolutions Company

19-09132 REC'D SEP 23 2019

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

Relinquished by:	Date (mm/dd/yyyy):	Time:	Received by:	Date: (mm/dd/yyyy):	
Jack Mucia	9/18/19	0805	Richard F. Rickert	09/18/2019	0805
Relinquished by:	Date (mm/dd/yyyy):	Time:	Received by:	Date: (mm/dd/yyyy):	
Richard F. Rickert	09/19/2019	1000	Fed Ex Ground	09/19/2019	1000
Relinquished by:	Date (mm/dd/yyyy):	Time:	Received by:	Date: (mm/dd/yyyy):	
Fedex Ground			Randolph Spencer	9/23/2019	1045
Relinquished by:	Date (mm/dd/yyyy):	Time:	Received by:	Date: (mm/dd/yyyy):	

Comments

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