



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

**WASTE WATER TREATMENT FACILITY
SURVEY UNIT 09100**



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LIST OF ACRONYMS AND ABBREVIATIONS

ALARA	As Low As Reasonably Achievable
AMCG	Average Member of the Critical Group
BcDCGL	Base Case Derived Concentration Guideline Level
BcSOF	Base Case Sum-of-Fraction
BFM	Basement Fill Model
CoC	Chain-of-Custody
DQA	Data Quality Assessment
DQO	Data Quality Objective
DCGL	Derived Concentration Guideline Level
EMC	Elevated Measurement Comparison
FSS	Final Status Survey
GPS	Global Positioning System
HTD	Hard-to-Detect
IC	Insignificant Contributor
LTP	License Termination Plan
LBGR	Lower Bound of the Gray Region
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	Minimum Detectable Concentration
MDCR	Minimal Detectable Count Rate
NAD	North American Datum
NaI	Sodium Iodide
OpDCGL	Operational Derived Concentration Guideline Level
OpSOF	Operational Sum-of-Fraction
QAPP	Quality Assurance Project Plan
QC	Quality Control
RE	Radiological Engineer
ROC	Radionuclides of Concern

SOF	Sum-of-Fraction
TEDE	Total Effective Dose Equivalent
UBGR	Upper Bound of the Gray Region
UCL	Upper Confidence Level
USNRC	United States Nuclear Regulatory Commission
VCC	Vertical Concrete Cask
VSP	Visual Sample Plan
WWTF	Waste Water Treatment Facility
ZNPS	Zion Nuclear Power Station
ZSRP	Zion Station Restoration Project

1. EXECUTIVE SUMMARY

This Final Status Survey (FSS) Release Record for Survey Unit #B1-09100AF, Waste Water Treatment Facility (WWTF), has been generated for the Zion Station Restoration Project (ZSRP) in accordance with ZionSolutions procedure ZS-LT-300-001-005, “*Final Status Survey Data Reporting*” (Reference 1) and satisfies the requirements of Section 5.11 of the “*Zion Station Restoration Project License Termination Plan*” (LTP) (Reference 2).

Final Status Survey (FSS) sample plans for each of these survey units were developed in accordance with ZionSolutions procedure ZS-LT-300-001-001, “*Final Status Survey Package Development*” (Reference 3), the ZSRP LTP, and guidance from NUREG-1575, Revision 1, “*Multi-Agency Radiation Survey and Site Investigation Manual*” (MARSSIM) (Reference 4).

In accordance with ZSRP LTP Chapter 5, section 5.5.2.1.2 and Table 5-19, the WWTF survey unit has a MARSSIM classification of 1. Survey plans were 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. The Canberra *In Situ* Object Counting System (ISOCS) was selected as the primary instrument used to perform FSS of the WWTF survey unit. As a Class 1 survey unit, ISOCS measurement locations were designated to ensure 100% areal coverage of all accessible structural surfaces within the survey unit.

Based on a measurement Field-of-View (FOV) of 28 m² for each ISOCS measurement, it was initially determined that fifty four (54) ISOCS measurements were required to ensure 100% areal coverage of the WWTF.

Minor modifications to the designed sample plan were required based on the “as-left” conditions of the WWTF demolition to the 588 ft. elevation. Some measurement locations were eliminated due to the final configuration of the WWTF. Additional measurement locations were added to ensure 100% areal coverage within the survey unit. After making those adjustments to the sample plan, a total of seventy-four (74) ISOCS measurements were taken; seventy (70) systematic measurements on the floor, walls, and sumps in addition to four (4) QC samples.

The results for all ISOCS measurements taken in the WWTF survey unit indicate that the Sum-of-Fractions (SOF) for each measurement, considering the concentration of all applicable ROC, either by direct measurement or by inference, is less than one (1) when applying the respective Operational Derived Concentration Guideline Levels (OpDCGL) for the Containment Basements (ZionSolutions Technical Support Document (TSD) 17-004, “*Operational Derived Concentration Guideline Levels for FSS*” [Reference 5]).

Therefore the null hypothesis is rejected and the WWTF survey unit (Survey Unit #B1-09100AF) is acceptable for unrestricted release.

2. SURVEY UNIT DESCRIPTION

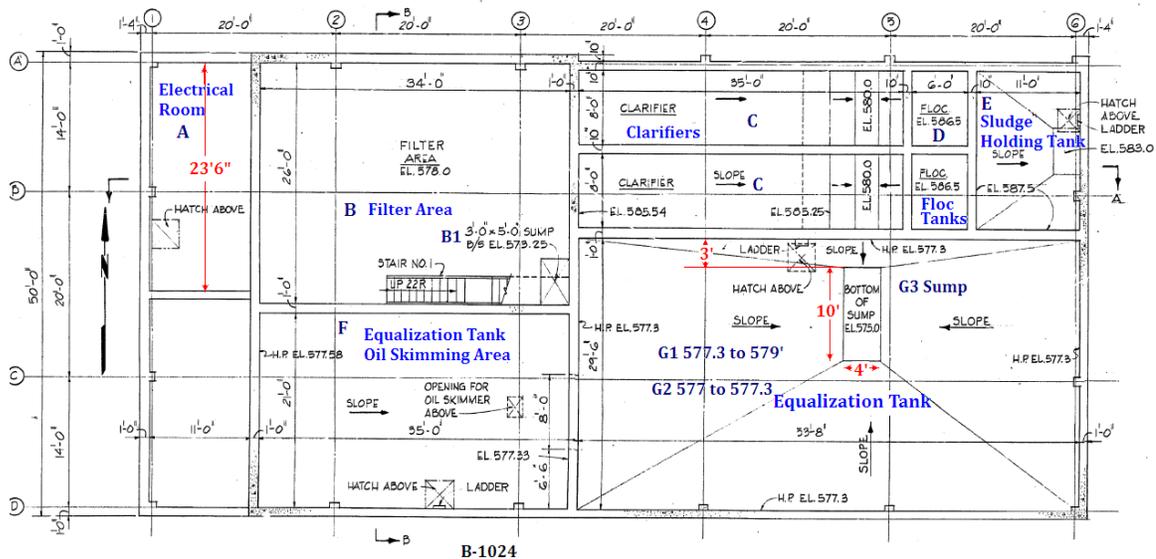
The Wastewater Treatment Facility (WWTF) was designed to treat non-radioactive and low-level radioactive liquid from Zion Nuclear Power Station (ZNPS) sources including building roof run-off and the Turbine Building Fire Sump, which received liquid waste from the Turbine Building Equipment and Floor Drains, and the Fuel Pool Cooling Tower Blowdown. The WWTF was designed to remove suspended solids and oil to ensure compliance with the facility National Pollutant Discharge Elimination System (NPDES) permit. Since the wastewater discharge rates were variable, an equalization tank was installed. The WWTF also included other equipment such as mixing tanks, mixers, oil skimmers, flocculators, oil coalescers, clarifiers, sludge drying beds and filters. Discharge from the WWTF was by gravity to the Forebay. During ZNPS operations, liquid waste with detectable low-level radioactive contamination was processed by the WWTF. Consequently, the internal surfaces of the WWTF systems were considered to be potentially contaminated.

All systems, component and materials associated with the WWTF that were identified by radiological survey as contaminated with detectable plant-derived radioactive material were removed by *ZionSolutions* personnel and dispositioned and properly disposed of as radioactive waste. The remaining structure was then made “Cold, Dark and Dry”. Once this was complete, all remaining commodities and all structural surfaces were demolished to a depth of 3 feet below grade.

Once the remaining concrete structure located below 3 feet below grade (588 foot elevation) has been satisfactorily surveyed and compliance with the unrestricted release criteria has been demonstrated and, contingent upon the completion of confirmatory surveys, the WWTF void will be backfilled using concrete debris suitable for reuse as clean hard fill and/or clean fill to the original site grade and contours. The top 3 feet of fill will be soil only (i.e. concrete clean hard fill will only be utilized as fill up to the 588 foot elevation).

The Waste Water Treatment Facility (WWTF) end state consists of concrete settling and equalization tanks, clarifiers, flocculant (FLOC) and sludge tanks with sloped bottoms as seen in the top view of the WWTF basement in Figure 1. (*ZionSolutions* TSD 14-014, “*End State Surface Areas, Volumes, and Source Terms of Ancillary Buildings*” [Reference 6]).

Figure 1 - Waste Water Treatment Facility Top View from Drawing B-1024



The northeast portion of the WWTF contained two (north and south) Clarifiers and Flocculant Tanks and a single Sludge Holding Tank. Each Clarifier consists of a mildly sloped floor and is 8 feet wide. There is a pit with angled east and west walls and a 2.5 feet wide floor. A 6 inch opening in the East wall above the pit allows flow to the Flocculant Tank.

The west wall of the Clarifier Pit has an average width of 2 feet with a depth of approximately 5 feet. The concrete spans the 18 foot, 6 inch width of the structure. Similarly the East wall of the pit has an average width of 1 foot 6 inches plus 10 inches or 2.33 feet with a depth of 5.67 feet which with a 18 foot, 6 inch width. Between the walls, the pit floor is 2.5 feet long by 18 feet, 6 inch wide and 1 foot thick. The north and south walls of the clarifier are 10 inches thick and the north wall has an additional 10 inches thick outer layer.

The north and south FLOC Tanks are 6 feet long by 8 feet wide and 1.5 feet deep. The west wall has a 6 inch opening and is only 1 foot deep.

The Sludge Holding Tank wall slopes from the 587.5 foot elevation to the 583 foot elevation and has a tank interior that is 11 feet by 16 feet 10 inches.

The basic decommissioning end-state for the WWTF is for the walls, floor, and sumps/pits below the 588 foot elevation to remain. Most of the end state concrete below the 588 foot elevation is above the 579 foot water table. However, after FSS is complete, the floors of the structures will be perforated to ensure they can equilibrate with the water table and

will not overflow the structure at the 588 foot elevation. Figures 2 and 3 illustrate the WWTF conditions after demolition and prior to FSS.

Figure 2 - Waste Water Treatment Facility after Demolition



Figure 3 - Waste Water Treatment Facility Conditions at FSS



3. CLASSIFICATION BASIS

The Waste Water Treatment Facility (WWTF) was constructed and placed into service in the fall of 1978. The design purpose of the WWTF was to receive the discharges from the fire sump and the heater bay roof drains. Due to the contamination of the fire sump (as a

result of primary to secondary leakage), many portions of the WWTF systems contained trace levels of radioactive contaminants.

Sections of the subfloor on the south side of the building were posted for radioactive materials. Additionally, due to the system design and operation, organic contaminants (mainly turbine oil) were assumed to be present throughout the building and components. Piping below floor on south side of the building was labeled as radioactive.

The following summary of processes and incidents was obtained from the “*Zion Station Historical Site Assessment*” (HSA) (Reference 7) and other sources:

- About 10/1/1978 – the fire sump discharge and the heater bay roof drains were rerouted to the newly completed WWTF in accordance with a commitment to the EPA. The facility was designed to reduce solids in the plant discharge. (NRC IR 78-26/78-26)
- On 11/16/1996 – approximately 1000 gallons of turbine oil was sent to the fire sump and the WWTF. (PIF 96-4264)
- On 12/6/1996 – approximately 100 gallons of turbine oil was sent to the fire sump and the WWTF. (PIF 96-4665)
- 05/22/2017 – approximately 2 gallons of low level radioactive water leaked onto the ground at north end of a tent located north of the WWTF. (Condition Report ES-ZION-CR-2017-0073)
- 05/10/2018 – Routine RP survey (2018-1480) conducted in WWTF indicated contact dose rates up to 88 mRem/hr on a HIC.
- 05/24/2018 – Survey unit area classification revised from Class 3 to Class 1 in LTP to reflect the use of WWTF as a radioactive material storage area.

No initial characterization was performed on the WWTF as the systems remained active throughout decommissioning up to the point of building demolition. Based on the building design basis and the operating history, the WWTF was given an initial classification of Class 3 in the HSA. However, during decommissioning, the facility was used as a radioactive material storage area for unpackaged radioactive wastes. Consequently, LTP, Revision 2 section 5.5.2.1 and Table 5-18 identifies the WWTF as a Class 1 area requiring 100% areal coverage.

4. DATA QUALITY OBJECTIVES (DQO)

Final Status Survey planning and design hinges on coherence with the Data Quality Objective (DQO) process to ensure, through compliance with explicitly defined inputs and boundaries, that the primary objective of the survey is satisfied. The DQO process 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 was to demonstrate that the level of residual radioactivity in Survey Unit #B1-09100AF did not exceed the release criteria specified in the LTP and that the potential dose from residual radioactivity was As Low As Reasonably Achievable (ALARA).

ZionSolutions TSD 11-001, *“Potential Radionuclides of Concern during the Decommissioning of Zion Station”* (Reference 8) established the basis for an initial suite of potential ROC for the decommissioning of the ZNPS. LTP Chapter 2 provides detailed characterization data that described contamination levels in the Containments and Auxiliary Building, which were the primary source of radioactive contaminants. ZionSolutions TSD 14-019, *“Radionuclides of Concern for Soil and Basement Fill Model Source Terms”* (Reference 9) evaluates the results of the concrete core analysis data from the Containments and Auxiliary Building and refines the initial suite of radionuclides potential ROC by evaluating the dose significance of each radionuclide.

The final Radionuclides-of-Concern (ROC) for the decommissioning of Zion are Co-60, Cs-134 and Cs-137 (as well as Eu-152 and Eu-154 for Containment), which are gamma emitters and Ni-63, Sr-90 and H-3 (applicable only to Containment), which are Hard-to-Detect (HTD) radionuclides. LTP section 5.1 states that HTD concentrations will be inferred using a surrogate approach and the maximum ratios from LTP Chapter 5, Table 5-15 unless area-specific ratios as determined by actual survey data are used in lieu of the maximum ratios.

LTP Chapter 6, section 6.5.2 discusses the process used to derive the ROC for the decommissioning of the ZNPS, including the elimination of insignificant dose contributors from the initial suite consistent with the guidance in Section 3.3 of NUREG-1757. Based upon the analysis of the Auxiliary Building mixture in TSD 14-019, Table 19, it was

determined that Co-60, Ni-63, Sr-90, Cs-134 and Cs-137 accounted for 99.5% of all dose in the contaminated concrete mixes. Table 1 presents the ROC for the decommissioning of Auxiliary Building structural surfaces and the normalized mixture fractions based on the radionuclide mixture.

Table 1 - Dose Significant Radionuclides and Mixture

Radionuclide	% of Total Activity (normalized) ⁽¹⁾
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.

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 structures.

The End State Basements are comprised of steel and/or concrete structures which will be covered by at least three feet of clean soil and physically altered to a condition which would not realistically allow the remaining structures, if excavated, to be occupied. The exposure pathways in the Basement Fill Model (BFM) are associated with residual radioactivity in floors and walls that is released through leaching into water contained in the interstitial spaces of the fill material. The BFM assumes that the inventory of residual radioactivity in a given building is released either instantly or over time by diffusion, depending on whether the activity is surficial or volumetric, respectively. The activity released into the fill water will adsorb onto the clean fill, as a function of the radionuclide-specific distribution coefficients, resulting in equilibrium concentrations between the fill and the water. Consequently, the only potential exposure pathways after backfill, assuming the ‘as-left’ geometry, are associated with the residual radioactivity in the water contained in the fill.

The final outputs of the BFM are the Basement Derived Concentration Guideline Levels (DCGL), in units of pCi/m², which are calculated using the BFM Groundwater (GW) and BFM Drilling Spoils Dose Factors. DCGLs are calculated separately for the GW and Drilling Spoils scenarios and for the summation of both scenarios. The summation DCGL

is designated as the Base Case DCGL (BcDCGL) and is used during FSS to demonstrate compliance (analogous to the $DCGL_W$ as defined in MARSSIM). The BcDCGLs are radionuclide-specific concentrations that represent the 10 CFR 20.1402 dose criterion of 25 mrem/year and are calculated for each ROC and each backfilled Basement. Additional information pertaining to the calculation of DCGLs for basement surfaces is provided in LTP Chapter 6, section 6.6.8.

When applied to structures, the DCGLs are expressed in units of activity per unit of area (pCi/m^2). 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 BcDCGLs for the unrestricted release of the WWTF is provided in Table 2. The IC dose percentage of 10% was used to adjust the WWTF DCGLs to account for the dose from the eliminated IC radionuclides.

Table 2 - Base Case DCGLs for WWTF (BcDCGL_B) from LTP Chapter 5, Table 5-3

Radionuclide	Base Case DCGL (pCi/m^2)
Co-60	2.83E+07
Ni-63	2.89E+08
Sr-90	1.03E+05
Cs-134	2.31E+06
Cs-137	2.93E+06

Each radionuclide-specific BcDCGL is equivalent to the level of residual radioactivity (above background levels) that could, when considered independently, result in a Total Effective Dose Equivalent (TEDE) of 25 mrem per year to an Average Member of the Critical Group (AMCG). To ensure that the summation of dose from each source term is 25 mrem/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 (OpDCGL) 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 TSD 17-004.

The Operational DCGLs for the unrestricted release of the WWTF Survey Unit #B1-09100AF and are provided in Table 3.

Table 3 - Operational DCGLs (OpDCGL_B) for WWTF from LTP Chapter 5, Table 5-4

Radionuclide	Operational DCGL (pCi/m²)
Co-60	5.43E+06
Ni-63	5.55E+07
Sr-90	1.98E+04
Cs-134	4.44E+05
Cs-137	5.63E+05

Instrument DQOs included a verification of the ability of the survey instrument to detect the radiation(s) of interest relative to the Operational DCGL. The Canberra ISOCS was selected as the primary instrument used to perform FSS of basement surfaces. Response checks were required prior to issuance and after use. Control and accountability of ISOCS units was required to assure data quality.

As part of the DQOs applied to laboratory processes, analysis results were reported as actual calculated results. The actual recorded value was used as the recorded FSS result for measurement and/or sample values that are less than MDC. Negative values were recorded as “zero”. Results were not reported as “less than MDC”. Sample report summaries included unique sample identification, analytical method, radionuclide, result, uncertainty, laboratory data qualifiers, units, and the observed MDC.

In accordance with the LTP, for laboratory analysis, MDCs less than 10% of the Operational DCGL were preferable while MDCs up to 50% of the Operational DCGL were acceptable. The maximum acceptable MDC for measurements obtained using field instruments was 50 percent of the applicable Operational DCGL.

5. SURVEY DESIGN

Guidance for preparing FSS plans was provided in procedure ZS-LT-300-001-001 “*Final Status Survey Package Development*”. The FSS plan uses an integrated sample design that combines scanning surveys and sampling which can be either random or judgmental.

The Canberra ISOCS was selected as the primary instrument for performing FSS of basement surfaces. The ISOCS was selected as the instrument of choice to perform FSS

of basement surfaces due to the fact that an ISOCS measurement will provide results that can be used directly to determine total activity with depth in concrete and, the surface area covered by a single ISOCS measurement is large (a nominal FOV of 10-30 m²) which essentially eliminates the need for a scan surveys. In addition, after an ISOCS measurement is collected, it can be tested against a variety of geometry assumptions to address uncertainty in the source term geometry if necessary.

The source term geometry for ISOCS efficiency calibration, i.e., concentration depth profile and areal distribution of the residual radioactivity in structures, is required to generate efficiency curves (i.e., efficiency as a function of energy) for the ISOCS gamma spectroscopy measurements. These are provided in *ZionSolutions* TSD 14-022 Revision 2 Addendum 1, “*Use of In-Situ Gamma Spectroscopy for Final Status Survey of End State Structures*” (Reference 10).

As per TSD 14-022, a contamination depth of 0.5 inches (1.27 cm) was suggested for the WWTF with all the activity associated within the one-half inch layer. For the floors and walls of the WWTF, the Geometry Composer Circular Plane Template was used. A source to detector distance of 3.0 meters was selected. While several geometries were created where the source to detector distance was varied from 1 to 3 meters, only the 3 meter distance was necessary. A 90 degree collimator was used resulting in a six meter diameter field of view (FOV) that comprised 28.3 m². Measurements that were conducted using the 3 meter source to detector geometry were indicative of surficial contamination.

There are three sumps located within the WWTF of varying dimensions. In addition, the Clarifier, Flocculator Tank and Sludge Holding Tank exhibited geometries that were not well represented by the 3 meter source to detector geometry. To this end, separate geometries were designed for each using the Geometry Composer “Room” template. This was done to address the anomalies and best represent the geometric dimensions. ISOCS geometries are provided in Attachment 2 of this report.

In section 5.5.2.2 of the LTP, the number of ISOCS measurements required in the WWTF FSS survey unit was calculated as the quotient of the ISOCS FOV divided into the surface area required for areal coverage. Table 4, which is reproduced from LTP Table 5-18, presents the FSS survey unit for the WWTF, the classification based on contamination potential, the surface area to be surveyed and the minimum number of ISOCS measurements based on a measurement FOV of 28 m².

Table 4 - Number of ISOCS Measurements per FSS Unit based on Areal Coverage

FSS Unit	Classification	Area (m ²)	Minimum Areal Coverage (% of Area)	Minimum # of ISOCS Measurements (FOV-28 m ²)
WWTF	Class 1	1,124	100%	40

To ensure that the number of ISOCS measurements based on the necessary areal coverage in a basement surface FSS unit was sufficient to satisfy a statistically based sample design, a calculation was performed and documented in LTP section 5.5.2.2 to determine sample size using the standard method as presented in MARSSIM. If the sample size based on the statistical design required more ISOCS measurements than the number of ISOCS measurement required by the areal coverage, then the number of ISOCS measurements was adjusted to meet the larger sample size.

Following MARSSIM guidance, the Type I and Type II decision errors were set at 0.05. The upper boundary of the gray region was set at the Operational DCGL_B. The Lower Bound of the Gray Region (LBGR) was set at the expected fraction of 50% of the Operational DCGL_B. A reasonable value for sigma (σ) could not be determined based on existing survey data. Therefore, a coefficient of variation of 30% was used in accordance with the guidance in MARSSIM, section 5.5.2.2.

The relative shift (Δ/σ) was calculated as discussed in LTP section 5.6.4.1.6. The relative shift (Δ/σ) was greater than three for the FSS unit. Consequently, a value of three (3) was used for the WWTF as the adjusted relative shift (Δ/σ). From Table 5-5 of MARSSIM, the required number of measurements (N) for use with the Sign Test, using a value of 0.05 for the Type I and Type II decision errors, is 14 measurements for a Δ/σ value of three (3).

As previously noted, the required areal coverage for a Class 1 basement survey unit is 100%. The LTP required that sufficient measurements be taken in a Class 1 FSS unit to ensure that 100% of the surface area was surveyed (ISOCS FOV overlapped to ensure that there were no un-surveyed corners and gaps). In cases where the physical configuration or measurement geometry makes the acquisition of a 28 m² FOV difficult or prohibitive, then the FOV for the ISOCS measurement was reduced provided that the adjusted number of samples remained constant and the minimum areal coverage represented by the FSS unit classification was achieved. To ensure that there were no un-surveyed corners and gaps, the number of measurements that were taken in the WWTF Class 1 FSS unit was adjusted by overlaying the center-point of the 28 m² FOV for the ISOCS measurement on a 4m x 4m (16 m²) grid system. Table 5, which is reproduced from LTP Table 5-19, presents the adjusted number of ISOCS measurements that will be taken in WWTF FSS survey unit.

Table 5 - Adjusted(1) Minimum Number of ISOCS Measurements per FSS Unit

FSS Unit	Classification	Required Areal Coverage (m ²)	Adjusted # of ISOCS Measurements (FOV-28 m ²)	Adjusted Areal Coverage (m ²)	Adjusted Areal Coverage (% of Area)
WWTF	Class 1	1,124	71 ⁽¹⁾	1,124	100%

(1) Adjusted to ensure number of measurements that will be taken in Class 1 FSS units will ensure 100% areal coverage, including overlap to ensure that there are no un-surveyed corners and gaps (FOV based on a 4m x 4m grid system).

When the survey grids were established in the WWTF, obstacles and physical constraints were encountered that prompted further adjustments to the number of samples and the FOV. Some measurements were not feasible and other measurement locations were added. After adjustments to the survey design, a total of seventy-five (75) ISOCS measurements were taken in the WWTF.

The DQO process determined that Co-60, Ni-63, Sr-90, Cs-134 and Cs-137 would be the ROC in the WWTF FSS survey unit #B1-09100AF. During FSS, concentrations for HTD ROC Ni-63 and Sr-90 were to be 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 for the WWTF was calculated in TSD 14-019 and are presented in LTP Table 5-15 and Table 6 below. The maximum ratios were to be used to infer HTD concentrations during FSS unless area specific ratios were determined.

Table 6 - Surrogate Ratios for Auxiliary Building

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 #B1-09100AF, the surrogate Operational DCGLs for Co-60 and Cs-137 were computed based on the maximum ratios from Table 6. The equation for calculating a surrogate DCGL is as follows:

Equation 1

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

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

$DCGL_{2,3,\dots,n}$ = 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 Operational DCGLs for the WWTF presented in Table 3 and the maximum ratios from Table 6, the following surrogate calculations were performed for FSS unit #B1-09100AF;

Equation 2

$$Surrogate_{DCGL (Cs-137)} = \frac{1}{\left[\left(\frac{1}{5.63E + 05_{(Cs-137)}}\right) + \left(\frac{0.002}{1.98E + 04_{(Sr-90)}}\right)\right]} = 5.33E + 05 \text{ pCi/m}^2$$

The surrogate Operational DCGL that was used for Cs-137 in FSS unit #B1-09100AF for direct comparison of sample results to demonstrate compliance is 5.33E+05 pCi/m².

Equation 3

$$Surrogate_{DCGL (Co-60)} = \frac{1}{\left[\left(\frac{1}{5.43E + 06_{(Co-60)}}\right) + \left(\frac{180.450}{5.55E + 07_{(Ni-63)}}\right)\right]} = 2.91E + 05 \text{ pCi/m}^2$$

The surrogate Operational DCGL that was used for Co-60 in FSS unit #B1-09100AF for direct comparison of sample results to demonstrate compliance is 2.91E+05 pCi/m².

LTP section 5.1 discusses the commitment to acquire concrete core samples at 10% of the locations where an ISOCS measurement was collected with the locations selected at random. Only HTD radionuclides included as ROC (Ni-63, Sr-90, for the WWTF) were analyzed in the FSS confirmatory samples. For the WWTF FSS Survey Unit #B1-09100AF, seventy-one (71) ISOCS measurements were required by the survey design. Consequently, eight (8) concrete core samples were taken and analyzed to meet the requirements of LTP section 5.1.

To demonstrate compliance with the unrestricted release criteria in FSS unit #B1-09100AF, 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 Elevated Measurement Comparison (EMC) does not apply to this survey unit. At ZSRP, EMC only applies to soils as all other media (structural surfaces, embedded pipe, buried pipe and penetrations) will be remediated to their applicable Base Case DCGL.

A Prospective Power Curve was generated using COMPASS, a software package developed under the sponsorship of the United States Nuclear Regulatory Commission (USNRC) for implementation of the MARSSIM in support of the decommissioning

license termination rule (10CFR20, Subpart E). The result of the COMPASS computer run showed adequate power for the survey design (see Attachment 5).

For this Class 1 basement structure survey unit, the “Investigation Levels” for ISOCS measurement results are those levels specified in LTP Chapter 5, Table 5-25 and are reproduced below in Table 7.

Table 7 - Investigation Levels

Classification	Direct Measurement
Class 1	>Operational DCGL

Table 8 provides a synopsis of the survey designs for FSS unit #B1-09100AF.

Table 8 - Synopsis of Survey Design

FEATURE	DESIGN CRITERIA	BASIS
Survey Unit Surface Areas	1,124 m ²	LTP Ch. 5, Table 5-19
Number of Measurements (N)	71 ⁽¹⁾	<ul style="list-style-type: none"> • UBGR = SOF of 1 • LBGR = SOF of 0.01 • Type I error = 0.05 • Type II error = 0.05 • Δ/σ = 3 (adjusted) • MARSSIM Table 5.5
Grid Spacing	100% Areal Coverage (Planned for 28 m ² FOV)	LTP Chapter 5, Sec. 5.5.2.2
OpDCGL _B	<ul style="list-style-type: none"> • Co-60 – 5.43E+06 pCi/m² • Ni-63 – 5.55E+07 pCi/m² • Sr-90 – 1.98E+04 pCi/m² • Cs-134 – 4.44E+05 pCi/m² • Cs-137 – 5.63E+05 pCi/m² 	Operational DCGLs for WWTF (LTP Chapter 5, Table 5-4)
HTD ROC Analysis	8 Concrete Core samples selected for HTD ROC analysis	LTP Chapter 5, section 5.1
Investigation Level	>Operational DCGL	LTP Chapter 5, Table 5-25
Scan Survey Area Coverage	1,124 m ² or ~100% areal coverage	LTP Chapter 5, Table 5-19
QC	5 % Duplicate ISOCS Measurements	LTP Chapter 5, Sec. 5.9.3.1

(1) The number of ISOCS measurements designated in the survey designs is greater than the minimum number required for this survey unit, per Chapter 5 of the LTP, Table 5-19. Seventy-one (71) measurements were required to achieve 100% coverage of the WWTF.

6. SURVEY IMPLEMENTATION

For Survey Unit #B1-09100AF, compliance with the unrestricted release criteria was demonstrated through a combination of direct measurements using the ISOCS and analysis of concrete core samples obtained from the WWTF. The concrete core data was used to validate the ratios of gamma emitters to HTD ROC.

Remediation was completed on August 14th, 2018. The area was cleaned and turned over to the C/LT group for FSS. A walk-down and turnover survey was satisfactorily performed in the FSS survey unit in accordance with the Isolation and Control requirements of procedure ZS-LT-300-001-003, “*Isolation and Control for Final Status Survey*” (Reference 11). The turnover surveys consisted of surveys for loose surface contamination. All smear results were less than 1,000 dpm/100 cm². The WWTF was deemed acceptable for turnover and FSS commenced August 14th, 2018.

There are several system pipes and penetrations embedded in the concrete basement of the WWTF that must be removed to achieve the desired “end-state” of the survey unit. While undergoing decommissioning, it was determined that if the pipe and penetrations were removed, the WWTF basement would be susceptible to groundwater intrusion that could not be mitigated or controlled. Therefore, it was decided to forgo removal of the aforementioned piping/penetrations until the FSS of the WWTF structural concrete was complete. Once compliance was demonstrated, the pipe/penetrations were removed in a controlled manner. Surveillances performed on FSS surfaces following pipe/penetration removal demonstrated that there was no cross-contamination during the removal process.

“Field Logs” (ZS-LT-300-001-001 Attachment 14) were used to document field activities and other information pertaining to the performance of the FSS. Daily briefings were conducted to discuss the expectations for job performance and to review safety aspects of the job.

ZionSolutions TSD 14-022 provides the initial justification for the selection of reasonably conservative geometries for efficiency calibrations for the ISOCS based on the physical conditions of the remediated surface and the anticipated depth and distribution of activity.

All ISOCS measurements were acquired using approved geometries. The number and locations of the ISOCS shots were adjusted to ensure 100% coverage of the surfaces of the WWTF. Complete information pertaining to the ISOCS geometries used for the FSS of the WWTF basement is provided in Attachment 2 of the report.

The ISOCS detector was positioned horizontal or vertical to the surface at the center-point of each selected measurement location. In most cases, the exposed face of the detector was positioned at a distance of 3 meters from the surface with the 90 degree collimation shield installed; this orientation corresponded to a nominal FOV of 28 m². The detector to

source distance was reduced even further to accommodate physical constraints or encountered obstructions. In this case, the FOV was reduced and the number of measurements increased to ensure 100% areal coverage was achieved.

The measured activity for each gamma-emitting ROC (and any other gamma emitting radionuclide that was positively detected by ISOCS) was recorded (in units of pCi/m²). Background was not subtracted from any measurement. A SOF calculation was performed for each measurement by dividing the reported concentration of each ROC by the Operational DCGL for each ROC to derive an individual ROC fraction. The individual ROC fractions were then summed to provide a total SOF value for the measurement.

On August 16th, 2018 it was observed that during preparations for FSS, the demolition contractor had removed 1.5 feet to 2.5 feet high portions of the north wall resulting in the elimination of five (5) survey locations (#'s 46-50). Additionally, location 45 was changed to address one-half of Sump #2 in conjunction with location 68. Additional ISOCS measurements were collected on walls (#'s 64-66), in sumps (#'s 67-69), and in clarifier/flocculants (#'s 71-75) to ensure 100% areal coverage. The addition and subtraction of these measurement locations resulted in seventy (70) systematic ISOCS measurements. FSS of the WWTF was completed on August 22nd, 2018. Graphics in Attachment 1 identifies ISOCS measurement locations and core sample locations in the WWTF.

Four (4) duplicate measurements were taken with the ISOCS in the WWTF at locations 9, 14, 27 and 53. These locations were randomly selected using the Microsoft® Excel RANDBETWEEN function. The number of replicate measurements satisfies the requirement that a minimum of 5% percent of the number of measurements that will be used for non-parametric statistical testing be selected for additional QC evaluation.

7. SURVEY RESULTS

The SOF or “unity rule” is applied to the data used for the survey planning, and data evaluation and statistical tests for basement surfaces since multiple radionuclide-specific measurements will be performed or the concentrations inferred based on known relationships. The application of the unity rule serves to normalize the data to allow for an accurate comparison of the various data measurements to the release criteria. When the unity rule is applied, the DCGL_w (used for the nonparametric statistical test) becomes one (1). The Base Case basement structure DCGLs (BcDCGL_B), are directly analogous to the DCGL_w as defined in MARSSIM. The use and application of the unity rule was performed in accordance with section 4.3.3 of MARSSIM.

As described in LTP Chapter 5, section 5.10.3.2, the Sign Test was used to evaluate the measured residual radioactivity against the dose criterion. The SOF for each measurement was used as the sum value for the Sign Test. The Sign Test then demonstrated that the mean activity for each ROC was less than the Operational DCGL_B at a Type 1 decision error of 0.05.

For building surfaces, areas of elevated activity were defined as any area identified by measurement/sample (systematic or judgmental) that exceeded the Operational DCGL but was less than the Base Case DCGL. Any area that exceeded the Base Case DCGL would have required remediation. The SOF (based on the Operational DCGL) for a systematic or a judgmental measurement/sample(s) can exceed one without remediation as long as the survey unit passes the Sign Test and, the mean SOF (based on the Operational DCGL) for the survey unit does not exceed one. Once the survey data set passes the Sign Test (using Operational DCGLs), then the mean radionuclide activity (pCi/m²) for each ROC from systematic measurements along with any identified elevated areas from systematic and judgmental samples can be used with the Base Case DCGLs to perform a mean SOF_B calculation. The dose from residual radioactivity assigned to the FSS unit is the mean SOF_B multiplied by 25 mrem/yr.

The measurement population consisted of seventy (70) systematic and four (4) quality control locations using the ISOCS. A summary of the results of the seventy (70) ISOCS measurements taken for non-parametric statistical testing results are provided in Table 9. The concentrations for Ni-63 and Sr-90 are inferred based on the maximum ratios as specified in LTP Chapter 5, Table 5-15. The complete ISOCS gamma spectroscopy reports are presented in Attachment 6. The basic statistics for the systematic measurements are summarized in Table 10.

Table 9 - Waste Water Treatment Facility - Measured Concentrations of ROC for FSS

Measurement ID	Co-60 ⁽¹⁾ (pCi/m ²)	Ni-63 ⁽²⁾ (pCi/m ²)	Sr-90 ⁽²⁾ (pCi/m ²)	Cs-134 (pCi/m ²)	Cs-137 ⁽¹⁾ (pCi/m ²)	OpSOF ⁽³⁾
B1-09100AF-SFC-001-GD	3.74E+03	6.75E+05	3.04E+01	0.00E+00	1.52E+04	0.04138
B1-09100AF-SFC-002-GD	8.66E+03	1.56E+06	2.92E+01	3.14E+03	1.46E+04	0.06423
B1-09100AF-SFC-003-GD	0.00E+00	0.00E+00	4.64E+00	1.22E+03	2.32E+03	0.00710
B1-09100AF-SFC-004-GD	3.27E+03	5.90E+05	2.22E+01	1.52E+04	1.11E+04	0.06631
B1-09100AF-SFC-005-GD	8.16E+03	1.47E+06	4.00E+01	0.00E+00	2.00E+04	0.06558
B1-09100AF-SFC-006-GD	1.42E+02	2.56E+04	6.86E+01	2.42E+03	3.43E+04	0.07033
B1-09100AF-SFC-007-GD	0.00E+00	0.00E+00	3.70E+01	1.33E+04	1.5E+04	0.06468
B1-09100AF-SFC-008-GD	9.46E+03	1.71E+06	2.14E+01	1.20E+04	1.07E+04	0.07961
B1-09100AF-SFC-009-GD	1.22E+04	2.20E+06	6.30E+00	0.00E+00	3.15E+03	0.04783
B1-09100AF-SFC-010-GD	0.00E+00	0.00E+00	0.00E+00	4.15E+03	0.00E+00	0.00935
B1-09100AF-SFC-011GD	6.65E+03	1.20E+06	4.04E+01	0.00E+00	2.02E+04	0.06077
B1-09100AF-SFC-012-GD	1.83E+03	3.30E+05	4.12E+01	7.52E+03	2.06E+04	0.06189
B1-09100AF-SFC-013-GD	4.99E+04	9.00E+06	3.22E+01	1.53E+04	1.61E+04	0.23611
B1-09100AF-SFC-014-GD	4.03E+03	7.27E+05	5.14E+01	1.63E+04	2.57E+04	0.09880
B1-09100AF-SFC-015-GD	6.59E+03	1.19E+06	1.89E+01	2.37E+04	9.47E+03	0.09380
B1-09100AF-SFC-016-GD	7.57E+03	1.37E+06	1.05E+01	1.03E+04	5.25E+03	0.05906
B1-09100AF-SFC-017-GD	2.95E+03	5.32E+05	0.00E+00	1.96E+04	0.00E+00	0.05428
B1-09100AF-SFC-018-GD	9.74E+03	1.76E+06	1.96E+01	1.24E+03	9.80E+03	0.05465
B1-09100AF-SFC-019-GD	1.60E+04	2.89E+06	3.04E+01	1.35E+04	1.52E+04	0.11391
B1-09100AF-SFC-020-GD	1.34E+04	2.42E+06	3.10E+01	3.01E+04	1.55E+04	0.14293
B1-09100AF-SFC-021-GD	1.08E+04	1.95E+06	2.22E+01	2.51E+04	1.11E+04	0.11447
B1-09100AF-SFC-022-GD	6.81E+03	1.23E+06	0.00E+00	2.63E+04	0.00E+00	0.08263
B1-09100AF-SFC-023-GD	1.50E+04	2.71E+06	2.72E+01	0.00E+00	1.36E+04	0.07706
B1-09100AF-SFC-024-GD	0.00E+00	0.00E+00	9.94E+00	2.39E+04	4.97E+03	0.06316
B1-09100AF-SFC-025-GD	0.00E+00	0.00E+00	5.14E+01	0.00E+00	2.57E+04	0.04824
B1-09100AF-SFC-026-GD	5.07E+02	9.14E+04	3.62E+01	0.00E+00	1.81E+04	0.03572
B1-09100AF-SFC-027-GD	3.96E+03	7.15E+05	5.14E+01	5.46E+03	2.57E+04	0.07415
B1-09100AF-SFC-028-GD	0.00E+00	0.00E+00	3.18E+01	3.20E+04	1.59E+04	0.10192
B1-09100AF-SWC-029-GD	7.57E+03	1.36E+06	1.58E+01	3.72E+03	7.91E+03	0.04923
B1-09100AF-SWC-030-GD	1.66E+04	3.00E+06	1.88E+01	2.11E+04	9.41E+03	0.12222
B1-09100AF-SWC-031-GD	6.02E+03	1.09E+06	0.00E+00	2.33E+04	0.00E+00	0.07316
B1-09100AF-SWC-032-GD	5.40E+03	9.74E+05	1.45E+01	1.59E+04	7.25E+03	0.06797

Table 9 (continued) – Waste Water Treatment Facility - Measured Concentrations of ROC for FSS

Measurement ID	Co-60 ⁽¹⁾ (pCi/m ²)	Ni-63 ⁽²⁾ (pCi/m ²)	Sr-90 ⁽²⁾ (pCi/m ²)	Cs-134 (pCi/m ²)	Cs-137 ⁽¹⁾ (pCi/m ²)	OpSOF ⁽³⁾
B1-09100AF-SWC-033-GD	1.25E+04	2.26E+06	5.48E+01	6.6+03	2.74E+04	0.10924
B1-09100AF-SWC-034-GD	9.80E+03	1.77E+06	2.92E+01	0.00E+00	1.46E+04	0.06108
B1-09100AF-SWC-035-GD	0.00E+00	0.00E+00	2.42E+01	7.44E+03	1.21E+04	0.03947
B1-09100AF-SWC-036-GD	1.83E+04	3.30E+06	0.00E+00	5.98E+03	0.00E+00	0.07634
B1-09100AF-SWC-037-GD	4.06E+04	7.33E+06	1.28E+01	0.00E+00	6.39E+03	0.15148
B1-09100AF-SWC-038-GD	8.42E+03	1.52E+06	2.22E+01	1.30E+04	1.11E+04	0.07904
B1-09100AF-SWC-039-GD	4.01E+03	7.24E+05	3.04E+01	2.61E+03	1.52E+04	0.04819
B1-09100AF-SWC-040-GD	9.47E+02	1.71E+05	4.00E+01	1.91E+04	2.00E+04	0.08382
B1-09100AF-SWC-041-GD	1.42E+04	2.56E+06	0.00E+00	3.82E+04	0.00E+00	0.13482
B1-09100AF-SWC-042-GD	2.51E+03	4.53E+05	0.00E+00	3.70E+04	0.00E+00	0.09196
B1-09100AF-SWC-043-GD	5.76E+03	1.04E+06	0.00E+00	2.10E+04	0.00E+00	0.06709
B1-09100AF-SWC-044-GD	0.00E+00	0.00E+00	5.82E+01	2.00E+04	2.91E+04	0.09967
B1-09100AF-SFC-045-GD	3.75E+03	6.77E+05	2.60E+01	1.78E+04	1.30E+04	0.07738
B1-09100AF-SWC-051-GD	4.43E+03	7.99E+05	3.04E+01	3.14E+04	1.52E+04	0.11447
B1-09100AF-SWC-052-GD	7.03E+03	1.27E+06	3.34E+01	3.91E+03	1.67E+04	0.06431
B1-09100AF-SWC-053-GD	4.35E+02	7.85E+04	1.32E+01	4.04E+03	6.59E+03	0.02296
B1-09100AF-SWC-054-GD	5.13E+03	9.26E+05	3.62E+01	1.15E+04	1.81E+04	0.07750
B1-09100AF-SWC-055-GD	2.38E+04	4.29E+06	1.94E+01	0.00E+00	9.72E+03	0.10001
B1-09100AF-SWC-056-GD	6.57E+03	1.19E+06	0.00E+00	0.00E+00	0.00E+00	0.02257
B1-09100AF-SWC-057-GD	6.86E+03	1.24E+06	0.00E+00	6.28E+03	0.00E+00	0.03771
B1-09100AF-SWC-058-GD	1.11E+04	2.00E+06	2.24E+01	1.82E+04	1.12E+04	0.10015
B1-09100AF-SWC-059-GD	6.31E+03	1.14E+06	2.48E+01	2.69E+04	1.24E+04	0.10554
B1-09100AF-SWC-060-GD	0.00E+00	0.00E+00	0.00E+00	1.85E+04	0.00E+00	0.04167
B1-09100AF-SWC-061-GD	0.00E+00	0.00E+00	4.58E+01	0.00E+00	2.29E+04	0.04299
B1-09100AF-SWC-062-GD	1.19E+04	2.15E+06	2.84E+01	1.77E+04	1.42E+04	0.10740
B1-09100AF-SWC-063-GD	0.00E+00	0.00E+00	2.74E+01	1.28E+04	1.37E+04	0.05455

Table 9 (continued) – Waste Water Treatment Facility - Measured Concentrations of ROC for FSS

Measurement ID	Co-60 ⁽¹⁾ (pCi/m ²)	Ni-63 ⁽²⁾ (pCi/m ²)	Sr-90 ⁽²⁾ (pCi/m ²)	Cs-134 (pCi/m ²)	Cs-137 ⁽¹⁾ (pCi/m ²)	OpSOF ⁽³⁾
B1-09100AF-SWC-064-GD	1.71E+03	3.09E+05	2.84E+00	1.63E+04	1.42E+03	0.04525
B1-09100AF-SWC-065-GD	5.76E+03	1.04E+06	3.28E+01	0.00E+00	1.64E+04	0.05057
B1-09100AF-SWC-066-GD	8.34E+03	1.50E+06	2.96E+01	0.00E+00	1.48E+04	0.05643
B1-09100AF-SFC-067-GD	5.67E+03	1.02E+06	1.87E+01	9.78E+02	9.35E+03	0.03923
B1-09100AF-SFC-068-GD	2.97E+03	5.36E+05	2.30E+01	5.55E+02	1.15E+04	0.03304
B1-09100AF-SFC-069-GD	4.86E+03	8.77E+05	7.78E+00	3.88E+03	3.89E+03	0.03274
B1-09100AF-SFC-070-GD	5.30E+03	9.56E+05	7.40E+00	0.00E+00	3.70E+03	0.02515
B1-09100AF-SFC-071-GD	5.38E+03	9.71E+05	0.00E+00	2.13E+03	0.00E+00	0.02328
B1-09100AF-SFC-072-GD	6.07E+03	1.10E+06	2.46E+01	2.52E+04	1.23E+04	0.10070
B1-09100AF-SFC-073-GD	0.00E+00	0.00E+00	1.62E+01	0.00E+00	8.08E+03	0.01517
B1-09100AF-SFC-074-GD	1.39E+03	2.51E+05	9.46E+00	1.31E+03	4.73E+03	0.01661
B1-09100AF-SFC-075-GD	5.55E+03	1.00E+06	8.36E+00	2.75E+03	4.18E+03	0.03311

Note (1) The surrogate OpDCGL for Cs-137 (inferring Sr-90 at the maximum ratios from LTP Table 5-15) equaled 5.33E+05 pCi/m² (Equation 2) and the surrogate OpDCGL for Co-60 (inferring Ni-63 at the maximum ratio from LTP Table 5-15) equaled 2.91E+05 pCi/m² (Equation 3). No ISOCS measurement result for Cs-137 or Co-60 exceeded its respective surrogate OpDCGL value.

Note (2) Inferred concentrations

Note (3) Compared against OpDCGL

Table 10 - Waste Water Treatment Facility – Statistical Quantities - Systematic Measurement Population
Individual Measurement Metrics

Total Number of Systematic Measurements	=	70
Number of Quality Control Measurements	=	4
Number of Judgmental/Investigational Measurements	=	0
Total Number of Measurements	=	74
Mean Systematic Measurement SOF	=	0.01341
Max Individual Systematic Measurement SOF	=	0.23611
Number of Systematic Measurements with SOF >1	=	0

Statistical Quantities - Systematic Measurement Population

ROC	MEAN (pCi/m ²)	MEDIAN (pCi/m ²)	MAX (pCi/m ²)	MIN (pCi/m ²)	δ (pCi/m ²)	BcDCGL (pCi/m ²)	Avg SOF per ROC	Avg Dose per ROC
Co-60	7.06E+03	5.61E+03	4.99E+04	0.00E+00	8.38E+03	2.83E+07	0.00025	0.00624
Ni-63	1.27E+06	1.01E+06	9.00E+06	0.00E+00	1.51E+06	2.89E+08	0.00441	0.11023
Sr-90	2.25E+01	2.23E+01	6.86E+01	0.00E+00	1.65E+01	1.03E+05	0.00022	0.00546
Cs-134	1.08E+04	7.02E+03	3.82E+04	0.00E+00	1.07E+04	2.31E+06	0.00469	0.11732
Cs-137	1.12E+04	1.12E+04	3.43E+04	0.00E+00	8.27E+03	2.93E+06	0.00384	0.09596

SOF ASSIGNED TO SURVEY UNIT (SYSTEMATIC AVG.) = 0.01341

DOSE ASSIGNED TO SURVEY UNIT (SYSTEMATIC AVG.) = 0.3352 mrem/yr.

The analytical results (converted to SOF) for all of the measurements taken in the WWTF were less than a SOF of one.

A six (6) inch concrete core sample was acquired at the eight (8) concrete core locations that were selected at random. Each core was cut into ½ inch pucks. The pucks representing the “as left” condition of the WWTF concrete to a depth of ½ inch at the eight (8) selected locations (see Figure 4), were sent to Eberline Laboratories for analysis results for Sr-90, Ni-63 and gamma spectroscopy.

The analysis results for the eight (8) concrete core pucks taken were received from Eberline on September 3, 2018 and the results are presented in Table 11. Each sample or ½-inch puck represents the concrete from the existing surface to a depth of ½-inch. Each of the 1st ½-inch concrete puck from each of the eight (8) concrete core samples were analyzed for all ROC, including the HTD ROC of Ni-63 and Sr-90. Cs-137 was the only ROC positively detected at concentrations greater than MDC. The maximum concentration observed was 3.81E-01 pCi/g. In accordance with LTP section 5.1, only samples with positive results (detectable concentrations greater than MDC) were assessed for HTD ratios.

Table 11 - WWTF FSS Concrete Core Sample Analysis – Surface to 0.5 inch Depth

Sample ID	Nuclide	Result (pCi/g)	Uncertainty (pCi/g)	MDA (pCi/g)	>MDC	Ratios
B1-09100AF-SFC-067-CV	Co-60	-3.21E-02	1.41E-01	1.81E-01	N	Ni-63/Co-60 = N/A (Ni-63/Co-60 not positively detected) Sr-90/Cs-137 = N/A (Sr-90/Cs-137 not positively detected)
	Ni-63	6.81E-01	1.77E+00	3.02E+00	N	
	Sr-90	-6.05E-02	3.91E-01	7.09E-01	N	
	Cs-134	3.78E-02	6.95E-02	1.72E-01	N	
	Cs-137	-8.69E-02	1.68E-01	2.33E-01	N	
B1-09100AF-SWC-031-CV	Co-60	-8.91E-02	1.48E-01	1.99E-01	N	Ni-63/Co-60 = N/A (Ni-63/Co-60 not positively detected) Sr-90/Cs-137 = N/A (Sr-90 not positively detected)
	Ni-63	8.74E-01	1.66E+00	2.82E+00	N	
	Sr-90	3.99E-01	4.00E-01	6.67E-01	N	
	Cs-134	7.5E-03	6.34E-02	1.49E-01	N	
	Cs-137	1.76E-01	1.84E-01	3.04E-01	Y	
B1-09100AF-SFC-001-CV	Co-60	6.88E-02	1.44E-01	2.69E-01	N	Ni-63/Co-60 = N/A (Ni-63/Co-60 not positively detected) Sr-90/Cs-137 = N/A (Sr-90 not positively detected)
	Ni-63	6.03E-01	1.79E+00	3.06E+00	N	
	Sr-90	0.00+00	4.65E-01	8.29E-01	N	
	Cs-134	-1.32E-02	1.06E-01	2.53E-01	N	
	Cs-137	4.75E-01	2.54E-01	3.81E-01	Y	
B1-09100AF-SFC-010-CV	Co-60	2.45E-02	1.17E-01	1.96E-01	N	Ni-63/Co-60 = N/A (Ni-63/Co-60 not positively detected) Sr-90/Cs-137 = N/A (Cs-137/Sr-90 not positively detected)
	Ni-63	1.55E+00	1.82E+00	3.06E+00	N	
	Sr-90	-1.49E-01	3.97E-01	7.36E-01	N	
	Cs-134	3.09E-02	6.51E-02	1.32E-01	N	
	Cs-137	1.50E-01	1.26E-01	2.01E-01	N	
B1-09100AF-SWC-041-CV	Co-60	8.14E-02	1.30E-01	1.71E-01	N	Ni-63/Co-60 = N/A (Ni-63/Co-60 not positively detected) Sr-90/Cs-137 = N/A (Cs-137/Sr-90 not positively detected)
	Ni-63	1.74E+00	1.84E+00	3.08E+00	N	
	Sr-90	2.69E-01	4.53E-01	7.80E-01	N	
	Cs-134	-6.54E-01	2.78E-01	2.01E-01	N	
	Cs-137	-2.85E-03	1.44E-01	2.24E-01	N	

Table 11 (continued) - WWTF FSS Concrete Core Sample Analysis – Surface to 0.5 inch Depth

B1-09100F-SFC-068-CV	Co-60	-1.34E-02	5.26E-02	1.39E-01	N	Ni-63/Co-60 = N/A (Ni-63/Co-60 not positively detected) Sr-90/Cs-137 = N/A (Sr-90 not positively detected)
	Ni-63	1.41E+00	1.50E+00	2.51E+00	N	
	Sr-90	2.04E-01	3.38E-01	5.81E-01	N	
	Cs-134	-3.89E-03	6.28E-02	2.06E-01	N	
	Cs-137	3.66E-01	1.88E-01	2.69E-01	Y	
B1-09100F-SWC-051-CV	Co-60	-2.76E-02	1.58E-01	2.36E-01	N	Ni-63/Co-60 = N/A (Ni-63 not positively detected) Sr-90/Cs-137 = N/A (Sr-90 not positively detected)
	Ni-63	1.27E+00	1.79E+00	3.01E+00	N	
	Sr-90	2.08E-01	4.14E-01	7.19E-01	N	
	Cs-134	-1.55E-02	5.30E-02	2.36E-01	N	
	Cs-137	4.90E-01	1.72E-01	2.88E-01	Y	
B1-09100F-SFC-021-CV	Co-60	9.18E-02	1.58E-01	2.22E-01	N	Ni-63/Co-60 = N/A (Ni-63/Co-60 not positively detected) Sr-90/Cs-137 = N/A (Sr-90 not positively detected)
	Ni-63	1.90E+00	1.45E+00	2.41E+00	N	
	Sr-90	4.70E-01	4.35E-01	7.22E-01	N	
	Cs-134	5.65E-02	8.51E-02	2.18E-01	N	
	Cs-137	4.31E-01	1.87E-01	3.37E-01	Y	

8. QUALITY CONTROL

The implementation of required QC measures included the collection of four (4) additional ISOCS measurements in the WWTF (Survey Unit #B1-09100AF) for “replicate measurement” analysis. The complete ISOCS gamma spectroscopy reports for the replicate measurements are presented in Attachment 6. All duplicate ISOCS measurements met the required acceptance criteria. The completed Duplicate Sample Assessment Forms are included in Attachment 4 of this Release Record.

Two ISOCS detectors were utilized for performing FSS measurements of the WWTF: detectors 6279 and 5452. There were no QC discontinuities associated with detector 6279. However, due to inclement weather, detector 5452 did exhibit some resolution anomalies likely due to noise associated with vibrations, humidity and wet conditions (rain followed by inversions).

These conditions existed principally on the low end of the spectrum (40-200 keV) resulting in the 86.5 keV Eu-155 energy peak QC data point appearing several keV lower in the spectrum (83.8 keV) while the 1274.5 keV Eu-155 peak was within tolerance. This was evident on the morning source check (8/15/18 at 10:16 AM) with peak energy of 83.76 keV. The Full Width-Half Maximum (FWHM) was acceptable and other principle peaks during operation were found acceptable based on peak location, energy and FWHM values. Identification of the cause (humidity and vibration noise) as well as identification of principle peaks during operation (Cs-137) allowed for the continued operation of the system with the lower energy (86.5 keV Eu-155) out of tolerance. As the weather improved and the inversion lifted, the system noise became less and the Post QC was within tolerance. The collected data was deemed acceptable following inspection of all the spectrums collected.

On 8/17/18 the same conditions occurred during the afternoon Post QC check with the exception that there was no inversion. The conditions were primarily caused by humidity and noise induced by vibration and equipment electrical operated hydraulic motors nearby. The 86.5 keV Eu-155 peak was out of tolerance (83.8 keV). This is approximately 9 channels from the energy peak and about 3 channels out of the tolerance (~0.75 keV) bounds. Examination of the data indicated the principle peaks of interest were well within tolerance based on peak location, energy and FWHM values. The collected spectrum data after examination was found acceptable.

It is important to note that the QC checks are intended as “markers” for additional evaluation of the spectrum, as necessary. Careful inspection of the collected data was conducted and the results determined to be acceptable based on both the examination of

the individual spectrums, the location of the principle peaks and the identified peaks and tolerances invoked by the Genie2000 software.

9. INVESTIGATIONS AND RESULTS

No investigations were conducted in the WWTF.

10. REMEDIATION AND RESULTS

Remediation was required prior to performance of FSS. In the case of the WWTF, remediation primarily consisted of system removal and the removal of internal structural surfaces above and below the 588 foot elevation. Following remediation, FSS was conducted successfully and met all acceptance criteria for release of the survey units.

Chapter 4 of the ZSRP LTP states that remediation beyond that required to meet the release criteria is unnecessary and that the remaining residual radioactivity in structures was ALARA.

11. CHANGES FROM THE FINAL STATUS SURVEY PLAN

In accordance with the LTP, compliance with the unrestricted release criteria is demonstrated through a series of static measurements taken with an ISOCS. LTP section 5.5.2.2, Table 5-19 lists the WWTF as a Class 1 basement structure survey unit with a total surface area of 1,124 m². The FSS design specified to demonstrate compliance required a minimum of seventy-one (71) static ISOCS measurements. However, only seventy (70) measurements were collected due to an interior wall being removed during demolition which resulted in the elimination of five (5) sample locations as well as the addition of four (4) measurements due to a decreased FOV. 100% areal coverage of the WWTF surfaces was maintained.

There were no addendums to the FSS plan, however, there were changes to the ISOCS survey plans as noted earlier in this Release Record. Those changes were required due to constraints on placement of ISOCS detectors that were not obvious when the FSS plan was first written. The changes in ISOCS measurement locations were made to ensure 100% areal coverage of the survey units.

12. DATA QUALITY ASSESSMENT (DQA)

The DQO sample design and data were reviewed in accordance with *ZionSolutions* procedure ZS-LT-300-001-004, "Final Status Survey Data Assessment" (Reference 12) for completeness and consistency. Documentation was complete and legible. Surveys and the collection of measurements were consistent with the DQOs and were sufficient to

ensure that the survey unit was properly designated as Class 1. The survey design had adequate power as indicated by the Retrospective Power Curve (see Attachment 5).

The analytical results of all ISOCS measurements were less than a SOF of one. 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 (Attachment 3) 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 preliminary data review consisted of calculating basic statistical quantities (e.g., mean, median, standard deviation). All data was considered valid including negative values, zeros, values reported below the MDC, and values with uncertainties that exceeded two standard deviations. The mean and median values for each ROC were well below the respective Operational DCGLs. Also, the retrospective power curve shows that a sufficient number of samples were collected to achieve the desired power. Therefore, the survey unit meets the unrestricted release criteria with adequate power as required by the DQOs.

The data for Co-60 and Cs-137 is represented graphically through a frequency plot and a quantile plot. All graphical representations are provided in Attachment 5.

13. ANOMALIES

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

14. COMPLIANCE EQUATION

There are four distinct source terms for the end-state at Zion: backfilled basements, soil, buried piping and groundwater. Demonstrating compliance with the dose criterion requires the summation of dose from the four source terms (see Equation 6-11 from LTP Chapter 6, section 6-17).

The final compliance dose will be calculated using Equation 6-11 after FSS has been completed in all survey units. The results of the FSS performed for each FSS unit will be reviewed to determine the maximum dose from each of the four source terms (e.g., basement, soil, buried pipe and existing groundwater if applicable) using the mean Base Case SOF of FSS systematic results plus the dose from any identified elevated areas. The compliance dose must be less than 25 mrem/yr. The dose contribution from each ROC is accounted for using the Base Case SOF (BcSOF) to ensure that the total dose from all ROC does not exceed the dose criterion.

The term for each Basement includes the dose contributions from wall and floor surfaces within the Basement, the dose contribution from embedded pipe within the Basement, the dose contribution from penetrations within the Basement and the dose contribution from concrete fill in the Basement when clean concrete debris was used as fill. Each (structural surfaces, embedded pipe and penetrations) are surveyed separately during FSS. The dose from clean concrete fill is predetermined in accordance with LTP Chapter 5, Table 5-16, which is conservatively based on a maximum allowable MDC of 5,000 dpm/100cm². The dose from fill assigned to the WWTF is 6.40 mrem/yr, which equates to a SOF of 0.2560.

The Base Case DCGL for the WWTF accounts for the activity in the structural surface. In accordance with LTP Chapter 6, Table 6-23, no additional adjustments need to occur to the WWTF mean BcSOF to account for the contribution of residual radioactivity from basements/structures that cannot, on their own, support a water supply well but were hydraulically connected to the WWTF. The mean BcSOF for the WWTF is 0.0134, which equates to a dose 0.3352 mrem/yr. The mean BcSOF was then used in the following equation to calculate BcSOF_{BASEMENT} for the WWTF.

Equation 4

$$BcSOF_{BASEMENT} = BcSOF_B + BcSOF_{EP} + BcSOF_{PN} + BcSOF_{CF}$$

where:

- $BcSOF_{BASEMENT}$ = BcSOF (mean of FSS systematic results plus the dose from any identified elevated areas) for backfilled Basements
- $BcSOF_B$ = BcSOF for structural survey unit(s) within the Basement (mean of FSS systematic results plus the dose from any identified elevated areas)
- $BcSOF_{EP}$ = BcSOF for embedded pipe survey unit(s) within the Basement (mean of FSS systematic results plus the dose from any identified elevated areas)
- $BcSOF_{PN}$ = BcSOF for penetration survey unit(s) within the Basement (mean of FSS systematic results plus the dose from any identified elevated areas)
- $BcSOF_{CF}$ = BcSOF for clean concrete fill (if applicable) based on maximum MDC during Unrestricted Release Survey (URS)

There are no penetrations or embedded pipe associated with the WWTF basement. Consequently, the dose contribution from both (variables BcSOF_{EP} and BcSOF_{PN}) are zero.

The $BcSOF_{BASEMENT}$ value for the WWTF is then derived as follows;

Equation 5

$$BcSOF_{BASEMENT} = 0.0134 + 0.0000 + 0.00000 + 0.2560 = 0.2694$$

The $BcSOF_{BASEMENT}$ for the WWTF basement is 0.2694. This SOF equates to a dose of 6.7350 mrem/yr TEDE to an AMCG from residual radioactivity in the WWTF basement.

15. CONCLUSION

Survey Unit #B1-09100AF has met the DQOs of the FSS plan. The ALARA criteria as specified in Chapter 4 of the LTP were achieved. The EMC is not applicable to structural surfaces and remediation was successfully implemented.

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

The sample data passed the Sign Test. The null hypothesis was rejected. The Retrospective Power Curve showed that adequate power was achieved. The survey unit is properly classified as Class 1.

The dose contribution from structural surfaces in Survey Unit #B1-09100AF, “WWTF Basement”, is 0.3352 mrem/yr TEDE, based on the average concentration of the ROC in samples used for non-parametric statistical sampling. The dose from embedded pipe and penetrations in the WWTF is zero and the dose from clean fill is 6.40 mrem/yr. The total dose attributed to the Crib House/Forebay as a summation of all dose components is 6.7350 mrem/yr.

Survey Unit #B1-09100AF, “Crib House/Forebay Basement” is acceptable for unrestricted release.

16. REFERENCES

1. ZionSolutions procedure ZS-LT-300-001-005, “Final Status Survey Data Reporting”
2. “Zion Station Restoration Project License Termination Plan”
3. ZionSolutions procedure ZS-LT-300-001-001, “Final Status Survey Package Development”
4. NUREG-1575, Revision 1, “Multi-Agency Radiation Survey and Site Investigation Manual” (MARSSIM)

5. *ZionSolutions* TSD 17-004, “Operational Derived Concentration Guideline Levels for FSS”
6. *ZionSolutions* Technical Support Document (TSD) 14-014, “End State Surface Areas, Volumes, and Source Terms of Ancillary Buildings”
7. “Zion Station Historical Site Assessment” (HSA)
8. *ZionSolutions* TSD 11-001, “Potential Radionuclides of Concern during the Decommissioning of Zion Station”
9. *ZionSolutions* TSD 14-019, “Radionuclides of Concern for Soil and Basement Fill Model Source Terms”
10. *ZionSolutions* TSD 14-022, “Use of In-Situ Gamma Spectroscopy for Source Term Survey of End State Structures”
11. *ZionSolutions* procedure ZS-LT-300-001-003, “Isolation and Control for Final Status Survey”
12. *ZionSolutions* procedure ZS-LT-300-001-004, “Final Status Survey Data Assessment”

17. ATTACHMENTS

- Attachment 1 – Additional Figures and Maps
- Attachment 2 – ISOCS Geometry
- Attachment 3 – Sign Test
- Attachment 4 – QC Measurement Assessments
- Attachment 5 – Graphical Presentations
- Attachment 6 – Eberline Report
- Attachment 7 – ISOCS Analytical Reports

ATTACHMENT 1

ADDITIONAL FIGURES AND MAPS

Figure 1 - Waste Water Treatment Facility Top View from Drawing B-1024

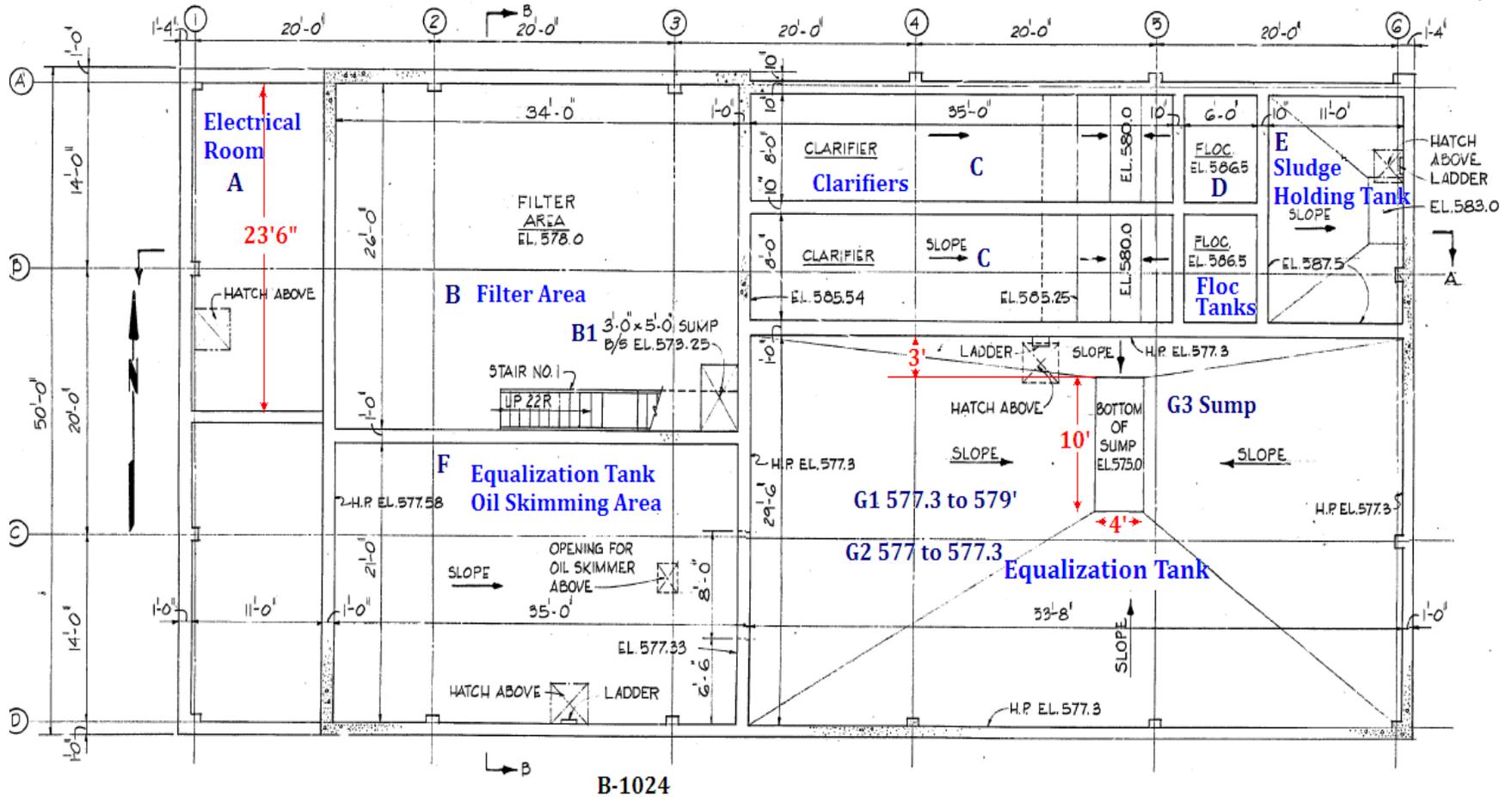
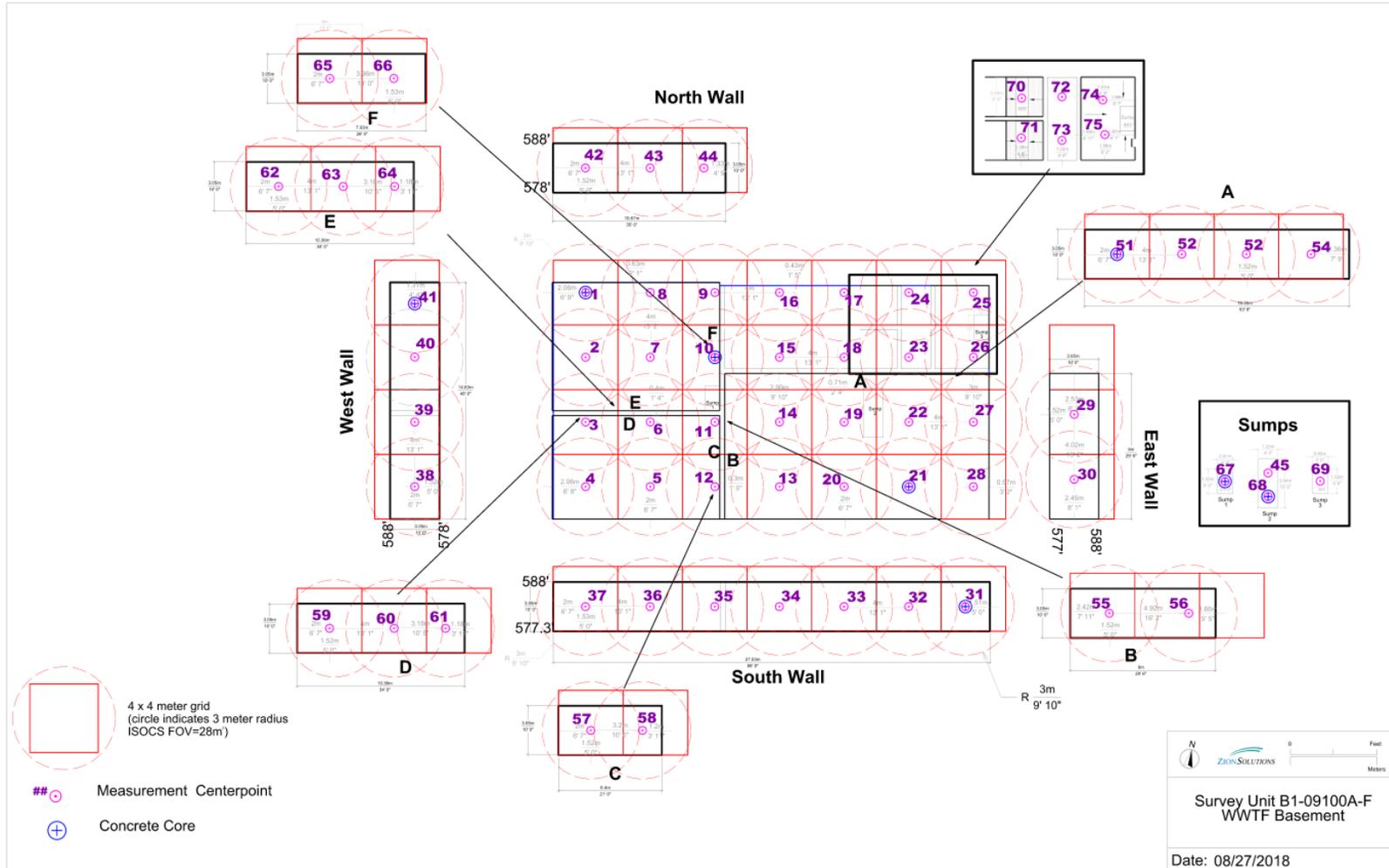


Figure 2 - Waste Water Treatment Facility ISOCS Measurement & Core Locations



ATTACHMENT 2

ISOCS Geometry

Waste Water Treatment Facility Geometries

As per TSD 14-022 Revision 1, a contamination depth of 0.5 inches (1.27 cm) was suggested for the Waste Water Treatment Facility (WWTF) with all the activity associated within the one-half inch layer. For the floors and walls of the WWTF, the Geometry Composer Circular Plane Template was used for the geometry. A source to detector distance of 3.0 meters was selected. While several geometries were created where the source to detector distance was varied from 1 to 3 meters, only the 3 meter distance was necessary. A 90 degree collimator was used resulting in a six meter diameter field of view (FOV) that comprised 28.3 m². Measurements that were conducted using the 3 meter source to detector geometry were indicative of minimal surficial contamination.

There are several (3) sumps located at the WWTF of varying dimensions. In addition, the Clarifier, Flocculator Tank and Sludge Holding Tank exhibited geometries that were not well represented by the 3 meter source to detector geometry. To this end, separate geometries were designed for each of these using the Geometry Composer “Room” template to address the anomalies and best represent the geometric dimensions. The “Room” geometry assumes surface contamination.

Sump 1 (Location 67)

Sump 1 is located in the NE corner of the WWTF Filter Area. It is 36.25 inches wide, 60 inches long and 55.25 inches deep resulting in an area of 8.26 m². The Room Geometry utilizes a 180 degree FOV (collimator removed) and the measurement location is at the top center of the “room”. That is at the lip of the sump (floor surrounding the sump). Residual contamination was assumed to comprise 10 percent of each wall and 60 percent of the floor.

Sump 2 (Location 68)

Sump 2 is located central and slightly south of the “A” wall in the Equalization Tank room. It is 120 inches wide, 48 inches long and 24 inches deep. Due to the length of the sump, it is divided into two Room Geometry measurement locations 60 inches by 48 inches by 24 inches deep. Each location results in an area of 4.27 m². The measurement location utilizes a 180 degree FOV is at the lip of the sump (floor surrounding the sump) at the top center of the “room”. Residual contamination was assumed to comprise 10 percent of each wall and 60 percent of the floor.

Sump 3 (Locations 74, 75 and 69)

Sump 3 is the Sludge Holding Tank Area located on the NE end of the WWTF. This Room Geometry is divided into two measurement locations 58 inches wide, 90 inches long and 53 inches deep. While the south, north and west wall slopes to the “sump” region (location 69), the geometry was treated as a “square” box resulting in conservative values for the three walls. The East wall is perpendicular. There is no real sump at the bottom, only a region the inclined walls

slope towards. Each location results in a total area of 10.41 m². The bottom was assumed square resulting in a slightly non-conservative area estimate that is offset by the assumption of a box design whereas three of the side walls are sloping and the source to detector distance is less than the values used. A third measurement that was not required was acquired over the “sump” using the same geometry. In all cases, the geometry included the 180 degree FOV (collimator removed) and was centered over each 58 by 90 inch region. The “sump 3” measurement (location 69) was centered over the sump. As before, the measurement location is at the lip of the Sludge Holding Tank (top elevation floor). Residual contamination was assumed to comprise 10 percent of each wall and 60 percent of the floor.

Flocculator Tank “Sump” (Locations 72 and 73)

The Flocculator Tank had been two separate compartments but during renovation, the central wall was removed as was the north wall. The Flocculator Tank was divided into two regions 76 inches wide, 103.5 inches long and 56 inches deep. Location 72 resulted in just two walls remaining. The Room Geometry accounted for this location by assuming that 50 percent of the residual contamination was present on each of the two walls. As before, the source to detector distance assumed the depth of the Flocculator tank (56 inches). The 180 degree FOV was used (collimator removed) and the measurement acquired at the lip of the Flocculator Tank (floor surrounding the tank). An area of 5.42 m² was used. The measurement location was centered over the region.

The second compartment of the Flocculator Tank (Location 73) uses the same dimensions as Location 72 above except this compartment consist of 3 walls and results in an area of 9.23 m². Location 73 utilizes the same source to detector distance, FOV and measurement centering as Location 72. Residual contamination was assumed to reside over three walls and the floor at a 0.25 concentration.

Clarifier “Sump” (Location 70 and 71)

The Clarifier Sumps) consist of two identical locations that are 96 inches wide, 90 inches long and 60 inches deep. These locations consist of sloped walls on the east and west sides and vertical walls on the north and south sides. The Room Geometry was used for these locations. Assuming a “rectangular” box, the total surface area was calculated to be 19.97 m². Adjustments were made to accommodate the area reduction due to sloping sides resulting in a surface area of 15.33 m². However, the physical geometry conservatively assumed the sides were perpendicular. The 180 degree FOV was used with the detector located at the center of the rectangular area and at the lip of the Clarifier.

Waste Water Treatment Facility 3 WWTF1.27CM

Geometry Composer Report

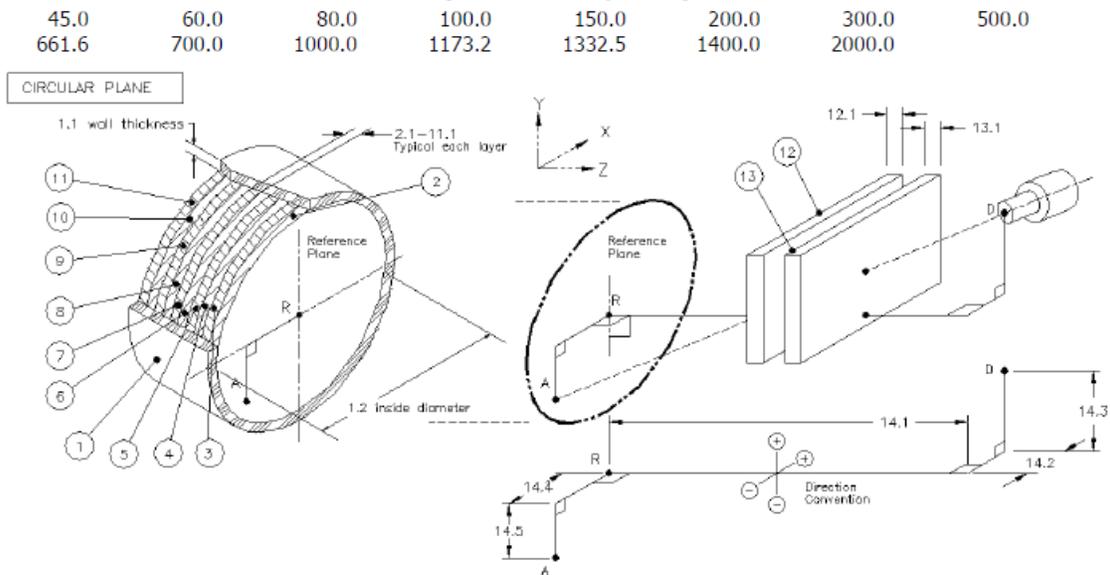


Date: Monday, August 06, 2018 - 15:28:29
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Comment: 3M90D_CP_WWTF_1.27 CM
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Software: ISOCS
Template: CIRCULAR_PLANE, Version: (default)
Detector: 5456
Collimator: 50mm-90d new (newISOCS 50mm side 90deg collimation [large hole collimator])
Environment: Temperature = 22 °C, Pressure = 760 mm Hg, Relative Humidity = 30%
Integration: Convergence = 1.00%, MDRPN = 2⁴ (16), CRPN = 2⁴ (16)

Dimensions (cm)

No.	Description	d.1	d.2	d.3	d.4	d.5	d.6	Material	Density	Rel. Conc.
1	Side Walls	0	600					none		
2	Layer 1	1.27						concrete	2.3	1.00
3	Layer 2	0						<none>		
4	Layer 3	0						<none>		
5	Layer 4	0						<none>		
6	Layer 5	0						<none>		
7	Layer 6	0						<none>		
8	Layer 7	0						<none>		
9	Layer 8	0						<none>		
10	Layer 9	0						<none>		
11	Layer 10	0						<none>		
12	Absorber1									
13	Absorber2									
14	Source-Detector	300	0	0	0	0				

List of energies for efficiency curve generation

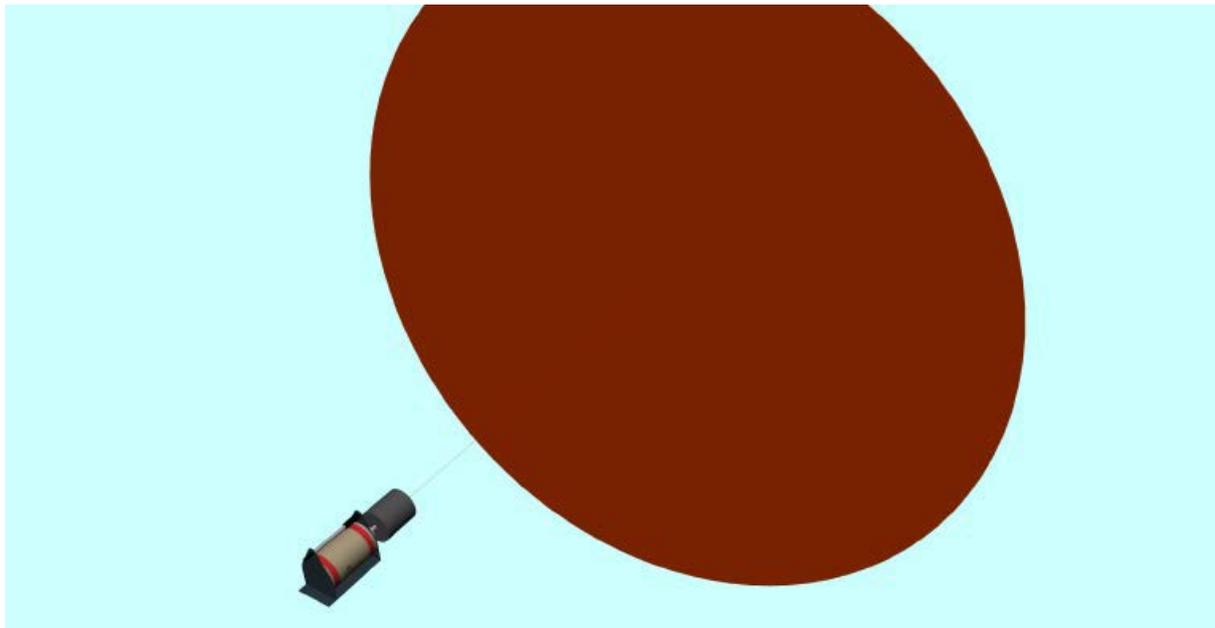


Waste Water Treatment Facility 3 WWTF1.27CM (continued)

Geometry Composer Report



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Software: ISOCS
Template: CIRCULAR_PLANE, Version: (default)



Waste Water Treatment Facility 3M 90D CP WWTF1.27CM (continued)

ISOCS/LABSOCS RESULTS

ISOCS/LabSOCS File: C:\GENIE2K\isocs\data\GEOMETRY\In-Situ\CIRCULAR_PLANE\3MWWTF1.27
ISOCS/LabSOCS Time: 07/31/18 12:17:36
Template: CIRCULAR_PLANE
Geom Description: 3MWWTF1,27CM
Comment: ISOCS:3M90D_WWTF_1,27CM
Detector: 6279
Collimator: 50MM-90D_NEW
Convergence: 1.00 %
Area [Sq Meters]: 2.8274e+001 (C)
Mass [Grams]: 8.4385e+005 (C)
Length [Meters]: not used
(C) = Value calculated by ISOCS
(U) = Value modified by user

Energy	Efficiency	%Uncertainty	%Convergence	Final # of Voxels
45.00	3.86721e-006	15.0	-0.096724	8185
60.00	5.38810e-006	10.0	-0.104474	8185
88.00	6.42171e-006	10.0	-0.128026	8185
100.00	6.40907e-006	10.0	-0.111067	8185
150.00	5.96042e-006	10.0	-0.155938	8185
200.00	5.16653e-006	8.0	-0.174585	8185
300.00	3.93887e-006	8.0	-0.171595	8185
500.00	2.74357e-006	6.0	-0.153465	8185
661.60	2.27234e-006	6.0	-0.147627	8185
700.00	2.19626e-006	6.0	-0.148448	8185
1000.00	1.75712e-006	4.0	-0.150141	8185
1173.20	1.59176e-006	4.0	-0.152219	8185
1332.50	1.47306e-006	4.0	-0.152974	8185
1400.00	1.42129e-006	4.0	-0.153520	8185
2000.00	1.09101e-006	4.0	-0.154182	8185

Waste Water Treatment Facility 3M 90D CP WWTF1.27CM (continued)

ISOCS/LABSOCS RESULTS

ISOCS/LabSOCS File: C:\GENIE2K\isocs\data\GEOMETRY\In-Situ\CIRCULAR_PLANE\3MWWTF1.27
ISOCS/LabSOCS Time: 07/31/18 12:17:36
Template: CIRCULAR_PLANE
Geom Description: 3MWWTF1,27CM
Comment: ISOCS:3M90D_WWTF_1,27CM
Detector: 6279
Collimator: 50MM-90D_NEW
Convergence: 1.00 %
Area [Sq Meters]: 2.8274e+001 (C)
Mass [Grams]: 8.4385e+005 (C)
Length [Meters]: not used
(C) = Value calculated by ISOCS
(U) = Value modified by user

Energy	Efficiency	%Uncertainty	%Convergence	Final # of Voxels
45.00	3.86721e-006	15.0	-0.096724	8185
60.00	5.38810e-006	10.0	-0.104474	8185
88.00	6.42171e-006	10.0	-0.128026	8185
100.00	6.40907e-006	10.0	-0.111067	8185
150.00	5.96042e-006	10.0	-0.155938	8185
200.00	5.16653e-006	8.0	-0.174585	8185
300.00	3.93887e-006	8.0	-0.171595	8185
500.00	2.74357e-006	6.0	-0.153465	8185
661.60	2.27234e-006	6.0	-0.147627	8185
700.00	2.19626e-006	6.0	-0.148448	8185
1000.00	1.75712e-006	4.0	-0.150141	8185
1173.20	1.59176e-006	4.0	-0.152219	8185
1332.50	1.47306e-006	4.0	-0.152974	8185
1400.00	1.42129e-006	4.0	-0.153520	8185
2000.00	1.09101e-006	4.0	-0.154182	8185

Waste Water Treatment Facility Sump 1

Geometry Composer Report



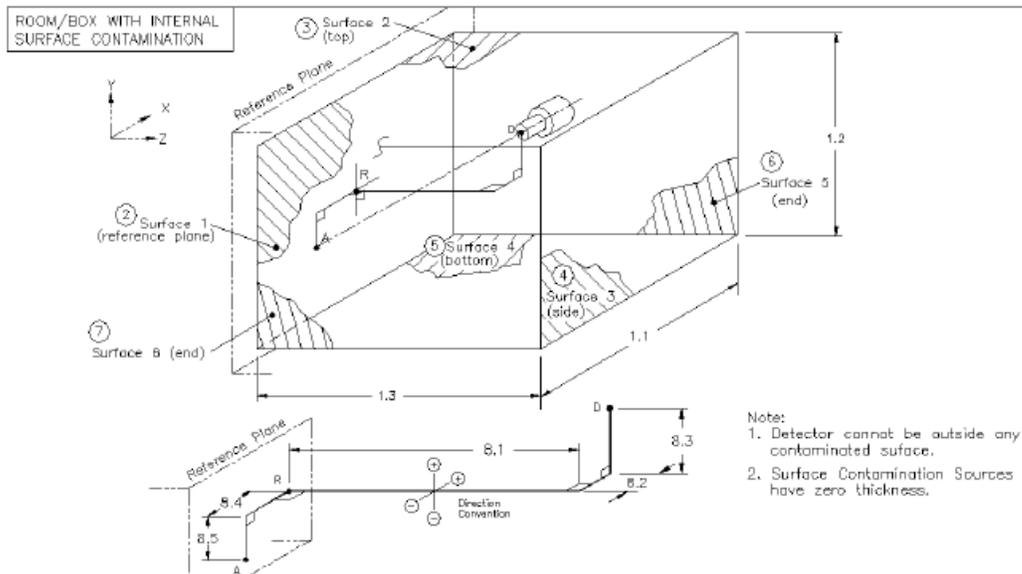
Date: Thursday, August 16, 2018 - 09:40:44
Description: WWTF Sump1
Comment: WWTF Sump1
File Name: C:\GENIE2K\isocs\data\GEOMETRY\In-Situ\ROOM\WWTF_Sump_1.geo
Software: ISOCS
Template: ROOM, Version: (default)
Detector: 5452
Collimator: 50mm-180d new (newISOCS 50mm side 180deg collimation [no collimator])
Environment: Temperature = 22 °C, Pressure = 760 mm Hg, Relative Humidity = 30%
Integration: Convergence = 1.00%, MDRPN = 2⁴ (16), CRPN = 2⁴ (16)

Dimensions (inches)

No.	Description	d.1	d.2	d.3	d.4	d.5	d.6	Material	Density	Rel. Conc.
1	Room/Box	36.25	60	55.25						
2	Surface 1									0.60
3	Surface 2									0.10
4	Surface 3									
5	Surface 4									0.10
6	Surface 5									0.10
7	Surface 6									0.10
8	Source-Detector	55.25	0	0	0	0				

List of energies for efficiency curve generation

59.5	63.3	88.0	122.1	143.8	165.9	185.7	238.6
351.9	391.7	583.2	661.7	898.0	911.6	1001.0	1173.2
1332.5	1460.7	1764.5	1836.1				



Waste Water Treatment Facility Sump 1 (continued)
ISOCS/LABSOCS RESULTS

ISOCS/LabSOCS File: C:\GENIE2K\isocs\data\GEOMETRY\In-Situ\ROOM\WWTF_Sump_1.ecc
ISOCS/LabSOCS Time: 08/16/18 09:27:02
Template: ROOM
Geom Description: WWTF_SUMP1
Comment: ISOCS:WWTF_SUMP1
Detector: 5452
Collimator: 50MM-180D_NEW
Convergence: 1.00 %
Area [Sq Meters]: 8.2649e+000 (C)
Mass [Grams]: 0.0000e+000 (C)
Length [Meters]: not used
(C) = Value calculated by ISOCS
(U) = Value modified by user

Energy	Efficiency	%Uncertainty	%Convergence	Final # of Voxels
59.50	1.33271e-004	10.0	-0.022559	40955
63.30	1.34951e-004	10.0	-0.022512	40955
88.00	1.40116e-004	10.0	-0.018912	40955
122.10	1.36649e-004	10.0	-0.013223	40955
143.80	1.30733e-004	10.0	-0.013787	40955
165.90	1.24118e-004	9.0	-0.014156	40955
185.70	1.18121e-004	8.0	-0.013754	40955
238.60	1.01352e-004	8.0	-0.012627	40955
351.90	7.81868e-005	8.0	-0.015035	40955
391.70	7.25684e-005	8.0	-0.016441	40955
583.20	5.55960e-005	6.0	-0.019233	40955
661.65	5.13349e-005	6.0	-0.019069	40955
898.00	4.26479e-005	5.0	-0.017818	40955
911.60	4.21548e-005	4.0	-0.017630	40955
1001.00	3.97723e-005	4.0	-0.016720	40955
1173.20	3.61511e-005	4.0	-0.015706	40955
1332.50	3.34164e-005	4.0	-0.015029	40955
1460.70	3.14578e-005	4.0	-0.014085	40955
1764.50	2.75820e-005	4.0	-0.013450	40955
1836.10	2.68721e-005	4.0	-0.013435	40955

Waste Water Treatment Facility Sump 2

Geometry Composer Report



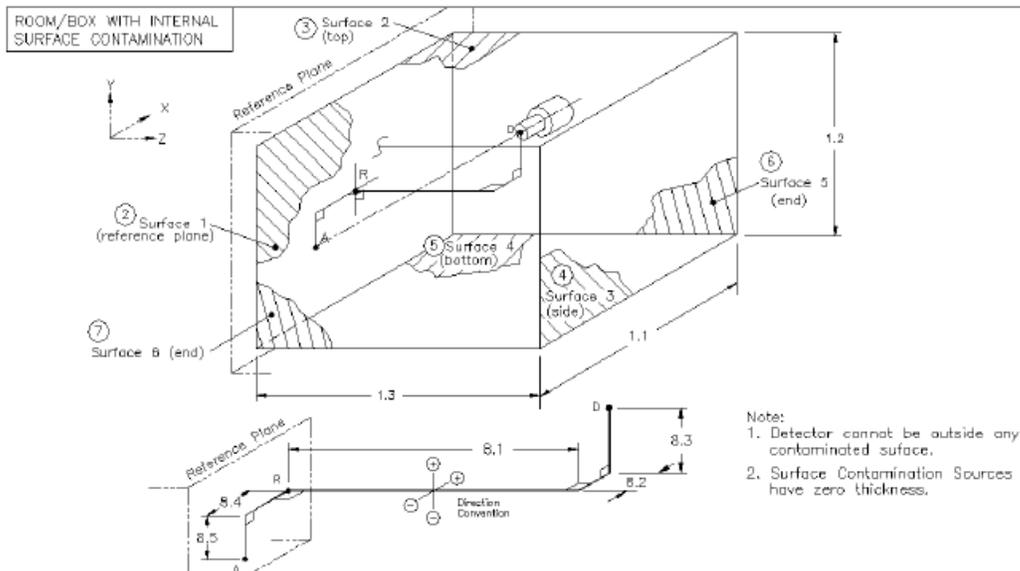
Date: Thursday, August 16, 2018 - 09:49:37
Description: WWTF Sump 2
Comment: W WTF Sump 2
File Name: C:\GENIE2K\isocs\data\GEOMETRY\In-Situ\ROOM\WWTF_Sump_2.geo
Software: ISOCS
Template: ROOM, Version: (default)
Detector: 5452
Collimator: 50mm-180d new (newISOCS 50mm side 180deg collimation [no collimator])
Environment: Temperature = 22 °C, Pressure = 760 mm Hg, Relative Humidity = 30%
Integration: Convergence = 1.00%, MDRPN = 2⁴ (16), CRPN = 2⁴ (16)

Dimensions (inches)

No.	Description	d.1	d.2	d.3	d.4	d.5	d.6	Material	Density	Rel. Conc.
1	Room/Box	60	48	24						
2	Surface 1									0.60
3	Surface 2									0.10
4	Surface 3									
5	Surface 4									0.10
6	Surface 5									0.10
7	Surface 6									0.10
8	Source-Detector	24	0	0	0	0				

List of energies for efficiency curve generation

59.5	63.3	88.0	122.1	143.8	165.9	185.7	238.6
351.9	391.7	583.2	661.7	898.0	911.6	1001.0	1173.2
1332.5	1460.7	1764.5	1836.1				



Waste Water Treatment Facility Sump 2 (continued)

ISOCS/LABSOCS RESULTS

ISOCS/LabSOCS File: C:\GENIE2K\isocs\data\GEOMETRY\In-Situ\ROOM\WWTF_Sump_2.ecc
ISOCS/LabSOCS Time: 08/16/18 09:49:18
Template: ROOM
Geom Description: WWTF_SUMP_2
Comment: ISOCS:W_WTF_SUMP_2
Detector: 5452
Collimator: 50MM-180D_NEW
Convergence: 1.00 %
Area [Sq Meters]: 5.2026e+000 (C)
Mass [Grams]: 0.0000e+000 (C)
Length [Meters]: not used
(C) = Value calculated by ISOCS
(U) = Value modified by user

Energy	Efficiency	%Uncertainty	%Convergence	Final # of Voxels
59.50	2.87044e-004	10.0	0.001055	40955
63.30	2.90589e-004	10.0	-0.001421	40955
88.00	3.01805e-004	10.0	-0.013879	40955
122.10	2.93391e-004	10.0	-0.024233	40955
143.80	2.79288e-004	10.0	-0.026816	40955
165.90	2.64630e-004	9.0	-0.030505	40955
185.70	2.51573e-004	8.0	-0.031414	40955
238.60	2.15266e-004	8.0	-0.028109	40955
351.90	1.65823e-004	8.0	-0.016145	40955
391.70	1.53968e-004	8.0	-0.010821	40955
583.20	1.18038e-004	6.0	-0.004369	40955
661.65	1.08869e-004	6.0	-0.002888	40955
898.00	9.04168e-005	5.0	-0.000990	40955
911.60	8.93346e-005	4.0	-0.000975	40955
1001.00	8.42760e-005	4.0	0.000150	40955
1173.20	7.66049e-005	4.0	-0.000819	40955
1332.50	7.08197e-005	4.0	-0.001665	40955
1460.70	6.65388e-005	4.0	-0.001599	40955
1764.50	5.81622e-005	4.0	-0.001793	40955
1836.10	5.66333e-005	4.0	-0.001741	40955

Waste Water Treatment Facility Sump 3

Geometry Composer Report



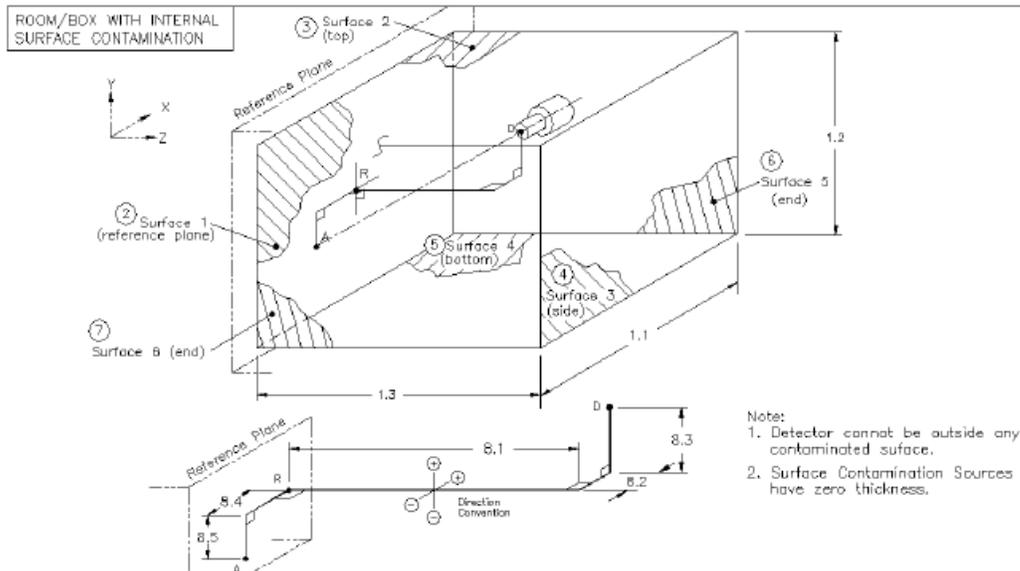
Date: Friday, August 17, 2018 - 06:36:02
Description: WWTF Sump_3
Comment: WWTF Sump_3
File Name: C:\GENIE2K\isocs\data\GEOMETRY\In-Situ\ROOM\WWTF_Sump_3.geo
Software: ISOCS
Template: ROOM, Version: (default)
Detector: 5452
Collimator: 50mm-180d new (newISOCS 50mm side 180deg collimation [no collimator])
Environment: Temperature = 22 °C, Pressure = 760 mm Hg, Relative Humidity = 30%
Integration: Convergence = 1.00%, MDRPN = 2⁴ (16), CRPN = 2⁴ (16)

Dimensions (inches)

No.	Description	d.1	d.2	d.3	d.4	d.5	d.6	Material	Density	Rel. Conc.
1	Room/Box	90	52	53						
2	Surface 1									0.60
3	Surface 2									0.10
4	Surface 3									
5	Surface 4									0.10
6	Surface 5									0.10
7	Surface 6									0.10
8	Source-Detector	53	0	0	0	0				

List of energies for efficiency curve generation

59.5	63.3	88.0	122.1	143.8	165.9	185.7	238.6
351.9	391.7	583.2	661.7	898.0	911.6	1001.0	1173.2
1332.5	1460.7	1764.5	1836.1				



Waste Water Treatment Facility Sump 3 (continued)

ISOCS/LABSOCS RESULTS

ISOCS/LabSOCS File: C:\GENIE2K\isocs\data\GEOMETRY\In-Situ\ROOM\WWTF_Sump_3.ecc
ISOCS/LabSOCS Time: 08/16/18 11:54:03
Template: ROOM
Geom Description: WWTF_SUMP_3
Comment: ISOCS:WWTF_SUMP_3
Detector: 5452
Collimator: 50MM-180D_NEW
Convergence: 1.00 %
Area [Sq Meters]: 1.2730e+001 (C)
Mass [Grams]: 0.0000e+000 (C)
Length [Meters]: not used
(C) = Value calculated by ISOCS
(U) = Value modified by user

Energy	Efficiency	%Uncertainty	%Convergence	Final # of Voxels
59.50	9.46571e-005	10.0	-0.018094	40955
63.30	9.59332e-005	10.0	-0.018126	40955
88.00	9.98817e-005	10.0	-0.017950	40955
122.10	9.75995e-005	10.0	-0.014225	40955
143.80	9.34178e-005	10.0	-0.014482	40955
165.90	8.87215e-005	9.0	-0.015844	40955
185.70	8.44695e-005	8.0	-0.016770	40955
238.60	7.25228e-005	8.0	-0.016536	40955
351.90	5.59399e-005	8.0	-0.010762	40955
391.70	5.19269e-005	8.0	-0.008315	40955
583.20	3.97761e-005	6.0	-0.000656	40955
661.65	3.67296e-005	6.0	0.000503	40955
898.00	3.04764e-005	5.0	0.002372	40955
911.60	3.01263e-005	4.0	0.002400	40955
1001.00	2.84256e-005	4.0	0.002573	40955
1173.20	2.58308e-005	4.0	0.002748	40955
1332.50	2.38389e-005	4.0	0.002989	40955
1460.70	2.24367e-005	4.0	0.002966	40955
1764.50	1.96620e-005	4.0	0.002700	40955
1836.10	1.91606e-005	4.0	0.002571	40955

Waste Water Treatment Facility Flocculator Tank 73

Geometry Composer Report



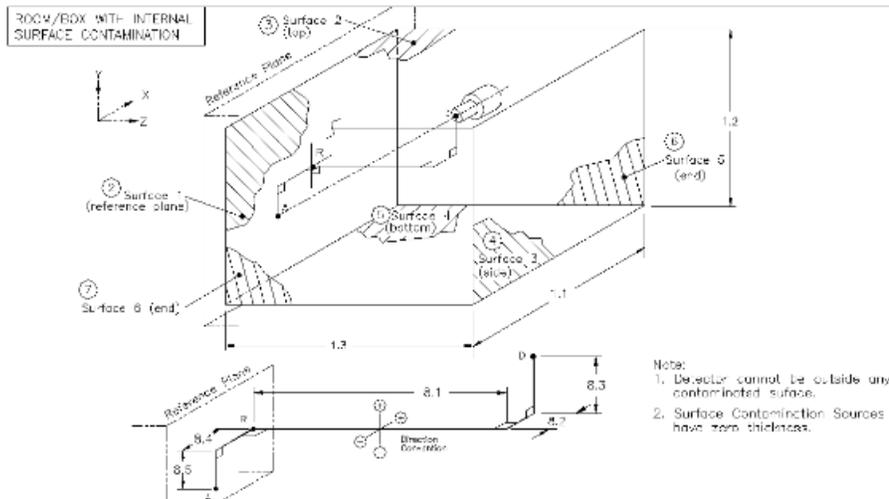
Date: Thursday, August 23, 2018 - 12:38:45
Description: WWTF Floc Tank
Comment: WWTF Floc Tank
File Name: C:\GENIE2K\isocs\data\GEOMETRY\In-Situ\ROOM\WWTF Floc Tank.geo
Software: ISOCS
Template: ROOM, Version: (default)
Detector: 6279
Collimator: 50mm-180d new (newISOCS 50mm side 180deg collimation [no collimator])
Environment: Temperature = 22 °C, Pressure = 760 mm Hg, Relative Humidity = 30%
Integration: Convergence = 1.00%, MDRPN = 2⁴ (16), CRPN = 2⁴ (16)

Dimensions (inches)

No.	Description	d.1	d.2	d.3	d.4	d.5	d.6	Material	Density	Rel. Conc.
1	Room/Box	103.5	76	56						
2	Surface 1									
3	Surface 2									0.25
4	Surface 3									
5	Surface 4									0.25
6	Surface 5									0.25
7	Surface 6									0.25
8	Source-Detector	56	0	0	0	0				

List of energies for efficiency curve generation

45.0 60.0 88.0 100.0 150.0 200.0 300.0 500.0
 661.6 700.0 1000.0 1173.2 1332.5 1400.0 2000.0

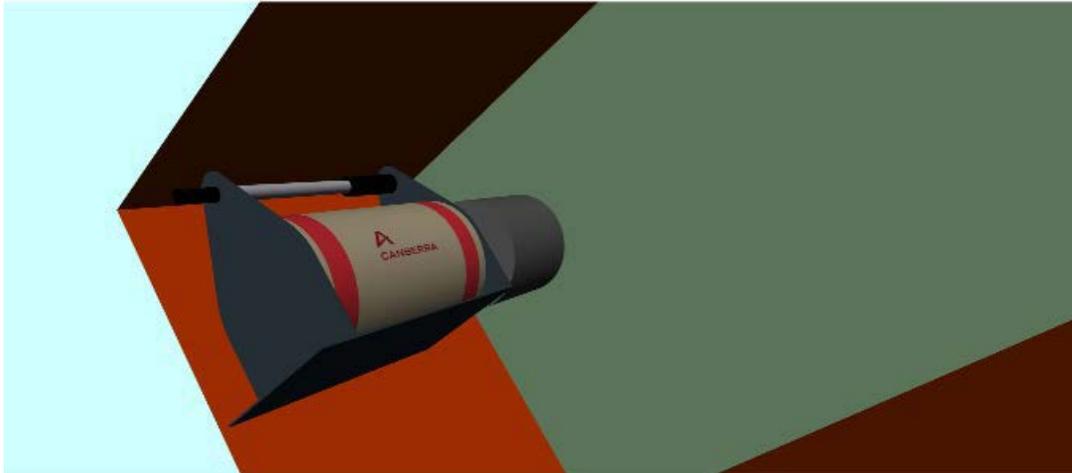


Waste Water Treatment Facility Flocculator Tank 73 (continued)

Geometry Composer Report



Date: Thursday, August 23, 2018 - 12:38:45
Description: WWTF Floc Tank
Comment: WWTF Floc Tank
File Name: C:\GENIE2K\isocs\data\GEOMETRY\In-Situ\ROOM\WWTF Floc Tank.geo
Software: ISOCS
Template: ROOM, Version: (default)



Waste Water Treatment Facility Flocculator Tank 73 (continued)

ISOCS/LABSOCS RESULTS

ISOCS/LabSOCS File: C:\GENIE2K\isocs\data\GEOMETRY\In-Situ\ROOM\WWTF Floc Tank.ecc
ISOCS/LabSOCS Time: 08/17/18 09:31:13
Template: ROOM
Geom Description: WWTF FLOC TANK
Comment: ISOCS:WWTF_FLOC_TANK
Detector: 6279
Collimator: 50MM-180D_NEW
Convergence: 1.00 %
Area [Sq Meters]: 1.2970e+001 (C)
Mass [Grams]: 0.0000e+000 (C)
Length [Meters]: not used
(C) = Value calculated by ISOCS
(U) = Value modified by user

Energy	Efficiency	%Uncertainty	%Convergence	Final # of Voxels
45.00	3.77343e-005	15.0	-0.025169	32764
60.00	4.08960e-005	10.0	-0.036334	32764
88.00	4.16126e-005	10.0	-0.039022	32764
100.00	4.08283e-005	10.0	-0.041401	32764
150.00	3.53525e-005	10.0	-0.033241	32764
200.00	2.94031e-005	8.0	-0.021614	32764
300.00	2.12493e-005	8.0	-0.001680	32764
500.00	1.39996e-005	6.0	0.018822	32764
661.60	1.14632e-005	6.0	0.021562	32764
700.00	1.10264e-005	6.0	0.022031	32764
1000.00	8.65111e-006	4.0	0.019665	32764
1173.20	7.84075e-006	4.0	0.017952	32764
1332.50	7.31020e-006	4.0	0.016821	32764
1400.00	7.06993e-006	4.0	0.016167	32764
2000.00	5.47345e-006	4.0	0.013353	32764

Waste Water Treatment Facility Flocculator Tank 72

Geometry Composer Report



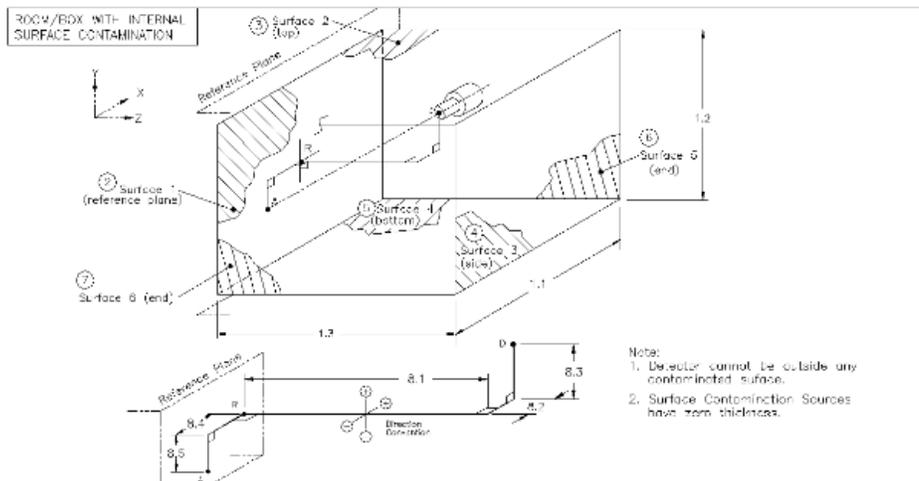
Date: Friday, August 17, 2018 - 12:09:34
Description: WWTF Floc Tank
Comment: WWTF Floc Tank
File Name: C:\GENIE2K\isocs\data\GEOMETRY\In-Situ\ROOM\WWTF_fLOC_TK_72.geo
Software: ISOCS
Template: ROOM, Version: (default)
Detector: 6279
Collimator: 50mm-180d new (newISOCS 50mm side 180deg collimation [no collimator])
Environment: Temperature = 22 °C, Pressure = 760 mm Hg, Relative Humidity = 30%
Integration: Convergence = 1.00%, MDRPN = 2⁴ (16), CRPN = 2⁴ (16)

Dimensions (inches)

No.	Description	d.1	d.2	d.3	d.4	d.5	d.6	Material	Density	Rel. Conc.
1	Room/Box	103.5	76	56						
2	Surface 1									
3	Surface 2									0.50
4	Surface 3									
5	Surface 4									0.50
6	Surface 5									
7	Surface 6									
8	Source-Detector	56	0	0	0	0				

List of energies for efficiency curve generation

45.0	60.0	88.0	100.0	150.0	200.0	300.0	500.0
661.6	700.0	1000.0	1173.2	1332.5	1400.0	2000.0	

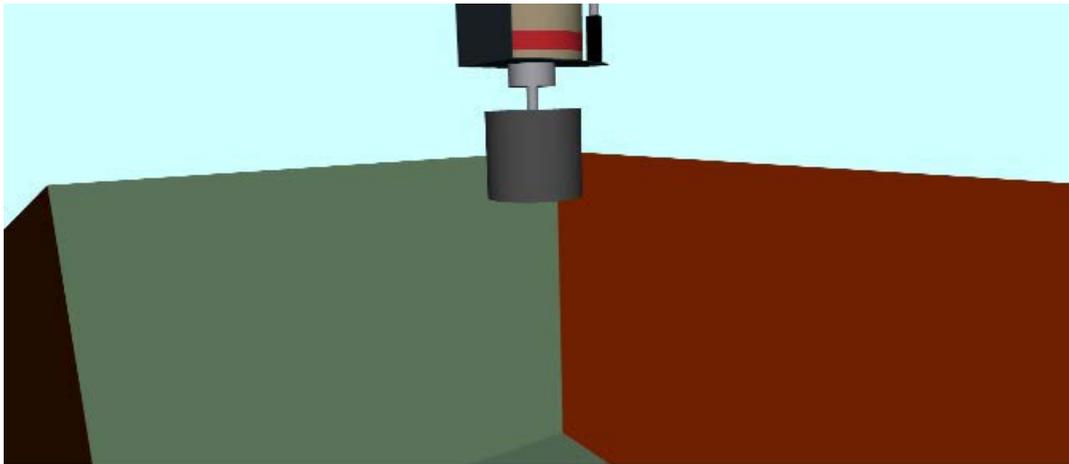


Waste Water Treatment Facility Flocculator Tank 72 (continued)

Geometry Composer Report



Date: Friday, August 17, 2018 - 12:09:34
Description: WWTF Floc Tank
Comment: WWTF Floc Tank
File Name: C:\GENIE2K\isocs\data\GEOMETRY\In-Situ\ROOM\WWTF_fLOC_TK_72.geo
Software: ISOCS
Template: ROOM, Version: (default)



Waste Water Treatment Facility Flocculator Tank 72 (continued)

ISOCS/LABSOCS RESULTS

ISOCS/LabSOCS File: C:\GENIE2K\isocs\data\GEOMETRY\In-Situ\ROOM\WWTF_FLOC_TK_72.ecc
ISOCS/LabSOCS Time: 08/17/18 10:15:45
Template: ROOM
Geom Description: WWTF FLOC TANK
Comment: ISOCS:WWTF_FLOC_TANK
Detector: 6279
Collimator: 50MM-180D_NEW
Convergence: 1.00 %
Area [Sq Meters]: 7.4787e+000 (C)
Mass [Grams]: 0.0000e+000 (C)
Length [Meters]: not used
(C) = Value calculated by ISOCS
(U) = Value modified by user

Energy	Efficiency	%Uncertainty	%Convergence	Final # of Voxels
45.00	4.46289e-005	15.0	-0.011519	16382
60.00	4.83588e-005	10.0	-0.027588	16382
88.00	4.92280e-005	10.0	-0.037471	16382
100.00	4.83200e-005	10.0	-0.046574	16382
150.00	4.18992e-005	10.0	-0.043342	16382
200.00	3.48875e-005	8.0	-0.035792	16382
300.00	2.52209e-005	8.0	-0.015609	16382
500.00	1.65971e-005	6.0	0.004057	16382
661.60	1.35641e-005	6.0	0.005089	16382
700.00	1.30462e-005	6.0	0.005451	16382
1000.00	1.02038e-005	4.0	0.002060	16382
1173.20	9.23048e-006	4.0	0.000316	16382
1332.50	8.59387e-006	4.0	-0.000805	16382
1400.00	8.30648e-006	4.0	-0.001391	16382
2000.00	6.40913e-006	4.0	-0.004414	16382

Waste Water Treatment Facility Clarifier Tank

Geometry Composer Report



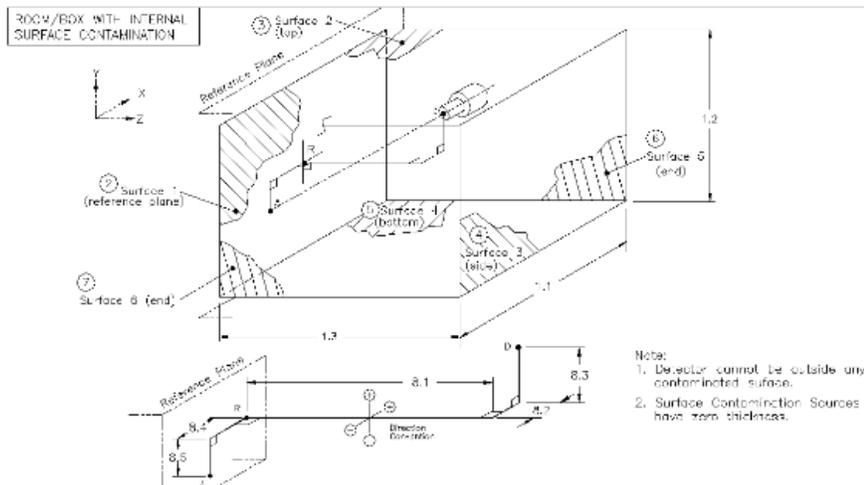
Date: Thursday, August 23, 2018 - 13:17:21
Description: WWTF Clarifier 70-71
Comment: WWTF Clarifier 70-71
File Name: C:\GENIE2K\isocs\data\GEOMETRY\In-Situ\ROOM\WWTF Clarifier 70-71.geo
Software: ISOCS
Template: ROOM, Version: (default)
Detector: 6279
Collimator: 50mm-180d new (newISOCS 50mm side 180deg collimation [no collimator])
Environment: Temperature = 22 °C, Pressure = 760 mm Hg, Relative Humidity = 30%
Integration: Convergence = 1.00%, MDRPN = 2⁴ (16), CRPN = 2⁴ (16)

Dimensions (inches)

No.	Description	d.1	d.2	d.3	d.4	d.5	d.6	Material	Density	Rel. Conc.
1	Room/Box	90	96	60						
2	Surface 1									0.60
3	Surface 2									0.10
4	Surface 3									
5	Surface 4									0.10
6	Surface 5									0.10
7	Surface 6									0.10
8	Source-Detector	60	0	0	0	0				

List of energies for efficiency curve generation

45.0 60.0 88.0 100.0 150.0 200.0 300.0 500.0
 661.6 700.0 1000.0 1173.2 1332.5 1400.0 2000.0

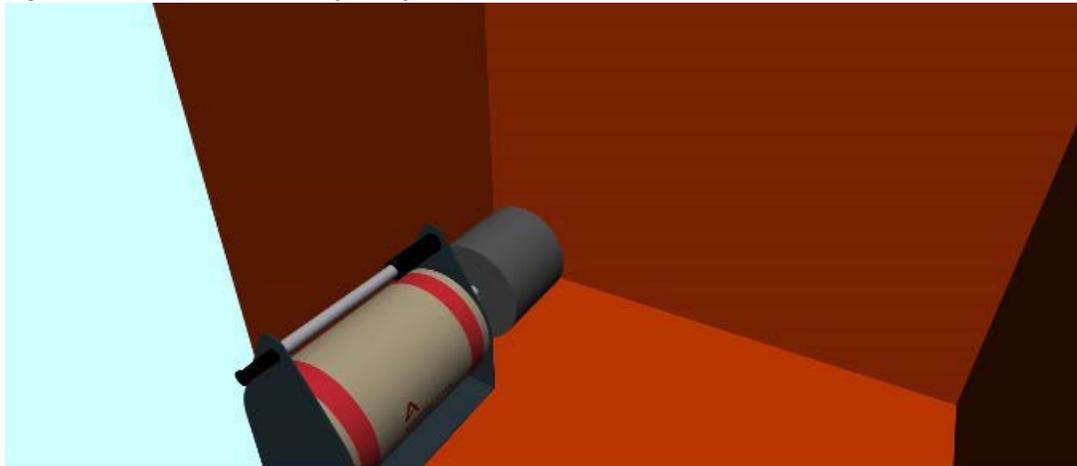


Waste Water Treatment Facility Clarifier Tank (continued)

Geometry Composer Report



Date: Thursday, August 23, 2018 - 13:17:21
Description: WWTF Clarifier 70-71
Comment: WWTF Clarifier 70-71
File Name: C:\GENIE2K\isocs\data\GEOMETRY\In-Situ\ROOM\WWtF Clarifier 70-71.geo
Software: ISOCS
Template: ROOM, Version: (default)



Waste Water Treatment Facility Clarifier Tank (continued)

ISOCS/LABSOCS RESULTS

ISOCS/LabSOCS File: C:\GENIE2K\isocs\data\GEOMETRY\In-Situ\ROOM\WWtF Clarifier 70-71
ISOCS/LabSOCS Time: 08/17/18 07:46:53
Template: ROOM
Geom Description: CLARIFIER 70-71
Comment: ISOCS:WWTF_CLARIFIER_70-71
Detector: 6279
Collimator: 50MM-180D_NEW
Convergence: 1.00 %
Area [Sq Meters]: 1.9974e+001 (C)
Mass [Grams]: 0.0000e+000 (C)
Length [Meters]: not used
(C) = Value calculated by ISOCS
(U) = Value modified by user

Energy	Efficiency	%Uncertainty	%Convergence	Final # of Voxels
45.00	5.35484e-005	15.0	0.007545	40955
60.00	5.77403e-005	10.0	0.011418	40955
88.00	5.89736e-005	10.0	0.004881	40955
100.00	5.81986e-005	10.0	0.006587	40955
150.00	5.12962e-005	10.0	0.001974	40955
200.00	4.31339e-005	8.0	-0.000651	40955
300.00	3.12704e-005	8.0	-0.003098	40955
500.00	2.01681e-005	6.0	-0.003612	40955
661.60	1.60940e-005	6.0	-0.003167	40955
700.00	1.54089e-005	6.0	-0.002857	40955
1000.00	1.17213e-005	4.0	-0.003216	40955
1173.20	1.04098e-005	4.0	-0.002347	40955
1332.50	9.51124e-006	4.0	-0.002090	40955
1400.00	9.13523e-006	4.0	-0.001696	40955
2000.00	6.82318e-006	4.0	-0.001613	40955

ATTACHMENT 3

SIGN TEST

Sign Test Waste Water Treatment Facility

Survey Area	09100	Description	Out Buildings
Survey Unit	B1-09100A-F	Description	WWTF
Classification	1 Type I Error 0.05	# of Measurements	70

#	SOF (W _s)	1-W _s	Sign
1	0.0414	0.96	+1
2	0.0642	0.94	+1
3	0.0071	0.99	+1
4	0.0663	0.93	+1
5	0.0656	0.93	+1
6	0.0703	0.93	+1
7	0.0647	0.94	+1
8	0.0796	0.92	+1
9	0.0478	0.95	+1
10	0.0093	0.99	+1
11	0.0608	0.94	+1
12	0.0619	0.94	+1
13	0.2361	0.76	+1
14	0.0988	0.90	+1
15	0.0938	0.91	+1
16	0.0591	0.94	+1
17	0.0543	0.95	+1
18	0.0547	0.95	+1
19	0.1139	0.89	+1
20	0.1429	0.86	+1
21	0.1145	0.89	+1
22	0.0826	0.92	+1
23	0.0771	0.92	+1
24	0.0632	0.94	+1
25	0.0482	0.95	+1
26	0.0357	0.96	+1
27	0.0741	0.93	+1
28	0.1019	0.90	+1
29	0.0492	0.95	+1
30	0.1222	0.88	+1
31	0.0732	0.93	+1
32	0.0680	0.93	+1
33	0.1092	0.89	+1
34	0.0611	0.94	+1

Sign Test Waste Water Treatment System (continued)

#	SOF (W _s)	1-W _s	Sign
35	0.0395	0.96	+1
36	0.0763	0.92	+1
37	0.1515	0.85	+1
38	0.0790	0.92	+1
39	0.0482	0.95	+1
40	0.0838	0.92	+1
41	0.1348	0.87	+1
42	0.0920	0.91	+1
43	0.0671	0.93	+1
44	0.0997	0.90	+1
45	0.0774	0.92	+1
51	0.1145	0.89	+1
52	0.0643	0.94	+1
53	0.0230	0.98	+1
54	0.0775	0.92	+1
55	0.1000	0.90	+1
56	0.0226	0.98	+1
57	0.0377	0.96	+1
58	0.1001	0.90	+1
59	0.1055	0.89	+1
60	0.0417	0.96	+1
61	0.0430	0.96	+1
62	0.1074	0.89	+1
63	0.0545	0.95	+1
64	0.0453	0.95	+1
65	0.0506	0.95	+1
66	0.0564	0.94	+1
67	0.0392	0.96	+1
68	0.0330	0.97	+1
69	0.0327	0.97	+1
70	0.0252	0.97	+1
71	0.0233	0.98	+1
72	0.1007	0.90	+1
73	0.0152	0.98	+1
74	0.0166	0.98	+1
75	0.0331	0.97	+1

Number of Positive Differences (S+) = 70
Critical Value = 40

Survey Unit Meets the Acceptance Criteria

ATTACHMENT 4 QC MEASUREMENT ASSESSMENTS

Replicate Measurement Assessment

Survey Unit # 09100 Survey Unit Name WWTF
 Sample Plan # B1-09100A-F

Sample Description: Comparison of systematic and QC ISOCS measurements of concrete floor at location #014.

STANDARD					COMPARISON												
ROC	Activity Value	Standard Error	Resolution	Agreement Range	Activity Value	Standard Error	Comparison Ratio	Acceptable (Y/N)									
Cs-137	2.57E+04	1.00E+00	25,700	0.85-1.18	3.56E+03	1.00E+00	7.22	N									
K-40	7.60E+05	2.13E+05	4	0.5-2.0	8.85E+05	2.20E+05	0.86	Y									
Comments/Corrective Actions: (1)-For Cs-137, comparison sample had a negative value and the standard error was not reported, therefore the value of 1 was used for the comparison sample activity and standard error. The Cs-137 activity for both the standard and comparison samples were less than the respective MDC's (2.76E+04 pCi/m ² and 2.52E+04 pCi/m ² respectively). When K-40 was used to compare the standard and comparison samples, they indicated an acceptable level of agreement between the two samples.					Table is provided to show acceptance criteria used to assess split samples.												
					<table border="0"> <thead> <tr> <th><u>Resolution</u></th> <th><u>Agreement Range</u></th> </tr> </thead> <tbody> <tr> <td>4 - 7</td> <td>0.5 - 2.0</td> </tr> <tr> <td>8 - 15</td> <td>0.6 - 1.66</td> </tr> <tr> <td>16 - 50</td> <td>0.75 - 1.33</td> </tr> <tr> <td>51 - 200</td> <td>0.80 - 1.25</td> </tr> <tr> <td>>200</td> <td>0.85 - 1.18</td> </tr> </tbody> </table>		<u>Resolution</u>	<u>Agreement Range</u>	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
<u>Resolution</u>	<u>Agreement Range</u>																
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: Robert Massengill Date 8/28/2018 Reviewed by: Robert Decker Date : 8/28/2018
 R. Massengill R. Decker

Replicate Measurement Assessment

Survey Unit # 09100 Survey Unit Name WWTF
 Sample Plan # B1-09100A-F

Sample Description: Comparison of systematic and QC ISOCS measurements of concrete floor at location # 009.

STANDARD					COMPARISON								
ROC	Activity Value	Standard Error	Resolution	Agreement Range	Activity Value	Standard Error	Comparison Ratio	Acceptable (Y/N)					
Cs-137	3.15E+03	1.00E+00	3,150	0.85-1.18	2.14E+04	1.00E+00	0.15	N					
K-40	1.22E+06	2.36E+05	5	0.5-2.0	1.01E+06	2.48E+05	1.21	Y					
Comments/Corrective Actions: (1)-For Cs-137, the standard error was not reported, therefore the value of 1 was used for standard error. The Cs-137 activity for both the standard and comparison samples were less than the respective MDC's (2.4E+04 pCi/m ² and 2.14E+04 pCi/m ² respectively). When K-40 was used to compare the standard and comparison samples, they indicated an acceptable level of agreement between the two samples.					Table is provided to show acceptance criteria used to assess split samples.								
									<table border="0"> <thead> <tr> <th><u>Resolution</u></th> <th><u>Agreement Range</u></th> </tr> </thead> <tbody> <tr> <td>4 - 7</td> <td>0.5 - 2.0</td> </tr> <tr> <td>8 - 15</td> <td>0.6 - 1.66</td> </tr> <tr> <td>16 - 50</td> <td>0.75 - 1.33</td> </tr> <tr> <td>51 - 200</td> <td>0.80 - 1.25</td> </tr> <tr> <td>>200</td> <td>0.85 - 1.18</td> </tr> </tbody> </table>		<u>Resolution</u>	<u>Agreement Range</u>	4 - 7
<u>Resolution</u>	<u>Agreement Range</u>												
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: Robert Massengill Date 8/28/2018 Reviewed by: Robert Decker Date : 8/28/2018
 R. Massengill R. Decker

Replicate Measurement Assessment

Survey Unit # 09100 Survey Unit Name WWTF
Sample Plan # B1-09100A-F

Sample Description: Comparison of systematic and QC ISOCS measurements of concrete wall at location # 027.

STANDARD					COMPARISON			
ROC	Activity Value	Standard Error	Resolution	Agreement Range	Activity Value	Standard Error	Comparison Ratio	Acceptable (Y/N)
Cs-137	2.57E+04	1.00E+00	3,150	0.85-1.18	1.00E+00	1.00E+00	25,700	N
K-40	1.06E+06	2.34E+05	5	0.5-2.0	1.11E+06	2.48E+05	0.95	Y
Comments/Corrective Actions: (1)-For Cs-137, comparison sample had a negative value and the standard error was not reported, therefore the value of 1 was used for the comparison sample activity and standard error. The Cs-137 activity for both the standard and comparison samples were less than the respective MDC's (2.76E+04 pCi/m ² and 2.52E+04 pCi/m ² respectively). When K-40 was used to compare the standard and comparison samples, they indicated an acceptable level of agreement between the two samples.					Table is provided to show acceptance criteria used to assess split samples.			
					<u>Resolution</u> 4 - 7 8 - 15 16 - 50 51 - 200 >200		<u>Agreement Range</u> 0.5 - 2.0 0.6 - 1.66 0.75 - 1.33 0.80 - 1.25 0.85 - 1.18	

Performed By: Robert Massengill Date 8/28/2018 Reviewed by: Robert F Decker Date : 8/28/2018
R. Massengill R. Decker

Replicate Measurement Assessment

Survey Unit # 09100 Survey Unit Name WWTF
Sample Plan # B1-09100A-F

Sample Description: Comparison of systematic and QC ISOCS measurements of concrete wall at location # 053.

STANDARD					COMPARISON															
ROC	Activity Value	Standard Error	Resolution	Agreement Range	Activity Value	Standard Error	Comparison Ratio	Acceptable (Y/N)												
Cs-137	6.59E+03	1.00E+00	6,590	0.85-1.18	3.34E+04	1.29E+04	0.20	N												
K-40	7.14E+05	2.03E+05	4	0.5-2.0	8.35E+05	2.04E+05	0.86	Y												
Comments/Corrective Actions: (1)-For Cs-137, the standard error was not reported, therefore the value of 1 was used for the comparison sample and standard error. The Cs-137 activity for the standard sample was less than the MDC (3.16E+04 pCi/m ²). When K-40 was used to compare the standard and comparison samples, they indicated an acceptable level of agreement between the two samples.					Table is provided to show acceptance criteria used to assess split samples. <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th><u>Resolution</u></th> <th><u>Agreement Range</u></th> </tr> </thead> <tbody> <tr> <td>4 - 7</td> <td>0.5 - 2.0</td> </tr> <tr> <td>8 - 15</td> <td>0.6 - 1.66</td> </tr> <tr> <td>16 - 50</td> <td>0.75 - 1.33</td> </tr> <tr> <td>51 - 200</td> <td>0.80 - 1.25</td> </tr> <tr> <td>>200</td> <td>0.85 - 1.18</td> </tr> </tbody> </table>				<u>Resolution</u>	<u>Agreement Range</u>	4 - 7	0.5 - 2.0	8 - 15	0.6 - 1.66	16 - 50	0.75 - 1.33	51 - 200	0.80 - 1.25	>200	0.85 - 1.18
<u>Resolution</u>	<u>Agreement Range</u>																			
4 - 7	0.5 - 2.0																			
8 - 15	0.6 - 1.66																			
16 - 50	0.75 - 1.33																			
51 - 200	0.80 - 1.25																			
>200	0.85 - 1.18																			

Performed By: *R Massengill* Date 8/28/2018 Reviewed by: *R. Decker* Date : 8/28/2018
R Massengill R. Decker

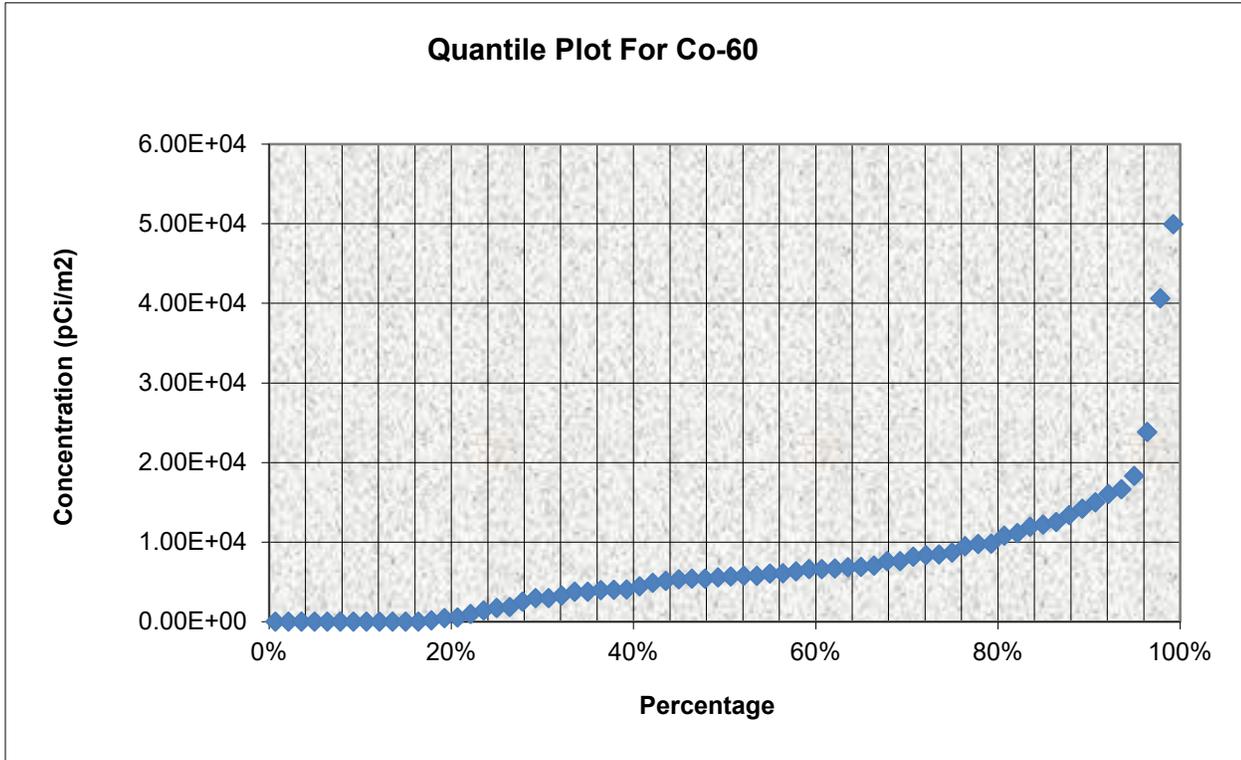
ATTACHMENT 5 GRAPHICAL PRESENTATIONS

Quantile Plot for Co-60

Survey Unit: B1-09100AF

Description: Waste Water Treatment Facility

Mean: 7.06E+03 pCi/m²

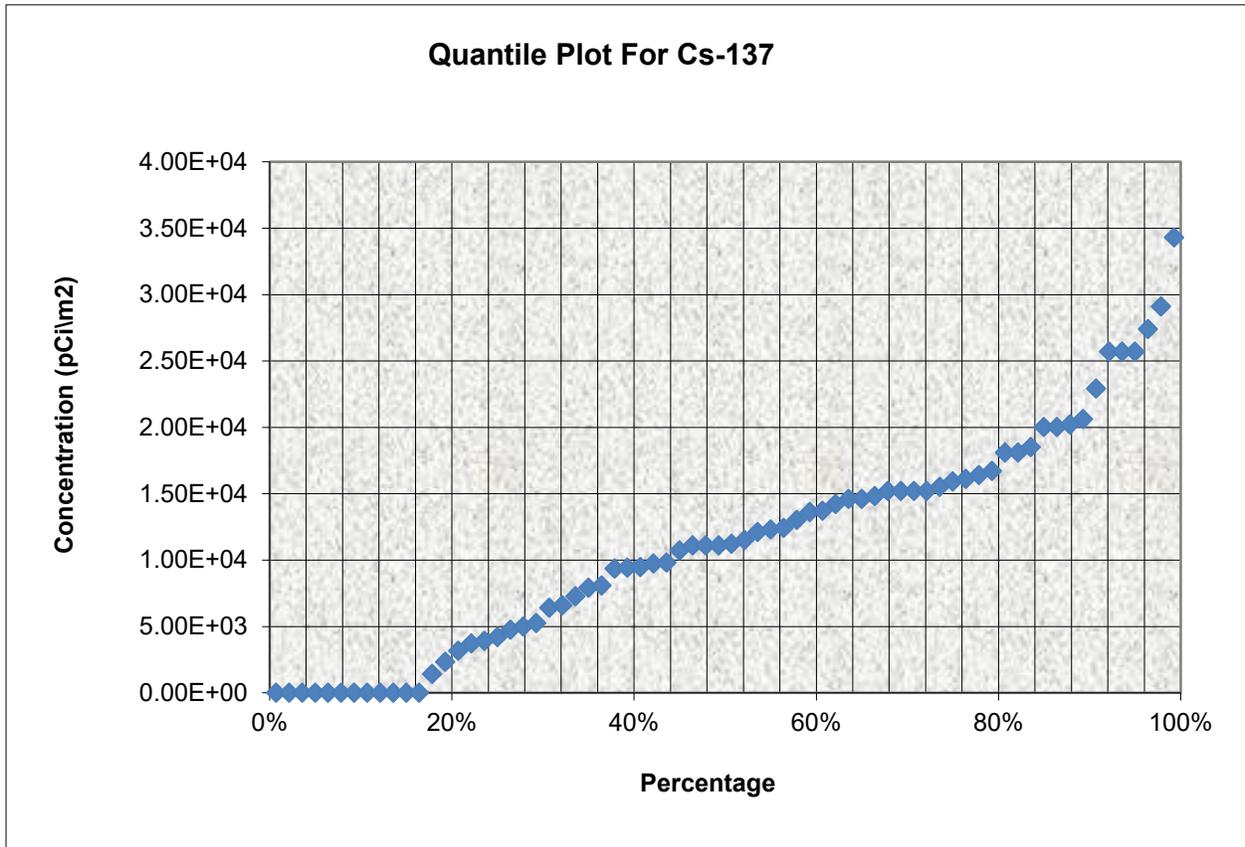


Quantile Plot for Cs-137

Survey Unit: B1-09100AF

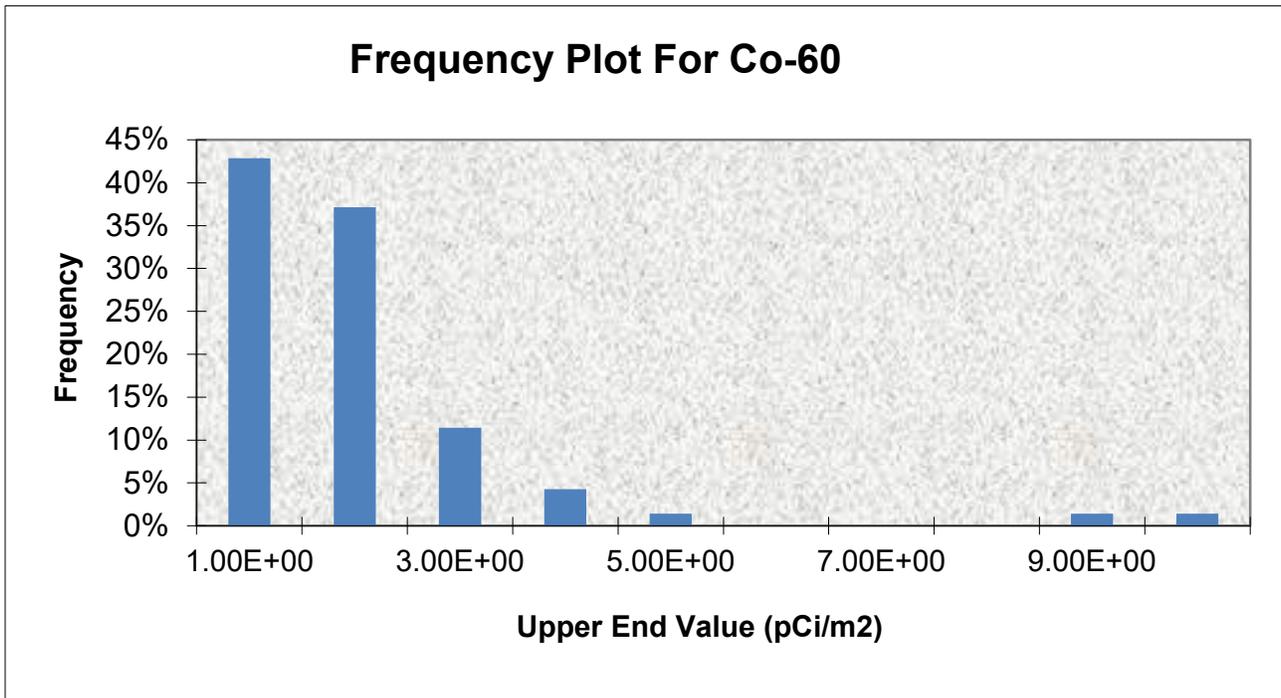
Description: Waste Water Treatment Facility

Mean: 1.12E+04 pCi/m²



Histogram for Co-60

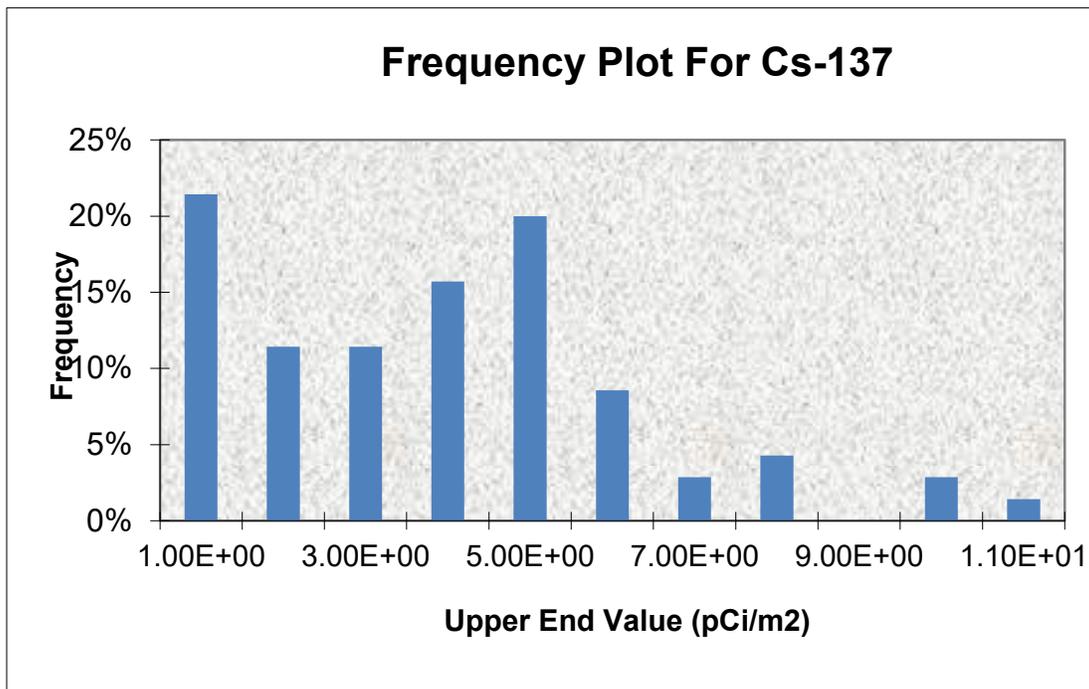
Survey Unit: B1-09100A
 Description: Waste Water Treatment Facility
 Mean: 7.06E+03 pCi/m²
 Median: 5.61E+03 pCi/m²
 ST Dev.: 8.38E+03
 Skew: 3.03E+00



Upper Value	Observation Frequency	Observation %
4.99E+03	30	43%
9.98E+03	26	37%
1.50E+04	8	11%
2.00E+04	3	4%
2.50E+04	1	1%
2.99E+04	0	0%
3.49E+04	0	0%
3.99E+04	0	0%
4.49E+04	1	1%
4.99E+04	1	1%
TOTAL	70	100%

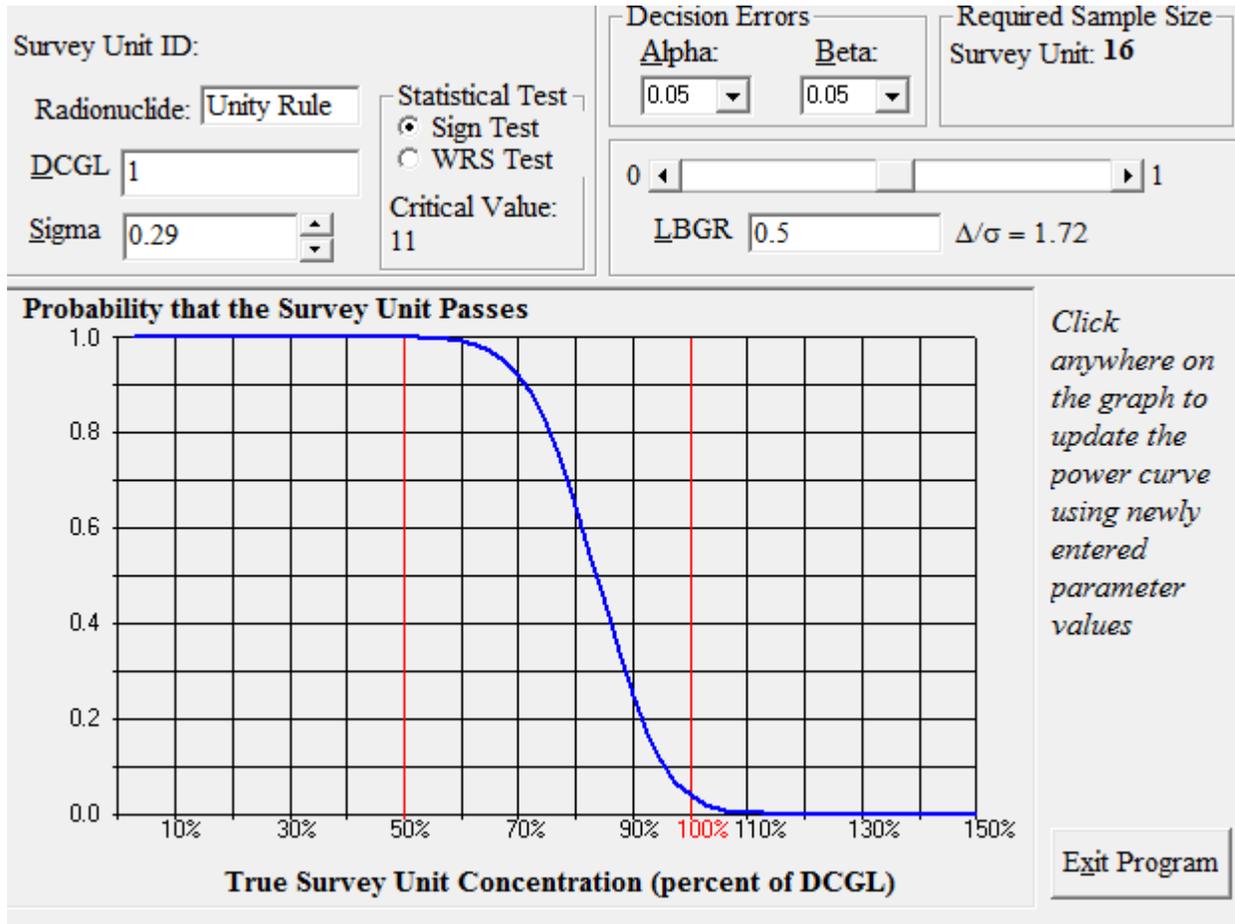
Histogram for Cs-137

Survey Unit: B1-09100A
Description: Waste Water Treatment Facility
Mean: 3.15E+06 pCi/m²
Median: 8.10E+05 pCi/m²
ST Dev.: 6.86E+06
Skew: 5.16E+00



Upper Value	Observation Frequency	Observation %
3.43E+03	15	21%
6.86E+03	8	11%
1.03E+04	8	11%
1.37E+04	11	16%
1.72E+04	14	20%
2.06E+04	6	9%
2.40E+04	2	3%
2.74E+04	3	4%
3.09E+04	0	0%
3.09E+04	2	3%
TOTAL	70	100%

Retrospective Power Curve for Survey Unit #B1-09100AF



ATTACHMENT 6 EBERLINE REPORT



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

EBS-OR-44289

September 19, 2018

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

CASE NARRATIVE
Work Order # 18-08150-OR

SAMPLE RECEIPT

This work order contains eight solid samples received 08/29/2018. Samples were analyzed for Total Strontium, Tritium, Nickel-63 and by Gamma Spectroscopy.

<u>CLIENT ID</u>	<u>LAB ID</u>	<u>CLIENT ID</u>	<u>LAB ID</u>
B1-09100A-FSFC-067CV	18-08150-04	B1-09100-FSWC-041CV	18-08150-08
B1-09100A-FSWC-031CV	18-08150-05	B1-09100A-FSFC-068CV	18-08150-09
B1-09100A-FSFC-001CV	18-08150-06	B1-09100A-FSWC-051CV	18-08150-10
B1-09100A-FSFC-010CV	18-08150-07	B1-09100-FSFC-021CV	18-08150-11

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 digesting with acids as appropriate. Strontium recovery carriers were added to the samples. Chemical separations were conducted using selective extractions. Strontium precipitate was mounted on tared filter media. Chemical recovery was determined by Strontium carrier mass determinations. Samples were counted by gas flow proportional counting and corrected for Yttrium-90 ingrowth.

Samples demonstrated acceptable results for all Total Strontium analyses. Strontium-90 results are reported from Total Strontium. 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 diluted with tritium free water. Cocktail was added. Samples were then 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

Samples were prepared by digesting with acids and diluting as appropriate. Aliquots were removed from dilution and placed into appropriately sized beakers. Stable elemental Nickel carrier was added to each sample prior to digestion. After digestion, sample pH was adjusted and Nickel-63 was precipitated selectively with Dimethylglyoxime. Precipitates were selectively separated, redissolved, and residual acid was effectively neutralized. Sample residuals were placed into scintillation vials, scintillation cocktail was added and Nickel-63 activity was determined by beta liquid scintillation.

Samples demonstrated acceptable results for all Nickel-63 analyses. The Nickel-63 method blank demonstrated an acceptable result. Results for the Nickel-63 duplicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Nickel-63 laboratory control sample demonstrated an acceptable percent recovery.

GAMMA SPECTROSCOPY

Samples for Gamma Spectroscopy analysis were prepared by transferring a known mass of each homogenized sample to a standard geometry container. Samples were counted on a High Purity Germanium (HPGe) gamma ray detector.

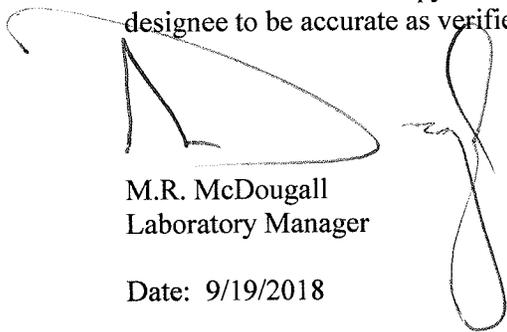
ANALYTICAL RESULTS CONTINUED

GAMMA SPECTROSCOPY CONTINUED

Samples demonstrated acceptable results for all gamma-emitting radionuclides as reported. Some samples demonstrated results that are greater than the method detection limit. These results are reported from the Canberra Gamma Apex "Nuclide MDA Report" and are not positive. These results are qualified as non-detect (U). The method blank demonstrated acceptable results for all radionuclides as reported. Results for the Cobalt-60, Cesium-137 and Potassium-40 replicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. 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: 9/19/2018

Eberline Analytical wants and encourages your feedback regarding our performance providing radioanalytical services. Please visit <http://eberlineanalytical.com/> to provide us with feedback on our services.

Eberline Analytical Final Report of Analysis								Report To:				Work Order Details:						
								Patricia Giza				SDG:	18-08150					
								Zion Solutions				Purchase Order:	677118					
								101 Shiloh Blvd				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				
18-08150-01	LCS	KNOWN	08/29/18 00:00	8/29/2018	9/2/2018	18-08150	Tritium	LANL ER-210 Modified	2.22E+02	8.00E+00				pCi/g				
18-08150-01	LCS	SPIKE	08/29/18 00:00	8/29/2018	9/2/2018	18-08150	Tritium	LANL ER-210 Modified	1.96E+02	7.53E+00	1.33E+01	5.11E+00		pCi/g				
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	9/2/2018	18-08150	Tritium	LANL ER-210 Modified	2.62E+00	2.96E+00	2.97E+00	4.98E+00	U	pCi/g				
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	9/2/2018	18-08150	Tritium	LANL ER-210 Modified	1.85E+00	2.90E+00	2.90E+00	4.93E+00	U	pCi/g				
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	9/2/2018	18-08150	Tritium	LANL ER-210 Modified	1.30E+00	2.88E+00	2.88E+00	4.92E+00	U	pCi/g				
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	9/2/2018	18-08150	Tritium	LANL ER-210 Modified	2.66E+00	3.01E+00	3.01E+00	5.06E+00	U	pCi/g				
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	9/2/2018	18-08150	Tritium	LANL ER-210 Modified	1.51E+00	2.94E+00	2.94E+00	5.01E+00	U	pCi/g				
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	9/2/2018	18-08150	Tritium	LANL ER-210 Modified	5.53E-01	2.84E+00	2.84E+00	4.90E+00	U	pCi/g				
18-08150-08	TRG	B1-09100A-FSWC-041CV	08/22/18 08:34	8/29/2018	9/2/2018	18-08150	Tritium	LANL ER-210 Modified	1.16E+00	3.00E+00	3.00E+00	5.15E+00	U	pCi/g				
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	9/2/2018	18-08150	Tritium	LANL ER-210 Modified	1.14E+00	2.95E+00	2.95E+00	5.06E+00	U	pCi/g				
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	9/2/2018	18-08150	Tritium	LANL ER-210 Modified	1.11E+00	2.87E+00	2.87E+00	4.93E+00	U	pCi/g				
18-08150-11	TRG	B1-09100A-FSFC-021CV	08/22/18 12:59	8/29/2018	9/2/2018	18-08150	Tritium	LANL ER-210 Modified	4.08E+00	3.13E+00	3.14E+00	5.17E+00	U	pCi/g				
18-08150-01	LCS	KNOWN	08/29/18 00:00	8/29/2018	9/3/2018	18-08150	Nickel-63	ASTM 3500-Ni Modified	1.54E+03	4.62E+01				pCi/g				
18-08150-01	LCS	SPIKE	08/29/18 00:00	8/29/2018	9/3/2018	18-08150	Nickel-63	ASTM 3500-Ni Modified	1.51E+03	1.29E+01	8.96E+01	2.99E+00		pCi/g				
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	9/3/2018	18-08150	Nickel-63	ASTM 3500-Ni Modified	-7.35E-01	1.65E+00	1.66E+00	2.90E+00	U	pCi/g				
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	9/3/2018	18-08150	Nickel-63	ASTM 3500-Ni Modified	2.14E+00	1.83E+00	1.83E+00	3.04E+00	U	pCi/g				
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	9/3/2018	18-08150	Nickel-63	ASTM 3500-Ni Modified	6.81E-01	1.77E+00	1.77E+00	3.02E+00	U	pCi/g				
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	9/3/2018	18-08150	Nickel-63	ASTM 3500-Ni Modified	8.74E-01	1.66E+00	1.66E+00	2.82E+00	U	pCi/g				
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	9/3/2018	18-08150	Nickel-63	ASTM 3500-Ni Modified	6.03E-01	1.79E+00	1.79E+00	3.06E+00	U	pCi/g				
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	9/3/2018	18-08150	Nickel-63	ASTM 3500-Ni Modified	1.55E+00	1.82E+00	1.82E+00	3.06E+00	U	pCi/g				
18-08150-08	TRG	B1-09100A-FSWC-041CV	08/22/18 08:34	8/29/2018	9/3/2018	18-08150	Nickel-63	ASTM 3500-Ni Modified	1.74E+00	1.84E+00	1.84E+00	3.08E+00	U	pCi/g				
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	9/3/2018	18-08150	Nickel-63	ASTM 3500-Ni Modified	1.41E+00	1.50E+00	1.50E+00	2.51E+00	U	pCi/g				
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	9/3/2018	18-08150	Nickel-63	ASTM 3500-Ni Modified	1.27E+00	1.79E+00	1.79E+00	3.01E+00	U	pCi/g				
18-08150-11	TRG	B1-09100A-FSFC-021CV	08/22/18 12:59	8/29/2018	9/3/2018	18-08150	Nickel-63	ASTM 3500-Ni Modified	1.90E+00	1.45E+00	1.46E+00	2.41E+00	U	pCi/g				

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



EBERLINE ANALYTICAL CORPORATION

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

Eberline Analytical Final Report of Analysis				Report To:					Work Order Details:							
				Patricia Giza					SDG:	18-08150						
				Zion Solutions					Purchase Order:	677118						
				101 Shiloh Blvd					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		
18-08150-01	LCS	KNOWN	08/29/18 00:00	8/29/2018	8/31/2018	18-08150	Strontium-90	EiChroM SRW01 Modified	4.99E+01	2.80E-01				pCi/g		
18-08150-01	LCS	SPIKE	08/29/18 00:00	8/29/2018	8/31/2018	18-08150	Strontium-90	EiChroM SRW01 Modified	4.55E+01	1.80E+00	1.59E+01	8.06E-01		pCi/g		
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/31/2018	18-08150	Strontium-90	EiChroM SRW01 Modified	-9.51E-02	5.15E-01	5.16E-01	9.33E-01	U	pCi/g		
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/31/2018	18-08150	Strontium-90	EiChroM SRW01 Modified	-2.28E-01	4.38E-01	4.45E-01	8.16E-01	U	pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/31/2018	18-08150	Strontium-90	EiChroM SRW01 Modified	-6.05E-02	3.91E-01	3.91E-01	7.09E-01	U	pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/31/2018	18-08150	Strontium-90	EiChroM SRW01 Modified	3.99E-01	4.00E-01	4.24E-01	6.67E-01	U	pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/31/2018	18-08150	Strontium-90	EiChroM SRW01 Modified	0.00E+00	4.65E-01	4.65E-01	8.29E-01	U	pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/31/2018	18-08150	Strontium-90	EiChroM SRW01 Modified	-1.49E-01	3.97E-01	4.00E-01	7.36E-01	U	pCi/g		
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/31/2018	18-08150	Strontium-90	EiChroM SRW01 Modified	2.69E-01	4.53E-01	4.63E-01	7.80E-01	U	pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/31/2018	18-08150	Strontium-90	EiChroM SRW01 Modified	2.04E-01	3.38E-01	3.45E-01	5.81E-01	U	pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/31/2018	18-08150	Strontium-90	EiChroM SRW01 Modified	2.08E-01	4.14E-01	4.21E-01	7.19E-01	U	pCi/g		
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/31/2018	18-08150	Strontium-90	EiChroM SRW01 Modified	4.70E-01	4.35E-01	4.65E-01	7.22E-01	U	pCi/g		
18-08150-01	LCS	KNOWN	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Cobalt-60	EPA 901.1 Modified	2.62E+02	1.02E+01				pCi/g		
18-08150-01	LCS	KNOWN	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Cesium-137	EPA 901.1 Modified	1.94E+02	7.96E+00				pCi/g		
18-08150-01	LCS	SPIKE	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Cobalt-60	EPA 901.1 Modified	2.47E+02	1.96E+01	2.33E+01	6.83E+00		pCi/g		
18-08150-01	LCS	SPIKE	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Cesium-137	EPA 901.1 Modified	1.60E+02	1.47E+01	1.68E+01	2.04E+00		pCi/g		

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EBERLINE ANALYTICAL CORPORATION

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

Eberline Analytical Final Report of Analysis			Report To:						Work Order Details:						
			Patricia Giza						SDG:	18-08150					
			Zion Solutions						Purchase Order:	677118					
			101 Shiloh Blvd						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	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Actinium-228	EPA 901.1 Modified	6.72E-03	1.22E-01	1.22E-01	1.99E-01	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Silver-108m	EPA 901.1 Modified	2.45E-03	3.44E-02	3.44E-02	4.18E-02	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Americium-241	EPA 901.1 Modified	-1.96E-01	9.53E-02	9.58E-02	1.07E-01	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Barium-133	EPA 901.1 Modified	1.52E-04	4.98E-02	4.98E-02	6.98E-02	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Bismuth-214	EPA 901.1 Modified	4.58E-02	7.39E-02	7.40E-02	1.27E-01	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Cobalt-60	EPA 901.1 Modified	1.41E-02	2.39E-02	2.39E-02	4.53E-02	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Cesium-134	EPA 901.1 Modified	-3.34E-02	4.01E-02	4.01E-02	5.20E-02	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Cesium-137	EPA 901.1 Modified	-1.25E-02	3.21E-02	3.21E-02	4.63E-02	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Europium-152	EPA 901.1 Modified	2.44E-02	1.20E-01	1.20E-01	1.40E-01	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Europium-154	EPA 901.1 Modified	2.36E-02	6.72E-02	6.73E-02	7.27E-02	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Europium-155	EPA 901.1 Modified	-5.02E-02	4.71E-02	4.72E-02	1.05E-01	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Holmium-166m	EPA 901.1 Modified	5.93E-03	5.48E-02	5.48E-02	5.39E-02	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Iodine-129	EPA 901.1 Modified	2.26E-02	1.85E-01	1.85E-01	2.52E-01	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Potassium-40	EPA 901.1 Modified	-5.20E-02	3.64E-01	3.64E-01	5.78E-01	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Manganese-54	EPA 901.1 Modified	-2.06E-02	2.37E-02	2.38E-02	5.16E-02	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Niobium-94	EPA 901.1 Modified	-7.33E-03	3.28E-02	3.28E-02	5.03E-02	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Lead-210	EPA 901.1 Modified	6.44E-02	7.27E-01	7.27E-01	1.21E+00	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Lead-212	EPA 901.1 Modified	7.38E-02	5.70E-02	5.71E-02	9.94E-02	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Lead-214	EPA 901.1 Modified	6.46E-02	7.52E-02	7.53E-02	1.29E-01	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Promethium-145	EPA 901.1 Modified	8.69E-02	1.28E-01	1.28E-01	1.89E-01	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Radium-226	EPA 901.1 Modified	4.58E-02	7.39E-02	7.40E-02	1.27E-01	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Antimony-125	EPA 901.1 Modified	6.06E-02	9.73E-02	9.74E-02	1.61E-01	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Thonium-234	EPA 901.1 Modified	1.85E+00	7.02E-01	7.08E-01	1.33E+00	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Thallium-208	EPA 901.1 Modified	1.06E-01	1.06E-01	1.06E-01	1.61E-01	U	pCi/g	
18-08150-02	MBL	BLANK	08/29/18 00:00	8/29/2018	8/29/2018	18-08150	Uranium-235	EPA 901.1 Modified	-2.74E-01	4.37E-01	4.38E-01	2.89E-01	U	pCi/g	

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EBERLINE ANALYTICAL CORPORATION

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

<h1>Eberline Analytical</h1> <h2>Final Report of Analysis</h2>			Report To:						Work Order Details:						
			Patricia Giza						SDG:	18-08150					
			Zion Solutions						Purchase Order:	677118					
			101 Shiloh Blvd						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	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Actinium-228	EPA 901.1 Modified	2.59E-01	3.81E-01	3.82E-01	7.21E-01	U	pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Silver-108m	EPA 901.1 Modified	-2.17E-02	1.34E-01	1.34E-01	1.52E-01	U	pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Americium-241	EPA 901.1 Modified	8.33E-02	1.06E-01	1.06E-01	3.02E-01	U	pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Barium-133	EPA 901.1 Modified	-5.63E-02	1.54E-01	1.54E-01	1.92E-01	U	pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Bismuth-214	EPA 901.1 Modified	5.56E-01	3.16E-01	3.18E-01	5.30E-01		pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Cobalt-60	EPA 901.1 Modified	-8.91E-02	1.48E-01	1.48E-01	1.99E-01	U	pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Cesium-134	EPA 901.1 Modified	7.45E-03	6.34E-02	6.34E-02	1.49E-01	U	pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Cesium-137	EPA 901.1 Modified	1.76E-01	1.84E-01	1.84E-01	3.04E-01	U	pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Europium-152	EPA 901.1 Modified	2.02E-01	4.74E-01	4.74E-01	4.44E-01	U	pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Europium-154	EPA 901.1 Modified	2.66E-01	2.70E-01	2.71E-01	2.35E-01	U	pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Europium-155	EPA 901.1 Modified	2.37E-01	2.26E-01	2.27E-01	3.72E-01	U	pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Holmium-166m	EPA 901.1 Modified	1.84E-01	1.76E-01	1.77E-01	1.87E-01	U	pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Iodine-129	EPA 901.1 Modified	2.56E+00	1.54E+00	1.54E+00	1.73E+00	U	pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Potassium-40	EPA 901.1 Modified	6.23E+00	2.05E+00	2.08E+00	1.86E+00		pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Manganese-54	EPA 901.1 Modified	-6.75E-03	1.34E-01	1.34E-01	2.06E-01	U	pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Niobium-94	EPA 901.1 Modified	3.17E-02	1.15E-01	1.15E-01	1.64E-01	U	pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Lead-210	EPA 901.1 Modified	3.12E+00	1.92E+00	1.92E+00	3.57E+00	U	pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Lead-212	EPA 901.1 Modified	2.05E-01	1.77E-01	1.78E-01	2.87E-01	U	pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Lead-214	EPA 901.1 Modified	5.31E-01	3.17E-01	3.18E-01	4.92E-01		pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Promethium-145	EPA 901.1 Modified	-1.90E-01	4.16E-01	4.16E-01	5.83E-01	U	pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Radium-226	EPA 901.1 Modified	5.56E-01	3.16E-01	3.18E-01	5.30E-01		pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Antimony-125	EPA 901.1 Modified	1.52E-02	2.45E-01	2.45E-01	4.17E-01	U	pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Thorium-234	EPA 901.1 Modified	2.37E+00	2.73E+00	2.73E+00	4.57E+00	U	pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Thallium-208	EPA 901.1 Modified	3.85E-01	3.29E-01	3.29E-01	6.55E-01	U	pCi/g	
18-08150-03	DUP	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Uranium-235	EPA 901.1 Modified	9.42E-01	1.98E+00	1.98E+00	9.87E-01	U	pCi/g	

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			Patricia Giza						SDG:	18-08150						
			Zion Solutions						Purchase Order:	677118						
			101 Shiloh Blvd						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		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Actinium-228	EPA 901.1 Modified	4.45E-01	5.22E-01	5.22E-01	9.56E-01	U	pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Silver-108m	EPA 901.1 Modified	-3.28E-02	1.28E-01	1.28E-01	1.42E-01	U	pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Americium-241	EPA 901.1 Modified	1.09E-01	2.36E-01	2.36E-01	3.33E-01	U	pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Barium-133	EPA 901.1 Modified	3.48E-02	9.14E-02	9.14E-02	1.98E-01	U	pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Bismuth-214	EPA 901.1 Modified	9.19E-01	3.03E-01	3.07E-01	3.92E-01		pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Cobalt-60	EPA 901.1 Modified	-3.21E-02	1.41E-01	1.41E-01	1.81E-01	U	pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Cesium-134	EPA 901.1 Modified	3.78E-02	6.95E-02	6.95E-02	1.72E-01	U	pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Cesium-137	EPA 901.1 Modified	-8.69E-02	1.68E-01	1.68E-01	2.33E-01	U	pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Europium-152	EPA 901.1 Modified	3.58E-01	3.86E-01	3.86E-01	4.25E-01	U	pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Europium-154	EPA 901.1 Modified	8.63E-02	3.97E-01	3.97E-01	2.15E-01	U	pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Europium-155	EPA 901.1 Modified	1.83E-01	2.74E-01	2.75E-01	3.77E-01	U	pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Holmium-166m	EPA 901.1 Modified	-3.60E-02	2.29E-01	2.29E-01	1.96E-01	U	pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Iodine-129	EPA 901.1 Modified	2.51E+00	1.57E+00	1.58E+00	1.80E+00	U	pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Potassium-40	EPA 901.1 Modified	9.74E+00	2.66E+00	2.71E+00	2.40E+00		pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Manganese-54	EPA 901.1 Modified	-6.01E-02	1.25E-01	1.25E-01	1.78E-01	U	pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Niobium-94	EPA 901.1 Modified	-1.47E-01	1.38E-01	1.38E-01	1.53E-01	U	pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Lead-210	EPA 901.1 Modified	2.29E+00	2.25E+00	2.26E+00	3.89E+00	U	pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Lead-212	EPA 901.1 Modified	4.72E-01	2.92E-01	2.93E-01	4.65E-01		pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Lead-214	EPA 901.1 Modified	8.03E-01	3.24E-01	3.26E-01	4.60E-01		pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Promethium-145	EPA 901.1 Modified	-3.69E-01	4.17E-01	4.17E-01	5.27E-01	U	pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Radium-226	EPA 901.1 Modified	9.19E-01	3.03E-01	3.07E-01	3.92E-01		pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Antimony-125	EPA 901.1 Modified	3.87E-02	2.59E-01	2.59E-01	4.55E-01	U	pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Thorium-234	EPA 901.1 Modified	3.48E+00	2.31E+00	2.32E+00	3.56E+00	U	pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Thallium-208	EPA 901.1 Modified	8.14E-01	3.51E-01	3.54E-01	7.61E-01	U	pCi/g		
18-08150-04	DO	B1-09100A-FSFC-067CV	08/22/18 09:20	8/29/2018	8/29/2018	18-08150	Uranium-235	EPA 901.1 Modified	1.95E-01	1.86E+00	1.86E+00	1.02E+00	U	pCi/g		

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



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<h1>Eberline Analytical</h1> <h2>Final Report of Analysis</h2>			Report To:						Work Order Details:							
			Patricia Giza						SDG:	18-08150						
			Zion Solutions						Purchase Order:	677118						
			101 Shiloh Blvd						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		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Actinium-228	EPA 901.1 Modified	5.33E-01	6.14E-01	6.15E-01	1.08E+00	U	pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Silver-108m	EPA 901.1 Modified	-5.31E-02	1.74E-01	1.74E-01	1.84E-01	U	pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Americium-241	EPA 901.1 Modified	2.06E-01	1.81E-01	1.81E-01	8.10E-01	U	pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Barium-133	EPA 901.1 Modified	1.80E-03	7.78E-02	7.78E-02	3.29E-01	U	pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Bismuth-214	EPA 901.1 Modified	5.82E-01	2.55E-01	2.56E-01	4.18E-01		pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Cobalt-60	EPA 901.1 Modified	1.21E-01	1.55E-01	1.55E-01	2.05E-01	U	pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Cesium-134	EPA 901.1 Modified	5.77E-02	9.43E-02	9.43E-02	1.97E-01	U	pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Cesium-137	EPA 901.1 Modified	2.75E-01	2.20E-01	2.21E-01	3.55E-01	U	pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Europium-152	EPA 901.1 Modified	-9.96E-02	4.22E-01	4.22E-01	5.32E-01	U	pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Europium-154	EPA 901.1 Modified	-1.60E-02	3.64E-01	3.64E-01	2.86E-01	U	pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Europium-155	EPA 901.1 Modified	2.44E-01	3.08E-01	3.09E-01	5.22E-01	U	pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Holmium-166m	EPA 901.1 Modified	1.81E-01	2.10E-01	2.11E-01	2.53E-01	U	pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Iodine-129	EPA 901.1 Modified	-2.00E-01	8.57E-01	8.57E-01	1.07E+00	U	pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Potassium-40	EPA 901.1 Modified	1.09E+01	2.69E+00	2.75E+00	2.37E+00		pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Manganese-54	EPA 901.1 Modified	-5.41E-02	1.28E-01	1.28E-01	1.87E-01	U	pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Niobium-94	EPA 901.1 Modified	1.41E-03	1.17E-01	1.17E-01	1.90E-01	U	pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Lead-210	EPA 901.1 Modified	2.67E+00	3.03E+00	3.03E+00	5.17E+00	U	pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Lead-212	EPA 901.1 Modified	1.09E+00	3.85E-01	3.89E-01	5.75E-01		pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Lead-214	EPA 901.1 Modified	1.16E+00	3.94E-01	3.98E-01	6.51E-01		pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Promethium-145	EPA 901.1 Modified	8.81E-02	5.62E-01	5.62E-01	7.59E-01	U	pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Radium-226	EPA 901.1 Modified	5.82E-01	2.55E-01	2.56E-01	4.18E-01		pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Antimony-125	EPA 901.1 Modified	1.27E-01	3.64E-01	3.64E-01	5.91E-01	U	pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Thorium-234	EPA 901.1 Modified	7.80E+00	3.07E+00	3.09E+00	5.53E+00	U	pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Thallium-208	EPA 901.1 Modified	6.84E-01	3.42E-01	3.43E-01	6.50E-01		pCi/g		
18-08150-05	TRG	B1-09100A-FSWC-031CV	08/22/18 13:30	8/29/2018	8/29/2018	18-08150	Uranium-235	EPA 901.1 Modified	-1.91E+00	1.96E+00	1.97E+00	1.22E+00	U	pCi/g		

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



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<h1>Eberline Analytical</h1> <h2>Final Report of Analysis</h2>			Report To:						Work Order Details:							
			Patricia Giza Zion Solutions 101 Shiloh Blvd Zion, IL 60099						SDG:	18-08150						
									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		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Actinium-228	EPA 901.1 Modified	6.96E-01	5.20E-01	5.21E-01	9.63E-01	U	pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Silver-108m	EPA 901.1 Modified	-8.90E-03	1.23E-01	1.23E-01	2.36E-01	U	pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Americium-241	EPA 901.1 Modified	1.51E+00	5.51E-01	5.56E-01	5.48E-01	U	pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Barium-133	EPA 901.1 Modified	4.07E-02	1.41E-01	1.41E-01	4.53E-01	U	pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Bismuth-214	EPA 901.1 Modified	1.28E+00	4.80E-01	4.85E-01	7.91E-01		pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Cobalt-60	EPA 901.1 Modified	6.88E-02	1.44E-01	1.44E-01	2.69E-01	U	pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Cesium-134	EPA 901.1 Modified	-1.32E-02	1.06E-01	1.06E-01	2.53E-01	U	pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Cesium-137	EPA 901.1 Modified	4.75E-01	2.54E-01	2.55E-01	3.81E-01		pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Europium-152	EPA 901.1 Modified	-2.46E-01	7.68E-01	7.69E-01	6.70E-01	U	pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Europium-154	EPA 901.1 Modified	-1.45E-01	5.40E-01	5.40E-01	3.33E-01	U	pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Europium-155	EPA 901.1 Modified	3.53E-02	3.15E-01	3.15E-01	5.93E-01	U	pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Holmium-166m	EPA 901.1 Modified	4.53E-02	3.32E-01	3.32E-01	2.90E-01	U	pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Iodine-129	EPA 901.1 Modified	2.88E-01	9.57E-01	9.58E-01	1.30E+00	U	pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Potassium-40	EPA 901.1 Modified	1.41E+01	3.49E+00	3.57E+00	3.22E+00		pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Manganese-54	EPA 901.1 Modified	1.32E-01	1.67E-01	1.67E-01	3.03E-01	U	pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Niobium-94	EPA 901.1 Modified	-2.40E-02	1.80E-01	1.80E-01	2.72E-01	U	pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Lead-210	EPA 901.1 Modified	4.35E+00	5.26E+00	5.27E+00	8.80E+00	U	pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Lead-212	EPA 901.1 Modified	7.27E-01	3.28E-01	3.30E-01	9.84E-01	U	pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Lead-214	EPA 901.1 Modified	1.51E+00	4.43E-01	4.50E-01	7.29E-01		pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Promethium-145	EPA 901.1 Modified	-3.70E-01	7.46E-01	7.47E-01	9.03E-01	U	pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Radium-226	EPA 901.1 Modified	1.28E+00	4.80E-01	4.85E-01	7.91E-01		pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Antimony-125	EPA 901.1 Modified	1.16E-01	4.68E-01	4.68E-01	7.34E-01	U	pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Thorium-234	EPA 901.1 Modified	8.47E+00	6.49E+00	6.51E+00	1.07E+01	U	pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Thallium-208	EPA 901.1 Modified	9.93E-01	4.65E-01	4.68E-01	9.53E-01	U	pCi/g		
18-08150-06	TRG	B1-09100A-FSFC-001CV	08/22/18 08:52	8/29/2018	8/29/2018	18-08150	Uranium-235	EPA 901.1 Modified	5.10E-01	2.17E+00	2.17E+00	1.50E+00	U	pCi/g		

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



EBERLINE ANALYTICAL CORPORATION

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

<h1 style="margin: 0;">Eberline Analytical</h1> <h2 style="margin: 0;">Final Report of Analysis</h2>			Report To:						Work Order Details:							
			Patricia Giza Zion Solutions 101 Shiloh Blvd Zion, IL 60099						SDG:	18-08150						
									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		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Actinium-228	EPA 901.1 Modified	6.40E-01	3.60E-01	3.61E-01	7.20E-01	U	pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Silver-108m	EPA 901.1 Modified	6.99E-03	6.26E-02	6.26E-02	1.07E-01	U	pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Americium-241	EPA 901.1 Modified	9.55E-02	2.26E-01	2.26E-01	3.02E-01	U	pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Barium-133	EPA 901.1 Modified	-4.69E-02	1.61E-01	1.61E-01	1.80E-01	U	pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Bismuth-214	EPA 901.1 Modified	8.23E-01	2.42E-01	2.45E-01	3.09E-01		pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Cobalt-60	EPA 901.1 Modified	2.45E-02	1.17E-01	1.17E-01	1.96E-01	U	pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Cesium-134	EPA 901.1 Modified	3.09E-02	6.51E-02	6.51E-02	1.32E-01	U	pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Cesium-137	EPA 901.1 Modified	1.50E-01	1.26E-01	1.27E-01	2.01E-01	U	pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Europium-152	EPA 901.1 Modified	1.82E-02	4.03E-01	4.03E-01	3.76E-01	U	pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Europium-154	EPA 901.1 Modified	-1.46E-01	3.52E-01	3.52E-01	1.89E-01	U	pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Europium-155	EPA 901.1 Modified	2.34E-01	2.14E-01	2.14E-01	3.17E-01	U	pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Holmium-166m	EPA 901.1 Modified	8.03E-02	1.67E-01	1.67E-01	1.70E-01	U	pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Iodine-129	EPA 901.1 Modified	2.04E+00	1.30E+00	1.31E+00	1.50E+00	U	pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Potassium-40	EPA 901.1 Modified	6.06E+00	2.11E+00	2.13E+00	2.41E+00		pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Manganese-54	EPA 901.1 Modified	-4.44E-02	1.16E-01	1.16E-01	1.71E-01	U	pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Niobium-94	EPA 901.1 Modified	7.20E-02	9.03E-02	9.04E-02	1.71E-01	U	pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Lead-210	EPA 901.1 Modified	2.36E+00	1.92E+00	1.93E+00	3.32E+00	U	pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Lead-212	EPA 901.1 Modified	4.12E-01	1.90E-01	1.91E-01	3.81E-01		pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Lead-214	EPA 901.1 Modified	9.40E-01	2.97E-01	3.01E-01	5.47E-01		pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Promethium-145	EPA 901.1 Modified	-3.09E-02	3.77E-01	3.77E-01	5.34E-01	U	pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Radium-226	EPA 901.1 Modified	8.23E-01	2.42E-01	2.45E-01	3.09E-01		pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Antimony-125	EPA 901.1 Modified	-3.29E-01	2.31E-01	2.31E-01	3.01E-01	U	pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Thorium-234	EPA 901.1 Modified	6.05E-01	2.16E+00	2.16E+00	2.95E+00	U	pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Thallium-208	EPA 901.1 Modified	4.28E-01	3.13E-01	3.14E-01	6.17E-01	U	pCi/g		
18-08150-07	TRG	B1-09100A-FSFC-010CV	08/22/18 12:40	8/29/2018	8/29/2018	18-08150	Uranium-235	EPA 901.1 Modified	1.39E-01	1.51E+00	1.51E+00	8.42E-01	U	pCi/g		

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



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			Patricia Giza					SDG:	18-08150						
			Zion Solutions					Purchase Order:	677118						
			101 Shiloh Blvd					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	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Actinium-228	EPA 901.1 Modified	8.33E-01	4.15E-01	4.18E-01	6.65E-01		pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Silver-108m	EPA 901.1 Modified	-1.94E-02	1.40E-01	1.40E-01	1.58E-01	U	pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Americium-241	EPA 901.1 Modified	-6.59E-01	3.62E-01	3.64E-01	4.60E-01	U	pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Barium-133	EPA 901.1 Modified	-1.98E-02	6.11E-02	6.11E-02	3.44E-01	U	pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Bismuth-214	EPA 901.1 Modified	1.23E+00	2.97E-01	3.04E-01	2.25E-01		pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Cobalt-60	EPA 901.1 Modified	8.14E-02	1.30E-01	1.30E-01	1.71E-01	U	pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Cesium-134	EPA 901.1 Modified	-6.64E-01	2.78E-01	2.80E-01	2.01E-01	U	pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Cesium-137	EPA 901.1 Modified	-2.85E-03	1.44E-01	1.44E-01	2.24E-01	U	pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Europium-152	EPA 901.1 Modified	1.19E-01	2.97E-01	2.97E-01	4.99E-01	U	pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Europium-154	EPA 901.1 Modified	-2.64E-01	3.62E-01	3.62E-01	2.71E-01	U	pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Europium-155	EPA 901.1 Modified	1.03E-01	3.12E-01	3.12E-01	5.17E-01	U	pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Holmium-166m	EPA 901.1 Modified	-8.52E-03	2.08E-01	2.08E-01	2.49E-01	U	pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Iodine-129	EPA 901.1 Modified	6.42E-01	7.30E-01	7.31E-01	1.01E+00	U	pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Potassium-40	EPA 901.1 Modified	1.19E+01	3.29E+00	3.35E+00	4.02E+00		pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Manganese-54	EPA 901.1 Modified	7.19E-02	1.22E-01	1.22E-01	2.16E-01	U	pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Niobium-94	EPA 901.1 Modified	-2.24E-02	1.08E-01	1.08E-01	1.66E-01	U	pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Lead-210	EPA 901.1 Modified	4.43E+00	2.88E+00	2.89E+00	5.12E+00	U	pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Lead-212	EPA 901.1 Modified	7.92E-01	2.57E-01	2.60E-01	9.05E-01	U	pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Lead-214	EPA 901.1 Modified	1.44E+00	3.90E-01	3.97E-01	6.77E-01		pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Promethium-145	EPA 901.1 Modified	-2.98E-02	5.54E-01	5.54E-01	7.13E-01	U	pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Radium-226	EPA 901.1 Modified	1.23E+00	2.97E-01	3.04E-01	2.25E-01		pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Antimony-125	EPA 901.1 Modified	1.85E-01	3.20E-01	3.20E-01	5.37E-01	U	pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Thorium-234	EPA 901.1 Modified	6.44E+00	2.90E+00	2.92E+00	5.18E+00	U	pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Thallium-208	EPA 901.1 Modified	5.23E-01	4.10E-01	4.10E-01	7.33E-01	U	pCi/g	
18-08150-08	TRG	B1-09100-FSWC-041CV	08/22/18 08:34	8/29/2018	8/29/2018	18-08150	Uranium-235	EPA 901.1 Modified	-1.02E+00	1.71E+00	1.71E+00	1.12E+00	U	pCi/g	

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



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			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		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Actinium-228	EPA 901.1 Modified	3.04E-02	2.53E-01	2.53E-01	1.02E+00	U	pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Silver-108m	EPA 901.1 Modified	5.70E-03	1.33E-01	1.33E-01	1.54E-01	U	pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Americium-241	EPA 901.1 Modified	-4.51E-02	2.72E-01	2.72E-01	3.53E-01	U	pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Barium-133	EPA 901.1 Modified	1.16E-02	9.13E-02	9.13E-02	2.53E-01	U	pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Bismuth-214	EPA 901.1 Modified	9.12E-01	4.46E-01	4.48E-01	8.16E-01		pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Cobalt-60	EPA 901.1 Modified	-1.34E-02	5.26E-02	5.26E-02	1.39E-01	U	pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Cesium-134	EPA 901.1 Modified	-3.89E-03	6.28E-02	6.28E-02	2.06E-01	U	pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Cesium-137	EPA 901.1 Modified	3.66E-01	1.88E-01	1.89E-01	2.69E-01		pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Europium-152	EPA 901.1 Modified	-9.52E-01	7.96E-01	7.98E-01	4.71E-01	U	pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Europium-154	EPA 901.1 Modified	-1.26E-01	4.10E-01	4.10E-01	2.41E-01	U	pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Europium-155	EPA 901.1 Modified	3.23E-02	1.45E-01	1.45E-01	4.08E-01	U	pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Holmium-166m	EPA 901.1 Modified	2.07E-01	2.44E-01	2.44E-01	2.24E-01	U	pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Iodine-129	EPA 901.1 Modified	2.52E+00	1.64E+00	1.64E+00	1.96E+00	U	pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Potassium-40	EPA 901.1 Modified	8.04E+00	2.69E+00	2.73E+00	2.82E+00		pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Manganese-54	EPA 901.1 Modified	-3.53E-02	1.42E-01	1.42E-01	2.03E-01	U	pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Niobium-94	EPA 901.1 Modified	8.37E-03	1.34E-01	1.34E-01	2.20E-01	U	pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Lead-210	EPA 901.1 Modified	3.53E+00	2.43E+00	2.44E+00	4.40E+00	U	pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Lead-212	EPA 901.1 Modified	3.79E-01	2.91E-01	2.91E-01	4.41E-01	U	pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Lead-214	EPA 901.1 Modified	3.53E-01	3.14E-01	3.14E-01	5.93E-01	U	pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Promethium-145	EPA 901.1 Modified	3.61E-01	4.89E-01	4.89E-01	7.59E-01	U	pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Radium-226	EPA 901.1 Modified	9.12E-01	4.46E-01	4.48E-01	8.16E-01		pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Antimony-125	EPA 901.1 Modified	-5.78E-02	3.39E-01	3.39E-01	5.76E-01	U	pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Thorium-234	EPA 901.1 Modified	1.79E+00	2.64E+00	2.65E+00	3.80E+00	U	pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Thallium-208	EPA 901.1 Modified	6.90E-01	3.70E-01	3.72E-01	7.96E-01	U	pCi/g		
18-08150-09	TRG	B1-09100A-FSFC-068CV	08/22/18 13:40	8/29/2018	8/29/2018	18-08150	Uranium-235	EPA 901.1 Modified	-6.20E-01	2.10E+00	2.10E+00	1.15E+00	U	pCi/g		

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



EBERLINE ANALYTICAL CORPORATION

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

<h1 style="margin: 0;">Eberline Analytical</h1> <h2 style="margin: 0;">Final Report of Analysis</h2>			Report To:					Work Order Details:								
			Patricia Giza					SDG:	18-08150							
			Zion Solutions					Purchase Order:	677118							
			101 Shiloh Blvd					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		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Actinium-228	EPA 901.1 Modified	1.18E+00	5.62E-01	5.65E-01	1.18E+00	U	pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Silver-108m	EPA 901.1 Modified	5.40E-02	9.37E-02	9.37E-02	2.02E-01	U	pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Americium-241	EPA 901.1 Modified	-7.50E-05	1.62E-01	1.62E-01	5.07E-01	U	pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Barium-133	EPA 901.1 Modified	-3.36E-02	8.65E-02	8.65E-02	3.88E-01	U	pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Bismuth-214	EPA 901.1 Modified	1.38E+00	4.07E-01	4.13E-01	6.04E-01		pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Cobalt-60	EPA 901.1 Modified	-2.76E-02	1.58E-01	1.58E-01	2.36E-01	U	pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Cesium-134	EPA 901.1 Modified	-1.55E-02	5.30E-02	5.30E-02	2.36E-01	U	pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Cesium-137	EPA 901.1 Modified	4.90E-01	1.72E-01	1.74E-01	2.88E-01		pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Europium-152	EPA 901.1 Modified	8.85E-02	5.33E-01	5.33E-01	6.45E-01	U	pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Europium-154	EPA 901.1 Modified	-9.48E-02	4.07E-01	4.07E-01	3.34E-01	U	pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Europium-155	EPA 901.1 Modified	-4.61E-02	3.38E-01	3.38E-01	5.45E-01	U	pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Holmium-166m	EPA 901.1 Modified	1.08E-02	2.49E-01	2.49E-01	2.70E-01	U	pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Iodine-129	EPA 901.1 Modified	5.31E-01	8.77E-01	8.77E-01	1.21E+00	U	pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Potassium-40	EPA 901.1 Modified	1.14E+01	3.06E+00	3.11E+00	3.15E+00		pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Manganese-54	EPA 901.1 Modified	-1.77E-01	1.67E-01	1.68E-01	2.10E-01	U	pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Niobium-94	EPA 901.1 Modified	1.19E-01	1.06E-01	1.06E-01	2.12E-01	U	pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Lead-210	EPA 901.1 Modified	3.84E+00	3.39E+00	3.39E+00	5.95E+00	U	pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Lead-212	EPA 901.1 Modified	7.72E-01	3.05E-01	3.08E-01	6.48E-01		pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Lead-214	EPA 901.1 Modified	1.22E+00	4.49E-01	4.54E-01	7.81E-01		pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Promethium-145	EPA 901.1 Modified	-2.04E-02	6.28E-01	6.28E-01	8.23E-01	U	pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Radium-226	EPA 901.1 Modified	1.38E+00	4.07E-01	4.13E-01	6.04E-01		pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Antimony-125	EPA 901.1 Modified	1.98E-01	4.35E-01	4.35E-01	7.08E-01	U	pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Thorium-234	EPA 901.1 Modified	4.67E+00	5.04E+00	5.05E+00	8.42E+00	U	pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Thallium-208	EPA 901.1 Modified	7.01E-01	3.68E-01	3.70E-01	4.92E-01		pCi/g		
18-08150-10	TRG	B1-09100A-FSWC-051CV	08/22/18 14:05	8/29/2018	8/29/2018	18-08150	Uranium-235	EPA 901.1 Modified	-3.61E-01	1.89E+00	1.89E+00	1.27E+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 CORPORATION

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

Eberline Analytical Final Report of Analysis								Report To:				Work Order Details:					
								Patricia Giza				SDG:		18-08150			
								Zion Solutions				Purchase Order:		677118			
								101 Shiloh Blvd				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			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Actinium-228	EPA 901.1 Modified	1.11E+00	5.51E-01	5.54E-01	1.14E+00	U	pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Silver-108m	EPA 901.1 Modified	2.12E-02	1.41E-01	1.41E-01	1.92E-01	U	pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Americium-241	EPA 901.1 Modified	-9.98E-01	3.95E-01	3.99E-01	4.38E-01	U	pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Barium-133	EPA 901.1 Modified	7.90E-02	1.00E-01	1.00E-01	3.49E-01	U	pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Bismuth-214	EPA 901.1 Modified	9.08E-01	4.27E-01	4.30E-01	7.76E-01		pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Cobalt-60	EPA 901.1 Modified	9.18E-02	1.58E-01	1.58E-01	2.22E-01	U	pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Cesium-134	EPA 901.1 Modified	5.65E-02	8.51E-02	8.52E-02	2.18E-01	U	pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Cesium-137	EPA 901.1 Modified	4.31E-01	1.87E-01	1.88E-01	3.37E-01		pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Europium-152	EPA 901.1 Modified	-2.91E-01	5.30E-01	5.30E-01	6.22E-01	U	pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Europium-154	EPA 901.1 Modified	2.92E-02	3.09E-01	3.09E-01	3.13E-01	U	pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Europium-155	EPA 901.1 Modified	-1.54E-01	3.10E-01	3.10E-01	4.91E-01	U	pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Holmium-166m	EPA 901.1 Modified	-3.92E-02	2.45E-01	2.45E-01	2.37E-01	U	pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Iodine-129	EPA 901.1 Modified	5.82E-03	8.36E-01	8.36E-01	1.08E+00	U	pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Potassium-40	EPA 901.1 Modified	9.90E+00	2.40E+00	2.46E+00	1.44E+00		pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Manganese-54	EPA 901.1 Modified	2.18E-02	1.23E-01	1.23E-01	2.05E-01	U	pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Niobium-94	EPA 901.1 Modified	-1.23E-02	1.29E-01	1.29E-01	2.03E-01	U	pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Lead-210	EPA 901.1 Modified	2.25E+00	3.14E+00	3.15E+00	5.40E+00	U	pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Lead-212	EPA 901.1 Modified	6.32E-01	3.63E-01	3.64E-01	5.88E-01		pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Lead-214	EPA 901.1 Modified	1.06E+00	3.07E-01	3.12E-01	4.81E-01		pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Promethium-145	EPA 901.1 Modified	2.29E-01	5.86E-01	5.86E-01	7.83E-01	U	pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Radium-226	EPA 901.1 Modified	9.08E-01	4.27E-01	4.30E-01	7.76E-01		pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Antimony-125	EPA 901.1 Modified	1.70E-01	3.75E-01	3.76E-01	6.17E-01	U	pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Thorium-234	EPA 901.1 Modified	7.99E+00	3.03E+00	3.06E+00	5.53E+00	U	pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Thallium-208	EPA 901.1 Modified	5.92E-01	4.56E-01	4.57E-01	8.27E-01	U	pCi/g			
18-08150-11	TRG	B1-09100-FSFC-021CV	08/22/18 12:59	8/29/2018	8/29/2018	18-08150	Uranium-235	EPA 901.1 Modified	-4.77E-01	1.84E+00	1.84E+00	1.32E+00	U	pCi/g			

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



EBERLINE ANALYTICAL CORPORATION

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

REC'D AUG 29 2018

Attachment 1 – Chain-of-Custody Form

18th 08150

Sample ID	Sample Log	Matrix	Sample Type	Sample Container				Sample Date	Sample Time	Analysis Type	Preservative	Remarks
				Vol	Unit	Type	Qty					
4 B1-09100A-FSFC-067CV	NA	Concrete	Concrete	57.94	cm ³	Puck	1	08-22-2018	0920	5 ROC-H ₃	None	96.20g, 0-1/2"
5 B1-09100A-FSFC-031CV	NA	Concrete	Concrete	57.94	cm ³	Puck	1	08-22-2018	1330	5 ROC-H ₃	None	120.52g, 0-1/2"
6 B1-09100A-FSFC-001CV	NA	Concrete	Concrete	57.94	cm ³	Puck	1	08-22-2018	0852	5 ROC-H ₃	None	98.54g, 0-1/2"
7 B1-09100A-FSFC-010CV	NA	Concrete	Concrete	57.94	cm ³	Puck	1	08-22-2018	1240	5 ROC-H ₃	None	100.10g 0-1/2"
8 B1-09100-FSFC-041CV	NA	Concrete	Concrete	57.94	cm ³	Puck	1	08-22-2018	0834	5 ROC-H ₃	None	131.64g 0-1/2"
9 B1-09100A-FSFC-068CV	NA	Concrete	Concrete	57.94	cm ³	Puck	1	08-22-2018	1340	5 ROC-H ₃	None	82.19g 0-1/2"
10 B1-09100A-FSFC-051CV	NA	Concrete	Concrete	57.94	cm ³	Puck	1	08-22-2018	1405	5 ROC-H ₃	None	110.94g 0-1/2"
11 B1-09100-FSFC-021CV	NA	Concrete	Concrete	57.94	cm ³	Puck	1	08-22-2018	1259	5 ROC-H ₃	None	117.07g 0-1/2"

REC 928 8-29-18
0815

Attachment 1 – Chain-of-Custody Form

Sample ID	Sample Log	Matrix	Sample Type	Sample Container				Sample Date	Sample Time	Analysis Type	Preservative	Remarks
				Vol	Unit	Type	Qty					
B1-09100A-FSFC-067CV	NA	Concrete	Concrete	57.94	cm ³	Puck	1	08-22-2018	0920	5 ROC -H ₃	None	96.20g 0-1/2"
B1-09100A-FSFC-031CV	NA	Concrete	Concrete	57.94	cm ³	Puck	1	08-22-2018	1330	5 ROC -H ₃	None	120.52g 0-1/2"
B1-09100A-FSFC-001CV	NA	Concrete	Concrete	57.94	cm ³	Puck	1	08-22-2018	0852	5 ROC -H ₃	None	98.54g 0-1/2"
B1-09100A-FSFC-010CV	NA	Concrete	Concrete	57.94	cm ³	Puck	1	08-22-2018	1240	5 ROC -H ₃	None	100.10g 0-1/2"
B1-09100-FSFC-041CV	NA	Concrete	Concrete	57.94	cm ³	Puck	1	08-22-2018	0834	5 ROC -H ₃	None	131.64g 0-1/2"
B1-09100A-FSFC-068CV	NA	Concrete	Concrete	57.94	cm ³	Puck	1	08-22-2018	1340	5 ROC -H ₃	None	82.19g 0-1/2"
B1-09100A-FSFC-051CV	NA	Concrete	Concrete	57.94	cm ³	Puck	1	08-22-2018	1405	5 ROC -H ₃	None	110.94g 0-1/2"
B1-09100-FSFC-021CV	NA	Concrete	Concrete	57.94	cm ³	Puck	1	08-22-2018	1259	5 ROC -H ₃	None	117.07g 0-1/2"

18 08150

Laboratory: <u>Eberline Labs</u>	Date Submitted To Lab:		Ship Container No.: <u>N/A</u>	Cooler Temperature: <u>N/A</u>	Airbill Number: <i>Fed Ex First Overnight</i> <i>8115-9639-7380</i>	
Relinquished by: Jack Mucia	Date: 08-28-2018	Time: 1400	Received by: <i>Richard E. Rickett</i>	Date: (mm/dd/yyyy): 08/28/2018	Time: 1400	
Relinquished by: <i>Richard E. Rickett</i>	Date (mm/dd/yyyy): 08/28/2018	Time: 1630	Received by: <i>Fed Ex First Overnight</i>	Date: (mm/dd/yyyy): 08/28/2018	Time: 1630	
Relinquished by: <i>Fedex</i>	Date (mm/dd/yyyy):	Time:	Received by: <i>Kenneth Spencer</i>	Date: (mm/dd/yyyy): 08-29-18	Time: 0815	
Relinquished by:	Date (mm/dd/yyyy):	Time:	Received by:	Date: (mm/dd/yyyy):	Time:	
Comments PO# ANALYSIS 5 ROC HTD-H₃ PRIORITY 7 day turnaround PO# 677118						

ATTACHMENT 7 ISOCS ANALYTICAL REPORTS

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: C:\GENIE2K\CAMFILES\00003478.CNF

Report Generated On : 8/20/2018 5:50:14 AM

Sample Title : B109100AFSFC001GD
Sample Description : WWTF Floor
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/15/2018 2:30:00 PM
Acquisition Started : 8/15/2018 2:31:00 PM

Live Time : 600.0 seconds
Real Time : 601.3 seconds

Dead Time : 0.21 %

Energy Calibration Used Done On : 3/15/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1.27CM

DATA VALIDATED
DATE 9-7-18
TIME 0900
R. Massery

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 5452A
 Sample Title: B109100AFSFC001GD
 Peak Analysis Performed on: 8/20/2018 5:50:13 AM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	297-	306	301.53	75.38	0.62	4.67E+001	41.97	1.73E+002
2	946-	963	955.47	238.87	0.80	3.72E+001	34.11	7.68E+001
3	1173-	1187	1180.46	295.11	1.11	3.30E+001	25.20	4.30E+001
4	1398-	1414	1408.08	352.02	0.53	7.10E+001	26.20	3.20E+001
5	2428-	2444	2436.70	609.17	0.98	8.16E+001	24.47	2.14E+001
6	5832-	5855	5843.27	1460.82	2.15	1.56E+002	28.19	1.11E+001

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC001GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

..... IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	1.06244E+006	2.13048E+005
Pb-212	1.000	238.63*	43.60	2.52184E+004	2.34895E+004
Bi-214	0.439	609.32*	45.49	8.49371E+004	2.74415E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	1.000	295.22*	18.42	5.89874E+004	4.59778E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	1.062444E+006	2.130478E+005
Pb-212	1.000	2.521844E+004	2.348949E+004
Bi-214	0.439	8.493714E+004	2.744147E+004
Pb-214	1.000	6.812315E+004	2.442599E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/20/2018 5:50:13 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.38	7.7875E-002	89.82		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 5452A
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSFC001GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.649E+005	1.65E+005	1.062E+006	7.322E+004
	Co-60	1173.23	99.85	1.959E+004	1.69E+004	2.190E+003	8.920E+003
		1332.49	99.98	1.689E+004		3.741E+003	7.515E+003
	Nb-94	702.65	99.81	1.705E+004	1.71E+004	-7.126E+003	7.838E+003
		871.09	99.89	1.737E+004		9.146E+003	7.928E+003
	Ag-108m	433.90	90.50	1.802E+004	1.80E+004	2.538E+002	8.410E+003
		614.30	89.80	3.006E+004		-1.409E+004	1.431E+004
		722.90	90.80	1.977E+004		-2.157E+004	9.118E+003
	Cs-134	604.72	97.62	2.754E+004	2.02E+004	-1.365E+004	1.311E+004
		795.86	85.46	2.019E+004		-5.870E+003	9.243E+003
	Cs-137	661.66	85.10	2.429E+004	2.43E+004	1.523E+004	1.136E+004
	Eu-152	121.78	28.67	7.203E+004	6.45E+004	1.483E+004	3.490E+004
		344.28	26.60	6.453E+004		-4.711E+004	3.046E+004
		1408.01	21.07	6.787E+004		4.724E+004	2.937E+004
	Eu-154	123.07	40.40	5.081E+004	4.55E+004	-7.839E+003	2.461E+004
		723.30	20.06	8.950E+004		-6.314E+004	4.128E+004
		1274.43	34.80	4.552E+004		-2.459E+004	2.014E+004
	Eu-155	86.55	30.70	8.059E+004	8.06E+004	-9.507E+003	3.925E+004
		105.31	21.10	1.052E+005		1.646E+004	5.107E+004
	Tl-208	583.19	85.00	2.388E+004	2.39E+004	1.778E+004	1.120E+004
	Bi-212	727.33	6.67	2.724E+005	2.72E+005	-2.355E+005	1.258E+005
+	Pb-212	238.63*	43.60	3.737E+004	3.74E+004	2.522E+004	1.777E+004
+	Bi-214	609.32*	45.49	3.108E+004	3.11E+004	8.494E+004	1.413E+004
		1120.29	14.92	1.618E+005		1.824E+005	7.515E+004
		1764.49	15.30	1.407E+005		1.384E+005	6.316E+004
+	Pb-214	295.22*	18.42	7.070E+004	3.60E+004	5.899E+004	3.294E+004
		351.93*	35.60	3.604E+004		7.172E+004	1.665E+004
	Ra-226	186.21	3.64	5.333E+005	5.33E+005	-1.531E+005	2.569E+005
	Ac-228	338.32	11.27	1.638E+005	7.38E+004	9.726E+004	7.765E+004
		911.20	25.80	7.376E+004		4.861E+004	3.387E+004
		968.97	15.80	1.114E+005		-5.894E+004	5.067E+004
	Am-241	59.54	35.90	7.740E+004	7.74E+004	-1.375E+005	3.763E+004

+ = Nuclide identified during the nuclide identification
 * = Energy line found in the spectrum
 > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
 @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/16/2018 8:46:07 AM

Sample Title : B109100AFSFC002GD
Sample Description : WWTF FLOOR
Sample Identification : 002
Sample Type : GAMMA DIRECT
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.826E+001 M^2

Sample Taken On : 8/16/2018 8:36:00 AM
Acquisition Started : 8/16/2018 8:36:05 AM

Live Time : 600.0 seconds
Real Time : 601.0 seconds

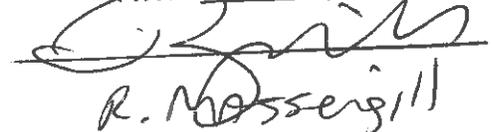
Dead Time : 0.16 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 0905


R. Masserigill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSFC002GD
 Peak Analysis Performed on: 8/16/2018 8:46:07 AM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	285-	306	301.06	75.39	0.73	1.37E+002	65.32	2.48E+002
2	579-	593	587.35	146.96	0.42	-9.31E+000	28.93	7.33E+001
3	1401-	1414	1407.60	352.01	1.06	3.51E+001	21.16	2.79E+001
4	2431-	2444	2437.42	609.45	0.50	3.40E+001	14.61	7.00E+000
5	5835-	5856	5846.60	1461.70	0.90	8.55E+001	20.61	5.50E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC002GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M^2)	Activity Uncertainty
K-40	0.999	1460.82*	10.66	9.28729E+005	2.46837E+005
Bi-214	0.461	609.32*	45.49	4.96102E+004	2.24091E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	4.46742E+004	2.79323E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	0.999	9.287290E+005	2.468374E+005
Bi-214	0.461	4.961017E+004	2.240907E+004
Pb-214	0.432	4.467424E+004	2.793230E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/16/2018 8:46:07 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.39	2.2833E-001	47.68		
2	146.96	-1.5514E-002	-310.81		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSFC002GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+ K-40	1460.82*	10.66	1.918E+005	1.92E+005	9.287E+005	8.122E+004
Co-60	1173.23	99.85	2.410E+004	1.72E+004	-1.717E+004	1.069E+004
	1332.49	99.98	1.717E+004		8.658E+003	7.121E+003
Nb-94	702.65	99.81	1.714E+004	1.71E+004	5.375E+002	7.583E+003
	871.09	99.89	1.870E+004		-1.283E+004	8.222E+003
Ag-108m	433.90	90.50	2.179E+004	2.18E+004	5.226E+003	1.011E+004
	614.30	89.80	2.857E+004		-1.515E+004	1.328E+004
	722.90	90.80	2.367E+004		-1.019E+002	1.073E+004
Cs-134	604.72	97.62	2.778E+004	2.43E+004	3.138E+003	1.298E+004
	795.86	85.46	2.432E+004		2.393E+004	1.092E+004
Cs-137	661.66	85.10	2.618E+004	2.62E+004	1.458E+004	1.198E+004
Eu-152	121.78	28.67	6.841E+004	6.84E+004	1.601E+004	3.299E+004
	344.28	26.60	7.476E+004		2.089E+004	3.511E+004
	1408.01	21.07	9.695E+004		5.880E+004	4.124E+004
Eu-154	123.07	40.40	4.911E+004	4.80E+004	4.595E+004	2.369E+004
	723.30	20.06	1.072E+005		4.616E+002	4.860E+004
	1274.43	34.80	4.801E+004		5.674E+003	1.991E+004
Eu-155	86.55	30.70	7.561E+004	7.56E+004	9.828E+004	3.670E+004
	105.31	21.10	9.315E+004		-4.840E+004	4.497E+004
Tl-208	583.19	85.00	2.674E+004	2.67E+004	2.317E+004	1.235E+004
Bi-212	727.33	6.67	3.045E+005	3.05E+005	1.672E+004	1.372E+005
Pb-212	238.63	43.60	4.693E+004	4.69E+004	4.709E+004	2.239E+004
+ Bi-214	609.32*	45.49	2.506E+004	2.51E+004	4.961E+004	1.056E+004
	1120.29	14.92	1.972E+005		8.037E+004	8.977E+004
	1764.49	15.30	1.953E+005		1.566E+005	8.589E+004
+ Pb-214	295.22	18.42	1.124E+005	4.02E+004	9.305E+004	5.327E+004
	351.93*	35.60	4.016E+004		4.467E+004	1.836E+004
Ra-226	186.21	3.64	4.789E+005	4.79E+005	1.612E+005	2.284E+005
Ac-228	338.32	11.27	1.617E+005	8.46E+004	-1.094E+005	7.555E+004
	911.20	25.80	8.459E+004		6.669E+003	3.781E+004
	968.97	15.80	1.634E+005		3.923E+004	7.408E+004
Am-241	59.54	35.90	6.142E+004	6.14E+004	-4.420E+003	2.959E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 5452A

Report Generated On : 8/15/2018 1:50:19 PM

Sample Title : B109100AFSFC003GD
Sample Description : WWTF Floor
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M^2

Sample Taken On : 8/15/2018 1:40:00 PM
Acquisition Started : 8/15/2018 1:40:17 PM

Live Time : 600.0 seconds
Real Time : 600.7 seconds

Dead Time : 0.12 %

Energy Calibration Used Done On : 3/15/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1.27CM

DATA VALIDATED
DATE 9-2-18
TIME 0910
R. Massengill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 5452A
 Sample Title: B109100AFSFC003GD
 Peak Analysis Performed on: 8/15/2018 1:50:18 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	306	301.27	75.32	0.25	1.43E+001	45.88	2.15E+002
2	436-	448	440.04	110.01	0.67	1.39E+001	37.24	1.24E+002
3	964-	976	968.25	242.06	0.75	9.00E+000	24.60	5.20E+001
4	1175-	1186	1181.22	295.31	0.44	2.31E+001	20.54	3.29E+001
5	1399-	1413	1407.52	351.88	0.87	5.09E+001	22.97	2.81E+001
6	2429-	2445	2436.40	609.10	1.46	5.53E+001	24.36	2.98E+001
7	2641-	2652	2646.94	661.73	0.25	4.00E+000	12.88	1.50E+001
8	4476-	4489	4482.98	1120.75	0.32	1.22E+001	12.09	8.76E+000
9	5832-	5854	5842.57	1460.64	1.95	1.40E+002	24.70	3.08E+000
10	7053-	7068	7060.36	1765.09	0.39	1.33E+001	11.04	5.74E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC003GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

***** IDENTIFIED NUCLIDES *****

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	9.53189E+005	1.87541E+005
Cs-137	1.000	661.66*	85.10	2.31830E+003	7.47264E+003
Pb-212	0.981	238.63*	43.60	6.14479E+003	1.68233E+004
Bi-214	1.000	609.32*	45.49	5.75132E+004	2.62880E+004
		1120.29*	14.92	5.19223E+004	5.14465E+004
		1764.49*	15.30	7.06301E+004	5.90474E+004
Pb-214	1.000	295.22*	18.42	4.12243E+004	3.72756E+004
		351.93*	35.60	5.14148E+004	2.46066E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	9.531892E+005	1.875413E+005
Cs-137	1.000	2.318298E+003	7.472637E+003
Pb-212	0.981	6.144788E+003	1.682330E+004
Bi-214	1.000	5.829444E+004	2.176128E+004
Pb-214	1.000	4.832189E+004	2.053569E+004

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/15/2018 1:50:18 PM
Peak Locate From Channel: 85
Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.32	2.3799E-002	321.28		
2	110.01	2.3104E-002	268.68		

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 5452A
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSFC003GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	9.812E+004	9.81E+004	9.532E+005	3.984E+004
	Co-60	1173.23	99.85	1.959E+004	1.58E+004	-9.916E+003	8.920E+003
		1332.49	99.98	1.583E+004		-4.259E+003	6.983E+003
	Nb-94	702.65	99.81	1.632E+004	1.63E+004	-1.206E+004	7.474E+003
		871.09	99.89	1.737E+004		5.811E+003	7.928E+003
	Ag-108m	433.90	90.50	1.671E+004	1.62E+004	-9.963E+003	7.757E+003
		614.30	89.80	2.727E+004		-2.116E+004	1.292E+004
		722.90	90.80	1.619E+004		-5.046E+003	7.328E+003
	Cs-134	604.72	97.62	2.665E+004	1.87E+004	1.219E+003	1.267E+004
		795.86	85.46	1.874E+004		4.083E+003	8.522E+003
+	Cs-137	661.66*	85.10	1.325E+004	1.32E+004	2.318E+003	5.838E+003
	Eu-152	121.78	28.67	6.558E+004	6.39E+004	-2.646E+004	3.167E+004
		344.28	26.60	6.389E+004		-2.896E+004	3.014E+004
		1408.01	21.07	7.192E+004		-8.177E+004	3.140E+004
	Eu-154	123.07	40.40	4.644E+004	4.64E+004	-2.160E+004	2.242E+004
		723.30	20.06	7.220E+004		-6.019E+004	3.264E+004
		1274.43	34.80	5.117E+004		4.654E+003	2.297E+004
	Eu-155	86.55	30.70	7.919E+004	7.92E+004	8.860E+004	3.855E+004
		105.31	21.10	9.816E+004		6.602E+004	4.756E+004
	Tl-208	583.19	85.00	2.145E+004	2.15E+004	9.244E+003	9.989E+003
	Bi-212	727.33	6.67	2.076E+005	2.08E+005	1.025E+005	9.336E+004
+	Pb-212	238.63*	43.60	2.864E+004	2.86E+004	6.145E+003	1.340E+004
+	Bi-214	609.32*	45.49	3.587E+004	3.59E+004	5.751E+004	1.653E+004
		1120.29*	14.92	8.026E+004		5.192E+004	3.439E+004
		1764.49*	15.30	8.705E+004		7.063E+004	3.632E+004
+	Pb-214	295.22*	18.42	5.817E+004	3.26E+004	4.122E+004	2.667E+004
		351.93*	35.60	3.262E+004		5.141E+004	1.495E+004
	Ra-226	186.21	3.64	5.527E+005	5.53E+005	1.620E+005	2.666E+005
	Ac-228	338.32	11.27	1.554E+005	7.45E+004	-6.732E+004	7.345E+004
		911.20	25.80	7.454E+004		1.842E+004	3.427E+004
		968.97	15.80	1.254E+005		3.226E+004	5.764E+004
	Am-241	59.54	35.90	6.633E+004	6.63E+004	-1.919E+004	3.210E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 5452A

Report Generated On : 8/15/2018 12:42:09 PM

Sample Title : B109100AFSFC004GD
Sample Description : WWTF Floor
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M^2

Sample Taken On : 8/15/2018 12:32:00 PM
Acquisition Started : 8/15/2018 12:32:08 PM

Live Time : 600.0 seconds
Real Time : 600.7 seconds

Dead Time : 0.11 %

Energy Calibration Used Done On : 3/15/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1.27CM

DATA VALIDATED

DATE 9-2-18

TIME 0915

R. Masselli

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 5452A
Sample Title: B109100AFSFC004GD
Peak Analysis Performed on: 8/15/2018 12:42:09 PM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	950-	961	955.83	238.96	0.47	2.90E+001	25.67	5.40E+001
2	1175-	1189	1181.46	295.37	0.36	5.58E+001	22.90	2.62E+001
3	1399-	1414	1407.82	351.95	1.33	6.81E+001	24.15	2.59E+001
4	2036-	2050	2043.51	510.88	0.71	5.40E+001	20.32	1.70E+001
5	2427-	2445	2436.43	609.11	1.67	7.75E+001	23.07	1.65E+001
6	2642-	2654	2647.00	661.75	0.39	1.92E+001	12.62	7.83E+000
7	3637-	3650	3643.88	910.97	0.30	1.82E+001	13.03	8.76E+000
8	5832-	5854	5844.15	1461.04	1.26	1.32E+002	24.87	5.73E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC004GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

..... IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	9.01211E+005	1.86680E+005
Cs-137	1.000	661.66*	85.10	1.11086E+004	7.43660E+003
Pb-212	1.000	238.63*	43.60	1.96716E+004	1.76983E+004
Bi-214	0.439	609.32*	45.49	8.06918E+004	2.58977E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	1.000	295.22*	18.42	9.97498E+004	4.39126E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	9.012113E+005	1.866800E+005
Cs-137	1.000	1.110863E+004	7.436604E+003
Pb-212	1.000	1.967159E+004	1.769828E+004
Bi-214	0.439	8.069178E+004	2.589766E+004
Pb-214	1.000	7.711537E+004	2.284303E+004

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/15/2018 12:42:09 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tot. Nuclide
4	510.88	9.0035E-002	37.61		
7	910.97	3.0401E-002	71.46	Sum	

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 5452A
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSFC004GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.246E+005	1.25E+005	9.012E+005	5.307E+004
	Co-60	1173.23	99.85	1.908E+004	1.62E+004	5.921E+003	8.661E+003
		1332.49	99.98	1.619E+004		3.271E+003	7.165E+003
	Nb-94	702.65	99.81	1.740E+004	1.37E+004	1.406E+004	8.015E+003
		871.09	99.89	1.374E+004		-2.354E+004	6.113E+003
	Ag-108m	433.90	90.50	1.711E+004	1.71E+004	6.029E+003	7.959E+003
		614.30	89.80	2.668E+004		-1.396E+004	1.262E+004
		722.90	90.80	2.140E+004		4.069E+003	9.936E+003
	Cs-134	604.72	97.62	2.665E+004	1.97E+004	-9.540E+003	1.267E+004
		795.86	85.46	1.972E+004		1.523E+004	9.009E+003
+	Cs-137	661.66*	85.10	1.024E+004	1.02E+004	1.111E+004	4.334E+003
	Eu-152	121.78	28.67	7.235E+004	6.16E+004	-2.673E+004	3.505E+004
		344.28	26.60	6.160E+004		-8.600E+002	2.899E+004
		1408.01	21.07	7.192E+004		2.773E+004	3.140E+004
	Eu-154	123.07	40.40	5.209E+004	4.24E+004	2.733E+004	2.525E+004
		723.30	20.06	9.287E+004		-6.473E+004	4.297E+004
		1274.43	34.80	4.238E+004		8.541E+002	1.857E+004
	Eu-155	86.55	30.70	9.238E+004	9.24E+004	1.050E+005	4.515E+004
		105.31	21.10	1.082E+005		1.308E+005	5.257E+004
	Tl-208	583.19	85.00	2.145E+004	2.15E+004	-1.873E+003	9.989E+003
	Bi-212	727.33	6.67	2.724E+005	2.72E+005	8.251E+004	1.258E+005
+	Pb-212	238.63*	43.60	2.783E+004	2.78E+004	1.967E+004	1.300E+004
+	Bi-214	609.32*	45.49	2.833E+004	2.83E+004	8.069E+004	1.276E+004
		1120.29	14.92	1.565E+005		1.307E+005	7.252E+004
		1764.49	15.30	1.545E+005		1.704E+005	7.007E+004
+	Pb-214	295.22*	18.42	5.582E+004	3.20E+004	9.975E+004	2.549E+004
		351.93*	35.60	3.202E+004		6.872E+004	1.464E+004
	Ra-226	186.21	3.64	5.018E+005	5.02E+005	-9.577E+004	2.411E+005
	Ac-228	338.32	11.27	1.426E+005	7.76E+004	-3.306E+004	6.705E+004
		911.20	25.80	7.759E+004		4.608E+004	3.579E+004
		968.97	15.80	1.114E+005		-1.375E+005	5.067E+004
	Am-241	59.54	35.90	7.430E+004	7.43E+004	-7.817E+003	3.609E+004

+ = Nuclide identified during the nuclide identification
 * = Energy line found in the spectrum
 > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
 @ = Half-life too short to be able to perform the decay correction

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 5452A

Report Generated On : 8/15/2018 12:55:16 PM

Sample Title : B109100AFSFC005GD
Sample Description : WWTF Floor
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/15/2018 12:45:00 PM
Acquisition Started : 8/15/2018 12:45:15 PM

Live Time : 600.0 seconds
Real Time : 600.6 seconds

Dead Time : 0.10 %

Energy Calibration Used Done On : 3/15/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1.27CM

DATA VALIDATED

DATE 9-2-18

TIME 0920

R. Masserill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 5452A
 Sample Title: B109100AFSFC005GD
 Peak Analysis Performed on: 8/15/2018 12:55:16 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	284-	306	292.07	73.02	0.40	1.63E+002	74.50	3.16E+002
2	951-	961	956.74	239.19	0.84	3.77E+001	23.35	4.13E+001
3	1174-	1191	1180.53	295.13	0.91	6.44E+001	25.88	3.16E+001
4	1400-	1417	1407.32	351.83	1.10	8.17E+001	26.95	3.03E+001
5	2325-	2338	2331.44	582.86	0.93	2.56E+001	15.89	1.34E+001
6	2429-	2443	2435.46	608.86	1.63	6.60E+001	20.95	1.50E+001
7	3067-	3078	3072.02	768.01	0.38	1.14E+001	10.13	5.56E+000
8	3637-	3650	3643.75	910.94	0.87	2.29E+001	14.84	1.11E+001
9	5833-	5854	5843.52	1460.88	0.80	1.50E+002	27.41	1.04E+001

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC005GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M^2)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	1.01932E+006	2.06690E+005
Tl-208	1.000	583.19*	85.00	1.39787E+004	8.82655E+003
Pb-212	1.000	238.63*	43.60	2.55892E+004	1.63774E+004
Bi-214	0.439	609.32*	45.49	6.86905E+004	2.33148E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	1.000	295.22*	18.42	1.14929E+005	4.97376E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	1.019320E+006	2.066896E+005
Tl-208	1.000	1.397872E+004	8.826551E+003
Pb-212	1.000	2.558925E+004	1.637743E+004
Bi-214	0.439	6.869053E+004	2.331476E+004
Pb-214	1.000	9.124877E+004	2.583633E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/15/2018 12:55:16 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tot. Nuclide
1	73.02	2.7156E-001	45.72		
7	768.01	1.9069E-002	88.57		
8	910.94	3.8150E-002	64.83	Sum	

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 5452A
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSFC005GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.571E+005	1.57E+005	1.019E+006	6.934E+004
	Co-60	1173.23	99.85	1.934E+004	1.55E+004	-4.246E+003	8.791E+003
		1332.49	99.98	1.546E+004		8.159E+003	6.797E+003
	Nb-94	702.65	99.81	1.740E+004	1.53E+004	2.821E+003	8.015E+003
		871.09	99.89	1.531E+004		8.544E+003	6.897E+003
	Ag-108m	433.90	90.50	1.802E+004	1.80E+004	1.235E+004	8.410E+003
		614.30	89.80	2.716E+004		-2.648E+003	1.286E+004
		722.90	90.80	1.838E+004		1.040E+004	8.427E+003
	Cs-134	604.72	97.62	2.584E+004	1.92E+004	-1.972E+004	1.227E+004
		795.86	85.46	1.924E+004		-1.689E+004	8.769E+003
	Cs-137	661.66	85.10	2.246E+004	2.25E+004	1.999E+004	1.044E+004
	Eu-152	121.78	28.67	7.096E+004	6.55E+004	7.050E+004	3.436E+004
		344.28	26.60	6.547E+004		-6.178E+004	3.093E+004
		1408.01	21.07	7.934E+004		1.434E+004	3.510E+004
	Eu-154	123.07	40.40	4.872E+004	4.87E+004	-2.879E+004	2.356E+004
		723.30	20.06	8.324E+004		5.516E+004	3.815E+004
		1274.43	34.80	5.028E+004		-1.086E+004	2.252E+004
	Eu-155	86.55	30.70	8.068E+004	8.07E+004	7.201E+004	3.930E+004
		105.31	21.10	1.078E+005		-4.341E+004	5.238E+004
+	Tl-208	583.19*	85.00	1.246E+004	1.25E+004	1.398E+004	5.493E+003
	Bi-212	727.33	6.67	2.304E+005	2.30E+005	-9.637E+004	1.048E+005
+	Pb-212	238.63*	43.60	2.401E+004	2.40E+004	2.559E+004	1.109E+004
+	Bi-214	609.32*	45.49	2.546E+004	2.55E+004	6.869E+004	1.132E+004
		1120.29	14.92	1.618E+005		1.127E+005	7.515E+004
		1764.49	15.30	1.523E+005		7.587E+004	6.896E+004
+	Pb-214	295.22*	18.42	6.447E+004	3.59E+004	1.149E+005	2.982E+004
		351.93*	35.60	3.591E+004		8.250E+004	1.659E+004
	Ra-226	186.21	3.64	4.888E+005	4.89E+005	1.059E+005	2.346E+005
	Ac-228	338.32	11.27	1.449E+005	8.67E+004	8.534E+003	6.822E+004
		911.20	25.80	8.670E+004		5.477E+004	4.035E+004
		968.97	15.80	1.425E+005		1.609E+005	6.618E+004
	Am-241	59.54	35.90	7.009E+004	7.01E+004	3.617E+004	3.398E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 5452A

Report Generated On : 8/15/2018 1:37:32 PM

Sample Title : B109100AFSFC006GD
Sample Description : WWTF Floor
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M^2

Sample Taken On : 8/15/2018 1:27:00 PM
Acquisition Started : 8/15/2018 1:27:30 PM

Live Time : 600.0 seconds
Real Time : 600.8 seconds

Dead Time : 0.13 %

Energy Calibration Used Done On : 3/15/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1.27CM

DATA VALIDATED

DATE 9-2-18

TIME 0925

R. Masserill *Rjm*

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 5452A
 Sample Title: B109100AFSFC006GD
 Peak Analysis Performed on: 8/15/2018 1:37:32 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	285-	305	300.91	75.23	0.65	1.17E+002	74.77	3.53E+002
2	349-	358	353.28	88.32	0.56	2.80E+001	37.19	1.40E+002
3	738-	748	743.97	185.99	0.30	2.74E+001	24.16	4.96E+001
4	949-	961	955.25	238.81	0.81	4.43E+001	27.86	5.67E+001
5	1400-	1415	1408.21	352.05	1.02	6.30E+001	26.61	3.80E+001
6	2035-	2050	2043.60	510.90	1.28	5.21E+001	18.75	1.19E+001
7	2428-	2443	2436.21	609.05	0.90	7.41E+001	18.54	3.94E+000
8	4473-	4486	4479.76	1119.94	1.58	2.27E+001	12.26	5.32E+000
9	5833-	5853	5843.64	1460.91	0.41	1.28E+002	24.10	4.88E+000
10	7052-	7067	7059.01	1764.75	1.23	2.37E+001	11.22	2.29E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC006GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	8.72878E+005	1.80837E+005
Eu-155	0.345	86.55*	30.70	2.14229E+004	2.87646E+004
		105.31	21.10		
Pb-212	1.000	238.63*	43.60	3.00439E+004	1.95047E+004
Bi-214	1.000	609.32*	45.49	7.70951E+004	2.14122E+004
		1120.29*	14.92	9.61846E+004	5.25722E+004
		1764.49*	15.30	1.26257E+005	6.05820E+004
Pb-214	0.438	295.22	18.42		
		351.93*	35.60	6.35973E+004	2.87345E+004
Ra-226	1.000	186.21*	3.64	1.97020E+005	1.76862E+005

*Ac-228 RTD
NHL*

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	8.728780E+005	1.808374E+005
Eu-155	0.345	2.142291E+004	2.876459E+004
Pb-212	1.000	3.004388E+004	1.950465E+004
Bi-214	1.000	8.430608E+004	1.884649E+004
Pb-214	0.438	6.359727E+004	2.873451E+004
Ra-226	1.000	1.970200E+005	1.768625E+005

*-Ac-228 RTD
 UK*

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/15/2018 1:37:32 PM
Peak Locate From Channel: 85
Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.23	1.9525E-001	63.82		
6	510.90	8.6823E-002	36.00		

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 5452A
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSFC006GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M^2)	Nuclide MDA (pCi/M^2)	Activity (pCi/M^2)	Dec. Level (pCi/M^2)
+	K-40	1460.82*	10.66	1.110E+005	1.11E+005	8.729E+005	4.630E+004
	Co-60	1173.23	99.85	2.130E+004	1.72E+004	3.001E+003	9.771E+003
		1332.49	99.98	1.723E+004		1.422E+002	7.683E+003
	Nb-94	702.65	99.81	1.651E+004	1.60E+004	1.397E+003	7.566E+003
		871.09	99.89	1.603E+004		4.654E+002	7.257E+003
	Ag-108m	433.90	90.50	1.764E+004	1.76E+004	-2.287E+004	8.220E+003
		614.30	89.80	2.727E+004		-1.034E+004	1.292E+004
		722.90	90.80	1.977E+004		4.667E+003	9.118E+003
	Cs-134	604.72	97.62	2.574E+004	1.97E+004	2.417E+003	1.222E+004
		795.86	85.46	1.972E+004		-6.315E+003	9.009E+003
	Cs-137	661.66	85.10	2.554E+004	2.55E+004	3.428E+004	1.198E+004
	Eu-152	121.78	28.67	6.523E+004	6.52E+004	-2.671E+004	3.149E+004
		344.28	26.60	6.578E+004		-3.758E+004	3.108E+004
		1408.01	21.07	8.442E+004		7.760E+004	3.764E+004
	Eu-154	123.07	40.40	4.551E+004	4.55E+004	-3.007E+004	2.196E+004
		723.30	20.06	9.120E+004		9.505E+004	4.213E+004
		1274.43	34.80	5.205E+004		2.275E+004	2.340E+004
+	Eu-155	86.55*	30.70	4.692E+004	4.69E+004	2.142E+004	2.243E+004
		105.31	21.10	1.003E+005		-1.244E+004	4.862E+004
	Tl-208	583.19	85.00	2.359E+004	2.36E+004	8.273E+003	1.106E+004
	Bi-212	727.33	6.67	2.672E+005	2.67E+005	1.300E+005	1.232E+005
+	Pb-212	238.63*	43.60	2.913E+004	2.91E+004	3.004E+004	1.365E+004
+	Bi-214	609.32*	45.49	1.463E+004	1.46E+004	7.710E+004	5.908E+003
		1120.29*	14.92	6.535E+004		9.618E+004	2.694E+004
		1764.49*	15.30	6.317E+004		1.263E+005	2.438E+004
+	Pb-214	295.22	18.42	1.038E+005	3.82E+004	2.214E+004	4.951E+004
		351.93*	35.60	3.821E+004		6.360E+004	1.774E+004
+	Ra-226	186.21*	3.64	2.775E+005	2.77E+005	1.970E+005	1.290E+005
	Ac-228	338.32	11.27	1.603E+005	7.22E+004	1.679E+005	7.593E+004
		911.20	25.80	7.216E+004		-7.720E+004	3.308E+004
		968.97	15.80	1.200E+005		3.964E+004	5.496E+004
	Am-241	59.54	35.90	8.063E+004	8.06E+004	1.784E+004	3.925E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/16/2018 9:02:01 AM

Sample Title : B109100AFSFC007GD
Sample Description : WWTF FLOOR
Sample Identification : 007
Sample Type : GAMMA DIRECT
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.826E+001 M^2

Sample Taken On : 8/16/2018 8:51:00 AM
Acquisition Started : 8/16/2018 8:51:58 AM

Live Time : 600.0 seconds
Real Time : 600.8 seconds

Dead Time : 0.14 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 0930

R. Masserill/Kojin

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSFC007GD
Peak Analysis Performed on: 8/16/2018 9:02:00 AM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	286-	307	300.56	75.27	1.09	1.64E+002	62.88	2.20E+002
2	344-	353	348.83	87.33	0.40	-4.38E+000	31.05	1.04E+002
3	739-	749	744.28	186.19	0.54	2.32E+001	22.58	4.38E+001
4	1174-	1185	1179.85	295.08	0.44	1.38E+001	16.43	2.12E+001
5	1400-	1413	1406.50	351.74	0.54	4.32E+001	17.39	1.18E+001
6	2429-	2442	2435.98	609.09	0.51	4.51E+001	16.91	8.89E+000
7	4473-	4486	4479.98	1120.06	0.47	1.40E+001	11.53	7.00E+000
8	5834-	5854	5844.85	1461.26	1.73	9.08E+001	20.96	5.25E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC007GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	9.85537E+005	2.52945E+005
Eu-155	0.348	86.55*	30.70	-3.55366E+003	2.52012E+004
		105.31	21.10		
Bi-214	0.748	609.32*	45.49	6.57966E+004	2.63138E+004
		1120.29*	14.92	9.13065E+004	7.58453E+004
		1764.49	15.30		
Pb-214	1.000	295.22*	18.42	3.00458E+004	3.60736E+004
		351.93*	35.60	5.50127E+004	2.39237E+004
Ra-226	1.000	186.21*	3.64	1.89384E+005	1.88005E+005

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	9.855371E+005	2.529445E+005
Eu-155	0.348	-3.553658E+003	2.520120E+004
Bi-214	0.748	6.847788E+004	2.497445E+004
Pb-214	1.000	4.750925E+004	2.002589E+004
Ra-226	1.000	1.893836E+005	1.880048E+005

← Ra-226
 R+D

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/16/2018 9:02:00 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.27	2.7400E-001	38.25		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSFC007GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.853E+005	1.85E+005	9.855E+005	7.795E+004
	Co-60	1173.23	99.85	2.305E+004	1.63E+004	-1.903E+004	1.017E+004
		1332.49	99.98	1.625E+004		-2.203E+003	6.661E+003
	Nb-94	702.65	99.81	2.085E+004	1.96E+004	1.330E+004	9.440E+003
		871.09	99.89	1.959E+004		-6.248E+003	8.667E+003
	Ag-108m	433.90	90.50	2.009E+004	2.01E+004	-1.043E+004	9.261E+003
		614.30	89.80	3.195E+004		-1.177E+004	1.497E+004
		722.90	90.80	2.621E+004		1.314E+004	1.200E+004
	Cs-134	604.72	97.62	2.927E+004	2.35E+004	1.325E+004	1.372E+004
		795.86	85.46	2.347E+004		-6.307E+003	1.049E+004
	Cs-137	661.66	85.10	2.253E+004	2.25E+004	1.850E+004	1.015E+004
	Eu-152	121.78	28.67	6.774E+004	6.55E+004	1.470E+004	3.265E+004
		344.28	26.60	6.548E+004		-1.794E+003	3.047E+004
		1408.01	21.07	1.006E+005		1.069E+004	4.308E+004
	Eu-154	123.07	40.40	4.807E+004	4.81E+004	3.467E+004	2.317E+004
		723.30	20.06	1.187E+005		5.765E+004	5.433E+004
		1274.43	34.80	5.489E+004		3.329E+004	2.335E+004
+	Eu-155	86.55*	30.70	4.401E+004	4.40E+004	-3.554E+003	2.091E+004
		105.31	21.10	9.683E+004		-4.804E+004	4.680E+004
	Tl-208	583.19	85.00	2.321E+004	2.32E+004	1.614E+004	1.058E+004
	Bi-212	727.33	6.67	3.498E+005	3.50E+005	1.282E+005	1.598E+005
	Pb-212	238.63	43.60	4.873E+004	4.87E+004	4.420E+004	2.329E+004
+	Bi-214	609.32*	45.49	2.858E+004	2.86E+004	6.580E+004	1.232E+004
		1120.29*	14.92	1.118E+005		9.131E+004	4.707E+004
		1764.49	15.30	1.855E+005		5.751E+004	8.098E+004
+	Pb-214	295.22*	18.42	5.822E+004	2.72E+004	3.005E+004	2.617E+004
		351.93*	35.60	2.725E+004		5.501E+004	1.190E+004
+	Ra-226	186.21*	3.64	2.969E+005	2.97E+005	1.894E+005	1.374E+005
	Ac-228	338.32	11.27	1.550E+005	9.35E+004	4.733E+004	7.219E+004
		911.20	25.80	9.352E+004		1.294E+004	4.227E+004
		968.97	15.80	1.513E+005		3.763E+004	6.805E+004
	Am-241	59.54	35.90	6.292E+004	6.29E+004	-6.306E+003	3.033E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 5452A

Report Generated On : 8/15/2018 2:57:10 PM

Sample Title : B109100AFSFC008GD
Sample Description : WWTF Floor
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/15/2018 2:46:00 PM
Acquisition Started : 8/15/2018 2:47:08 PM

Live Time : 600.0 seconds
Real Time : 601.3 seconds

Dead Time : 0.21 %

Energy Calibration Used Done On : 3/15/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1.27CM

DATA VALIDATED

DATE 9-2-18

TIME 0935

R. Masserilli

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 5452A
 Sample Title: B109100AFSFC008GD
 Peak Analysis Performed on: 8/15/2018 2:57:10 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	306	300.76	75.19	0.40	5.58E+001	48.03	2.17E+002
2	1173-	1185	1179.84	294.96	0.46	3.17E+001	24.02	4.13E+001
3	1398-	1415	1407.42	351.86	0.94	5.77E+001	22.90	2.24E+001
4	2428-	2443	2435.84	608.96	1.46	6.30E+001	20.49	1.40E+001
5	2640-	2651	2645.37	661.34	0.60	1.85E+001	11.38	5.52E+000
6	5830-	5854	5842.37	1460.59	1.62	1.66E+002	28.63	9.46E+000
7	7051-	7066	7058.59	1764.65	0.65	2.61E+001	11.25	1.86E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC008GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

..... IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	1.12771E+006	2.18232E+005
Cs-137	1.000	661.66*	85.10	1.07070E+004	6.71714E+003
Bi-214	0.705	609.32*	45.49	6.56139E+004	2.27344E+004
		1120.29	14.92		
		1764.49*	15.30	1.39198E+005	6.09215E+004
Pb-214	1.000	295.22*	18.42	5.65414E+004	4.38301E+004
		351.93*	35.60	5.81891E+004	2.49158E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	1.127712E+006	2.182323E+005
Cs-137	1.000	1.070697E+004	6.717145E+003
Bi-214	0.705	7.460854E+004	2.129963E+004
Pb-214	1.000	5.778668E+004	2.166059E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/15/2018 2:57:10 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.19	9.3045E-002	86.03		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 5452A
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSFC008GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M^2)	Nuclide MDA (pCi/M^2)	Activity (pCi/M^2)	Dec. Level (pCi/M^2)
+	K-40	1460.82*	10.66	1.590E+005	1.59E+005	1.128E+006	7.031E+004
	Co-60	1173.23	99.85	2.198E+004	1.58E+004	9.458E+003	1.011E+004
		1332.49	99.98	1.583E+004		-7.920E+003	6.983E+003
	Nb-94	702.65	99.81	1.432E+004	1.43E+004	-1.648E+004	6.472E+003
		871.09	99.89	1.800E+004		-1.322E+004	8.243E+003
	Ag-108m	433.90	90.50	1.827E+004	1.75E+004	1.768E+004	8.535E+003
		614.30	89.80	2.692E+004		-3.177E+003	1.274E+004
		722.90	90.80	1.754E+004		-9.051E+003	8.005E+003
	Cs-134	604.72	97.62	2.543E+004	2.09E+004	1.199E+004	1.206E+004
		795.86	85.46	2.087E+004		1.523E+004	9.584E+003
+	Cs-137	661.66*	85.10	8.672E+003	8.67E+003	1.071E+004	3.552E+003
	Eu-152	121.78	28.67	6.616E+004	6.62E+004	-3.843E+004	3.196E+004
		344.28	26.60	6.852E+004		1.963E+004	3.245E+004
		1408.01	21.07	9.367E+004		7.109E+004	4.227E+004
	Eu-154	123.07	40.40	4.685E+004	4.69E+004	-2.057E+003	2.263E+004
		723.30	20.06	8.230E+004		3.458E+004	3.769E+004
		1274.43	34.80	4.844E+004		-2.898E+004	2.160E+004
	Eu-155	86.55	30.70	7.969E+004	7.97E+004	-9.917E+003	3.880E+004
		105.31	21.10	1.026E+005		-3.002E+004	4.979E+004
	Tl-208	583.19	85.00	2.388E+004	2.39E+004	3.054E+004	1.120E+004
	Bi-212	727.33	6.67	2.365E+005	2.36E+005	-1.313E+005	1.078E+005
	Pb-212	238.63	43.60	4.699E+004	4.70E+004	6.272E+004	2.258E+004
+	Bi-214	609.32*	45.49	2.498E+004	2.50E+004	6.561E+004	1.108E+004
		1120.29	14.92	1.605E+005		-1.898E+005	7.450E+004
		1764.49*	15.30	5.545E+004		1.392E+005	2.052E+004
+	Pb-214	295.22*	18.42	6.716E+004	3.12E+004	5.654E+004	3.116E+004
		351.93*	35.60	3.118E+004		5.819E+004	1.423E+004
	Ra-226	186.21	3.64	5.399E+005	5.40E+005	3.332E+005	2.602E+005
	Ac-228	338.32	11.27	1.730E+005	7.30E+004	1.554E+005	8.228E+004
		911.20	25.80	7.297E+004		1.221E+004	3.348E+004
		968.97	15.80	1.305E+005		9.599E+004	6.020E+004
	Am-241	59.54	35.90	9.351E+004	9.35E+004	-6.369E+004	4.569E+004

+ = Nuclide identified during the nuclide identification
 * = Energy line found in the spectrum
 > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
 @ = Half-life too short to be able to perform the decay correction

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 5452A

Report Generated On : 8/15/2018 3:13:45 PM

Sample Title : B109100AFSFC009GD
Sample Description : WWTF Floor
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M^2

Sample Taken On : 8/15/2018 3:02:00 PM
Acquisition Started : 8/15/2018 3:03:42 PM

Live Time : 600.0 seconds
Real Time : 601.3 seconds

Dead Time : 0.22 %

Energy Calibration Used Done On : 3/15/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1.27CM

DATA VALIDATED

DATE 9-2-18

TIME 0940

R. Massengill 

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 5452A
Sample Title: B109100AFSFC009GD
Peak Analysis Performed on: 8/15/2018 3:13:45 PM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	949-	961	954.65	238.66	0.48	3.26E+001	28.27	6.34E+001
2	1177-	1189	1182.27	295.57	0.36	3.98E+001	22.73	3.22E+001
3	1211-	1221	1215.89	303.97	0.79	8.85E+000	17.18	2.72E+001
4	1402-	1414	1408.25	352.06	0.63	6.26E+001	24.53	3.34E+001
5	2327-	2338	2332.31	583.08	0.43	2.35E+001	16.11	1.65E+001
6	2428-	2444	2436.02	609.00	1.26	5.67E+001	20.07	1.33E+001
7	5831-	5854	5843.44	1460.86	1.31	1.79E+002	30.90	1.49E+001
8	7051-	7066	7058.53	1764.63	0.56	2.90E+001	11.84	1.97E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC009GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	1.21991E+006	2.35684E+005
Tl-208	1.000	583.19*	85.00	1.28037E+004	8.91782E+003
Pb-212	1.000	238.63*	43.60	2.21081E+004	1.94960E+004
Bi-214	0.705	609.32*	45.49	5.90404E+004	2.20668E+004
		1120.29	14.92		
		1764.49*	15.30	1.54582E+005	6.42243E+004
Pb-214	1.000	295.22*	18.42	7.11291E+004	4.21854E+004
		351.93*	35.60	6.31955E+004	2.67567E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	1.219907E+006	2.356844E+005
Tl-208	1.000	1.280367E+004	8.917818E+003
Pb-212	1.000	2.210806E+004	1.949604E+004
Bi-214	0.705	6.912851E+004	2.086931E+004
Pb-214	1.000	6.547152E+004	2.259509E+004

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/15/2018 3:13:45 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
3	303.97	1.4745E-002	194.16	Tol.	Pb-214

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 5452A
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSFC009GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.916E+005	1.92E+005	1.220E+006	8.658E+004
	Co-60	1173.23	99.85	2.130E+004	2.03E+004	1.236E+004	9.771E+003
		1332.49	99.98	2.027E+004		1.222E+004	9.203E+003
	Nb-94	702.65	99.81	1.594E+004	1.59E+004	-1.970E+004	7.284E+003
		871.09	99.89	1.758E+004		2.816E+003	8.034E+003
	Ag-108m	433.90	90.50	1.725E+004	1.72E+004	-1.454E+004	8.025E+003
		614.30	89.80	2.532E+004		-1.033E+004	1.194E+004
		722.90	90.80	1.879E+004		2.421E+003	8.630E+003
	Cs-134	604.72	97.62	2.500E+004	2.40E+004	-4.155E+003	1.185E+004
		795.86	85.46	2.396E+004		-1.614E+003	1.113E+004
	Cs-137	661.66	85.10	2.397E+004	2.40E+004	3.145E+003	1.120E+004
	Eu-152	121.78	28.67	6.799E+004	6.48E+004	-1.977E+004	3.287E+004
		344.28	26.60	6.484E+004		-8.084E+004	3.061E+004
		1408.01	21.07	6.573E+004		2.316E+004	2.830E+004
	Eu-154	123.07	40.40	4.919E+004	4.92E+004	4.512E+004	2.380E+004
		723.30	20.06	8.324E+004		-3.422E+004	3.815E+004
		1274.43	34.80	5.458E+004		5.808E+004	2.467E+004
	Eu-155	86.55	30.70	7.810E+004	7.81E+004	6.926E+004	3.801E+004
		105.31	21.10	9.672E+004		-5.673E+004	4.685E+004
+	Tl-208	583.19*	85.00	1.302E+004	1.30E+004	1.280E+004	5.771E+003
	Bi-212	727.33	6.67	2.592E+005	2.59E+005	1.351E+005	1.192E+005
+	Pb-212	238.63*	43.60	3.067E+004	3.07E+004	2.211E+004	1.442E+004
+	Bi-214	609.32*	45.49	2.554E+004	2.55E+004	5.904E+004	1.136E+004
		1120.29	14.92	1.538E+005		1.861E+005	7.116E+004
		1764.49*	15.30	5.728E+004		1.546E+005	2.144E+004
+	Pb-214	295.22*	18.42	6.042E+004	3.39E+004	7.113E+004	2.779E+004
		351.93*	35.60	3.387E+004		6.320E+004	1.557E+004
	Ra-226	186.21	3.64	5.311E+005	5.31E+005	4.625E+005	2.558E+005
	Ac-228	338.32	11.27	1.561E+005	7.98E+004	1.110E+005	7.381E+004
		911.20	25.80	7.979E+004		3.043E+004	3.689E+004
		968.97	15.80	1.200E+005		-1.027E+004	5.496E+004
	Am-241	59.54	35.90	6.778E+004	6.78E+004	1.472E+004	3.282E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/16/2018 9:18:04 AM

Sample Title : B109100AFSFC010GD
Sample Description : WWTF FLOOR
Sample Identification : 010
Sample Type : GAMMA DIRECT
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : ^{2.83}~~2.826E+001~~ M²

Sample Taken On : 8/16/2018 9:08:00 AM
Acquisition Started : 8/16/2018 9:08:03 AM

Live Time : 600.0 seconds
Real Time : 600.8 seconds

Dead Time : 0.13 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 0945

R. Massengill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSFC010GD
 Peak Analysis Performed on: 8/16/2018 9:18:04 AM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	305	300.64	75.29	0.81	5.56E+001	39.65	1.49E+002
2	651-	660	655.87	164.09	0.51	9.57E-001	20.25	4.50E+001
3	1401-	1412	1406.83	351.82	0.69	3.05E+001	18.13	2.05E+001
4	2427-	2441	2435.54	608.98	0.78	4.03E+001	15.42	6.72E+000
5	5837-	5853	5844.61	1461.20	1.50	7.06E+001	20.29	1.04E+001

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC010GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M^2)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	7.67109E+005	2.36467E+005
Bi-214	0.461	609.32*	45.49	5.87381E+004	2.39274E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	3.87972E+004	2.39430E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	7.671092E+005	2.364670E+005
Bi-214	0.461	5.873808E+004	2.392738E+004
Pb-214	0.432	3.879716E+004	2.394300E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/16/2018 9:18:04 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.29	9.2748E-002	71.25		
2	164.09	1.5942E-003	2117.23		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSFC010GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+ K-40	1460.82*	10.66	2.323E+005	2.32E+005	7.671E+005	1.014E+005
Co-60	1173.23	99.85	2.605E+004	1.89E+004	-7.722E+002	1.167E+004
	1332.49	99.98	1.885E+004		-4.605E+004	7.962E+003
Nb-94	702.65	99.81	2.203E+004	2.12E+004	-3.092E+003	1.003E+004
	871.09	99.89	2.124E+004		-2.516E+003	9.494E+003
Ag-108m	433.90	90.50	1.887E+004	1.89E+004	-1.121E+004	8.649E+003
	614.30	89.80	2.945E+004		-2.118E+004	1.372E+004
	722.90	90.80	2.299E+004		2.854E+003	1.039E+004
Cs-134	604.72	97.62	2.816E+004	2.35E+004	4.148E+003	1.317E+004
	795.86	85.46	2.347E+004		-3.221E+003	1.049E+004
Cs-137	661.66	85.10	1.981E+004	1.98E+004	-3.798E+003	8.788E+003
Eu-152	121.78	28.67	7.363E+004	6.45E+004	2.595E+003	3.560E+004
	344.28	26.60	6.447E+004		-7.409E+004	2.997E+004
	1408.01	21.07	1.139E+005		8.552E+004	4.974E+004
Eu-154	123.07	40.40	5.305E+004	5.30E+004	1.904E+004	2.566E+004
	723.30	20.06	1.041E+005		1.292E+004	4.705E+004
	1274.43	34.80	6.272E+004		4.539E+004	2.727E+004
Eu-155	86.55	30.70	7.482E+004	7.48E+004	1.538E+003	3.631E+004
	105.31	21.10	9.601E+004		7.540E+004	4.639E+004
Tl-208	583.19	85.00	2.649E+004	2.65E+004	2.803E+003	1.222E+004
Bi-212	727.33	6.67	3.280E+005	3.28E+005	2.030E+005	1.489E+005
Pb-212	238.63	43.60	4.769E+004	4.77E+004	3.365E+004	2.277E+004
+ Bi-214	609.32*	45.49	2.493E+004	2.49E+004	5.874E+004	1.049E+004
	1120.29	14.92	1.920E+005		1.132E+004	8.717E+004
	1764.49	15.30	2.091E+005		3.698E+004	9.277E+004
+ Pb-214	295.22	18.42	1.060E+005	3.35E+004	-6.876E+004	5.005E+004
	351.93*	35.60	3.353E+004		3.880E+004	1.504E+004
Ra-226	186.21	3.64	5.081E+005	5.08E+005	4.654E+005	2.430E+005
Ac-228	338.32	11.27	1.550E+005	9.35E+004	-4.845E+004	7.219E+004
	911.20	25.80	9.352E+004		-6.795E+004	4.227E+004
	968.97	15.80	1.488E+005		2.999E+004	6.678E+004
Am-241	59.54	35.90	6.242E+004	6.24E+004	-4.606E+004	3.009E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 5452A

Report Generated On : 8/15/2018 1:24:50 PM

Sample Title : B109100AFSFC011GD
Sample Description : WWTF Floor
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M^2

Sample Taken On : 8/15/2018 1:14:00 PM
Acquisition Started : 8/15/2018 1:14:48 PM

Live Time : 600.0 seconds
Real Time : 600.7 seconds

Dead Time : 0.12 %

Energy Calibration Used Done On : 3/15/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1.27CM

DATA VALIDATED

DATE 9-2-18

TIME 0950

R. Massengill

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 5452A
Sample Title: B109100AFSFC011GD
Peak Analysis Performed on: 8/15/2018 1:24:50 PM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	285-	306	290.55	72.64	0.60	1.38E+002	71.34	3.02E+002
2	738-	748	743.47	185.87	0.63	2.01E+001	23.74	5.09E+001
3	950-	963	955.11	238.78	0.84	4.97E+001	28.70	5.63E+001
4	1400-	1416	1408.30	352.07	0.58	7.57E+001	26.33	3.13E+001
5	2428-	2445	2436.56	609.14	1.67	7.25E+001	23.69	2.05E+001
6	2638-	2653	2645.28	661.32	0.37	3.48E+001	17.73	1.42E+001
7	4474-	4487	4480.18	1120.05	0.86	1.90E+001	12.38	7.00E+000
8	5833-	5854	5843.79	1460.95	1.50	1.36E+002	26.31	1.02E+001
9	7052-	7067	7059.03	1764.76	0.77	2.68E+001	11.64	2.17E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC011GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M^2)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	9.25297E+005	1.96417E+005
Cs-137	1.000	661.66*	85.10	2.01814E+004	1.05534E+004
Pb-212	1.000	238.63*	43.60	3.37166E+004	2.02074E+004
Bi-214	1.000	609.32*	45.49	7.54807E+004	2.62763E+004
		1120.29*	14.92	8.05866E+004	5.28951E+004
		1764.49*	15.30	1.42849E+005	6.30523E+004
Pb-214	0.438	295.22	18.42		
		351.93*	35.60	7.64214E+004	2.92667E+004
Ra-226	1.000	186.21*	3.64	1.44994E+005	1.72502E+005

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	9.252967E+005	1.964172E+005
Cs-137	1.000	2.018139E+004	1.055337E+004
Pb-212	1.000	3.371663E+004	2.020741E+004
Bi-214	1.000	8.460453E+004	2.204717E+004
Pb-214	0.438	7.642136E+004	2.926674E+004
Ra-226	1.000	1.449945E+005	1.725016E+005

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/15/2018 1:24:50 PM
Peak Locate From Channel: 85
Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	72.64	2.2920E-001	51.88		

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 5452A
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSFC011GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.551E+005	1.55E+005	9.253E+005	6.835E+004
	Co-60	1173.23	99.85	2.082E+004	1.55E+004	2.021E+003	9.535E+003
		1332.49	99.98	1.546E+004		6.648E+003	6.797E+003
	Nb-94	702.65	99.81	1.365E+004	1.37E+004	-1.114E+004	6.140E+003
		871.09	99.89	1.716E+004		8.532E+003	7.820E+003
	Ag-108m	433.90	90.50	1.887E+004	1.75E+004	7.380E+003	8.839E+003
		614.30	89.80	2.704E+004		-1.980E+004	1.280E+004
		722.90	90.80	1.754E+004		9.120E+003	8.005E+003
	Cs-134	604.72	97.62	2.543E+004	2.00E+004	-1.162E+004	1.206E+004
		795.86	85.46	1.995E+004		-1.368E+004	9.127E+003
+	Cs-137	661.66*	85.10	1.417E+004	1.42E+004	2.018E+004	6.303E+003
	Eu-152	121.78	28.67	6.487E+004	6.49E+004	-9.895E+004	3.132E+004
		344.28	26.60	6.516E+004		1.089E+004	3.077E+004
		1408.01	21.07	7.386E+004		5.736E+004	3.236E+004
	Eu-154	123.07	40.40	4.726E+004	4.73E+004	7.574E+003	2.284E+004
		723.30	20.06	7.942E+004		6.083E+004	3.624E+004
		1274.43	34.80	4.749E+004		1.307E+004	2.113E+004
	Eu-155	86.55	30.70	8.520E+004	8.52E+004	1.159E+005	4.156E+004
		105.31	21.10	1.021E+005		3.470E+004	4.952E+004
	Tl-208	583.19	85.00	2.359E+004	2.36E+004	1.368E+004	1.106E+004
	Bi-212	727.33	6.67	2.006E+005	2.01E+005	-1.239E+005	8.983E+004
+	Pb-212	238.63*	43.60	2.971E+004	2.97E+004	3.372E+004	1.394E+004
+	Bi-214	609.32*	45.49	3.101E+004	3.10E+004	7.548E+004	1.410E+004
		1120.29*	14.92	7.279E+004		8.059E+004	3.065E+004
		1764.49*	15.30	6.100E+004		1.428E+005	2.330E+004
+	Pb-214	295.22	18.42	1.035E+005	3.56E+004	3.093E+004	4.933E+004
		351.93*	35.60	3.556E+004		7.642E+004	1.642E+004
+	Ra-226	186.21*	3.64	2.798E+005	2.80E+005	1.450E+005	1.301E+005
	Ac-228	338.32	11.27	1.433E+005	7.14E+004	-8.255E+004	6.744E+004
		911.20	25.80	7.135E+004		1.459E+004	3.267E+004
		968.97	15.80	1.267E+005		6.163E+004	5.829E+004
	Am-241	59.54	35.90	7.261E+004	7.26E+004	-8.926E+003	3.524E+004

+ = Nuclide identified during the nuclide identification
 * = Energy line found in the spectrum
 > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
 @ = Half-life too short to be able to perform the decay correction

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 5452A

Report Generated On : 8/15/2018 1:07:52 PM

Sample Title : B109100AFSFC012GD
Sample Description : WWTF Floor
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M^2

Sample Taken On : 8/15/2018 12:57:00 PM
Acquisition Started : 8/15/2018 12:57:50 PM

Live Time : 600.0 seconds
Real Time : 600.4 seconds

Dead Time : 0.06 %

Energy Calibration Used Done On : 3/15/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1.27CM

DATA VALIDATED

DATE 9-2-18

TIME 0955

R. Massengill *Rail*

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 5452A
 Sample Title: B109100AFSFC012GD
 Peak Analysis Performed on: 8/15/2018 1:07:51 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	297-	311	301.10	75.28	0.72	5.98E+001	54.39	2.34E+002
2	1175-	1186	1181.05	295.26	0.29	2.65E+001	22.64	4.05E+001
3	1401-	1413	1407.14	351.78	1.01	4.57E+001	23.97	3.73E+001
4	2327-	2338	2332.19	583.05	0.45	2.03E+001	14.91	1.37E+001
5	2429-	2445	2436.97	609.24	0.72	7.19E+001	21.38	1.31E+001
6	5832-	5855	5843.64	1460.91	1.01	1.44E+002	24.93	2.89E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC012GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	9.81847E+005	1.90071E+005
Tl-208	1.000	583.19*	85.00	1.10455E+004	8.23994E+003
Bi-214	0.439	609.32*	45.49	7.48049E+004	2.40081E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	1.000	295.22*	18.42	4.72888E+004	4.11411E+004
		351.93*	35.60	4.60940E+004	2.52940E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	9.818475E+005	1.900712E+005
Tl-208	1.000	1.104548E+004	8.239941E+003
Bi-214	0.439	7.480487E+004	2.400813E+004
Pb-214	1.000	4.642176E+004	2.154738E+004

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/15/2018 1:07:51 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.28	9.9728E-002	90.90		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 5452A
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSFC012GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	9.382E+004	9.38E+004	9.818E+005	3.769E+004
	Co-60	1173.23	99.85	2.010E+004	1.47E+004	8.775E+003	9.171E+003
		1332.49	99.98	1.468E+004		1.829E+003	6.408E+003
	Nb-94	702.65	99.81	1.495E+004	1.50E+004	7.319E+003	6.788E+003
		871.09	99.89	1.737E+004		1.896E+003	7.928E+003
	Ag-108m	433.90	90.50	1.601E+004	1.60E+004	-1.020E+004	7.409E+003
		614.30	89.80	2.704E+004		-4.057E+003	1.280E+004
		722.90	90.80	1.710E+004		8.659E+003	7.786E+003
	Cs-134	604.72	97.62	2.685E+004	1.82E+004	-1.187E+004	1.277E+004
		795.86	85.46	1.823E+004		7.519E+003	8.267E+003
	Cs-137	661.66	85.10	2.263E+004	2.26E+004	2.057E+004	1.053E+004
	Eu-152	121.78	28.67	7.329E+004	6.32E+004	1.721E+004	3.553E+004
		344.28	26.60	6.324E+004		-1.105E+005	2.981E+004
		1408.01	21.07	7.756E+004		4.062E+004	3.421E+004
	Eu-154	123.07	40.40	5.231E+004	5.23E+004	-4.067E+003	2.536E+004
		723.30	20.06	7.843E+004		4.006E+004	3.575E+004
		1274.43	34.80	5.620E+004		3.243E+004	2.548E+004
	Eu-155	86.55	30.70	8.059E+004	8.06E+004	1.854E+004	3.925E+004
		105.31	21.10	9.957E+004		1.290E+004	4.827E+004
+	Tl-208	583.19*	85.00	1.214E+004	1.21E+004	1.105E+004	5.333E+003
	Bi-212	727.33	6.67	2.482E+005	2.48E+005	5.078E+004	1.136E+005
	Pb-212	238.63	43.60	4.967E+004	4.97E+004	1.930E+004	2.392E+004
+	Bi-214	609.32*	45.49	2.513E+004	2.51E+004	7.480E+004	1.116E+004
		1120.29	14.92	1.565E+005		1.960E+005	7.252E+004
		1764.49	15.30	1.279E+005		1.118E+005	5.676E+004
+	Pb-214	295.22*	18.42	6.409E+004	3.56E+004	4.729E+004	2.963E+004
		351.93*	35.60	3.560E+004		4.609E+004	1.644E+004
	Ra-226	186.21	3.64	5.155E+005	5.16E+005	1.531E+005	2.480E+005
	Ac-228	338.32	11.27	1.665E+005	7.30E+004	6.600E+004	7.900E+004
		911.20	25.80	7.297E+004		-2.564E+003	3.348E+004
		968.97	15.80	1.330E+005		1.071E+005	6.145E+004
	Am-241	59.54	35.90	6.879E+004	6.88E+004	-1.626E+004	3.333E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/14/2018 1:34:45 PM

Sample Title : B109100AFSFC013GD
Sample Description : WWTF Floor
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3MWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/14/2018 1:24:00 PM
Acquisition Started : 8/14/2018 1:24:44 PM

Live Time : 600.0 seconds
Real Time : 600.8 seconds

Dead Time : 0.14 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-5-18

TIME 1000

R. Massengill/Bjm

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSFC013GD
Peak Analysis Performed on: 8/14/2018 1:34:45 PM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	295-	305	300.26	75.19	0.64	5.01E+001	43.56	1.78E+002
2	1175-	1186	1180.09	295.14	0.33	7.44E+000	17.79	2.86E+001
3	1400-	1412	1406.58	351.76	0.47	1.58E+001	19.25	2.93E+001
4	2431-	2442	2436.38	609.19	0.69	3.37E+001	14.18	6.30E+000
5	4684-	4700	4692.67	1173.23	0.65	5.26E+001	16.40	4.45E+000
6	5324-	5338	5330.08	1332.58	0.63	4.39E+001	14.45	3.07E+000
7	5835-	5853	5843.36	1460.89	0.74	7.14E+001	18.00	2.62E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC013GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	7.73921E+005	2.06383E+005
Co-60	1.000	1173.23*	99.85	5.26305E+004	1.69596E+004
		1332.49*	99.98	4.74735E+004	1.60708E+004
		1764.49	15.30		
Bi-214	0.461	609.32*	45.49	4.90889E+004	2.14885E+004
		1120.29	14.92		
Pb-214	1.000	295.22*	18.42	1.61390E+004	3.86822E+004
		351.93*	35.60	2.00103E+004	2.46429E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	7.739208E+005	2.063829E+005
Co-60	1.000	4.991329E+004	1.166532E+004
Bi-214	0.461	4.908885E+004	2.148852E+004
Pb-214	1.000	1.889268E+004	2.078371E+004

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/14/2018 1:34:45 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.19	8.3556E-002	86.89		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3MWWTF1.27CM
 Sample Title: B109100AFSFC013GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M^2)	Nuclide MDA (pCi/M^2)	Activity (pCi/M^2)	Dec. Level (pCi/M^2)
+	K-40	1460.82*	10.66	1.398E+005	1.40E+005	7.739E+005	5.525E+004
+	Co-60	1173.23*	99.85	1.535E+004	1.31E+004	5.263E+004	6.321E+003
		1332.49*	99.98	1.315E+004		4.747E+004	5.111E+003
	Nb-94	702.65	99.81	1.957E+004	1.96E+004	5.526E+003	8.798E+003
		871.09	99.89	2.345E+004		1.944E+004	1.060E+004
	Ag-108m	433.90	90.50	1.905E+004	1.91E+004	-2.899E+003	8.742E+003
		614.30	89.80	3.006E+004		-8.105E+003	1.402E+004
		722.90	90.80	2.296E+004		2.850E+003	1.038E+004
	Cs-134	604.72	97.62	2.716E+004	2.55E+004	1.530E+004	1.267E+004
		795.86	85.46	2.551E+004		-8.468E+003	1.151E+004
	Cs-137	661.66	85.10	2.792E+004	2.79E+004	1.605E+004	1.285E+004
	Eu-152	121.78	28.67	7.166E+004	7.16E+004	5.594E+004	3.462E+004
		344.28	26.60	7.156E+004		8.951E+003	3.351E+004
		1408.01	21.07	9.681E+004		5.871E+004	4.118E+004
	Eu-154	123.07	40.40	5.122E+004	5.12E+004	1.950E+004	2.475E+004
		723.30	20.06	1.055E+005		3.884E+004	4.776E+004
		1274.43	34.80	5.481E+004		-1.284E+004	2.332E+004
	Eu-155	86.55	30.70	7.781E+004	7.78E+004	1.085E+005	3.781E+004
		105.31	21.10	9.061E+004		-5.465E+004	4.370E+004
	Tl-208	583.19	85.00	2.910E+004	2.91E+004	3.057E+004	1.353E+004
	Bi-212	727.33	6.67	3.090E+005	3.09E+005	3.502E+004	1.394E+005
	Pb-212	238.63	43.60	4.777E+004	4.78E+004	1.460E+004	2.281E+004
+	Bi-214	609.32*	45.49	2.347E+004	2.35E+004	4.909E+004	9.764E+003
		1120.29	14.92	1.917E+005		5.887E+004	8.705E+004
		1764.49	15.30	1.514E+005		8.690E+004	6.393E+004
+	Pb-214	295.22*	18.42	6.630E+004	4.01E+004	1.614E+004	3.022E+004
		351.93*	35.60	4.010E+004		2.001E+004	1.833E+004
	Ra-226	186.21	3.64	5.162E+005	5.16E+005	1.674E+005	2.470E+005
	Ac-228	338.32	11.27	1.689E+005	1.16E+005	1.199E+005	7.918E+004
		911.20	25.80	1.157E+005		3.597E+004	5.339E+004
		968.97	15.80	1.806E+005		1.118E+005	8.271E+004
	Am-241	59.54	35.90	6.536E+004	6.54E+004	5.418E+002	3.156E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/14/2018 2:50:02 PM

Sample Title : B109100AFSFC014GD
Sample Description : WWTF Floor
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3MWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M^2

Sample Taken On : 8/14/2018 2:39:00 PM
Acquisition Started : 8/14/2018 2:40:00 PM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.16 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1005

[164]

R. Massengill 

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSFC014GD
Peak Analysis Performed on: 8/14/2018 2:50:01 PM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	321	300.18	75.17	0.76	6.43E+001	73.83	2.99E+002
2	947-	959	953.28	238.44	0.38	2.09E+001	24.14	4.71E+001
3	1400-	1413	1406.86	351.82	0.66	4.54E+001	20.75	2.26E+001
4	2429-	2441	2435.43	608.95	0.31	3.29E+001	14.81	8.12E+000
5	5833-	5851	5842.50	1460.67	0.94	7.01E+001	18.69	4.89E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC014GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M^2)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	7.60049E+005	2.13097E+005
Pb-212	1.000	238.63*	43.60	1.66061E+004	1.93700E+004
Bi-214	0.461	609.32*	45.49	4.78880E+004	2.23234E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	5.76519E+004	2.77424E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	7.600493E+005	2.130971E+005
Pb-212	1.000	1.660608E+004	1.937003E+004
Bi-214	0.461	4.788795E+004	2.232336E+004
Pb-214	0.432	5.765191E+004	2.774235E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/14/2018 2:50:01 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.17	1.0724E-001	114.75		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3MWTF1.27CM
 Sample Title: B109100AFSFC014GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.773E+005	1.77E+005	7.600E+005	7.400E+004
	Co-60	1173.23	99.85	2.302E+004	2.17E+004	4.032E+003	1.016E+004
		1332.49	99.98	2.174E+004		-1.351E+003	9.407E+003
	Nb-94	702.65	99.81	1.989E+004	1.99E+004	2.157E+003	8.959E+003
		871.09	99.89	2.236E+004		1.102E+004	1.006E+004
	Ag-108m	433.90	90.50	2.229E+004	2.23E+004	1.695E+004	1.036E+004
		614.30	89.80	3.027E+004		-1.712E+004	1.413E+004
		722.90	90.80	2.587E+004		4.510E+003	1.183E+004
	Cs-134	604.72	97.62	2.657E+004	2.21E+004	1.628E+004	1.237E+004
		795.86	85.46	2.208E+004		7.920E+003	9.796E+003
	Cs-137	661.66	85.10	2.763E+004	2.76E+004	2.572E+004	1.270E+004
	Eu-152	121.78	28.67	6.724E+004	6.59E+004	5.642E+003	3.241E+004
		344.28	26.60	6.589E+004		-1.322E+005	3.068E+004
		1408.01	21.07	8.015E+004		3.241E+003	3.285E+004
	Eu-154	123.07	40.40	4.694E+004	4.69E+004	-3.288E+004	2.261E+004
		723.30	20.06	1.157E+005		-2.989E+004	5.288E+004
		1274.43	34.80	6.783E+004		3.014E+004	2.983E+004
	Eu-155	86.55	30.70	7.647E+004	7.65E+004	4.464E+004	3.714E+004
		105.31	21.10	9.251E+004		-5.330E+004	4.465E+004
	Tl-208	583.19	85.00	2.541E+004	2.54E+004	2.942E+004	1.168E+004
	Bi-212	727.33	6.67	3.617E+005	3.62E+005	9.894E+004	1.658E+005
+	Pb-212	238.63*	43.60	3.136E+004	3.14E+004	1.661E+004	1.460E+004
+	Bi-214	609.32*	45.49	2.639E+004	2.64E+004	4.789E+004	1.122E+004
		1120.29	14.92	1.722E+005		7.002E+004	7.726E+004
		1764.49	15.30	1.576E+005		9.559E+004	6.705E+004
+	Pb-214	295.22	18.42	9.506E+004	3.64E+004	-5.188E+004	4.459E+004
		351.93*	35.60	3.643E+004		5.765E+004	1.649E+004
	Ra-226	186.21	3.64	4.876E+005	4.88E+005	8.169E+002	2.327E+005
	Ac-228	338.32	11.27	1.700E+005	9.75E+004	8.554E+004	7.970E+004
		911.20	25.80	9.751E+004		3.614E+004	4.427E+004
		968.97	15.80	1.460E+005		-4.520E+004	6.539E+004
	Am-241	59.54	35.90	6.653E+004	6.65E+004	5.472E+004	3.214E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/21/2018 8:11:49 AM

Sample Title : B109100AFSFC015GD
Sample Description : WWTF Floor
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/21/2018 8:01:00 AM
Acquisition Started : 8/21/2018 8:01:47 AM

Live Time : 600.0 seconds
Real Time : 600.8 seconds

Dead Time : 0.13 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-7-18

TIME 1010

R. Messergill *[Signature]*

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSFC015GD
 Peak Analysis Performed on: 8/21/2018 8:11:48 AM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	183-	193	187.76	47.07	0.43	1.10E+001	22.73	4.90E+001
2	287-	305	300.84	75.34	1.28	1.21E+002	56.17	1.97E+002
3	949-	961	954.70	238.79	0.91	3.09E+001	21.50	3.21E+001
4	1401-	1413	1407.38	351.96	0.62	2.99E+001	18.51	1.81E+001
5	2430-	2442	2436.12	609.13	0.54	2.93E+001	13.83	6.75E+000
6	5835-	5855	5844.33	1461.13	0.42	9.60E+001	19.60	0.00E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC015GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	1.04101E+006	2.30924E+005
Pb-212	1.000	238.63*	43.60	2.46033E+004	1.75625E+004
Bi-214	0.461	609.32*	45.49	4.26038E+004	2.07866E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	3.79977E+004	2.42047E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	1.041009E+006	2.309238E+005
Pb-212	1.000	2.460334E+004	1.756248E+004
Bi-214	0.461	4.260378E+004	2.078661E+004
Pb-214	0.432	3.799767E+004	2.420473E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/21/2018 8:11:48 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	47.07	1.8347E-002	206.50		
2	75.34	2.0143E-001	46.48		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSFC015GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	2.934E+004	2.93E+004	1.041E+006	0.000E+000
	Co-60	1173.23	99.85	2.554E+004	1.88E+004	6.593E+003	1.141E+004
		1332.49	99.98	1.883E+004		-2.378E+004	7.951E+003
	Nb-94	702.65	99.81	2.021E+004	1.91E+004	6.732E+003	9.118E+003
		871.09	99.89	1.912E+004		8.395E+003	8.435E+003
	Ag-108m	433.90	90.50	1.946E+004	1.95E+004	-9.383E+003	8.948E+003
		614.30	89.80	2.830E+004		-1.904E+003	1.315E+004
		722.90	90.80	2.525E+004		2.040E+004	1.152E+004
	Cs-134	604.72	97.62	2.534E+004	2.11E+004	2.374E+004	1.176E+004
		795.86	85.46	2.112E+004		-7.811E+003	9.318E+003
	Cs-137	661.66	85.10	2.355E+004	2.36E+004	9.466E+003	1.066E+004
	Eu-152	121.78	28.67	6.602E+004	6.18E+004	-2.008E+004	3.180E+004
		344.28	26.60	6.179E+004		-1.597E+003	2.863E+004
		1408.01	21.07	1.074E+005		7.473E+004	4.646E+004
	Eu-154	123.07	40.40	4.781E+004	4.78E+004	4.147E+004	2.304E+004
		723.30	20.06	1.129E+005		6.169E+004	5.147E+004
		1274.43	34.80	6.615E+004		-3.666E+004	2.899E+004
	Eu-155	86.55	30.70	7.210E+004	7.21E+004	1.815E+004	3.495E+004
		105.31	21.10	9.387E+004		-3.214E+004	4.533E+004
	Tl-208	583.19	85.00	2.620E+004	2.62E+004	2.138E+004	1.207E+004
	Bi-212	727.33	6.67	3.408E+005	3.41E+005	-5.997E+004	1.553E+005
+	Pb-212	238.63*	43.60	2.624E+004	2.62E+004	2.460E+004	1.204E+004
+	Bi-214	609.32*	45.49	2.460E+004	2.46E+004	4.260E+004	1.033E+004
		1120.29	14.92	1.751E+005		1.242E+005	7.874E+004
		1764.49	15.30	1.902E+005		1.477E+005	8.335E+004
+	Pb-214	295.22	18.42	1.074E+005	3.47E+004	8.293E+004	5.074E+004
		351.93*	35.60	3.467E+004		3.800E+004	1.561E+004
	Ra-226	186.21	3.64	4.998E+005	5.00E+005	1.164E+005	2.389E+005
	Ac-228	338.32	11.27	1.547E+005	9.75E+004	7.367E+004	7.209E+004
		911.20	25.80	9.751E+004		1.093E+005	4.427E+004
		968.97	15.80	1.677E+005		-3.910E+004	7.625E+004
	Am-241	59.54	35.90	6.572E+004	6.57E+004	-7.721E+003	3.173E+004

+ = Nuclide identified during the nuclide identification
 * = Energy line found in the spectrum
 > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
 @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/21/2018 7:56:47 AM

Sample Title : B109100AFSFC016GD
Sample Description : WWTF Floor
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/21/2018 7:46:00 AM
Acquisition Started : 8/21/2018 7:46:46 AM

Live Time : 600.0 seconds
Real Time : 600.8 seconds

Dead Time : 0.13 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1015

R. Messerill

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSFC016GD
Peak Analysis Performed on: 8/21/2018 7:56:47 AM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	295-	307	301.14	75.41	1.24	7.56E+001	47.07	1.81E+002
2	390-	399	394.03	98.63	0.44	5.07E+000	27.67	8.09E+001
3	949-	960	954.70	238.79	0.65	2.61E+001	22.14	3.79E+001
4	1402-	1414	1407.98	352.11	0.38	3.61E+001	15.82	9.88E+000
5	5835-	5855	5845.13	1461.33	2.04	1.10E+002	22.00	2.81E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2=000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC016GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	1.19496E+006	2.60173E+005
Pb-212	1.000	238.63*	43.60	2.08036E+004	1.79326E+004
Pb-214	0.432	295.22	18.42		
		351.93*	35.60	4.59220E+004	2.12563E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	1.194960E+006	2.601731E+005
Pb-212	1.000	2.080357E+004	1.793256E+004
Pb-214	0.432	4.592201E+004	2.125627E+004

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/21/2018 7:56:47 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.41	1.2605E-001	62.23		
2	98.63	8.4496E-003	545.73	Tol.	Eu-155

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSFC016GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.467E+005	1.47E+005	1.195E+006	5.866E+004
	Co-60	1173.23	99.85	2.457E+004	1.62E+004	0.000E+000	1.093E+004
		1332.49	99.98	1.623E+004		7.565E+003	6.652E+003
	Nb-94	702.65	99.81	2.082E+004	2.00E+004	-1.773E+004	9.427E+003
		871.09	99.89	1.999E+004		6.873E+003	8.868E+003
	Ag-108m	433.90	90.50	2.065E+004	2.06E+004	3.595E+003	9.538E+003
		614.30	89.80	2.642E+004		-1.289E+004	1.221E+004
		722.90	90.80	2.462E+004		5.683E+003	1.121E+004
	Cs-134	604.72	97.62	2.405E+004	2.40E+004	1.034E+004	1.111E+004
		795.86	85.46	2.551E+004		-5.743E+003	1.151E+004
	Cs-137	661.66	85.10	2.584E+004	2.58E+004	5.253E+003	1.180E+004
	Eu-152	121.78	28.67	6.724E+004	6.72E+004	2.509E+004	3.241E+004
		344.28	26.60	7.111E+004		-5.340E+003	3.329E+004
		1408.01	21.07	8.015E+004		1.620E+004	3.285E+004
	Eu-154	123.07	40.40	4.771E+004	4.77E+004	6.450E+003	2.299E+004
		723.30	20.06	1.100E+005		-4.826E+003	5.002E+004
		1274.43	34.80	5.887E+004		-2.882E+004	2.535E+004
	Eu-155	86.55	30.70	7.501E+004	7.50E+004	4.819E+004	3.641E+004
		105.31	21.10	9.336E+004		-3.343E+004	4.507E+004
	Tl-208	583.19	85.00	2.432E+004	2.43E+004	2.105E+004	1.114E+004
	Bi-212	727.33	6.67	3.230E+005	3.23E+005	-1.566E+005	1.465E+005
+	Pb-212	238.63*	43.60	2.785E+004	2.79E+004	2.080E+004	1.285E+004
	Bi-214	609.32	45.49	5.139E+004	5.14E+004	1.371E+004	2.372E+004
		1120.29	14.92	1.692E+005		-4.234E+003	7.576E+004
		1764.49	15.30	1.379E+005		-1.575E+004	5.718E+004
+	Pb-214	295.22	18.42	1.093E+005	2.50E+004	1.281E+005	5.174E+004
		351.93*	35.60	2.496E+004		4.592E+004	1.076E+004
	Ra-226	186.21	3.64	4.891E+005	4.89E+005	6.348E+004	2.335E+005
	Ac-228	338.32	11.27	1.647E+005	9.75E+004	1.278E+005	7.707E+004
		911.20	25.80	9.751E+004		6.211E+004	4.427E+004
		968.97	15.80	1.536E+005		3.714E+004	6.920E+004
	Am-241	59.54	35.90	6.369E+004	6.37E+004	-1.358E+004	3.072E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/18/2018 10:30:19 AM

Sample Title : B109100AFSFC017GD
Sample Description : WWTF FLOOR
Sample Identification : 017
Sample Type : GAMMA DIRECT
Sample Geometry : 3MWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.826E+001 M²

Sample Taken On : 8/18/2018 10:20:00 AM
Acquisition Started : 8/18/2018 10:20:17 AM

Live Time : 600.0 seconds
Real Time : 600.8 seconds

Dead Time : 0.14 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 10:20

R. Massengill

```
*****  
***** P E A K A N A L Y S I S R E P O R T *****  
*****
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Detector Name: 6279
Sample Title: B109100AFSFC017GD
Peak Analysis Performed on: 8/18/2018 10:30:19 AM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	305	300.29	75.20	0.79	6.02E+001	37.03	1.25E+002
2	2037-	2048	2042.55	510.74	0.42	2.84E+001	13.14	5.56E+000
3	5836-	5856	5844.98	1461.30	1.40	1.05E+002	22.55	6.56E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC017GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M^2)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	1.14506E+006	2.64351E+005

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	1.145061E+006	2.643515E+005

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/18/2018 10:30:19 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.20	1.0033E-001	61.52		
2	510.74	4.7402E-002	46.18		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3MWWTF1.27CM
 Sample Title: B109100AFSFC017GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.960E+005	1.96E+005	1.145E+006	8.328E+004
	Co-60	1173.23	99.85	2.651E+004	1.53E+004	2.951E+003	1.190E+004
		1332.49	99.98	1.526E+004		-1.001E+004	6.167E+003
	Nb-94	702.65	99.81	1.824E+004	1.82E+004	2.305E+003	8.132E+003
		871.09	99.89	2.084E+004		9.073E+003	9.294E+003
	Ag-108m	433.90	90.50	2.048E+004	2.05E+004	-2.373E+003	9.456E+003
		614.30	89.80	2.621E+004		2.446E+004	1.210E+004
		722.90	90.80	2.156E+004		3.270E+003	9.674E+003
	Cs-134	604.72	97.62	2.317E+004	2.07E+004	1.959E+004	1.067E+004
		795.86	85.46	2.066E+004		-1.068E+004	9.083E+003
	Cs-137	661.66	85.10	2.426E+004	2.43E+004	-1.484E+004	1.102E+004
	Eu-152	121.78	28.67	6.037E+004	6.04E+004	-2.266E+004	2.897E+004
		344.28	26.60	6.241E+004		-5.588E+004	2.893E+004
		1408.01	21.07	9.695E+004		5.880E+004	4.124E+004
	Eu-154	123.07	40.40	4.270E+004	4.27E+004	-1.755E+004	2.049E+004
		723.30	20.06	9.760E+004		4.708E+004	4.380E+004
		1274.43	34.80	5.696E+004		1.009E+004	2.439E+004
	Eu-155	86.55	30.70	7.179E+004	7.18E+004	4.975E+004	3.479E+004
		105.31	21.10	9.161E+004		-2.799E+004	4.419E+004
	Tl-208	583.19	85.00	2.797E+004	2.80E+004	2.161E+004	1.296E+004
	Bi-212	727.33	6.67	3.045E+005	3.05E+005	1.706E+005	1.372E+005
	Pb-212	238.63	43.60	4.521E+004	4.52E+004	5.037E+004	2.153E+004
	Bi-214	609.32	45.49	5.337E+004	5.34E+004	4.939E+004	2.471E+004
		1120.29	14.92	1.567E+005		-6.717E+004	6.954E+004
		1764.49	15.30	1.381E+005		6.961E+004	5.726E+004
	Pb-214	295.22	18.42	1.134E+005	5.47E+004	1.598E+005	5.375E+004
		351.93	35.60	5.473E+004		-1.231E+004	2.564E+004
	Ra-226	186.21	3.64	4.975E+005	4.98E+005	2.108E+004	2.377E+005
	Ac-228	338.32	11.27	1.550E+005	9.21E+004	4.965E+004	7.219E+004
		911.20	25.80	9.210E+004		4.893E+004	4.156E+004
		968.97	15.80	1.611E+005		9.429E+004	7.291E+004
	Am-241	59.54	35.90	5.830E+004	5.83E+004	2.261E+004	2.803E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/18/2018 10:15:19 AM

Sample Title : B109100AFSFC018GD
Sample Description : WWTF FLOOR
Sample Identification : 018
Sample Type : GAMMA DIRECT
Sample Geometry : 3MWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.826E+001 M²

Sample Taken On : 8/18/2018 10:05:00 AM
Acquisition Started : 8/18/2018 10:05:17 AM

Live Time : 600.0 seconds
Real Time : 601.0 seconds

Dead Time : 0.16 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1025

R. Massey

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSFC018GD
Peak Analysis Performed on: 8/18/2018 10:15:19 AM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	297-	308	301.34	75.46	1.10	5.85E+001	39.67	1.33E+002
2	1401-	1414	1406.98	351.86	1.67	3.86E+001	17.11	1.24E+001
3	2429-	2442	2436.03	609.10	0.49	2.90E+001	13.89	7.00E+000
4	5836-	5855	5844.82	1461.26	0.43	6.58E+001	17.09	2.21E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC018GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	7.14436E+005	1.95697E+005
Bi-214	0.461	609.32*	45.49	4.22984E+004	2.08912E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42		
		351.93*	35.60	4.91179E+004	2.29843E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	7.144358E+005	1.956965E+005
Bi-214	0.461	4.229835E+004	2.089120E+004
Pb-214	0.432	4.911790E+004	2.298433E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/18/2018 10:15:19 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.46	9.7500E-002	67.81		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3MWTF1.27CM
 Sample Title: B109100AFSFC018GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M^2)	Nuclide MDA (pCi/M^2)	Activity (pCi/M^2)	Dec. Level (pCi/M^2)
+	K-40	1460.82*	10.66	1.255E+005	1.25E+005	7.144E+005	4.806E+004
	Co-60	1173.23	99.85	2.557E+004	1.80E+004	1.483E+003	1.143E+004
		1332.49	99.98	1.803E+004		9.740E+003	7.553E+003
	Nb-94	702.65	99.81	1.893E+004	1.89E+004	6.195E+002	8.478E+003
		871.09	99.89	2.202E+004		4.357E+003	9.882E+003
	Ag-108m	433.90	90.50	2.009E+004	2.01E+004	1.743E+004	9.261E+003
		614.30	89.80	2.945E+004		-7.856E+003	1.372E+004
		722.90	90.80	2.367E+004		-9.035E+003	1.073E+004
	Cs-134	604.72	97.62	2.474E+004	1.96E+004	1.238E+003	1.146E+004
		795.86	85.46	1.962E+004		1.438E+003	8.563E+003
	Cs-137	661.66	85.10	2.393E+004	2.39E+004	9.802E+003	1.085E+004
	Eu-152	121.78	28.67	6.185E+004	6.19E+004	-1.241E+003	2.971E+004
		344.28	26.60	6.888E+004		2.196E+004	3.217E+004
		1408.01	21.07	1.041E+005		-5.314E+004	4.484E+004
	Eu-154	123.07	40.40	4.377E+004	4.38E+004	3.086E+004	2.102E+004
		723.30	20.06	1.072E+005		-7.530E+003	4.860E+004
		1274.43	34.80	5.489E+004		3.329E+004	2.335E+004
	Eu-155	86.55	30.70	6.775E+004	6.78E+004	2.258E+003	3.277E+004
		105.31	21.10	8.150E+004		-7.960E+004	3.914E+004
	Tl-208	583.19	85.00	2.491E+004	2.49E+004	1.512E+004	1.143E+004
	Bi-212	727.33	6.67	3.045E+005	3.05E+005	2.985E+003	1.372E+005
	Pb-212	238.63	43.60	4.257E+004	4.26E+004	1.340E+004	2.021E+004
+	Bi-214	609.32*	45.49	2.500E+004	2.50E+004	4.230E+004	1.053E+004
		1120.29	14.92	1.694E+005		5.883E+004	7.587E+004
		1764.49	15.30	1.450E+005		7.832E+004	6.073E+004
+	Pb-214	295.22	18.42	9.745E+004	2.81E+004	1.837E+004	4.579E+004
		351.93*	35.60	2.808E+004		4.912E+004	1.232E+004
	Ra-226	186.21	3.64	4.494E+005	4.49E+005	-4.174E+005	2.136E+005
	Ac-228	338.32	11.27	1.584E+005	9.49E+004	1.739E+004	7.389E+004
		911.20	25.80	9.492E+004		9.283E+003	4.297E+004
		968.97	15.80	1.488E+005		6.701E+004	6.678E+004
	Am-241	59.54	35.90	5.844E+004	5.84E+004	4.448E+004	2.809E+004

+ = Nuclide identified during the nuclide identification
 * = Energy line found in the spectrum
 > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
 @ = Half-life too short to be able to perform the decay correction

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/14/2018 2:38:26 PM

Sample Title : B109100AFSFC019GD
Sample Description : WWTF Floor
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3MWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/14/2018 2:28:00 PM
Acquisition Started : 8/14/2018 2:28:25 PM

Live Time : 600.0 seconds
Real Time : 601.0 seconds

Dead Time : 0.17 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-7-18

TIME 10:30

R. Massersill / R. Gill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSFC019GD
 Peak Analysis Performed on: 8/14/2018 2:38:26 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	305	300.12	75.16	0.92	5.82E+001	38.54	1.38E+002
2	949-	958	953.91	238.59	0.95	4.51E+001	17.99	1.59E+001
3	2429-	2440	2434.13	608.63	1.21	2.04E+001	13.66	8.58E+000
4	5832-	5853	5841.51	1460.43	1.09	1.01E+002	20.10	0.00E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC019GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	1.09484E+006	2.37719E+005
Pb-212	1.000	238.63*	43.60	3.58958E+004	1.54346E+004
Bi-214	0.460	609.32*	45.49	2.97297E+004	2.01982E+004
		1120.29	14.92		
		1764.49	15.30		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	1.094837E+006	2.377194E+005
Pb-212	1.000	3.589583E+004	1.543458E+004
Bi-214	0.460	2.972966E+004	2.019825E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/14/2018 2:38:26 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.16	9.7011E-002	66.22		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3MWWTF1.27CM
 Sample Title: B109100AFSFC019GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	2.933E+004	2.93E+004	1.095E+006	0.000E+000
	Co-60	1173.23	99.85	2.506E+004	1.62E+004	1.596E+004	1.117E+004
		1332.49	99.98	1.623E+004		-1.467E+003	6.652E+003
	Nb-94	702.65	99.81	2.142E+004	2.00E+004	4.521E+002	9.726E+003
		871.09	99.89	1.999E+004		6.655E+003	8.868E+003
	Ag-108m	433.90	90.50	1.884E+004	1.88E+004	1.015E+004	8.637E+003
		614.30	89.80	2.438E+004		-4.847E+003	1.119E+004
		722.90	90.80	1.998E+004		6.552E+003	8.886E+003
	Cs-134	604.72	97.62	2.534E+004	2.39E+004	1.350E+004	1.176E+004
		795.86	85.46	2.386E+004		4.245E+003	1.069E+004
	Cs-137	661.66	85.10	2.763E+004	2.76E+004	1.523E+004	1.270E+004
	Eu-152	121.78	28.67	6.616E+004	6.62E+004	-5.667E+003	3.187E+004
		344.28	26.60	7.065E+004		-6.392E+004	3.306E+004
		1408.01	21.07	7.528E+004		3.203E+004	3.042E+004
	Eu-154	123.07	40.40	4.733E+004	4.73E+004	3.625E+003	2.280E+004
		723.30	20.06	9.045E+004		3.151E+004	4.024E+004
		1274.43	34.80	7.261E+004		4.285E+004	3.222E+004
	Eu-155	86.55	30.70	7.372E+004	7.37E+004	1.006E+005	3.576E+004
		105.31	21.10	9.387E+004		-9.882E+003	4.533E+004
	Tl-208	583.19	85.00	2.620E+004	2.62E+004	5.339E+003	1.207E+004
	Bi-212	727.33	6.67	2.890E+005	2.89E+005	4.351E+004	1.295E+005
+	Pb-212	238.63*	43.60	1.779E+004	1.78E+004	3.590E+004	7.820E+003
+	Bi-214	609.32*	45.49	2.845E+004	2.85E+004	2.973E+004	1.226E+004
		1120.29	14.92	1.497E+005		-3.591E+004	6.605E+004
		1764.49	15.30	1.636E+005		1.043E+005	7.003E+004
	Pb-214	295.22	18.42	1.011E+005	6.14E+004	5.544E+004	4.763E+004
		351.93	35.60	6.138E+004		3.484E+004	2.897E+004
	Ra-226	186.21	3.64	4.938E+005	4.94E+005	2.871E+005	2.358E+005
	Ac-228	338.32	11.27	1.679E+005	9.62E+004	-5.868E+004	7.866E+004
		911.20	25.80	9.615E+004		3.486E+004	4.360E+004
		968.97	15.80	1.536E+005		1.192E+005	6.920E+004
	Am-241	59.54	35.90	6.332E+004	6.33E+004	1.447E+004	3.054E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/14/2018 1:47:43 PM

Sample Title : B109100AFSFC020GD
Sample Description : WWTF Floor
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3MWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M^2

Sample Taken On : 8/14/2018 1:37:00 PM
Acquisition Started : 8/14/2018 1:37:41 PM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.15 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 10:35

R. Massengill 

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSFC020GD
 Peak Analysis Performed on: 8/14/2018 1:47:42 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	295-	304	299.81	75.08	0.71	4.76E+001	40.49	1.59E+002
2	948-	962	954.22	238.67	0.28	2.38E+001	25.08	4.62E+001
3	1400-	1412	1406.48	351.73	1.12	4.21E+001	14.84	4.89E+000
4	2428-	2442	2434.55	608.74	0.80	3.45E+001	15.00	7.50E+000
5	5831-	5851	5840.84	1460.26	1.45	9.70E+001	19.70	0.00E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC020GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

..... IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	0.999	1460.82*	10.66	1.05139E+006	2.32206E+005
Pb-212	1.000	238.63*	43.60	1.89458E+004	2.01813E+004
Bi-214	0.460	609.32*	45.49	5.02289E+004	2.26517E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	5.34931E+004	2.04824E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	0.999	1.051388E+006	2.322058E+005
Pb-212	1.000	1.894583E+004	2.018134E+004
Bi-214	0.460	5.022888E+004	2.265172E+004
Pb-214	0.432	5.349308E+004	2.048239E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/14/2018 1:47:42 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.08	7.9348E-002	85.06		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3MWTF1.27CM
 Sample Title: B109100AFSFC020GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	2.933E+004	2.93E+004	1.051E+006	0.000E+000
	Co-60	1173.23	99.85	2.192E+004	2.19E+004	1.000E+004	9.606E+003
		1332.49	99.98	2.426E+004		1.343E+004	1.067E+004
	Nb-94	702.65	99.81	1.673E+004	1.67E+004	-3.112E+003	7.380E+003
		871.09	99.89	1.999E+004		-3.016E+004	8.868E+003
	Ag-108m	433.90	90.50	1.863E+004	1.86E+004	7.020E+003	8.531E+003
		614.30	89.80	2.761E+004		-1.328E+004	1.280E+004
		722.90	90.80	2.225E+004		7.468E+003	1.003E+004
	Cs-134	604.72	97.62	2.812E+004	2.47E+004	3.006E+004	1.315E+004
		795.86	85.46	2.470E+004		-3.229E+004	1.111E+004
	Cs-137	661.66	85.10	2.584E+004	2.58E+004	1.548E+004	1.180E+004
	Eu-152	121.78	28.67	6.884E+004	6.28E+004	-1.820E+004	3.320E+004
		344.28	26.60	6.284E+004		-2.978E+004	2.915E+004
		1408.01	21.07	9.298E+004		2.082E+004	3.927E+004
	Eu-154	123.07	40.40	4.894E+004	3.63E+004	2.861E+004	2.361E+004
		723.30	20.06	1.024E+005		6.040E+004	4.620E+004
		1274.43	34.80	3.630E+004		1.209E+004	1.406E+004
	Eu-155	86.55	30.70	7.302E+004	7.30E+004	6.884E+004	3.541E+004
		105.31	21.10	9.131E+004		3.443E+004	4.405E+004
	Tl-208	583.19	85.00	2.487E+004	2.49E+004	1.287E+004	1.141E+004
	Bi-212	727.33	6.67	3.041E+005	3.04E+005	-6.628E+004	1.370E+005
+	Pb-212	238.63*	43.60	3.238E+004	3.24E+004	1.895E+004	1.511E+004
+	Bi-214	609.32*	45.49	2.626E+004	2.63E+004	5.023E+004	1.116E+004
		1120.29	14.92	1.995E+005		8.210E+004	9.092E+004
		1764.49	15.30	1.852E+005		7.332E+004	8.086E+004
+	Pb-214	295.22	18.42	1.058E+005	1.85E+004	5.022E+003	4.998E+004
		351.93*	35.60	1.848E+004		5.349E+004	7.519E+003
	Ra-226	186.21	3.64	4.766E+005	4.77E+005	-2.176E+005	2.272E+005
	Ac-228	338.32	11.27	1.559E+005	1.01E+005	-1.366E+004	7.266E+004
		911.20	25.80	1.014E+005		7.205E+004	4.624E+004
		968.97	15.80	1.632E+005		6.333E+004	7.398E+004
	Am-241	59.54	35.90	6.159E+004	6.16E+004	-3.256E+004	2.967E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/14/2018 2:01:19 PM

Sample Title : B109100AFSFC021GD
Sample Description : WWTF Floor
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3MWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/14/2018 1:51:00 PM
Acquisition Started : 8/14/2018 1:51:17 PM

Live Time : 600.0 seconds
Real Time : 601.0 seconds

Dead Time : 0.16 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 10:40

R. Massengill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSFC021GD
 Peak Analysis Performed on: 8/14/2018 2:01:18 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	305	300.21	75.18	0.36	5.29E+001	39.57	1.48E+002
2	334-	346	338.41	84.73	0.47	1.56E+001	38.63	1.35E+002
3	948-	960	952.53	238.25	0.62	3.85E+001	20.67	2.55E+001
4	1399-	1411	1405.83	351.57	0.33	2.12E+001	19.51	2.78E+001
5	2430-	2441	2435.07	608.86	0.44	2.73E+001	12.58	4.70E+000
6	5833-	5851	5841.78	1460.50	0.95	7.60E+001	19.95	7.01E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC021GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	8.23801E+005	2.27769E+005
Eu-155	0.346	86.55*	30.70	1.28463E+004	3.18370E+004
		105.31	21.10		
Pb-212	1.000	238.63*	43.60	3.05466E+004	1.71476E+004
Bi-214	0.461	609.32*	45.49	3.97588E+004	1.89288E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	2.69035E+004	2.51062E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	8.238008E+005	2.277694E+005
Eu-155	0.346	1.284630E+004	3.183700E+004
Pb-212	1.000	3.054661E+004	1.714759E+004
Bi-214	0.461	3.975883E+004	1.892877E+004
Pb-214	0.432	2.690352E+004	2.510622E+004

Ac-228 until

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/14/2018 2:01:18 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.18	8.8130E-002	74.83		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3MWTF1.27CM
 Sample Title: B109100AFSFC021GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M^2)	Nuclide MDA (pCi/M^2)	Activity (pCi/M^2)	Dec. Level (pCi/M^2)
+	K-40	1460.82*	10.66	2.022E+005	2.02E+005	8.238E+005	8.642E+004
	Co-60	1173.23	99.85	2.248E+004	1.88E+004	8.387E+003	9.885E+003
		1332.49	99.98	1.883E+004		1.081E+004	7.951E+003
	Nb-94	702.65	99.81	2.021E+004	2.00E+004	-3.325E+003	9.118E+003
		871.09	99.89	1.999E+004		1.089E+004	8.868E+003
	Ag-108m	433.90	90.50	1.863E+004	1.86E+004	-5.802E+003	8.531E+003
		614.30	89.80	2.830E+004		-6.600E+003	1.315E+004
		722.90	90.80	2.462E+004		2.240E+004	1.121E+004
	Cs-134	604.72	97.62	2.534E+004	2.53E+004	2.508E+004	1.176E+004
		795.86	85.46	2.551E+004		-3.367E+003	1.151E+004
	Cs-137	661.66	85.10	2.615E+004	2.61E+004	1.111E+004	1.196E+004
	Eu-152	121.78	28.67	6.322E+004	6.32E+004	-9.497E+004	3.040E+004
		344.28	26.60	6.438E+004		-3.308E+004	2.993E+004
		1408.01	21.07	9.298E+004		5.338E+004	3.927E+004
	Eu-154	123.07	40.40	4.566E+004	4.57E+004	-2.854E+004	2.196E+004
		723.30	20.06	1.100E+005		7.652E+004	5.002E+004
		1274.43	34.80	5.264E+004		-1.360E+003	2.223E+004
+	Eu-155	86.55*	30.70	5.332E+004	5.33E+004	1.285E+004	2.555E+004
		105.31	21.10	9.096E+004		-5.870E+004	4.387E+004
	Tl-208	583.19	85.00	2.568E+004	2.57E+004	1.019E+004	1.181E+004
	Bi-212	727.33	6.67	3.090E+005	3.09E+005	9.805E+004	1.394E+005
+	Pb-212	238.63*	43.60	2.376E+004	2.38E+004	3.055E+004	1.081E+004
+	Bi-214	609.32*	45.49	2.071E+004	2.07E+004	3.976E+004	8.383E+003
		1120.29	14.92	1.692E+005		1.050E+005	7.576E+004
		1764.49	15.30	1.576E+005		1.363E+004	6.705E+004
+	Pb-214	295.22	18.42	9.842E+004	3.94E+004	2.265E+004	4.628E+004
		351.93*	35.60	3.938E+004		2.690E+004	1.797E+004
	Ra-226	186.21	3.64	4.750E+005	4.75E+005	1.923E+005	2.264E+005
	Ac-228	338.32	11.27	1.536E+005	8.60E+004	4.422E+004	7.152E+004
		911.20	25.80	8.603E+004		1.411E+004	3.853E+004
		968.97	15.80	1.322E+005		-8.938E+004	5.848E+004
	Am-241	59.54	35.90	6.258E+004	6.26E+004	-4.301E+004	3.017E+004

+ = Nuclide identified during the nuclide identification
 * = Energy line found in the spectrum
 > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
 @ = Half-life too short to be able to perform the decay correction

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/14/2018 2:26:42 PM

Sample Title : B109100AFSFC022GD
Sample Description : WWTF Floor
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3MWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M^2

Sample Taken On : 8/14/2018 2:16:00 PM
Acquisition Started : 8/14/2018 2:16:40 PM

Live Time : 600.0 seconds
Real Time : 601.0 seconds

Dead Time : 0.16 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 10:45

R. Massengill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSFC022GD
 Peak Analysis Performed on: 8/14/2018 2:26:41 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	295-	305	300.30	75.20	0.74	4.90E+001	41.48	1.59E+002
2	334-	344	338.93	84.86	0.88	4.47E+001	34.15	1.03E+002
3	949-	961	954.13	238.65	1.03	5.18E+001	22.46	2.82E+001
4	1175-	1185	1179.81	295.07	0.82	1.63E+001	15.52	1.67E+001
5	1399-	1414	1406.35	351.70	0.79	5.32E+001	18.17	9.82E+000
6	2325-	2336	2330.80	582.80	0.33	1.40E+001	10.78	6.00E+000
7	2429-	2440	2434.68	608.77	1.31	2.23E+001	14.18	1.07E+001
8	5832-	5851	5841.56	1460.44	1.82	9.70E+001	19.70	0.00E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC022GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	1.05148E+006	2.32227E+005
Eu-155	0.346	86.55*	30.70	3.67089E+004	2.89824E+004
		105.31	21.10		
Tl-208	1.000	583.19*	85.00	1.05934E+004	8.25273E+003
Pb-212	1.000	238.63*	43.60	4.12252E+004	1.90663E+004
Bi-214	0.460	609.32*	45.49	3.24282E+004	2.10080E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	1.000	295.22*	18.42	3.54205E+004	3.41536E+004
		351.93*	35.60		

- Ac-228

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	1.051484E+006	2.322272E+005
Eu-155	0.346	3.670891E+004	2.898240E+004
Tl-208	1.000	1.059339E+004	8.252727E+003
Pb-212	1.000	4.122520E+004	1.906629E+004
Bi-214	0.460	3.242821E+004	2.100797E+004
Pb-214	1.000	5.622774E+004	2.027755E+004

- Ac-228 uTL RFD

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/14/2018 2:26:41 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.20	8.1589E-002	84.73		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3MWWTF1.27CM
 Sample Title: B109100AFSFC022GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	2.933E+004	2.93E+004	1.051E+006	0.000E+000
	Co-60	1173.23	99.85	2.076E+004	1.88E+004	6.810E+003	9.023E+003
		1332.49	99.98	1.883E+004		-5.674E+003	7.951E+003
	Nb-94	702.65	99.81	1.890E+004	1.89E+004	8.544E+003	8.466E+003
		871.09	99.89	2.309E+004		1.255E+003	1.042E+004
	Ag-108m	433.90	90.50	1.842E+004	1.84E+004	5.367E+003	8.424E+003
		614.30	89.80	3.006E+004		-1.094E+004	1.402E+004
		722.90	90.80	2.115E+004		-7.134E+003	9.473E+003
	Cs-134	604.72	97.62	2.755E+004	2.43E+004	2.629E+004	1.286E+004
		795.86	85.46	2.429E+004		1.041E+004	1.090E+004
	Cs-137	661.66	85.10	2.138E+004	2.14E+004	-6.338E+003	9.575E+003
	Eu-152	121.78	28.67	6.871E+004	6.44E+004	4.775E+004	3.314E+004
		344.28	26.60	6.438E+004		-7.772E+004	2.993E+004
		1408.01	21.07	9.681E+004		-2.535E+004	4.118E+004
	Eu-154	123.07	40.40	4.838E+004	4.84E+004	-1.755E+003	2.333E+004
		723.30	20.06	9.746E+004		-2.854E+004	4.374E+004
		1274.43	34.80	5.688E+004		1.379E+004	2.435E+004
+	Eu-155	86.55*	30.70	4.466E+004	4.47E+004	3.671E+004	2.122E+004
		105.31	21.10	9.927E+004		3.442E+004	4.803E+004
+	Tl-208	583.19*	85.00	1.170E+004	1.17E+004	1.059E+004	4.826E+003
	Bi-212	727.33	6.67	3.184E+005	3.18E+005	-1.795E+004	1.442E+005
+	Pb-212	238.63*	43.60	2.471E+004	2.47E+004	4.123E+004	1.128E+004
+	Bi-214	609.32*	45.49	2.928E+004	2.93E+004	3.243E+004	1.267E+004
		1120.29	14.92	1.630E+005		5.480E+004	7.267E+004
		1764.49	15.30	2.043E+005		1.738E+005	9.041E+004
+	Pb-214	295.22*	18.42	5.318E+004	2.61E+004	3.542E+004	2.365E+004
		351.93*	35.60	2.608E+004		6.756E+004	1.132E+004
	Ra-226	186.21	3.64	4.604E+005	4.60E+005	-3.040E+005	2.192E+005
	Ac-228	338.32	11.27	1.604E+005	9.75E+004	-4.386E+004	7.490E+004
		911.20	25.80	9.751E+004		8.779E+004	4.427E+004
		968.97	15.80	1.379E+005		-3.654E+004	6.134E+004
	Am-241	59.54	35.90	6.501E+004	6.50E+004	4.387E+004	3.138E+004

+ = Nuclide identified during the nuclide identification
 * = Energy line found in the spectrum
 > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
 @ = Half-life too short to be able to perform the decay correction

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/18/2018 1:09:33 PM

Sample Title : B109100AFSFC023GD
Sample Description : WWTF FLOOR
Sample Identification : 023
Sample Type : GAMMA DIRECT
Sample Geometry : 3M90DWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : ^{2.83}
~~-2.826E+001~~ M²
m 8/27/18

Sample Taken On : 8/18/2018 12:59:00 PM
Acquisition Started : 8/18/2018 12:59:31 PM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.14 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 10:50

R. Massengill *Rj*

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSFC023GD
Peak Analysis Performed on: 8/18/2018 1:09:33 PM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	290-	307	300.64	75.29	0.60	8.58E+001	53.01	1.89E+002
2	2432-	2443	2437.92	609.58	0.80	2.45E+001	10.64	1.49E+000
3	5840-	5856	5847.80	1462.00	0.83	5.83E+001	17.23	4.66E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC023GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

..... IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M^2)	Activity Uncertainty
K-40	0.998	1460.82*	10.66	6.33818E+005	1.95128E+005
Bi-214	0.461	609.32*	45.49	3.57675E+004	1.61164E+004
		1120.29	14.92		
		1764.49	15.30		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	0.998	6.338184E+005	1.951284E+005
Bi-214	0.461	3.576749E+004	1.611640E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/18/2018 1:09:33 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Ident. Nuclide
1	75.29	1.4295E-001	61.80		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSFC023GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.719E+005	1.72E+005	6.338E+005	7.124E+004
	Co-60	1173.23	99.85	2.079E+004	1.96E+004	1.504E+004	9.036E+003
		1332.49	99.98	1.963E+004		-6.248E+003	8.350E+003
	Nb-94	702.65	99.81	1.959E+004	1.32E+004	6.269E+003	8.810E+003
		871.09	99.89	1.322E+004		8.591E+002	5.481E+003
	Ag-108m	433.90	90.50	1.823E+004	1.79E+004	1.117E+004	8.327E+003
		614.30	89.80	2.415E+004		1.141E+004	1.107E+004
		722.90	90.80	1.785E+004		-2.183E+003	7.823E+003
	Cs-134	604.72	97.62	2.173E+004	2.16E+004	-1.104E+004	9.952E+003
		795.86	85.46	2.164E+004		-1.031E+004	9.574E+003
	Cs-137	661.66	85.10	2.738E+004	2.74E+004	1.356E+004	1.258E+004
	Eu-152	121.78	28.67	5.945E+004	5.26E+004	6.636E+003	2.851E+004
		344.28	26.60	5.264E+004		2.030E+003	2.405E+004
		1408.01	21.07	8.481E+004		-1.336E+003	3.517E+004
	Eu-154	123.07	40.40	4.060E+004	4.06E+004	-1.116E+004	1.944E+004
		723.30	20.06	8.083E+004		-1.081E+004	3.542E+004
		1274.43	34.80	5.489E+004		9.835E+003	2.335E+004
	Eu-155	86.55	30.70	6.991E+004	6.99E+004	8.698E+004	3.385E+004
		105.31	21.10	8.247E+004		-3.567E+003	3.963E+004
	Tl-208	583.19	85.00	2.292E+004	2.29E+004	2.653E+004	1.043E+004
	Bi-212	727.33	6.67	2.621E+005	2.62E+005	-3.047E+005	1.159E+005
	Pb-212	238.63	43.60	3.939E+004	3.94E+004	4.051E+004	1.862E+004
+	Bi-214	609.32*	45.49	1.332E+004	1.33E+004	3.577E+004	4.687E+003
		1120.29	14.92	1.271E+005		-5.607E+004	5.471E+004
		1764.49	15.30	1.905E+005		6.258E+004	8.347E+004
	Pb-214	295.22	18.42	9.049E+004	4.74E+004	-4.342E+004	4.230E+004
		351.93	35.60	4.736E+004		4.166E+004	2.196E+004
	Ra-226	186.21	3.64	4.249E+005	4.25E+005	-8.998E+004	2.014E+005
	Ac-228	338.32	11.27	1.353E+005	9.35E+004	7.819E+003	6.235E+004
		911.20	25.80	9.352E+004		7.735E+004	4.227E+004
		968.97	15.80	1.381E+005		4.363E+004	6.143E+004
	Am-241	59.54	35.90	6.438E+004	6.44E+004	1.299E+004	3.107E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/18/2018 12:55:43 PM

Sample Title : B109100AFSFC024GD
Sample Description : WWTF FLOOR
Sample Identification : 024
Sample Type : GAMMA DIRECT
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : ^{2.83}~~2.826~~E+001 M²
run 8/27/18
Sample Taken On : 8/18/2018 12:45:00 PM
Acquisition Started : 8/18/2018 12:45:41 PM

Live Time : 600.0 seconds
Real Time : 600.6 seconds

Dead Time : 0.09 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 10:55

R. Massengill

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSFC024GD
Peak Analysis Performed on: 8/18/2018 12:55:42 PM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	287-	306	300.99	75.37	0.31	9.92E+001	57.56	2.08E+002
2	1402-	1413	1407.92	352.09	0.70	2.90E+001	16.32	1.50E+001
3	5838-	5855	5846.79	1461.75	0.74	6.48E+001	16.97	2.21E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC024GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	0.999	1460.82*	10.66	7.03799E+005	1.94170E+005
Pb-214	0.432	295.22	18.42		
		351.93*	35.60	3.69792E+004	2.15063E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	0.999	7.037988E+005	1.941700E+005
Pb-214	0.432	3.697919E+004	2.150627E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/18/2018 12:55:42 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.37	1.6532E-001	58.03		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSFC024GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+ K-40	1460.82*	10.66	1.251E+005	1.25E+005	7.038E+005	4.787E+004
Co-60	1173.23	99.85	2.138E+004	1.72E+004	-7.945E+003	9.332E+003
	1332.49	99.98	1.717E+004		-8.793E+003	7.121E+003
Nb-94	702.65	99.81	1.714E+004	1.71E+004	-4.337E+003	7.583E+003
	871.09	99.89	1.776E+004		-4.113E+003	7.752E+003
Ag-108m	433.90	90.50	1.887E+004	1.89E+004	1.720E+004	8.649E+003
	614.30	89.80	2.276E+004		2.000E+004	1.037E+004
	722.90	90.80	1.960E+004		6.320E+003	8.694E+003
Cs-134	604.72	97.62	2.271E+004	2.27E+004	-3.443E+003	1.044E+004
	795.86	85.46	2.432E+004		2.393E+004	1.092E+004
Cs-137	661.66	85.10	2.179E+004	2.18E+004	4.970E+003	9.778E+003
Eu-152	121.78	28.67	5.662E+004	5.20E+004	-1.094E+004	2.710E+004
	344.28	26.60	5.200E+004		-6.672E+004	2.373E+004
	1408.01	21.07	8.907E+004		1.173E+004	3.730E+004
Eu-154	123.07	40.40	4.060E+004	4.06E+004	5.707E+003	1.944E+004
	723.30	20.06	8.873E+004		5.100E+003	3.937E+004
	1274.43	34.80	5.043E+004		9.331E+003	2.112E+004
Eu-155	86.55	30.70	6.851E+004	6.85E+004	5.728E+004	3.315E+004
	105.31	21.10	8.789E+004		3.623E+004	4.234E+004
Tl-208	583.19	85.00	2.105E+004	2.10E+004	1.180E+004	9.497E+003
Bi-212	727.33	6.67	2.621E+005	2.62E+005	7.077E+004	1.159E+005
Pb-212	238.63	43.60	3.939E+004	3.94E+004	1.827E+004	1.862E+004
Bi-214	609.32	45.49	4.741E+004	4.74E+004	1.207E+004	2.173E+004
	1120.29	14.92	1.811E+005		8.794E+004	8.172E+004
	1764.49	15.30	1.516E+005		8.702E+004	6.402E+004
+ Pb-214	295.22	18.42	7.739E+004	2.91E+004	8.042E+003	3.575E+004
	351.93*	35.60	2.912E+004		3.698E+004	1.284E+004
Ra-226	186.21	3.64	4.177E+005	4.18E+005	-3.886E+004	1.978E+005
Ac-228	338.32	11.27	1.366E+005	7.97E+004	6.312E+004	6.301E+004
	911.20	25.80	7.971E+004		1.414E+004	3.537E+004
	968.97	15.80	1.200E+005		9.007E+004	5.238E+004
Am-241	59.54	35.90	6.778E+004	6.78E+004	2.404E+004	3.277E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/18/2018 1:25:57 PM

Sample Title : B109100AFSFC025GD
Sample Description : WWTF FLOOR
Sample Identification : 025
Sample Type : GAMMA DIRECT
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : ^{2.83}~~2.826~~E+001 M²

Sample Taken On : 8/18/2018 1:15:00 PM
Acquisition Started : 8/18/2018 1:15:55 PM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.16 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 11:00

R. Massonilli

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSFC025GD
 Peak Analysis Performed on: 8/18/2018 1:25:56 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	89-	98	93.70	23.55	0.69	1.16E+001	19.41	3.64E+001
2	297-	311	301.05	75.39	0.95	7.14E+001	47.45	1.66E+002
3	1401-	1414	1407.00	351.86	0.41	3.52E+001	18.45	1.78E+001
4	2432-	2445	2438.45	609.71	1.10	3.04E+001	14.70	8.60E+000
5	5838-	5857	5848.16	1462.09	0.98	9.90E+001	21.60	4.98E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC025GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M^2)	Activity Uncertainty
K-40	0.997	1460.82*	10.66	1.07579E+006	2.52608E+005
Bi-214	0.461	609.32*	45.49	4.43662E+004	2.21056E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42		
		351.93*	35.60	4.48157E+004	2.44209E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	0.997	1.075792E+006	2.526076E+005
Bi-214	0.461	4.436624E+004	2.210563E+004
Pb-214	0.432	4.481567E+004	2.442093E+004

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/18/2018 1:25:56 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	23.55	1.9358E-002	167.16		
2	75.39	1.1908E-001	66.41		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSFC025GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.796E+005	1.80E+005	1.076E+006	7.508E+004
	Co-60	1173.23	99.85	2.358E+004	1.96E+004	-2.582E+003	1.043E+004
		1332.49	99.98	1.963E+004		-1.323E+004	8.350E+003
	Nb-94	702.65	99.81	1.893E+004	1.89E+004	1.071E+003	8.478E+003
		871.09	99.89	2.202E+004		5.222E+003	9.882E+003
	Ag-108m	433.90	90.50	1.800E+004	1.80E+004	3.680E+003	8.217E+003
		614.30	89.80	2.923E+004		2.712E+004	1.361E+004
		722.90	90.80	2.192E+004		2.024E+003	9.859E+003
	Cs-134	604.72	97.62	2.580E+004	2.39E+004	-1.339E+004	1.198E+004
		795.86	85.46	2.390E+004		-1.003E+003	1.070E+004
	Cs-137	661.66	85.10	2.935E+004	2.94E+004	2.572E+004	1.356E+004
	Eu-152	121.78	28.67	6.639E+004	6.24E+004	-4.663E+004	3.198E+004
		344.28	26.60	6.241E+004		8.660E+003	2.893E+004
		1408.01	21.07	8.907E+004		-3.563E+004	3.730E+004
	Eu-154	123.07	40.40	4.642E+004	4.64E+004	-2.067E+004	2.234E+004
		723.30	20.06	9.927E+004		3.457E+004	4.464E+004
		1274.43	34.80	5.896E+004		-5.267E+004	2.538E+004
	Eu-155	86.55	30.70	7.312E+004	7.31E+004	6.395E+004	3.546E+004
		105.31	21.10	9.109E+004		-1.074E+004	4.393E+004
	Tl-208	583.19	85.00	3.005E+004	3.00E+004	2.350E+004	1.400E+004
	Bi-212	727.33	6.67	2.996E+005	3.00E+005	1.713E+005	1.347E+005
	Pb-212	238.63	43.60	4.291E+004	4.29E+004	4.316E+004	2.038E+004
+	Bi-214	609.32*	45.49	2.728E+004	2.73E+004	4.437E+004	1.167E+004
		1120.29	14.92	1.694E+005		5.649E+004	7.587E+004
		1764.49	15.30	1.450E+005		1.668E+004	6.073E+004
+	Pb-214	295.22	18.42	1.065E+005	3.30E+004	-2.634E+004	5.031E+004
		351.93*	35.60	3.302E+004		4.482E+004	1.479E+004
	Ra-226	186.21	3.64	4.676E+005	4.68E+005	3.068E+004	2.227E+005
	Ac-228	338.32	11.27	1.606E+005	9.63E+004	6.500E+004	7.500E+004
		911.20	25.80	9.629E+004		1.161E+004	4.366E+004
		968.97	15.80	1.809E+005		-1.548E+004	8.283E+004
	Am-241	59.54	35.90	6.698E+004	6.70E+004	2.937E+004	3.236E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/18/2018 1:42:08 PM

Sample Title : B109100AFSFC026GD
Sample Description : WWTF FLOOR
Sample Identification : 026
Sample Type : GAMMA DIRECT
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : ^{2.83}
~~2.826E+001~~ M²

Sample Taken On : 8/18/2018 1:32:00 PM
Acquisition Started : 8/18/2018 1:32:06 PM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.15 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 11:05

R. Massengill

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSFC026GD
Peak Analysis Performed on: 8/18/2018 1:42:07 PM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	314	300.83	75.33	0.64	1.21E+002	56.80	2.01E+002
2	950-	959	954.62	238.77	0.35	3.23E+001	18.51	2.37E+001
3	2431-	2444	2437.67	609.52	0.96	4.20E+001	15.71	7.04E+000
4	2641-	2652	2646.61	661.75	1.21	2.20E+001	10.87	3.00E+000
5	5838-	5858	5847.87	1462.02	1.16	9.50E+001	19.49	0.00E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC026GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

..... IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	0.998	1460.82*	10.66	1.03209E+006	2.29963E+005
Cs-137	1.000	661.66*	85.10	1.81365E+004	9.22470E+003
Pb-212	1.000	238.63*	43.60	2.57710E+004	1.53242E+004
Bi-214	0.461	609.32*	45.49	6.12279E+004	2.40744E+004
		1120.29	14.92		
		1764.49	15.30		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	0.998	1.032087E+006	2.299626E+005
Cs-137	1.000	1.813647E+004	9.224696E+003
Pb-212	1.000	2.577100E+004	1.532420E+004
Bi-214	0.461	6.122795E+004	2.407438E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/18/2018 1:42:07 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.33	2.0168E-001	46.94		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSFC026GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+ K-40	1460.82*	10.66	2.940E+004	2.94E+004	1.032E+006	0.000E+000
Co-60	1173.23	99.85	2.079E+004	1.72E+004	-1.143E+004	9.036E+003
	1332.49	99.98	1.717E+004		5.073E+002	7.121E+003
Nb-94	702.65	99.81	1.554E+004	1.55E+004	-8.177E+003	6.782E+003
	871.09	99.89	1.676E+004		5.578E+003	7.251E+003
Ag-108m	433.90	90.50	1.800E+004	1.80E+004	-2.584E+004	8.217E+003
	614.30	89.80	3.114E+004		-3.493E+004	1.457E+004
	722.90	90.80	2.367E+004		1.660E+004	1.073E+004
Cs-134	604.72	97.62	2.980E+004	2.47E+004	-1.167E+004	1.399E+004
	795.86	85.46	2.474E+004		-6.314E+003	1.112E+004
+ Cs-137	661.66*	85.10	9.687E+003	9.69E+003	1.814E+004	3.728E+003
Eu-152	121.78	28.67	6.693E+004	6.69E+004	1.834E+003	3.225E+004
	344.28	26.60	7.121E+004		-7.632E+004	3.333E+004
	1408.01	21.07	1.108E+005		-4.009E+003	4.816E+004
Eu-154	123.07	40.40	4.730E+004	4.73E+004	-1.245E+004	2.279E+004
	723.30	20.06	1.072E+005		7.703E+004	4.860E+004
	1274.43	34.80	7.116E+004		1.589E+004	3.148E+004
Eu-155	86.55	30.70	7.590E+004	7.59E+004	6.163E+004	3.685E+004
	105.31	21.10	9.633E+004		4.522E+004	4.656E+004
Tl-208	583.19	85.00	2.982E+004	2.98E+004	3.289E+003	1.389E+004
Bi-212	727.33	6.67	2.734E+005	2.73E+005	-2.615E+005	1.216E+005
+ Pb-212	238.63*	43.60	2.129E+004	2.13E+004	2.577E+004	9.569E+003
+ Bi-214	609.32*	45.49	2.527E+004	2.53E+004	6.123E+004	1.066E+004
	1120.29	14.92	1.997E+005		9.118E+004	9.105E+004
	1764.49	15.30	2.000E+005		1.653E+005	8.824E+004
Pb-214	295.22	18.42	1.085E+005	6.30E+004	2.624E+004	5.132E+004
	351.93	35.60	6.296E+004		5.696E+004	2.976E+004
Ra-226	186.21	3.64	4.929E+005	4.93E+005	-6.135E+003	2.354E+005
Ac-228	338.32	11.27	1.628E+005	9.63E+004	-1.324E+004	7.610E+004
	911.20	25.80	9.629E+004		-1.410E+004	4.366E+004
	968.97	15.80	1.563E+005		-1.077E+005	7.052E+004
Am-241	59.54	35.90	6.365E+004	6.37E+004	2.268E+004	3.070E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/14/2018 3:15:00 PM

Sample Title : B109100AFSFC027GD
Sample Description : WWTF Floor
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3MWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M^2

Sample Taken On : 8/14/2018 3:04:00 PM
Acquisition Started : 8/14/2018 3:04:59 PM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.15 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 11:10

R. Massengill / OR jml

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSFC027GD
 Peak Analysis Performed on: 8/14/2018 3:15:00 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	295-	304	299.99	75.12	1.20	8.75E+001	43.29	1.68E+002
2	333-	344	338.89	84.85	0.46	5.61E+001	38.48	1.25E+002
3	948-	959	954.00	238.62	0.55	4.99E+001	24.35	3.91E+001
4	1398-	1414	1406.74	351.80	0.47	6.67E+001	25.24	2.93E+001
5	2430-	2442	2435.77	609.04	1.26	4.83E+001	16.32	6.73E+000
6	3636-	3649	3642.71	910.76	1.27	1.68E+001	12.28	7.21E+000
7	5833-	5851	5842.60	1460.70	0.41	9.80E+001	19.80	0.00E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC027GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	1.06246E+006	2.33638E+005
Eu-155	0.346	86.55*	30.70	4.60860E+004	3.29102E+004
		105.31	21.10		
Pb-212	1.000	238.63*	43.60	3.96887E+004	2.04006E+004
Bi-214	0.461	609.32*	45.49	7.02977E+004	2.52319E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	8.47128E+004	3.44864E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	1.062464E+006	2.336377E+005
Eu-155	0.346	4.608597E+004	3.291022E+004
Pb-212	1.000	3.968874E+004	2.040055E+004
Bi-214	0.461	7.029770E+004	2.523193E+004
Pb-214	0.432	8.471277E+004	3.448644E+004

Ac-228 ntl 270

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/14/2018 3:15:00 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.12	1.4575E-001	49.50		
6	910.76	2.7986E-002	73.11	Tol.	Ac-228

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3MWTF1.27CM
 Sample Title: B109100AFSFC027GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	2.934E+004	2.93E+004	1.062E+006	0.000E+000
	Co-60	1173.23	99.85	2.737E+004	2.43E+004	1.277E+004	1.233E+004
		1332.49	99.98	2.426E+004		3.963E+003	1.067E+004
	Nb-94	702.65	99.81	2.229E+004	2.00E+004	3.447E+003	1.016E+004
		871.09	99.89	1.999E+004		1.254E+004	8.868E+003
	Ag-108m	433.90	90.50	1.967E+004	1.97E+004	-5.006E+003	9.049E+003
		614.30	89.80	3.403E+004		-9.455E+003	1.601E+004
		722.90	90.80	2.587E+004		2.097E+004	1.183E+004
	Cs-134	604.72	97.62	2.940E+004	2.06E+004	5.460E+003	1.379E+004
		795.86	85.46	2.063E+004		-1.426E+004	9.070E+003
	Cs-137	661.66	85.10	2.763E+004	2.76E+004	2.572E+004	1.270E+004
	Eu-152	121.78	28.67	7.166E+004	7.17E+004	2.272E+004	3.462E+004
		344.28	26.60	7.201E+004		1.832E+004	3.374E+004
		1408.01	21.07	1.005E+005		-2.002E+004	4.302E+004
	Eu-154	123.07	40.40	5.184E+004	5.18E+004	4.306E+004	2.506E+004
		723.30	20.06	1.171E+005		7.108E+004	5.357E+004
		1274.43	34.80	6.442E+004		-3.872E+003	2.812E+004
+	Eu-155	86.55*	30.70	5.009E+004	5.01E+004	4.609E+004	2.393E+004
		105.31	21.10	1.026E+005		3.311E+004	4.967E+004
	Tl-208	583.19	85.00	2.594E+004	2.59E+004	2.976E+004	1.194E+004
	Bi-212	727.33	6.67	3.493E+005	3.49E+005	-5.711E+003	1.596E+005
+	Pb-212	238.63*	43.60	2.810E+004	2.81E+004	3.969E+004	1.297E+004
+	Bi-214	609.32*	45.49	2.447E+004	2.45E+004	7.030E+004	1.026E+004
		1120.29	14.92	1.864E+005		1.169E+005	8.437E+004
		1764.49	15.30	2.088E+005		1.825E+005	9.264E+004
+	Pb-214	295.22	18.42	1.206E+005	4.37E+004	1.218E+005	5.735E+004
		351.93*	35.60	4.366E+004		8.471E+004	2.011E+004
	Ra-226	186.21	3.64	5.460E+005	5.46E+005	2.156E+005	2.619E+005
	Ac-228	338.32	11.27	1.790E+005	1.03E+005	3.014E+004	8.423E+004
		911.20	25.80	1.027E+005		1.226E+005	4.688E+004
		968.97	15.80	1.699E+005		7.460E+004	7.737E+004
	Am-241	59.54	35.90	6.618E+004	6.62E+004	-6.109E+004	3.197E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/14/2018 2:14:27 PM

Sample Title : B109100AFSFC028GD
Sample Description : WWTF Floor
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3MWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/14/2018 2:04:00 PM
Acquisition Started : 8/14/2018 2:04:25 PM

Live Time : 600.0 seconds
Real Time : 600.8 seconds

Dead Time : 0.13 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATEL
DATE 9-2-18
TIME 11:15
R. Massengill/Rjm

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSFC028GD
 Peak Analysis Performed on: 8/14/2018 2:14:27 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	294-	307	300.05	75.14	0.98	8.95E+001	51.03	2.01E+002
2	388-	397	392.27	98.19	0.33	8.31E-001	26.43	7.62E+001
3	537-	546	541.99	135.62	0.53	-1.50E+000	21.60	5.25E+001
4	949-	958	953.98	238.61	0.33	1.78E+001	21.92	4.52E+001
5	1401-	1413	1406.81	351.81	0.93	2.39E+001	17.00	1.81E+001
6	2427-	2440	2434.32	608.68	0.79	3.36E+001	15.06	8.38E+000
7	5833-	5851	5842.05	1460.56	1.74	7.77E+001	18.46	2.26E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC028GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M^2)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	8.42730E+005	2.13092E+005
Pb-212	1.000	238.63*	43.60	1.41746E+004	1.75786E+004
Bi-214	0.460	609.32*	45.49	4.89518E+004	2.27061E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	3.03969E+004	2.20742E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	8.427304E+005	2.130923E+005
Pb-212	1.000	1.417459E+004	1.757864E+004
Bi-214	0.460	4.895176E+004	2.270610E+004
Pb-214	0.432	3.039695E+004	2.207419E+004

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/14/2018 2:14:27 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.14	1.4917E-001	57.02		
2	98.19	1.3853E-003	3179.34	Tol.	Eu-155
3	135.62	-2.5000E-003	-1440.2		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3MWTF1.27CM
 Sample Title: B109100AFSFC028GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.268E+005	1.27E+005	8.427E+005	4.873E+004
	Co-60	1173.23	99.85	2.355E+004	2.35E+004	-2.829E+003	1.042E+004
		1332.49	99.98	2.366E+004		-1.271E+002	1.037E+004
	Nb-94	702.65	99.81	2.052E+004	2.05E+004	1.716E+004	9.274E+003
		871.09	99.89	2.160E+004		1.536E+004	9.676E+003
	Ag-108m	433.90	90.50	1.863E+004	1.86E+004	-1.049E+004	8.531E+003
		614.30	89.80	3.006E+004		-3.232E+004	1.402E+004
		722.90	90.80	2.430E+004		-2.083E+004	1.105E+004
	Cs-134	604.72	97.62	2.849E+004	2.67E+004	3.197E+004	1.333E+004
		795.86	85.46	2.667E+004		2.402E+004	1.209E+004
	Cs-137	661.66	85.10	2.734E+004	2.73E+004	1.586E+004	1.256E+004
	Eu-152	121.78	28.67	6.988E+004	6.99E+004	-1.756E+003	3.373E+004
		344.28	26.60	7.246E+004		-4.383E+004	3.396E+004
		1408.01	21.07	7.528E+004		3.203E+004	3.042E+004
	Eu-154	123.07	40.40	4.959E+004	4.96E+004	1.353E+004	2.393E+004
		723.30	20.06	1.100E+005		-7.077E+004	5.002E+004
		1274.43	34.80	7.261E+004		3.990E+004	3.222E+004
	Eu-155	86.55	30.70	7.599E+004	7.60E+004	6.371E+004	3.689E+004
		105.31	21.10	9.863E+004		4.617E+004	4.771E+004
	Tl-208	583.19	85.00	2.404E+004	2.40E+004	2.053E+004	1.100E+004
	Bi-212	727.33	6.67	3.320E+005	3.32E+005	-1.443E+005	1.510E+005
+	Pb-212	238.63*	43.60	2.861E+004	2.86E+004	1.417E+004	1.323E+004
+	Bi-214	609.32*	45.49	2.696E+004	2.70E+004	4.895E+004	1.151E+004
		1120.29	14.92	1.630E+005		5.048E+004	7.267E+004
		1764.49	15.30	1.514E+005		7.821E+003	6.393E+004
+	Pb-214	295.22	18.42	1.093E+005	3.25E+004	5.697E+004	5.174E+004
		351.93*	35.60	3.250E+004		3.040E+004	1.453E+004
	Ra-226	186.21	3.64	5.058E+005	5.06E+005	8.970E+004	2.419E+005
	Ac-228	338.32	11.27	1.615E+005	1.06E+005	1.169E+005	7.544E+004
		911.20	25.80	1.064E+005		1.692E+004	4.874E+004
		968.97	15.80	1.677E+005		1.110E+005	7.625E+004
	Am-241	59.54	35.90	6.465E+004	6.46E+004	5.876E+003	3.120E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: C:\GENIE2K\CAMFILES\00001663.CNF

Report Generated On : 8/20/2018 3:28:10 PM

Sample Title : B109100AFSWC029GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/20/2018 10:22:00 AM
Acquisition Started : 8/20/2018 10:22:32 AM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.15 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 11:20

R. Massengill/Rjm

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSWC029GD
 Peak Analysis Performed on: 8/20/2018 3:28:10 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	286-	295	290.66	72.79	0.64	-2.56E+001	39.62	1.67E+002
2	332-	345	339.09	84.90	0.38	1.12E+001	42.96	1.63E+002
3	949-	961	954.39	238.72	0.53	3.25E+001	21.93	3.25E+001
4	1176-	1187	1181.08	295.38	0.37	1.44E+001	18.86	2.96E+001
5	1402-	1413	1407.35	351.95	1.19	4.01E+001	19.04	1.99E+001
6	2428-	2444	2435.92	609.08	1.00	5.37E+001	17.84	8.28E+000
7	5834-	5852	5842.82	1460.76	0.75	7.90E+001	17.78	0.00E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC029GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	8.56500E+005	2.06581E+005
Eu-155	0.346	86.55*	30.70	9.19457E+003	3.53088E+004
		105.31	21.10		
Pb-212	1.000	238.63*	43.60	2.58512E+004	1.79337E+004
Bi-214	0.461	609.32*	45.49	7.82378E+004	2.76292E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	1.000	295.22*	18.42	3.12845E+004	4.12503E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	8.565003E+005	2.065807E+005
Eu-155	0.346	9.194566E+003	3.530883E+004
Pb-212	1.000	2.585125E+004	1.793366E+004
Bi-214	0.461	7.823777E+004	2.762922E+004
Pb-214	1.000	4.556419E+004	2.161149E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/20/2018 3:28:10 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	72.79	-4.2630E-002	-154.92		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC029GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	2.934E+004	2.93E+004	8.565E+005	0.000E+000
	Co-60	1173.23	99.85	2.248E+004	1.62E+004	6.176E+003	9.885E+003
		1332.49	99.98	1.623E+004		7.565E+003	6.652E+003
	Nb-94	702.65	99.81	1.856E+004	1.86E+004	-8.643E+002	8.295E+003
		871.09	99.89	2.121E+004		-2.911E+003	9.480E+003
	Ag-108m	433.90	90.50	1.707E+004	1.71E+004	-8.684E+003	7.749E+003
		614.30	89.80	3.270E+004		-8.348E+003	1.534E+004
		722.90	90.80	2.261E+004		-3.173E+003	1.020E+004
	Cs-134	604.72	97.62	3.114E+004	2.88E+004	-1.256E+003	1.466E+004
		795.86	85.46	2.884E+004		3.718E+003	1.318E+004
	Cs-137	661.66	85.10	2.521E+004	2.52E+004	7.911E+003	1.149E+004
	Eu-152	121.78	28.67	7.090E+004	7.09E+004	4.198E+004	3.424E+004
		344.28	26.60	7.845E+004		-4.466E+004	3.696E+004
		1408.01	21.07	1.168E+005		9.074E+004	5.120E+004
	Eu-154	123.07	40.40	4.931E+004	4.93E+004	-5.811E+003	2.379E+004
		723.30	20.06	1.024E+005		-3.964E+004	4.620E+004
		1274.43	34.80	5.887E+004		-2.842E+004	2.535E+004
+	Eu-155	86.55*	30.70	5.952E+004	5.95E+004	9.195E+003	2.865E+004
		105.31	21.10	9.815E+004		-4.977E+004	4.747E+004
	Tl-208	583.19	85.00	2.541E+004	2.54E+004	-1.080E+003	1.168E+004
	Bi-212	727.33	6.67	2.890E+005	2.89E+005	-7.123E+004	1.295E+005
+	Pb-212	238.63*	43.60	2.666E+004	2.67E+004	2.585E+004	1.225E+004
+	Bi-214	609.32*	45.49	2.829E+004	2.83E+004	7.824E+004	1.218E+004
		1120.29	14.92	1.864E+005		2.019E+005	8.437E+004
		1764.49	15.30	2.043E+005		3.975E+004	9.041E+004
+	Pb-214	295.22*	18.42	6.753E+004	3.32E+004	3.128E+004	3.083E+004
		351.93*	35.60	3.316E+004		5.097E+004	1.486E+004
	Ra-226	186.21	3.64	4.983E+005	4.98E+005	8.603E+004	2.381E+005
	Ac-228	338.32	11.27	1.668E+005	8.60E+004	-1.231E+005	7.813E+004
		911.20	25.80	8.603E+004		1.345E+004	3.853E+004
		968.97	15.80	1.608E+005		1.027E+005	7.281E+004
	Am-241	59.54	35.90	7.167E+004	7.17E+004	2.521E+004	3.471E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/21/2018 9:14:46 AM

Sample Title : B109100AFSWC030GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/21/2018 9:04:00 AM
Acquisition Started : 8/21/2018 9:04:45 AM

Live Time : 600.0 seconds
Real Time : 600.7 seconds

Dead Time : 0.12 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWTF1,27CM

DATA VALIDATED
DATE 9-2-18
TIME 11:25
R. Massengill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSWC030GD
 Peak Analysis Performed on: 8/21/2018 9:14:46 AM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	295-	307	301.06	75.39	0.88	3.23E+001	49.66	2.21E+002
2	336-	345	340.69	85.30	0.76	2.86E+001	35.02	1.21E+002
3	2429-	2444	2436.12	609.13	0.59	4.69E+001	18.29	1.21E+001
4	2639-	2650	2644.37	661.19	0.56	1.14E+001	12.75	1.16E+001
5	5835-	5853	5844.22	1461.11	1.67	7.91E+001	19.62	4.88E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC030GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	8.58008E+005	2.25379E+005
Cs-137	1.000	661.66*	85.10	9.40813E+003	1.05536E+004
Eu-155	0.347	86.55*	30.70	2.33903E+004	2.90612E+004
		105.31	21.10		
Bi-214	0.461	609.32*	45.49	6.83586E+004	2.78728E+004
		1120.29	14.92		
		1764.49	15.30		

Ac-228 270

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	8.580081E+005	2.253791E+005
Cs-137	1.000	9.408133E+003	1.055357E+004
Eu-155	0.347	2.339032E+004	2.906120E+004
Bi-214	0.461	6.835859E+004	2.787280E+004

Ac-228 RFD

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/21/2018 9:14:46 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.39	5.3841E-002	153.71		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWTF1.27CM
 Sample Title: B109100AFSWC030GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.767E+005	1.77E+005	8.580E+005	7.370E+004
	Co-60	1173.23	99.85	2.823E+004	1.71E+004	1.659E+004	1.276E+004
		1332.49	99.98	1.715E+004		-1.689E+002	7.111E+003
	Nb-94	702.65	99.81	2.229E+004	1.87E+004	2.124E+004	1.016E+004
		871.09	99.89	1.867E+004		-2.600E+003	8.210E+003
	Ag-108m	433.90	90.50	1.926E+004	1.93E+004	5.360E+002	8.845E+003
		614.30	89.80	3.289E+004		-1.273E+004	1.544E+004
		722.90	90.80	2.364E+004		1.527E+004	1.072E+004
	Cs-134	604.72	97.62	2.958E+004	2.30E+004	-2.018E+003	1.388E+004
		795.86	85.46	2.299E+004		2.114E+004	1.025E+004
+	Cs-137	661.66*	85.10	1.686E+004	1.69E+004	9.408E+003	7.317E+003
	Eu-152	121.78	28.67	7.328E+004	6.83E+004	1.122E+003	3.543E+004
		344.28	26.60	6.831E+004		-4.812E+004	3.189E+004
		1408.01	21.07	1.198E+005		4.900E+004	5.268E+004
	Eu-154	123.07	40.40	5.149E+004	5.15E+004	-9.380E+003	2.488E+004
		723.30	20.06	1.070E+005		6.914E+004	4.853E+004
		1274.43	34.80	7.106E+004		-1.964E+003	3.144E+004
+	Eu-155	86.55*	30.70	4.715E+004	4.71E+004	2.339E+004	2.247E+004
		105.31	21.10	1.012E+005		2.115E+004	4.897E+004
	Tl-208	583.19	85.00	2.720E+004	2.72E+004	9.652E+003	1.258E+004
	Bi-212	727.33	6.67	3.090E+005	3.09E+005	2.546E+005	1.394E+005
	Pb-212	238.63	43.60	4.747E+004	4.75E+004	2.127E+004	2.266E+004
+	Bi-214	609.32*	45.49	3.296E+004	3.30E+004	6.836E+004	1.451E+004
		1120.29	14.92	1.808E+005		3.667E+004	8.160E+004
		1764.49	15.30	1.748E+005		1.217E+005	7.564E+004
	Pb-214	295.22	18.42	1.033E+005	5.86E+004	1.056E+005	4.869E+004
		351.93	35.60	5.860E+004		-3.813E+003	2.758E+004
	Ra-226	186.21	3.64	5.029E+005	5.03E+005	-1.964E+005	2.404E+005
	Ac-228	338.32	11.27	1.800E+005	8.60E+004	1.022E+005	8.472E+004
		911.20	25.80	8.603E+004		-1.159E+004	3.853E+004
		968.97	15.80	1.460E+005		-9.556E+004	6.539E+004
	Am-241	59.54	35.90	6.825E+004	6.83E+004	4.711E+003	3.300E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/21/2018 8:59:26 AM

Sample Title : B109100AFSWC031GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/21/2018 8:49:00 AM
Acquisition Started : 8/21/2018 8:49:24 AM

Live Time : 600.0 seconds
Real Time : 600.7 seconds

Dead Time : 0.12 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 8-2-18

TIME 11:30

R. Massengill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSWC031GD
 Peak Analysis Performed on: 8/21/2018 8:59:25 AM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	305	300.60	75.27	0.92	3.14E+001	42.00	1.79E+002
2	949-	959	954.12	238.65	0.37	6.26E+000	21.04	4.37E+001
3	1173-	1188	1180.22	295.17	0.91	4.01E+001	19.41	1.79E+001
4	1401-	1415	1407.89	352.08	0.47	4.92E+001	18.57	1.28E+001
5	2429-	2442	2436.07	609.12	1.02	4.94E+001	15.48	3.63E+000
6	5838-	5853	5845.21	1461.35	0.93	5.56E+001	16.15	3.41E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC031GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	6.02912E+005	1.82797E+005
Pb-212	1.000	238.63*	43.60	4.97840E+003	1.67540E+004
Bi-214	0.461	609.32*	45.49	7.19054E+004	2.41419E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	1.000	295.22*	18.42	8.70849E+004	4.43765E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	6.029118E+005	1.827973E+005
Pb-212	1.000	4.978403E+003	1.675402E+004
Bi-214	0.461	7.190540E+004	2.414193E+004
Pb-214	1.000	6.862954E+004	2.204584E+004

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/21/2018 8:59:25 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.27	5.2381E-002	133.64		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC031GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.399E+005	1.40E+005	6.029E+005	5.529E+004
	Co-60	1173.23	99.85	2.647E+004	1.96E+004	1.167E+004	1.188E+004
		1332.49	99.98	1.960E+004		6.018E+003	8.339E+003
	Nb-94	702.65	99.81	2.142E+004	1.82E+004	8.160E+002	9.726E+003
		871.09	99.89	1.821E+004		7.389E+003	7.979E+003
	Ag-108m	433.90	90.50	2.332E+004	2.33E+004	1.739E+004	1.088E+004
		614.30	89.80	3.191E+004		-1.270E+004	1.495E+004
		722.90	90.80	2.364E+004		4.479E+003	1.072E+004
	Cs-134	604.72	97.62	2.755E+004	2.30E+004	2.328E+004	1.286E+004
		795.86	85.46	2.299E+004		8.770E+003	1.025E+004
	Cs-137	661.66	85.10	2.389E+004	2.39E+004	-2.315E+002	1.083E+004
	Eu-152	121.78	28.67	7.052E+004	6.49E+004	-2.273E+004	3.405E+004
		344.28	26.60	6.489E+004		-3.252E+004	3.018E+004
		1408.01	21.07	9.681E+004		2.026E+004	4.118E+004
	Eu-154	123.07	40.40	5.077E+004	5.08E+004	2.051E+004	2.452E+004
		723.30	20.06	1.070E+005		1.498E+004	4.853E+004
		1274.43	34.80	5.688E+004		-3.507E+004	2.435E+004
	Eu-155	86.55	30.70	8.187E+004	8.19E+004	5.527E+004	3.984E+004
		105.31	21.10	9.815E+004		3.641E+004	4.747E+004
	Tl-208	583.19	85.00	2.769E+004	2.77E+004	1.688E+004	1.282E+004
	Bi-212	727.33	6.67	3.230E+005	3.23E+005	2.921E+005	1.465E+005
+	Pb-212	238.63*	43.60	2.889E+004	2.89E+004	4.978E+003	1.337E+004
+	Bi-214	609.32*	45.49	1.948E+004	1.95E+004	7.191E+004	7.768E+003
		1120.29	14.92	1.722E+005		1.152E+005	7.726E+004
		1764.49	15.30	1.902E+005		3.425E+004	8.335E+004
+	Pb-214	295.22*	18.42	5.839E+004	2.89E+004	8.708E+004	2.626E+004
		351.93*	35.60	2.889E+004		6.258E+004	1.272E+004
	Ra-226	186.21	3.64	5.542E+005	5.54E+005	5.285E+005	2.660E+005
	Ac-228	338.32	11.27	1.524E+005	1.03E+005	1.271E+005	7.094E+004
		911.20	25.80	1.027E+005		-1.135E+005	4.688E+004
		968.97	15.80	1.536E+005		-2.811E+003	6.920E+004
	Am-241	59.54	35.90	6.937E+004	6.94E+004	3.287E+004	3.356E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/21/2018 8:47:24 AM

Sample Title : B109100AFSWC032GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/21/2018 8:37:00 AM
Acquisition Started : 8/21/2018 8:37:22 AM

Live Time : 600.0 seconds
Real Time : 600.7 seconds

Dead Time : 0.11 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1135

R. Massengill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSWC032GD
 Peak Analysis Performed on: 8/21/2018 8:47:24 AM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	245-	255	251.04	62.89	0.79	2.08E+001	31.63	9.63E+001
2	290-	305	300.53	75.26	0.75	1.10E+002	55.09	2.14E+002
3	949-	961	955.13	238.90	1.31	2.59E+001	23.28	4.11E+001
4	1400-	1413	1407.39	351.96	0.85	4.25E+001	19.81	1.95E+001
5	2430-	2443	2435.96	609.09	0.69	3.27E+001	17.11	1.43E+001
6	5838-	5853	5844.85	1461.26	0.69	4.62E+001	15.48	4.82E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC032GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M^2)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	5.00764E+005	1.73364E+005
Pb-212	1.000	238.63*	43.60	2.06293E+004	1.88283E+004
Bi-214	0.461	609.32*	45.49	4.75834E+004	2.55744E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	5.40025E+004	2.64462E+004
		351.93*	35.60		
Am-241	0.982	59.54*	35.90	1.67109E+004	2.56916E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	5.007637E+005	1.733644E+005
Pb-212	1.000	2.062930E+004	1.882828E+004
Bi-214	0.461	4.758337E+004	2.557435E+004
Pb-214	0.432	5.400247E+004	2.644615E+004
Am-241	0.982	1.671089E+004	2.569156E+004

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/21/2018 8:47:24 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
2	75.26	1.8402E-001	49.89		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC032GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.614E+005	1.61E+005	5.008E+005	6.602E+004
	Co-60	1173.23	99.85	2.248E+004	1.42E+004	-1.872E+004	9.885E+003
		1332.49	99.98	1.417E+004		5.404E+003	5.622E+003
	Nb-94	702.65	99.81	1.711E+004	1.71E+004	-9.279E+003	7.572E+003
		871.09	99.89	2.309E+004		1.248E+003	1.042E+004
	Ag-108m	433.90	90.50	1.820E+004	1.82E+004	1.595E+003	8.315E+003
		614.30	89.80	3.048E+004		-6.758E+003	1.424E+004
		722.90	90.80	2.525E+004		1.332E+004	1.152E+004
	Cs-134	604.72	97.62	2.736E+004	2.63E+004	-2.647E+004	1.277E+004
		795.86	85.46	2.629E+004		1.585E+004	1.190E+004
	Cs-137	661.66	85.10	2.645E+004	2.65E+004	7.254E+003	1.211E+004
	Eu-152	121.78	28.67	7.001E+004	7.00E+004	1.312E+004	3.379E+004
		344.28	26.60	7.156E+004		-3.022E+004	3.351E+004
		1408.01	21.07	1.005E+005		-1.779E+003	4.302E+004
	Eu-154	123.07	40.40	4.950E+004	4.95E+004	5.964E+004	2.389E+004
		723.30	20.06	1.129E+005		7.913E+003	5.147E+004
		1274.43	34.80	5.887E+004		1.557E+004	2.535E+004
	Eu-155	86.55	30.70	7.753E+004	7.75E+004	2.319E+004	3.766E+004
		105.31	21.10	9.831E+004		-8.242E+004	4.755E+004
	Tl-208	583.19	85.00	2.793E+004	2.79E+004	2.271E+003	1.294E+004
	Bi-212	727.33	6.67	3.408E+005	3.41E+005	1.683E+005	1.553E+005
+	Pb-212	238.63*	43.60	2.957E+004	2.96E+004	2.063E+004	1.371E+004
+	Bi-214	609.32*	45.49	3.446E+004	3.45E+004	4.758E+004	1.526E+004
		1120.29	14.92	1.722E+005		1.434E+004	7.726E+004
		1764.49	15.30	1.801E+005		1.303E+005	7.829E+004
+	Pb-214	295.22	18.42	1.127E+005	3.46E+004	8.796E+004	5.343E+004
		351.93*	35.60	3.463E+004		5.400E+004	1.560E+004
	Ra-226	186.21	3.64	5.501E+005	5.50E+005	8.630E+005	2.640E+005
	Ac-228	338.32	11.27	1.790E+005	9.34E+004	7.820E+003	8.423E+004
		911.20	25.80	9.339E+004		7.683E+004	4.221E+004
		968.97	15.80	1.608E+005		-1.243E+005	7.281E+004
+	Am-241	59.54*	35.90	4.230E+004	4.23E+004	1.671E+004	2.006E+004

+ = Nuclide identified during the nuclide identification
 * = Energy line found in the spectrum
 > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
 @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/18/2018 3:18:02 PM

Sample Title : B109100AFSWC033GD
Sample Description : WWTF WALL
Sample Identification : 033
Sample Type : GAMMA DIRECT
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : ^{2.83}~~2.826E+001~~ M²

Sample Taken On : 8/18/2018 3:07:00 PM
Acquisition Started : 8/18/2018 3:08:00 PM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.15 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1140

R. Massengill *[Signature]*

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSWC033GD
 Peak Analysis Performed on: 8/18/2018 3:18:02 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	295-	305	300.92	75.36	1.09	5.24E+001	43.72	1.76E+002
2	334-	344	338.14	84.66	0.97	4.14E+001	36.90	1.25E+002
3	946-	958	953.35	238.46	0.55	3.76E+001	23.76	3.84E+001
4	2430-	2444	2437.29	609.42	0.52	3.49E+001	14.87	7.13E+000
5	5836-	5853	5844.75	1461.24	1.25	6.36E+001	18.36	6.35E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC033GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M^2)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	6.91186E+005	2.08212E+005
Eu-155	0.346	86.55*	30.70	3.40765E+004	3.11257E+004
		105.31	21.10		
Pb-212	1.000	238.63*	43.60	2.99483E+004	1.95238E+004
Bi-214	0.461	609.32*	45.49	5.08765E+004	2.25397E+004
		1120.29	14.92		
		1764.49	15.30		

*Ag 228
 1/12/18*

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	6.911858E+005	2.082116E+005
Eu-155	0.346	3.407655E+004	3.112574E+004
Pb-212	1.000	2.994829E+004	1.952379E+004
Bi-214	0.461	5.087648E+004	2.253970E+004

Ke-220 RFD

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/18/2018 3:18:02 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.36	8.7288E-002	83.48		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC033GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.916E+005	1.92E+005	6.912E+005	8.111E+004
	Co-60	1173.23	99.85	2.251E+004	2.24E+004	1.248E+004	9.899E+003
		1332.49	99.98	2.243E+004		-5.051E+002	9.751E+003
	Nb-94	702.65	99.81	1.751E+004	1.75E+004	-3.280E+003	7.770E+003
		871.09	99.89	2.163E+004		-2.083E+003	9.690E+003
	Ag-108m	433.90	90.50	2.142E+004	2.14E+004	-2.758E+003	9.926E+003
		614.30	89.80	3.031E+004		2.522E+003	1.415E+004
		722.90	90.80	2.466E+004		1.774E+004	1.122E+004
	Cs-134	604.72	97.62	2.701E+004	2.70E+004	-1.995E+004	1.259E+004
		795.86	85.46	2.818E+004		6.595E+003	1.284E+004
	Cs-137	661.66	85.10	2.824E+004	2.82E+004	2.741E+004	1.301E+004
	Eu-152	121.78	28.67	7.177E+004	6.45E+004	4.172E+004	3.467E+004
		344.28	26.60	6.447E+004		-7.921E+004	2.997E+004
		1408.01	21.07	8.481E+004		-7.483E+004	3.517E+004
	Eu-154	123.07	40.40	4.957E+004	4.96E+004	-2.307E+004	2.392E+004
		723.30	20.06	1.102E+005		5.360E+004	5.009E+004
		1274.43	34.80	6.272E+004		2.381E+004	2.727E+004
+	Eu-155	86.55*	30.70	4.905E+004	4.90E+004	3.408E+004	2.341E+004
		105.31	21.10	1.013E+005		4.342E+004	4.904E+004
	Tl-208	583.19	85.00	2.891E+004	2.89E+004	4.397E+004	1.343E+004
	Bi-212	727.33	6.67	3.142E+005	3.14E+005	-8.971E+004	1.420E+005
+	Pb-212	238.63*	43.60	2.880E+004	2.88E+004	2.995E+004	1.332E+004
+	Bi-214	609.32*	45.49	2.563E+004	2.56E+004	5.088E+004	1.084E+004
		1120.29	14.92	1.839E+005		-5.436E+002	8.311E+004
		1764.49	15.30	1.638E+005		1.044E+005	7.013E+004
	Pb-214	295.22	18.42	1.065E+005	5.71E+004	3.172E+004	5.031E+004
		351.93	35.60	5.707E+004		3.655E+003	2.681E+004
	Ra-226	186.21	3.64	5.169E+005	5.17E+005	-2.510E+005	2.474E+005
	Ac-228	338.32	11.27	1.743E+005	9.35E+004	4.046E+004	8.186E+004
		911.20	25.80	9.352E+004		4.982E+004	4.227E+004
		968.97	15.80	1.611E+005		1.745E+005	7.291E+004
	Am-241	59.54	35.90	6.914E+004	6.91E+004	5.788E+003	3.344E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/18/2018 3:05:45 PM

Sample Title : B109100AFSWC034GD
Sample Description : WWTF WALL
Sample Identification : 034
Sample Type : GAMMA DIRECT
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : ~~2.826E+001~~ ^{2.87} M²
Run 8/27/18
Sample Taken On : 8/18/2018 2:55:00 PM
Acquisition Started : 8/18/2018 2:55:44 PM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.15 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1145

R. Massengill *10/2/18*

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSWC034GD
 Peak Analysis Performed on: 8/18/2018 3:05:45 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	305	300.16	75.17	0.83	3.99E+001	41.13	1.69E+002
2	335-	345	339.90	85.10	0.52	2.79E+001	39.17	1.48E+002
3	753-	764	758.71	189.80	0.39	3.13E+001	21.16	3.17E+001
4	949-	961	954.68	238.79	0.63	4.21E+001	22.95	3.39E+001
5	1176-	1187	1181.55	295.50	0.35	1.34E+001	18.49	2.86E+001
6	1401-	1413	1407.45	351.97	0.62	4.17E+001	18.43	1.63E+001
7	2430-	2443	2436.01	609.10	1.09	2.46E+001	17.72	1.94E+001
8	2641-	2652	2646.62	661.75	0.96	1.78E+001	11.99	7.25E+000
9	5835-	5854	5845.20	1461.35	0.93	8.25E+001	19.11	2.50E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC034GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	8.95951E+005	2.21696E+005
Cs-137	1.000	661.66*	85.10	1.46329E+004	1.00411E+004
Eu-155	0.347	86.55*	30.70	2.29397E+004	3.24827E+004
		105.31	21.10		
Pb-212	1.000	238.63*	43.60	3.35273E+004	1.90744E+004
Bi-214	0.461	609.32*	45.49	3.58838E+004	2.62092E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	1.000	295.22*	18.42	2.91011E+004	4.04762E+004
		351.93*	35.60		
Ra-226	0.980	186.21*	3.64	2.58357E+005	1.80129E+005

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	8.959507E+005	2.216963E+005
Cs-137	1.000	1.463286E+004	1.004108E+004
Eu-155	0.347	2.293970E+004	3.248269E+004
Pb-212	1.000	3.352726E+004	1.907436E+004
Bi-214	0.461	3.588383E+004	2.620922E+004
Pb-214	1.000	4.650350E+004	2.112760E+004
Ra-226	0.980	2.583573E+005	1.801293E+005

Ac-228 not used

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/18/2018 3:05:45 PM
Peak Locate From Channel: 85
Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.17	6.6445E-002	103.17		

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC034GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.357E+005	1.36E+005	8.960E+005	5.314E+004
	Co-60	1173.23	99.85	2.784E+004	2.43E+004	2.908E+004	1.256E+004
		1332.49	99.98	2.429E+004		9.800E+003	1.068E+004
	Nb-94	702.65	99.81	2.055E+004	2.05E+004	-3.735E+003	9.287E+003
		871.09	99.89	2.163E+004		-3.240E+003	9.690E+003
	Ag-108m	433.90	90.50	2.142E+004	2.14E+004	-3.258E+003	9.926E+003
		614.30	89.80	3.155E+004		-6.598E+002	1.477E+004
		722.90	90.80	2.590E+004		-4.914E+003	1.185E+004
	Cs-134	604.72	97.62	2.980E+004	2.21E+004	-7.290E+003	1.399E+004
		795.86	85.46	2.211E+004		-5.981E+003	9.810E+003
+	Cs-137	661.66*	85.10	1.380E+004	1.38E+004	1.463E+004	5.786E+003
	Eu-152	121.78	28.67	7.202E+004	7.03E+004	7.503E+003	3.479E+004
		344.28	26.60	7.029E+004		1.493E+004	3.287E+004
		1408.01	21.07	7.538E+004		-3.341E+003	3.046E+004
	Eu-154	123.07	40.40	5.165E+004	5.16E+004	4.769E+004	2.496E+004
		723.30	20.06	1.173E+005		2.701E+004	5.365E+004
		1274.43	34.80	6.451E+004		4.842E+004	2.816E+004
+	Eu-155	86.55*	30.70	5.316E+004	5.32E+004	2.294E+004	2.547E+004
		105.31	21.10	1.053E+005		8.226E+003	5.103E+004
	Tl-208	583.19	85.00	2.724E+004	2.72E+004	2.359E+004	1.259E+004
	Bi-212	727.33	6.67	3.540E+005	3.54E+005	2.159E+005	1.619E+005
+	Pb-212	238.63*	43.60	2.697E+004	2.70E+004	3.353E+004	1.241E+004
+	Bi-214	609.32*	45.49	3.919E+004	3.92E+004	3.588E+004	1.762E+004
		1120.29	14.92	1.866E+005		-3.524E+003	8.449E+004
		1764.49	15.30	1.905E+005		7.589E+004	8.347E+004
+	Pb-214	295.22*	18.42	6.663E+004	3.10E+004	2.910E+004	3.037E+004
		351.93*	35.60	3.100E+004		5.302E+004	1.378E+004
+	Ra-226	186.21*	3.64	2.663E+005	2.66E+005	2.584E+005	1.220E+005
	Ac-228	338.32	11.27	1.561E+005	9.21E+004	3.283E+004	7.276E+004
		911.20	25.80	9.210E+004		-2.151E+004	4.156E+004
		968.97	15.80	1.702E+005		-4.520E+004	7.748E+004
	Am-241	59.54	35.90	6.991E+004	6.99E+004	1.616E+004	3.383E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/22/2018 9:03:27 AM

Sample Title : B109100AFSWC035GD
Sample Description : WWTF WALL
Sample Identification : 035
Sample Type : GAMMA DIRECT
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : ^{2.83}~~2.826E+001~~ M²

Sample Taken On : ^{Run 8/27/18} 8/22/2018 8:53:00 AM
Acquisition Started : 8/22/2018 8:53:26 AM

Live Time : 600.0 seconds
Real Time : 601.0 seconds

Dead Time : 0.16 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 11:50

R. Massengill 02 Jul

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSWC035GD
 Peak Analysis Performed on: 8/22/2018 9:03:27 AM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	305	300.10	75.15	0.66	3.99E+001	42.21	1.79E+002
2	334-	344	339.29	84.95	0.30	1.83E+001	36.63	1.32E+002
3	950-	960	954.73	238.80	0.74	9.87E+000	22.21	4.71E+001
4	1402-	1415	1407.92	352.09	0.65	3.93E+001	18.50	1.68E+001
5	2429-	2444	2436.75	609.28	0.47	4.11E+001	17.52	1.19E+001
6	5838-	5857	5847.05	1461.81	1.81	8.63E+001	21.38	7.74E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC035GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	0.998	1460.82*	10.66	9.37015E+005	2.46039E+005
Eu-155	0.347	86.55*	30.70	1.50768E+004	3.02458E+004
		105.31	21.10		
Pb-212	1.000	238.63*	43.60	7.86601E+003	1.77417E+004
Bi-214	0.461	609.32*	45.49	6.00195E+004	2.65649E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42		
		351.93*	35.60	4.99710E+004	2.47116E+004

Ac-228RD

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	0.998	9.370152E+005	2.460395E+005
Eu-155	0.347	1.507678E+004	3.024578E+004
Pb-212	1.000	7.866005E+003	1.774173E+004
Bi-214	0.461	6.001952E+004	2.656490E+004
Pb-214	0.432	4.997097E+004	2.471161E+004

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/22/2018 9:03:27 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.15	6.6495E-002	105.79		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC035GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	2.184E+005	2.18E+005	9.370E+005	9.450E+004
	Co-60	1173.23	99.85	2.358E+004	1.96E+004	-3.824E+003	1.043E+004
		1332.49	99.98	1.963E+004		-4.600E+003	8.350E+003
	Nb-94	702.65	99.81	1.788E+004	1.79E+004	2.418E+003	7.953E+003
		871.09	99.89	2.043E+004		-2.749E+004	9.090E+003
	Ag-108m	433.90	90.50	2.067E+004	2.07E+004	-5.388E+003	9.552E+003
		614.30	89.80	3.052E+004		-2.759E+004	1.426E+004
		722.90	90.80	2.367E+004		3.963E+003	1.073E+004
	Cs-134	604.72	97.62	3.033E+004	2.35E+004	7.440E+003	1.425E+004
		795.86	85.46	2.347E+004		2.876E+003	1.049E+004
	Cs-137	661.66	85.10	2.618E+004	2.62E+004	1.212E+004	1.198E+004
	Eu-152	121.78	28.67	7.088E+004	6.74E+004	-3.371E+004	3.422E+004
		344.28	26.60	6.745E+004		-3.414E+004	3.145E+004
		1408.01	21.07	1.041E+005		6.949E+004	4.484E+004
	Eu-154	123.07	40.40	5.111E+004	5.11E+004	7.479E+003	2.469E+004
		723.30	20.06	1.041E+005		-4.388E+004	4.705E+004
		1274.43	34.80	5.271E+004		-1.589E+004	2.226E+004
+	Eu-155	86.55*	30.70	5.036E+004	5.04E+004	1.508E+004	2.407E+004
		105.31	21.10	1.032E+005		-1.411E+004	4.997E+004
	Tl-208	583.19	85.00	2.436E+004	2.44E+004	1.550E+004	1.115E+004
	Bi-212	727.33	6.67	2.996E+005	3.00E+005	2.241E+005	1.347E+005
+	Pb-212	238.63*	43.60	3.008E+004	3.01E+004	7.866E+003	1.396E+004
+	Bi-214	609.32*	45.49	3.260E+004	3.26E+004	6.002E+004	1.433E+004
		1120.29	14.92	2.143E+005		2.740E+005	9.834E+004
		1764.49	15.30	1.855E+005		1.392E+005	8.098E+004
+	Pb-214	295.22	18.42	1.119E+005	3.20E+004	1.381E+005	5.303E+004
		351.93*	35.60	3.195E+004		4.997E+004	1.425E+004
	Ra-226	186.21	3.64	5.384E+005	5.38E+005	1.575E+005	2.581E+005
	Ac-228	338.32	11.27	1.617E+005	1.16E+005	9.383E+004	7.555E+004
		911.20	25.80	1.159E+005		1.120E+005	5.347E+004
		968.97	15.80	1.563E+005		7.444E+004	7.052E+004
	Am-241	59.54	35.90	7.284E+004	7.28E+004	2.666E+003	3.529E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/22/2018 9:22:53 AM

Sample Title : B109100AFSWC036GD
Sample Description : WWTF WALL
Sample Identification : 036
Sample Type : GAMMA DIRECT
Sample Geometry : 3M90DWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : ^{2.83}~~2.826~~E+001 M^2

Sample Taken On : ^{Rm}8/22/2018 9:13:00 AM
Acquisition Started : 8/22/2018 9:12:52 AM

Live Time : 600.0 seconds
Real Time : 600.7 seconds

Dead Time : 0.12 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED
DATE 9-2-18
TIME 11:55
R. Massengill

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSWC036GD
Peak Analysis Performed on: 8/22/2018 9:22:53 AM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	282-	305	300.76	75.32	1.16	1.92E+002	73.95	2.94E+002
2	1402-	1415	1407.76	352.05	1.01	3.35E+001	19.46	2.15E+001
3	2035-	2046	2040.69	510.28	0.67	2.72E+001	15.04	1.08E+001
4	2428-	2444	2436.69	609.27	0.50	5.33E+001	18.05	8.73E+000
5	5837-	5853	5845.23	1461.36	1.14	6.20E+001	19.78	1.10E+001

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC036GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	6.73570E+005	2.22673E+005
Bi-214	0.461	609.32*	45.49	7.77062E+004	2.79427E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42		
		351.93*	35.60	4.26239E+004	2.55848E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	6.735699E+005	2.226733E+005
Bi-214	0.461	7.770615E+004	2.794270E+004
Pb-214	0.432	4.262394E+004	2.558476E+004

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/22/2018 9:22:53 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.32	3.2006E-001	38.51		
3	510.28	4.5340E-002	55.27		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC036GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	2.432E+005	2.43E+005	6.736E+005	1.069E+005
	Co-60	1173.23	99.85	2.696E+004	1.30E+004	1.827E+004	1.212E+004
		1332.49	99.98	1.300E+004		-5.411E+003	5.035E+003
	Nb-94	702.65	99.81	1.859E+004	1.86E+004	-5.033E+003	8.306E+003
		871.09	99.89	2.202E+004		1.554E+004	9.882E+003
	Ag-108m	433.90	90.50	2.105E+004	2.11E+004	-7.649E+002	9.741E+003
		614.30	89.80	3.351E+004		-1.664E+004	1.575E+004
		722.90	90.80	2.299E+004		-4.098E+003	1.039E+004
	Cs-134	604.72	97.62	3.101E+004	2.75E+004	-6.707E+003	1.459E+004
		795.86	85.46	2.746E+004		5.981E+003	1.248E+004
	Cs-137	661.66	85.10	2.216E+004	2.22E+004	-2.969E+003	9.965E+003
	Eu-152	121.78	28.67	7.326E+004	7.33E+004	5.085E+004	3.542E+004
		344.28	26.60	7.563E+004		2.599E+004	3.554E+004
		1408.01	21.07	8.907E+004		-1.336E+003	3.730E+004
	Eu-154	123.07	40.40	5.048E+004	5.05E+004	5.635E+003	2.438E+004
		723.30	20.06	1.025E+005		-6.650E+004	4.626E+004
		1274.43	34.80	5.271E+004		-1.589E+004	2.226E+004
	Eu-155	86.55	30.70	8.253E+004	8.25E+004	7.067E+004	4.016E+004
		105.31	21.10	1.025E+005		3.122E+004	4.966E+004
	Tl-208	583.19	85.00	3.027E+004	3.03E+004	2.985E+004	1.411E+004
	Bi-212	727.33	6.67	3.189E+005	3.19E+005	-2.058E+004	1.444E+005
	Pb-212	238.63	43.60	4.708E+004	4.71E+004	4.779E+004	2.246E+004
+	Bi-214	609.32*	45.49	2.944E+004	2.94E+004	7.771E+004	1.274E+004
		1120.29	14.92	1.632E+005		-9.238E+004	7.277E+004
		1764.49	15.30	1.578E+005		9.572E+004	6.714E+004
+	Pb-214	295.22	18.42	1.055E+005	3.62E+004	8.687E+004	4.980E+004
		351.93*	35.60	3.622E+004		4.262E+004	1.639E+004
	Ra-226	186.21	3.64	5.412E+005	5.41E+005	3.480E+005	2.595E+005
	Ac-228	338.32	11.27	1.763E+005	8.92E+004	1.032E+005	8.286E+004
		911.20	25.80	8.918E+004		6.767E+004	4.010E+004
		968.97	15.80	1.611E+005		-2.433E+004	7.291E+004
	Am-241	59.54	35.90	6.958E+004	6.96E+004	2.725E+003	3.367E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 5452A

Report Generated On : 8/16/2018 3:30:51 PM

Sample Title : B109100AFSFC045GD
Sample Description : WWTF SUMP #2
Sample Identification : 045
Sample Type : GAMMA DIRECT
Sample Geometry : WWTF SUMP 2

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 4.270E+000 M^2

Sample Taken On : 8/16/2018 3:20:00 PM
Acquisition Started : 8/16/2018 3:20:49 PM

Live Time : 600.0 seconds
Real Time : 601.4 seconds

Dead Time : 0.23 %

Energy Calibration Used Done On : 3/15/2018
Efficiency Calibration Used Done On : 8/16/2018
Efficiency ID : WWTF_SUMP_2

DATA VALIDATED

DATE 9-21-18

TIME 1240

R. Massersill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 5452A
 Sample Title: B109100AFSFC045GD
 Peak Analysis Performed on: 8/16/2018 3:30:51 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	295-	308	300.96	75.24	0.71	1.12E+002	89.24	6.81E+002
2	945-	960	953.51	238.38	0.99	1.13E+002	57.71	2.40E+002
3	1169-	1190	1178.86	294.71	1.00	1.60E+002	55.17	1.58E+002
4	1398-	1412	1406.15	351.54	1.18	2.13E+002	41.96	7.89E+001
5	2030-	2049	2038.51	509.63	0.85	7.03E+001	40.74	9.77E+001
6	2322-	2336	2328.49	582.12	1.10	7.78E+001	26.37	3.32E+001
7	2423-	2441	2433.14	608.29	1.48	1.93E+002	40.13	6.18E+001
8	2634-	2650	2642.35	660.59	1.49	9.05E+001	29.09	3.85E+001
9	3430-	3443	3436.84	859.21	0.30	1.15E+001	17.77	2.45E+001
10	3631-	3648	3639.05	909.76	0.83	7.86E+001	28.59	3.84E+001
11	3865-	3878	3871.59	967.90	0.39	4.13E+001	19.26	1.87E+001
12	4466-	4481	4473.74	1118.44	0.59	6.94E+001	24.19	2.56E+001
13	4681-	4694	4687.32	1171.83	1.02	2.52E+001	16.57	1.58E+001
14	4941-	4955	4947.68	1236.92	0.30	3.38E+001	19.11	1.92E+001
15	5316-	5329	5322.82	1330.70	1.27	2.65E+001	13.13	5.48E+000
16	5822-	5850	5836.81	1459.20	1.75	5.39E+002	49.89	1.80E+001
17	7041-	7060	7051.05	1762.76	0.32	5.25E+001	19.65	1.25E+001

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC045GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	0.996	1460.82*	10.66	8.01007E+005	1.01663E+005
Co-60	0.996	1173.23*	99.85	3.47909E+003	2.30104E+003
		1332.49*	99.98	3.94713E+003	1.97978E+003
Cs-137	0.998	661.66*	85.10	1.02980E+004	3.53259E+003
Tl-208	0.998	583.19*	85.00	8.17113E+003	2.93836E+003
Pb-212	1.000	238.63*	43.60	1.27190E+004	6.80119E+003
Bi-214	0.997	609.32*	45.49	3.90008E+004	9.35890E+003
		1120.29*	14.92	6.22001E+004	2.22554E+004
		1764.49*	15.30	6.21565E+004	2.38028E+004
Pb-214	1.000	295.22*	18.42	4.89890E+004	1.86451E+004
		351.93*	35.60	3.80631E+004	9.65729E+003
Ac-228	0.560	338.32	11.27		
		911.20*	25.80	3.59104E+004	1.34431E+004
		968.97*	15.80	3.20606E+004	1.52080E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	0.996	8.010073E+005	1.016631E+005
Co-60	0.996	3.748039E+003	1.500754E+003
Cs-137	0.998	1.029804E+004	3.532585E+003
Tl-208	0.998	8.171125E+003	2.938360E+003
Pb-212	1.000	1.271902E+004	6.801185E+003
Bi-214	0.997	4.477072E+004	8.110820E+003
Pb-214	1.000	4.037420E+004	8.575279E+003
Ac-228	0.560	3.422173E+004	1.007215E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/16/2018 3:30:51 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.24	1.8630E-001	79.83		
5	509.63	1.1712E-001	57.98		
9	859.21	1.9167E-002	154.50		
14	1236.92	5.6297E-002	56.58	Sum	

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 5452A
 Sample Geometry: WWTF SUMP 2
 Sample Title: B109100AFSFC045GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	4.863E+004	4.86E+004	8.010E+005	2.230E+004
+	Co-60	1173.23*	99.85	3.361E+003	2.40E+003	3.479E+003	1.494E+003
		1332.49*	99.98	2.397E+003		3.947E+003	9.971E+002
	Nb-94	702.65	99.81	5.141E+003	5.14E+003	-2.917E+003	2.434E+003
		871.09	99.89	5.455E+003		5.062E+003	2.572E+003
	Ag-108m	433.90	90.50	5.711E+003	5.71E+003	-1.925E+003	2.746E+003
		614.30	89.80	8.174E+003		-1.710E+002	3.948E+003
		722.90	90.80	6.163E+003		2.159E+003	2.929E+003
	Cs-134	604.72	97.62	8.421E+003	6.42E+003	1.778E+004	4.084E+003
		795.86	85.46	6.420E+003		6.277E+002	3.038E+003
+	Cs-137	661.66*	85.10	4.425E+003	4.42E+003	1.030E+004	2.059E+003
	Eu-152	121.78	28.67	2.043E+004	1.87E+004	-1.129E+004	1.005E+004
		344.28	26.60	1.872E+004		-3.437E+004	9.042E+003
		1408.01	21.07	2.304E+004		-3.703E+004	1.053E+004
	Eu-154	123.07	40.40	1.455E+004	1.45E+004	-4.425E+002	7.153E+003
		723.30	20.06	2.791E+004		1.621E+004	1.326E+004
		1274.43	34.80	1.663E+004		-1.131E+003	7.750E+003
	Eu-155	86.55	30.70	2.138E+004	2.14E+004	1.950E+004	1.054E+004
		105.31	21.10	2.917E+004		-2.036E+004	1.436E+004
+	Tl-208	583.19*	85.00	3.669E+003	3.67E+003	8.171E+003	1.692E+003
	Bi-212	727.33	6.67	8.061E+004	8.06E+004	4.451E+004	3.822E+004
+	Pb-212	238.63*	43.60	1.022E+004	1.02E+004	1.272E+004	4.957E+003
+	Bi-214	609.32*	45.49	1.016E+004	1.02E+004	3.900E+004	4.805E+003
		1120.29*	14.92	2.830E+004		6.220E+004	1.294E+004
		1764.49*	15.30	2.907E+004		6.216E+004	1.293E+004
+	Pb-214	295.22*	18.42	2.556E+004	9.34E+003	4.899E+004	1.237E+004
		351.93*	35.60	9.336E+003		3.806E+004	4.426E+003
	Ra-226	186.21	3.64	1.524E+005	1.52E+005	1.314E+004	7.464E+004
+	Ac-228	338.32	11.27	4.837E+004	1.81E+004	3.380E+004	2.344E+004
		911.20*	25.80	1.809E+004		3.591E+004	8.429E+003
		968.97*	15.80	2.040E+004		3.206E+004	9.149E+003
	Am-241	59.54	35.90	1.476E+004	1.48E+004	1.990E+003	7.242E+003

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/20/2018 9:29:00 AM

Sample Title : B109100AFSWC051GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/20/2018 9:18:00 AM
Acquisition Started : 8/20/2018 9:18:58 AM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.16 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1245

R. Massengill Ryan

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSWC051GD
Peak Analysis Performed on: 8/20/2018 9:29:00 AM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	287-	308	301.21	75.43	0.62	1.04E+002	68.86	2.88E+002
2	949-	959	953.99	238.62	1.08	1.39E+001	21.01	4.01E+001
3	1400-	1415	1407.58	352.01	0.41	3.92E+001	21.03	2.38E+001
4	2429-	2442	2435.57	608.99	0.54	3.88E+001	14.58	5.22E+000
5	5836-	5854	5844.00	1461.05	1.37	7.20E+001	16.97	0.00E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC051GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	7.80724E+005	1.96110E+005
Pb-212	1.000	238.63*	43.60	1.10886E+004	1.68005E+004
Bi-214	0.461	609.32*	45.49	5.64737E+004	2.22973E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	4.98567E+004	2.77548E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	7.807244E+005	1.961096E+005
Pb-212	1.000	1.108861E+004	1.680052E+004
Bi-214	0.461	5.647366E+004	2.229728E+004
Pb-214	0.432	4.985666E+004	2.775485E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/20/2018 9:29:00 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.43	1.7276E-001	66.43		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC051GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	2.934E+004	2.93E+004	7.807E+005	0.000E+000
	Co-60	1173.23	99.85	2.302E+004	2.11E+004	-2.456E+004	1.016E+004
		1332.49	99.98	2.105E+004		4.427E+003	9.065E+003
	Nb-94	702.65	99.81	1.634E+004	1.63E+004	-5.458E+003	7.183E+003
		871.09	99.89	1.912E+004		-1.232E+004	8.435E+003
	Ag-108m	433.90	90.50	1.967E+004	1.97E+004	2.551E+003	9.049E+003
		614.30	89.80	3.171E+004		-1.892E+004	1.485E+004
		722.90	90.80	1.998E+004		-3.665E+003	8.886E+003
	Cs-134	604.72	97.62	2.849E+004	2.47E+004	3.141E+004	1.333E+004
		795.86	85.46	2.470E+004		-1.914E+004	1.111E+004
	Cs-137	661.66	85.10	2.584E+004	2.58E+004	1.516E+004	1.180E+004
	Eu-152	121.78	28.67	7.229E+004	6.39E+004	1.496E+004	3.493E+004
		344.28	26.60	6.387E+004		1.313E+004	2.967E+004
		1408.01	21.07	1.138E+005		4.470E+004	4.967E+004
	Eu-154	123.07	40.40	5.041E+004	5.04E+004	-1.947E+004	2.434E+004
		723.30	20.06	9.045E+004		-1.517E+004	4.024E+004
		1274.43	34.80	6.079E+004		-1.727E+003	2.630E+004
	Eu-155	86.55	30.70	8.042E+004	8.04E+004	2.705E+004	3.911E+004
		105.31	21.10	1.079E+005		1.104E+005	5.236E+004
	Tl-208	583.19	85.00	2.318E+004	2.32E+004	5.972E+003	1.057E+004
	Bi-212	727.33	6.67	2.890E+005	2.89E+005	1.948E+005	1.295E+005
+	Pb-212	238.63*	43.60	2.784E+004	2.78E+004	1.109E+004	1.284E+004
+	Bi-214	609.32*	45.49	2.212E+004	2.21E+004	5.647E+004	9.089E+003
		1120.29	14.92	1.692E+005		1.123E+005	7.576E+004
		1764.49	15.30	1.636E+005		3.403E+004	7.003E+004
+	Pb-214	295.22	18.42	1.241E+005	3.88E+004	1.264E+005	5.910E+004
		351.93*	35.60	3.877E+004		4.986E+004	1.766E+004
	Ra-226	186.21	3.64	5.029E+005	5.03E+005	2.185E+005	2.404E+005
	Ac-228	338.32	11.27	1.524E+005	1.06E+005	1.854E+004	7.094E+004
		911.20	25.80	1.064E+005		1.072E+005	4.874E+004
		968.97	15.80	1.585E+005		-7.233E+004	7.163E+004
	Am-241	59.54	35.90	7.156E+004	7.16E+004	4.978E+004	3.466E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/18/2018 2:51:08 PM

Sample Title : B109100AFSWC052GD
Sample Description : WWTF WALL
Sample Identification : 052
Sample Type : GAMMA DIRECT
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : ^{7.83}~~2.826E+001~~ M²
pm 8/27/18
Sample Taken On : 8/18/2018 2:40:00 PM
Acquisition Started : 8/18/2018 2:41:07 PM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.14 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1250

R. Massengill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSWC052GD
 Peak Analysis Performed on: 8/18/2018 2:51:08 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	306	300.61	75.28	0.39	4.62E+001	43.24	1.76E+002
2	335-	354	339.20	84.92	0.45	5.27E+001	54.02	1.92E+002
3	948-	959	953.90	238.59	0.54	2.56E+001	18.92	2.54E+001
4	1401-	1414	1407.98	352.11	0.73	4.60E+001	17.13	1.00E+001
5	2035-	2050	2042.65	510.76	0.56	3.69E+001	14.90	6.09E+000
6	2431-	2443	2436.71	609.27	0.73	3.58E+001	16.15	1.12E+001
7	2641-	2652	2646.05	661.61	1.09	2.03E+001	12.67	7.69E+000
8	5834-	5853	5844.17	1461.09	0.63	7.70E+001	19.44	5.00E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC052GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M^2)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	8.36141E+005	2.23260E+005
Cs-137	1.000	661.66*	85.10	1.67432E+004	1.06320E+004
Eu-155	0.346	86.55*	30.70	4.33398E+004	4.52291E+004
		105.31	21.10		
Pb-212	1.000	238.63*	43.60	2.03636E+004	1.54230E+004
Bi-214	0.461	609.32*	45.49	5.22466E+004	2.43820E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	5.85438E+004	2.35026E+004
		351.93*	35.60		

*Ac-228
wt 270*

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	8.361414E+005	2.232597E+005
Cs-137	1.000	1.674319E+004	1.063196E+004
Eu-155	0.346	4.333979E+004	4.522906E+004
Pb-212	1.000	2.036355E+004	1.542297E+004
Bi-214	0.461	5.224662E+004	2.438196E+004
Pb-214	0.432	5.854381E+004	2.350256E+004

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/18/2018 2:51:08 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.28	7.6948E-002	93.65		
5	510.76	6.1521E-002	40.36		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWTF1.27CM
 Sample Title: B109100AFSWC052GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.788E+005	1.79E+005	8.361E+005	7.473E+004
	Co-60	1173.23	99.85	2.784E+004	2.11E+004	7.029E+003	1.256E+004
		1332.49	99.98	2.108E+004		-2.435E+003	9.078E+003
	Nb-94	702.65	99.81	2.232E+004	1.39E+004	7.653E+003	1.017E+004
		871.09	99.89	1.388E+004		-3.957E+003	5.814E+003
	Ag-108m	433.90	90.50	1.866E+004	1.87E+004	1.316E+004	8.543E+003
		614.30	89.80	3.114E+004		-6.758E+003	1.457E+004
		722.90	90.80	2.264E+004		1.284E+004	1.022E+004
	Cs-134	604.72	97.62	2.908E+004	2.07E+004	-1.654E+004	1.363E+004
		795.86	85.46	2.066E+004		3.911E+003	9.083E+003
+	Cs-137	661.66*	85.10	1.430E+004	1.43E+004	1.674E+004	6.032E+003
	Eu-152	121.78	28.67	7.126E+004	6.19E+004	8.370E+004	3.441E+004
		344.28	26.60	6.188E+004		-8.719E+004	2.867E+004
		1408.01	21.07	8.907E+004		4.811E+004	3.730E+004
	Eu-154	123.07	40.40	4.892E+004	4.89E+004	-2.605E+004	2.359E+004
		723.30	20.06	1.025E+005		5.816E+004	4.626E+004
		1274.43	34.80	5.896E+004		1.595E+004	2.538E+004
+	Eu-155	86.55*	30.70	7.256E+004	7.26E+004	4.334E+004	3.517E+004
		105.31	21.10	1.022E+005		1.176E+005	4.951E+004
	Tl-208	583.19	85.00	2.674E+004	2.67E+004	7.983E+003	1.235E+004
	Bi-212	727.33	6.67	2.842E+005	2.84E+005	4.876E+004	1.270E+005
+	Pb-212	238.63*	43.60	2.310E+004	2.31E+004	2.036E+004	1.047E+004
+	Bi-214	609.32*	45.49	2.997E+004	3.00E+004	5.225E+004	1.301E+004
		1120.29	14.92	1.866E+005		1.572E+005	8.449E+004
		1764.49	15.30	1.516E+005		8.702E+004	6.402E+004
+	Pb-214	295.22	18.42	1.023E+005	2.54E+004	1.985E+004	4.823E+004
		351.93*	35.60	2.536E+004		5.854E+004	1.096E+004
	Ra-226	186.21	3.64	5.169E+005	5.17E+005	7.765E+004	2.474E+005
	Ac-228	338.32	11.27	1.671E+005	8.62E+004	2.541E+004	7.824E+004
		911.20	25.80	8.615E+004		5.537E+004	3.859E+004
		968.97	15.80	1.488E+005		6.030E+004	6.678E+004
	Am-241	59.54	35.90	6.914E+004	6.91E+004	-3.320E+004	3.344E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/20/2018 9:53:36 AM

Sample Title : B109100AFSWC053GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/20/2018 9:43:00 AM
Acquisition Started : 8/20/2018 9:43:34 AM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.14 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED
DATE 9-2-18
TIME 1255
R. Massengill / RZnd

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSWC053GD
Peak Analysis Performed on: 8/20/2018 9:53:36 AM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	181-	190	185.77	46.57	0.44	9.07E+000	24.88	6.39E+001
2	296-	307	300.74	75.31	0.47	1.48E+001	46.65	2.09E+002
3	949-	972	954.49	238.74	0.87	5.14E+001	31.10	4.76E+001
4	1401-	1413	1406.56	351.75	0.59	2.72E+001	16.32	1.48E+001
5	2430-	2443	2436.17	609.14	0.34	3.84E+001	15.75	8.63E+000
6	5837-	5853	5845.23	1461.36	1.27	6.58E+001	17.78	4.17E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC053GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	7.13916E+005	2.02508E+005
Pb-212	1.000	238.63*	43.60	4.08545E+004	2.56055E+004
Bi-214	0.461	609.32*	45.49	5.58916E+004	2.39093E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	3.45752E+004	2.13738E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	7.139164E+005	2.025076E+005
Pb-212	1.000	4.085450E+004	2.560549E+004
Bi-214	0.461	5.589157E+004	2.390935E+004
Pb-214	0.432	3.457524E+004	2.137376E+004

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/20/2018 9:53:36 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	46.57	1.5120E-002	274.28		
2	75.31	2.4702E-002	314.76		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC053GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.588E+005	1.59E+005	7.139E+005	6.474E+004
	Co-60	1173.23	99.85	2.506E+004	1.80E+004	4.354E+002	1.117E+004
		1332.49	99.98	1.801E+004		-1.630E+004	7.543E+003
	Nb-94	702.65	99.81	1.785E+004	1.79E+004	-8.328E+003	7.942E+003
		871.09	99.89	1.821E+004		-2.470E+004	7.979E+003
	Ag-108m	433.90	90.50	2.026E+004	2.03E+004	-6.233E+003	9.345E+003
		614.30	89.80	2.963E+004		-2.528E+004	1.381E+004
		722.90	90.80	2.038E+004		2.656E+001	9.086E+003
	Cs-134	604.72	97.62	2.793E+004	2.39E+004	-1.176E+004	1.305E+004
		795.86	85.46	2.386E+004		4.043E+003	1.069E+004
	Cs-137	661.66	85.10	3.165E+004	3.16E+004	6.585E+003	1.471E+004
	Eu-152	121.78	28.67	7.166E+004	6.78E+004	4.389E+004	3.462E+004
		344.28	26.60	6.783E+004		4.414E+004	3.165E+004
		1408.01	21.07	1.005E+005		2.713E+004	4.302E+004
	Eu-154	123.07	40.40	5.104E+004	5.10E+004	2.131E+004	2.466E+004
		723.30	20.06	9.226E+004		1.964E+003	4.114E+004
		1274.43	34.80	6.079E+004		-5.418E+004	2.630E+004
	Eu-155	86.55	30.70	7.800E+004	7.80E+004	2.295E+004	3.790E+004
		105.31	21.10	1.010E+005		-1.085E+005	4.889E+004
	Tl-208	583.19	85.00	2.645E+004	2.65E+004	1.259E+004	1.220E+004
	Bi-212	727.33	6.67	2.674E+005	2.67E+005	-1.463E+005	1.186E+005
+	Pb-212	238.63*	43.60	3.827E+004	3.83E+004	4.085E+004	1.806E+004
+	Bi-214	609.32*	45.49	2.726E+004	2.73E+004	5.589E+004	1.166E+004
		1120.29	14.92	1.943E+005		2.215E+005	8.836E+004
		1764.49	15.30	1.801E+005		7.154E+004	7.829E+004
+	Pb-214	295.22	18.42	1.069E+005	2.97E+004	4.154E+004	5.049E+004
		351.93*	35.60	2.967E+004		3.458E+004	1.312E+004
	Ra-226	186.21	3.64	4.798E+005	4.80E+005	-1.167E+005	2.288E+005
	Ac-228	338.32	11.27	1.453E+005	7.06E+004	-8.447E+003	6.736E+004
		911.20	25.80	7.062E+004		8.178E+003	3.083E+004
		968.97	15.80	1.433E+005		-1.218E+004	6.407E+004
	Am-241	59.54	35.90	6.937E+004	6.94E+004	3.926E+004	3.356E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/20/2018 10:18:37 AM

Sample Title : B109100AFSWC054GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/20/2018 10:08:00 AM
Acquisition Started : 8/20/2018 10:08:35 AM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.15 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1300

R. Massengill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSWC054GD
 Peak Analysis Performed on: 8/20/2018 10:18:36 AM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	305	300.99	75.37	1.32	6.81E+001	38.71	1.35E+002
2	950-	959	954.85	238.83	0.42	1.84E+001	19.21	3.26E+001
3	1402-	1415	1407.79	352.06	0.32	2.43E+001	18.65	2.17E+001
4	2430-	2442	2435.95	609.08	1.24	2.53E+001	14.28	9.75E+000
5	5835-	5851	5842.58	1460.70	0.33	6.07E+001	17.27	4.31E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC054GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	6.57992E+005	1.95796E+005
Pb-212	1.000	238.63*	43.60	1.46109E+004	1.54661E+004
Bi-214	0.461	609.32*	45.49	3.67758E+004	2.12696E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	3.09111E+004	2.41594E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	6.579920E+005	1.957961E+005
Pb-212	1.000	1.461085E+004	1.546610E+004
Bi-214	0.461	3.677585E+004	2.126962E+004
Pb-214	0.432	3.091114E+004	2.415936E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/20/2018 10:18:36 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.37	1.1344E-001	56.88		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC054GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.623E+005	1.62E+005	6.580E+005	6.650E+004
	Co-60	1173.23	99.85	2.355E+004	2.03E+004	-2.917E+003	1.042E+004
		1332.49	99.98	2.034E+004		5.133E+003	8.709E+003
	Nb-94	702.65	99.81	1.989E+004	1.99E+004	-2.632E+003	8.959E+003
		871.09	99.89	2.040E+004		-4.575E+003	9.077E+003
	Ag-108m	433.90	90.50	1.905E+004	1.91E+004	-1.920E+004	8.742E+003
		614.30	89.80	2.897E+004		-2.412E+003	1.348E+004
		722.90	90.80	1.998E+004		1.792E+004	8.886E+003
	Cs-134	604.72	97.62	2.617E+004	2.01E+004	1.149E+004	1.217E+004
		795.86	85.46	2.011E+004		8.595E+003	8.814E+003
	Cs-137	661.66	85.10	2.675E+004	2.68E+004	1.808E+004	1.226E+004
	Eu-152	121.78	28.67	7.090E+004	6.74E+004	4.642E+004	3.424E+004
		344.28	26.60	6.735E+004		-1.338E+004	3.141E+004
		1408.01	21.07	1.005E+005		-1.957E+004	4.302E+004
	Eu-154	123.07	40.40	4.996E+004	5.00E+004	-6.735E+003	2.412E+004
		723.30	20.06	9.045E+004		8.113E+004	4.024E+004
		1274.43	34.80	6.783E+004		4.449E+003	2.983E+004
	Eu-155	86.55	30.70	8.268E+004	8.27E+004	8.015E+004	4.024E+004
		105.31	21.10	9.911E+004		3.891E+004	4.795E+004
	Tl-208	583.19	85.00	2.289E+004	2.29E+004	-2.460E+003	1.042E+004
	Bi-212	727.33	6.67	2.498E+005	2.50E+005	-1.538E+005	1.098E+005
+	Pb-212	238.63*	43.60	2.466E+004	2.47E+004	1.461E+004	1.125E+004
+	Bi-214	609.32*	45.49	2.826E+004	2.83E+004	3.678E+004	1.216E+004
		1120.29	14.92	1.565E+005		8.615E+004	6.944E+004
		1764.49	15.30	1.950E+005		8.822E+004	8.577E+004
+	Pb-214	295.22	18.42	1.079E+005	3.65E+004	-9.575E+003	5.099E+004
		351.93*	35.60	3.655E+004		3.091E+004	1.655E+004
	Ra-226	186.21	3.64	5.044E+005	5.04E+005	-2.451E+004	2.411E+005
	Ac-228	338.32	11.27	1.720E+005	9.48E+004	6.450E+004	8.073E+004
		911.20	25.80	9.478E+004		2.981E+004	4.291E+004
		968.97	15.80	1.486E+005		1.095E+005	6.668E+004
	Am-241	59.54	35.90	7.389E+004	7.39E+004	-3.211E+004	3.582E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/20/2018 8:58:44 AM

Sample Title : B109100AFSWC055GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M^2

Sample Taken On : 8/20/2018 8:48:00 AM
Acquisition Started : 8/20/2018 8:48:42 AM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.15 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWTF1,27CM

DATA VALIDATED
DATE 9-2-18
TIME 1305
R. Massengill

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSWC055GD
Peak Analysis Performed on: 8/20/2018 8:58:44 AM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	295-	306	301.28	75.45	0.48	6.90E+001	49.01	2.12E+002
2	1399-	1413	1406.24	351.67	1.01	4.69E+001	19.07	1.51E+001
3	2428-	2440	2434.65	608.76	0.38	3.25E+001	14.11	6.47E+000
4	2638-	2649	2644.00	661.09	0.64	1.18E+001	11.04	7.18E+000
5	5835-	5853	5843.07	1460.82	0.74	5.83E+001	17.44	5.70E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC055GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M^2)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	6.32146E+005	1.96914E+005
Cs-137	0.999	661.66*	85.10	9.72068E+003	9.15335E+003
Bi-214	0.460	609.32*	45.49	4.73649E+004	2.13164E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	5.95492E+004	2.58083E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	6.321458E+005	1.969140E+005
Cs-137	0.999	9.720676E+003	9.153352E+003
Bi-214	0.460	4.736491E+004	2.131641E+004
Pb-214	0.432	5.954919E+004	2.580826E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/20/2018 8:58:44 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.45	1.1503E-001	71.01		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC055GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M^2)	Nuclide MDA (pCi/M^2)	Activity (pCi/M^2)	Dec. Level (pCi/M^2)
+	K-40	1460.82*	10.66	1.796E+005	1.80E+005	6.321E+005	7.514E+004
	Co-60	1173.23	99.85	3.431E+004	2.65E+004	3.156E+004	1.580E+004
		1332.49	99.98	2.651E+004		2.378E+004	1.179E+004
	Nb-94	702.65	99.81	2.082E+004	1.72E+004	-8.745E+002	9.427E+003
		871.09	99.89	1.724E+004		-1.619E+004	7.495E+003
	Ag-108m	433.90	90.50	2.281E+004	2.19E+004	9.679E+003	1.062E+004
		614.30	89.80	3.171E+004		-1.359E+004	1.485E+004
		722.90	90.80	2.189E+004		6.033E+003	9.845E+003
	Cs-134	604.72	97.62	2.657E+004	1.85E+004	-1.182E+003	1.237E+004
		795.86	85.46	1.848E+004		-1.241E+004	7.999E+003
+	Cs-137	661.66*	85.10	1.391E+004	1.39E+004	9.721E+003	5.841E+003
	Eu-152	121.78	28.67	7.116E+004	6.97E+004	-1.861E+004	3.437E+004
		344.28	26.60	6.972E+004		-3.355E+004	3.260E+004
		1408.01	21.07	9.298E+004		-3.069E+004	3.927E+004
	Eu-154	123.07	40.40	5.113E+004	5.11E+004	-2.909E+004	2.470E+004
		723.30	20.06	1.008E+005		5.439E+004	4.539E+004
		1274.43	34.80	6.783E+004		5.439E+004	2.983E+004
	Eu-155	86.55	30.70	8.426E+004	8.43E+004	9.170E+003	4.103E+004
		105.31	21.10	1.015E+005		5.498E+004	4.913E+004
	Tl-208	583.19	85.00	2.670E+004	2.67E+004	2.181E+004	1.233E+004
	Bi-212	727.33	6.67	3.230E+005	3.23E+005	1.043E+004	1.465E+005
	Pb-212	238.63	43.60	4.792E+004	4.79E+004	4.454E+004	2.288E+004
+	Bi-214	609.32*	45.49	2.383E+004	2.38E+004	4.736E+004	9.943E+003
		1120.29	14.92	1.891E+005		1.207E+005	8.572E+004
		1764.49	15.30	1.902E+005		1.477E+005	8.335E+004
+	Pb-214	295.22	18.42	1.017E+005	3.12E+004	1.302E+004	4.790E+004
		351.93*	35.60	3.116E+004		5.955E+004	1.386E+004
	Ra-226	186.21	3.64	5.542E+005	5.54E+005	3.451E+005	2.660E+005
	Ac-228	338.32	11.27	1.751E+005	1.14E+005	8.006E+004	8.225E+004
		911.20	25.80	1.135E+005		3.691E+004	5.227E+004
		968.97	15.80	1.536E+005		7.729E+004	6.920E+004
	Am-241	59.54	35.90	7.574E+004	7.57E+004	-9.334E+002	3.675E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/20/2018 9:15:01 AM

Sample Title : B109100AFSWC056GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/20/2018 9:04:00 AM
Acquisition Started : 8/20/2018 9:04:59 AM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.15 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1310

R. Massengill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSWC056GD
 Peak Analysis Performed on: 8/20/2018 9:15:01 AM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	295-	305	300.29	75.20	0.69	2.29E+001	47.53	2.26E+002
2	948-	961	954.32	238.70	0.60	3.04E+001	22.88	3.56E+001
3	1400-	1415	1407.83	352.07	0.47	5.54E+001	20.21	1.56E+001
4	2430-	2443	2436.80	609.30	0.85	3.27E+001	17.10	1.43E+001
5	5836-	5853	5844.03	1461.06	0.62	7.20E+001	19.06	6.01E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC056GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	7.80623E+005	2.17518E+005
Pb-212	1.000	238.63*	43.60	2.41628E+004	1.86147E+004
Bi-214	0.461	609.32*	45.49	4.76253E+004	2.55636E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	7.03866E+004	2.77669E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	7.806227E+005	2.175179E+005
Pb-212	1.000	2.416279E+004	1.861469E+004
Bi-214	0.461	4.762533E+004	2.556360E+004
Pb-214	0.432	7.038665E+004	2.776691E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/20/2018 9:15:01 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.20	3.8199E-002	207.37		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC056GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.842E+005	1.84E+005	7.806E+005	7.742E+004
	Co-60	1173.23	99.85	2.248E+004	2.03E+004	1.803E+004	9.885E+003
		1332.49	99.98	2.034E+004		6.574E+003	8.709E+003
	Nb-94	702.65	99.81	1.821E+004	1.82E+004	-1.819E+003	8.120E+003
		871.09	99.89	1.999E+004		7.645E+003	8.868E+003
	Ag-108m	433.90	90.50	2.065E+004	2.06E+004	6.448E+003	9.538E+003
		614.30	89.80	3.191E+004		9.416E+003	1.495E+004
		722.90	90.80	2.189E+004		4.962E+003	9.845E+003
	Cs-134	604.72	97.62	2.868E+004	2.16E+004	-5.215E+003	1.343E+004
		795.86	85.46	2.161E+004		-7.926E+002	9.560E+003
	Cs-137	661.66	85.10	2.584E+004	2.58E+004	-2.026E+004	1.180E+004
	Eu-152	121.78	28.67	7.242E+004	6.64E+004	-3.476E+003	3.499E+004
		344.28	26.60	6.638E+004		2.053E+004	3.092E+004
		1408.01	21.07	9.298E+004		2.255E+004	3.927E+004
	Eu-154	123.07	40.40	5.005E+004	5.00E+004	3.984E+003	2.416E+004
		723.30	20.06	9.746E+004		-1.844E+003	4.374E+004
		1274.43	34.80	6.263E+004		-7.152E+003	2.723E+004
	Eu-155	86.55	30.70	7.540E+004	7.54E+004	-2.879E+003	3.660E+004
		105.31	21.10	1.002E+005		3.119E+004	4.850E+004
	Tl-208	583.19	85.00	2.347E+004	2.35E+004	-8.184E+002	1.071E+004
	Bi-212	727.33	6.67	2.890E+005	2.89E+005	4.418E+004	1.295E+005
+	Pb-212	238.63*	43.60	2.839E+004	2.84E+004	2.416E+004	1.312E+004
+	Bi-214	609.32*	45.49	3.442E+004	3.44E+004	4.763E+004	1.524E+004
		1120.29	14.92	1.532E+005		-1.694E+004	6.777E+004
		1764.49	15.30	1.852E+005		1.390E+005	8.086E+004
+	Pb-214	295.22	18.42	1.084E+005	3.20E+004	9.175E+004	5.124E+004
		351.93*	35.60	3.203E+004		7.039E+004	1.430E+004
	Ra-226	186.21	3.64	5.249E+005	5.25E+005	9.128E+004	2.514E+005
	Ac-228	338.32	11.27	1.501E+005	9.34E+004	1.256E+004	6.976E+004
		911.20	25.80	9.339E+004		3.031E+004	4.221E+004
		968.97	15.80	1.561E+005		1.630E+005	7.042E+004
	Am-241	59.54	35.90	7.124E+004	7.12E+004	3.717E+004	3.449E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/22/2018 8:43:04 AM

Sample Title : B109100AFSWC057GD
Sample Description : WWTF WALL
Sample Identification : 057
Sample Type : GAMMA DIRECT
Sample Geometry : 3M90DWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : ~~2.826E+001~~ ^{2.83} M²
Rem 8/27/18

Sample Taken On : 8/22/2018 8:33:00 AM
Acquisition Started : 8/22/2018 8:33:03 AM

Live Time : 600.0 seconds
Real Time : 600.5 seconds

Dead Time : 0.08 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1315

R. Massengill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSWC057GD
 Peak Analysis Performed on: 8/22/2018 8:43:04 AM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	269-	276	272.33	68.21	0.47	2.48E+001	25.50	6.82E+001
2	295-	306	300.39	75.22	0.32	1.18E+001	46.57	2.11E+002
3	950-	961	955.51	238.99	0.53	2.50E+001	20.71	3.20E+001
4	1402-	1414	1407.52	351.99	0.79	3.66E+001	17.11	1.34E+001
5	2430-	2444	2437.46	609.46	0.80	3.58E+001	16.50	1.13E+001
6	5839-	5855	5846.71	1461.73	1.22	6.21E+001	18.56	7.86E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC057GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	0.999	1460.82*	10.66	6.75025E+005	2.09958E+005
Pb-212	1.000	238.63*	43.60	1.99258E+004	1.68244E+004
Bi-214	0.461	609.32*	45.49	5.21643E+004	2.48856E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	4.65496E+004	2.28678E+004
		351.93*	35.60		
Am-241	0.887	59.54*	35.90	1.92372E+004	2.01873E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	0.999	6.750250E+005	2.099583E+005
Pb-212	1.000	1.992577E+004	1.682444E+004
Bi-214	0.461	5.216428E+004	2.488556E+004
Pb-214	0.432	4.654955E+004	2.286782E+004
Am-241	0.887	1.923720E+004	2.018728E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/22/2018 8:43:04 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
2	75.22	1.9623E-002	395.53		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWTF1.27CM
 Sample Title: B109100AFSWC057GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	2.044E+005	2.04E+005	6.750E+005	8.750E+004
	Co-60	1173.23	99.85	2.138E+004	1.63E+004	6.864E+003	9.332E+003
		1332.49	99.98	1.625E+004		-1.461E+004	6.661E+003
	Nb-94	702.65	99.81	1.926E+004	1.93E+004	9.657E+003	8.646E+003
		871.09	99.89	2.124E+004		-5.467E+003	9.494E+003
	Ag-108m	433.90	90.50	1.709E+004	1.71E+004	1.280E+003	7.760E+003
		614.30	89.80	2.879E+004		-2.455E+004	1.339E+004
		722.90	90.80	2.229E+004		1.203E+004	1.004E+004
	Cs-134	604.72	97.62	2.872E+004	2.43E+004	6.282E+003	1.344E+004
		795.86	85.46	2.432E+004		-1.237E+004	1.092E+004
	Cs-137	661.66	85.10	2.179E+004	2.18E+004	-6.341E+002	9.778E+003
	Eu-152	121.78	28.67	6.653E+004	6.24E+004	4.086E+004	3.205E+004
		344.28	26.60	6.241E+004		-4.594E+004	2.893E+004
		1408.01	21.07	8.026E+004		-3.360E+004	3.290E+004
	Eu-154	123.07	40.40	4.691E+004	4.69E+004	5.288E+003	2.259E+004
		723.30	20.06	1.009E+005		3.089E+004	4.546E+004
		1274.43	34.80	5.896E+004		1.199E+004	2.538E+004
	Eu-155	86.55	30.70	7.745E+004	7.74E+004	3.925E+004	3.762E+004
		105.31	21.10	9.715E+004		1.846E+003	4.697E+004
	Tl-208	583.19	85.00	2.518E+004	2.52E+004	3.610E+003	1.156E+004
	Bi-212	727.33	6.67	3.456E+005	3.46E+005	1.919E+005	1.577E+005
+	Pb-212	238.63*	43.60	2.595E+004	2.59E+004	1.993E+004	1.190E+004
+	Bi-214	609.32*	45.49	3.125E+004	3.13E+004	5.216E+004	1.365E+004
		1120.29	14.92	1.893E+005		1.093E+005	8.584E+004
		1764.49	15.30	1.750E+005		5.998E+004	7.575E+004
+	Pb-214	295.22	18.42	1.090E+005	2.88E+004	5.764E+004	5.156E+004
		351.93*	35.60	2.879E+004		4.655E+004	1.267E+004
	Ra-226	186.21	3.64	4.898E+005	4.90E+005	9.865E+004	2.338E+005
	Ac-228	338.32	11.27	1.639E+005	9.35E+004	1.083E+005	7.664E+004
		911.20	25.80	9.352E+004		2.599E+004	4.227E+004
		968.97	15.80	1.408E+005		-2.374E+004	6.281E+004
+	Am-241	59.54*	35.90	3.211E+004	3.21E+004	1.924E+004	1.500E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/22/2018 8:28:15 AM

Sample Title : B109100AFSWC058GD
Sample Description : WWTF WALL
Sample Identification : 058
Sample Type : GAMMA DIRECT
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : ^{2.83}~~2.826~~E+001 M²

Sample Taken On : 8/22/2018 8:18:00 AM
Acquisition Started : 8/22/2018 8:18:14 AM
Rn 8/27/18

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.14 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1320

R. Massengill

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSWC058GD
Peak Analysis Performed on: 8/22/2018 8:28:15 AM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	183-	190	186.40	46.73	0.32	9.24E+000	20.12	4.48E+001
2	287-	306	300.71	75.30	0.43	1.16E+002	62.16	2.43E+002
3	345-	354	349.64	87.54	0.49	4.11E+000	31.68	1.09E+002
4	1075-	1085	1079.99	270.11	0.57	8.45E+000	12.47	1.25E+001
5	1402-	1415	1408.24	352.17	0.95	3.05E+001	17.76	1.75E+001
6	2641-	2652	2646.75	661.78	0.67	1.60E+001	11.23	6.02E+000
7	5838-	5853	5845.95	1461.54	0.80	6.10E+001	17.11	3.98E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC058GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	0.999	1460.82*	10.66	6.62714E+005	1.94576E+005
Cs-137	1.000	661.66*	85.10	1.31718E+004	9.39583E+003
Eu-155	0.348	86.55*	30.70	3.33332E+003	2.56860E+004
		105.31	21.10		
Pb-214	0.432	295.22	18.42		
		351.93*	35.60	3.88373E+004	2.33449E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

-Ac 228

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	0.999	6.627144E+005	1.945762E+005
Cs-137	1.000	1.317183E+004	9.395834E+003
Eu-155	0.348	3.333324E+003	2.568595E+004
Pb-214	0.432	3.883728E+004	2.334495E+004

← AC-220 RTD

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/22/2018 8:28:15 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	46.73	1.5401E-002	217.69		
2	75.30	1.9405E-001	53.39		
4	270.11	1.4087E-002	147.56		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC058GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M^2)	Nuclide MDA (pCi/M^2)	Activity (pCi/M^2)	Dec. Level (pCi/M^2)
+	K-40	1460.82*	10.66	1.542E+005	1.54E+005	6.627E+005	6.240E+004
	Co-60	1173.23	99.85	2.079E+004	2.08E+004	5.834E+003	9.036E+003
		1332.49	99.98	2.307E+004		1.116E+004	1.007E+004
	Nb-94	702.65	99.81	1.824E+004	1.82E+004	1.822E+003	8.132E+003
		871.09	99.89	1.915E+004		4.384E+003	8.447E+003
	Ag-108m	433.90	90.50	1.949E+004	1.87E+004	-1.539E+004	8.960E+003
		614.30	89.80	2.415E+004		2.783E+004	1.107E+004
		722.90	90.80	1.875E+004		-3.219E+002	8.270E+003
	Cs-134	604.72	97.62	2.363E+004	2.26E+004	1.821E+004	1.090E+004
		795.86	85.46	2.257E+004		-1.235E+004	1.004E+004
+	Cs-137	661.66*	85.10	1.294E+004	1.29E+004	1.317E+004	5.352E+003
	Eu-152	121.78	28.67	6.501E+004	6.50E+004	-2.239E+004	3.129E+004
		344.28	26.60	6.696E+004		3.182E+004	3.121E+004
		1408.01	21.07	9.695E+004		5.880E+004	4.124E+004
	Eu-154	123.07	40.40	4.691E+004	4.69E+004	2.081E+004	2.259E+004
		723.30	20.06	8.489E+004		-2.381E+003	3.745E+004
		1274.43	34.80	6.087E+004		2.070E+004	2.634E+004
+	Eu-155	86.55*	30.70	4.408E+004	4.41E+004	3.333E+003	2.095E+004
		105.31	21.10	9.484E+004		-3.108E+004	4.581E+004
	Tl-208	583.19	85.00	2.436E+004	2.44E+004	2.066E+004	1.115E+004
	Bi-212	727.33	6.67	2.842E+005	2.84E+005	1.902E+005	1.270E+005
	Pb-212	238.63	43.60	4.738E+004	4.74E+004	4.481E+004	2.261E+004
	Bi-214	609.32	45.49	4.948E+004	4.95E+004	2.911E+004	2.277E+004
		1120.29	14.92	1.782E+005		1.321E+005	8.030E+004
		1764.49	15.30	1.307E+005		-2.175E+003	5.356E+004
+	Pb-214	295.22	18.42	1.034E+005	3.26E+004	6.721E+004	4.876E+004
		351.93*	35.60	3.257E+004		3.884E+004	1.456E+004
	Ra-226	186.21	3.64	4.660E+005	4.66E+005	1.582E+005	2.219E+005
	Ac-228	338.32	11.27	1.467E+005	9.07E+004	-3.056E+004	6.806E+004
		911.20	25.80	9.065E+004		7.482E+004	4.084E+004
		968.97	15.80	1.200E+005		6.157E+003	5.238E+004
	Am-241	59.54	35.90	6.616E+004	6.62E+004	-2.663E+004	3.196E+004

+ = Nuclide identified during the nuclide identification
 * = Energy line found in the spectrum
 > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
 @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/21/2018 2:26:55 PM

Sample Title : B109100AFSWC059GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M^2

Sample Taken On : 8/21/2018 2:16:00 PM
Acquisition Started : 8/21/2018 2:16:53 PM

Live Time : 600.0 seconds
Real Time : 600.8 seconds

Dead Time : 0.14 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED
DATE 9-2-18
TIME 1325
R. Massengill

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSWC059GD
Peak Analysis Performed on: 8/21/2018 2:26:55 PM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	310	300.25	75.19	0.63	1.01E+002	47.94	1.62E+002
2	1176-	1187	1180.84	295.32	0.59	2.22E+001	17.77	2.08E+001
3	1400-	1411	1405.40	351.46	0.73	2.09E+001	15.49	1.51E+001
4	2429-	2441	2435.27	608.92	1.14	2.84E+001	11.44	1.63E+000
5	5833-	5851	5842.38	1460.65	0.75	7.00E+001	16.73	0.00E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC059GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	7.58882E+005	1.93006E+005
Bi-214	0.461	609.32*	45.49	4.13196E+004	1.73894E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	1.000	295.22*	18.42	4.82387E+004	3.93515E+004
		351.93*	35.60	2.65587E+004	2.00610E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	7.588816E+005	1.930058E+005
Bi-214	0.461	4.131964E+004	1.738939E+004
Pb-214	1.000	3.103081E+004	1.787257E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/21/2018 2:26:55 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.19	1.6869E-001	47.36		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC059GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M^2)	Nuclide MDA (pCi/M^2)	Activity (pCi/M^2)	Dec. Level (pCi/M^2)
+	K-40	1460.82*	10.66	2.934E+004	2.93E+004	7.589E+005	0.000E+000
	Co-60	1173.23	99.85	2.248E+004	2.17E+004	1.039E+004	9.885E+003
		1332.49	99.98	2.174E+004		6.311E+003	9.407E+003
	Nb-94	702.65	99.81	1.924E+004	1.92E+004	-1.845E+004	8.633E+003
		871.09	99.89	2.199E+004		-1.248E+003	9.868E+003
	Ag-108m	433.90	90.50	1.863E+004	1.86E+004	-1.087E+004	8.531E+003
		614.30	89.80	2.593E+004		-3.349E+004	1.196E+004
		722.90	90.80	1.998E+004		1.786E+003	8.886E+003
	Cs-134	604.72	97.62	2.360E+004	1.90E+004	2.688E+004	1.089E+004
		795.86	85.46	1.905E+004		7.290E+003	8.279E+003
	Cs-137	661.66	85.10	2.456E+004	2.46E+004	1.236E+004	1.117E+004
	Eu-152	121.78	28.67	6.724E+004	5.68E+004	-4.031E+004	3.241E+004
		344.28	26.60	5.680E+004		-1.721E+004	2.613E+004
		1408.01	21.07	8.469E+004		4.270E+004	3.512E+004
	Eu-154	123.07	40.40	4.714E+004	4.71E+004	-2.293E+004	2.270E+004
		723.30	20.06	9.226E+004		1.387E+004	4.114E+004
		1274.43	34.80	7.261E+004		3.738E+004	3.222E+004
	Eu-155	86.55	30.70	7.922E+004	7.92E+004	2.902E+004	3.851E+004
		105.31	21.10	9.251E+004		-1.960E+004	4.465E+004
	Tl-208	583.19	85.00	2.318E+004	2.32E+004	7.307E+003	1.057E+004
	Bi-212	727.33	6.67	3.230E+005	3.23E+005	-1.404E+005	1.465E+005
	Pb-212	238.63	43.60	4.450E+004	4.45E+004	2.422E+003	2.117E+004
+	Bi-214	609.32*	45.49	1.395E+004	1.40E+004	4.132E+004	5.006E+003
		1120.29	14.92	1.864E+005		2.019E+005	8.437E+004
		1764.49	15.30	1.902E+005		7.667E+004	8.335E+004
+	Pb-214	295.22*	18.42	5.969E+004	2.95E+004	4.824E+004	2.691E+004
		351.93*	35.60	2.954E+004		2.656E+004	1.305E+004
	Ra-226	186.21	3.64	5.073E+005	5.07E+005	3.590E+005	2.426E+005
	Ac-228	338.32	11.27	1.513E+005	9.62E+004	9.150E+004	7.035E+004
		911.20	25.80	9.615E+004		-6.473E+004	4.360E+004
		968.97	15.80	1.379E+005		1.237E+005	6.134E+004
	Am-241	59.54	35.90	6.848E+004	6.85E+004	-2.841E+004	3.312E+004

+ = Nuclide identified during the nuclide identification
 * = Energy line found in the spectrum
 > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
 @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/21/2018 2:40:07 PM

Sample Title : B109100AFSWC060GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M^2

Sample Taken On : 8/21/2018 2:30:00 PM
Acquisition Started : 8/21/2018 2:30:05 PM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.15 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1330

R. Massengill

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSWC060GD
Peak Analysis Performed on: 8/21/2018 2:40:07 PM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	305	301.00	75.38	0.99	5.76E+001	37.53	1.29E+002
2	949-	959	954.17	238.66	0.55	1.64E+001	19.02	3.06E+001
3	1400-	1412	1406.05	351.62	0.91	3.47E+001	16.05	1.13E+001
4	2429-	2442	2435.02	608.85	0.73	2.75E+001	13.20	5.53E+000
5	5833-	5851	5842.34	1460.64	1.72	6.14E+001	17.56	4.63E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC060GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	6.65332E+005	1.98968E+005
Pb-212	1.000	238.63*	43.60	1.30462E+004	1.52727E+004
Bi-214	0.461	609.32*	45.49	3.99986E+004	1.98094E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	4.40411E+004	2.14276E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	6.653323E+005	1.989685E+005
Pb-212	1.000	1.304625E+004	1.527272E+004
Bi-214	0.461	3.999856E+004	1.980944E+004
Pb-214	0.432	4.404108E+004	2.142761E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/21/2018 2:40:07 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.38	9.5980E-002	65.18		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC060GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.708E+005	1.71E+005	6.653E+005	7.075E+004
	Co-60	1173.23	99.85	1.951E+004	1.52E+004	-1.573E+004	8.400E+003
		1332.49	99.98	1.524E+004		-2.648E+004	6.158E+003
	Nb-94	702.65	99.81	1.989E+004	1.82E+004	-1.263E+004	8.959E+003
		871.09	99.89	1.821E+004		-6.055E+003	7.979E+003
	Ag-108m	433.90	90.50	1.610E+004	1.61E+004	1.000E+004	7.264E+003
		614.30	89.80	2.491E+004		-1.591E+004	1.145E+004
		722.90	90.80	1.998E+004		1.490E+003	8.886E+003
	Cs-134	604.72	97.62	2.383E+004	2.21E+004	1.853E+004	1.100E+004
		795.86	85.46	2.208E+004		-4.496E+003	9.796E+003
	Cs-137	661.66	85.10	2.489E+004	2.49E+004	-1.317E+004	1.133E+004
	Eu-152	121.78	28.67	6.778E+004	6.54E+004	-4.655E+003	3.268E+004
		344.28	26.60	6.539E+004		-2.414E+004	3.043E+004
		1408.01	21.07	1.138E+005		1.334E+003	4.967E+004
	Eu-154	123.07	40.40	4.838E+004	4.84E+004	2.219E+004	2.333E+004
		723.30	20.06	9.045E+004		8.004E+003	4.024E+004
		1274.43	34.80	5.481E+004		8.379E+003	2.332E+004
	Eu-155	86.55	30.70	7.472E+004	7.47E+004	-5.971E+003	3.626E+004
		105.31	21.10	9.587E+004		-4.527E+004	4.633E+004
	Tl-208	583.19	85.00	2.318E+004	2.32E+004	-7.344E+003	1.057E+004
	Bi-212	727.33	6.67	3.041E+005	3.04E+005	1.506E+005	1.370E+005
+	Pb-212	238.63*	43.60	2.467E+004	2.47E+004	1.305E+004	1.126E+004
+	Bi-214	609.32*	45.49	2.315E+004	2.31E+004	4.000E+004	9.604E+003
		1120.29	14.92	1.598E+005		9.385E+004	7.107E+004
		1764.49	15.30	1.576E+005		1.955E+004	6.705E+004
+	Pb-214	295.22	18.42	1.006E+005	2.62E+004	1.055E+005	4.736E+004
		351.93*	35.60	2.623E+004		4.404E+004	1.139E+004
	Ra-226	186.21	3.64	4.813E+005	4.81E+005	1.709E+004	2.296E+005
	Ac-228	338.32	11.27	1.636E+005	1.04E+005	1.447E+005	7.653E+004
		911.20	25.80	1.040E+005		2.415E+004	4.751E+004
		968.97	15.80	1.511E+005		-4.247E+004	6.795E+004
	Am-241	59.54	35.90	6.700E+004	6.70E+004	-2.527E+004	3.237E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 5452A

Report Generated On : 8/16/2018 3:30:51 PM

Sample Title : B109100AFSFC045GD
Sample Description : WWTF SUMP #2
Sample Identification : 045
Sample Type : GAMMA DIRECT
Sample Geometry : WWTF SUMP 2

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 4.270E+000 M^2

Sample Taken On : 8/16/2018 3:20:00 PM
Acquisition Started : 8/16/2018 3:20:49 PM

Live Time : 600.0 seconds
Real Time : 601.4 seconds

Dead Time : 0.23 %

Energy Calibration Used Done On : 3/15/2018
Efficiency Calibration Used Done On : 8/16/2018
Efficiency ID : WWTF_SUMP_2

DATA VALIDATED

DATE 9-21-18

TIME 1240

R. Massersill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 5452A
 Sample Title: B109100AFSFC045GD
 Peak Analysis Performed on: 8/16/2018 3:30:51 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	295-	308	300.96	75.24	0.71	1.12E+002	89.24	6.81E+002
2	945-	960	953.51	238.38	0.99	1.13E+002	57.71	2.40E+002
3	1169-	1190	1178.86	294.71	1.00	1.60E+002	55.17	1.58E+002
4	1398-	1412	1406.15	351.54	1.18	2.13E+002	41.96	7.89E+001
5	2030-	2049	2038.51	509.63	0.85	7.03E+001	40.74	9.77E+001
6	2322-	2336	2328.49	582.12	1.10	7.78E+001	26.37	3.32E+001
7	2423-	2441	2433.14	608.29	1.48	1.93E+002	40.13	6.18E+001
8	2634-	2650	2642.35	660.59	1.49	9.05E+001	29.09	3.85E+001
9	3430-	3443	3436.84	859.21	0.30	1.15E+001	17.77	2.45E+001
10	3631-	3648	3639.05	909.76	0.83	7.86E+001	28.59	3.84E+001
11	3865-	3878	3871.59	967.90	0.39	4.13E+001	19.26	1.87E+001
12	4466-	4481	4473.74	1118.44	0.59	6.94E+001	24.19	2.56E+001
13	4681-	4694	4687.32	1171.83	1.02	2.52E+001	16.57	1.58E+001
14	4941-	4955	4947.68	1236.92	0.30	3.38E+001	19.11	1.92E+001
15	5316-	5329	5322.82	1330.70	1.27	2.65E+001	13.13	5.48E+000
16	5822-	5850	5836.81	1459.20	1.75	5.39E+002	49.89	1.80E+001
17	7041-	7060	7051.05	1762.76	0.32	5.25E+001	19.65	1.25E+001

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC045GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	0.996	1460.82*	10.66	8.01007E+005	1.01663E+005
Co-60	0.996	1173.23*	99.85	3.47909E+003	2.30104E+003
		1332.49*	99.98	3.94713E+003	1.97978E+003
Cs-137	0.998	661.66*	85.10	1.02980E+004	3.53259E+003
Tl-208	0.998	583.19*	85.00	8.17113E+003	2.93836E+003
Pb-212	1.000	238.63*	43.60	1.27190E+004	6.80119E+003
Bi-214	0.997	609.32*	45.49	3.90008E+004	9.35890E+003
		1120.29*	14.92	6.22001E+004	2.22554E+004
		1764.49*	15.30	6.21565E+004	2.38028E+004
Pb-214	1.000	295.22*	18.42	4.89890E+004	1.86451E+004
		351.93*	35.60	3.80631E+004	9.65729E+003
Ac-228	0.560	338.32	11.27		
		911.20*	25.80	3.59104E+004	1.34431E+004
		968.97*	15.80	3.20606E+004	1.52080E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	0.996	8.010073E+005	1.016631E+005
Co-60	0.996	3.748039E+003	1.500754E+003
Cs-137	0.998	1.029804E+004	3.532585E+003
Tl-208	0.998	8.171125E+003	2.938360E+003
Pb-212	1.000	1.271902E+004	6.801185E+003
Bi-214	0.997	4.477072E+004	8.110820E+003
Pb-214	1.000	4.037420E+004	8.575279E+003
Ac-228	0.560	3.422173E+004	1.007215E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/16/2018 3:30:51 PM
Peak Locate From Channel: 85
Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.24	1.8630E-001	79.83		
5	509.63	1.1712E-001	57.98		
9	859.21	1.9167E-002	154.50		
14	1236.92	5.6297E-002	56.58	Sum	

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 5452A
 Sample Geometry: WWTF SUMP 2
 Sample Title: B109100AFSFC045GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	4.863E+004	4.86E+004	8.010E+005	2.230E+004
+	Co-60	1173.23*	99.85	3.361E+003	2.40E+003	3.479E+003	1.494E+003
		1332.49*	99.98	2.397E+003		3.947E+003	9.971E+002
	Nb-94	702.65	99.81	5.141E+003	5.14E+003	-2.917E+003	2.434E+003
		871.09	99.89	5.455E+003		5.062E+003	2.572E+003
	Ag-108m	433.90	90.50	5.711E+003	5.71E+003	-1.925E+003	2.746E+003
		614.30	89.80	8.174E+003		-1.710E+002	3.948E+003
		722.90	90.80	6.163E+003		2.159E+003	2.929E+003
	Cs-134	604.72	97.62	8.421E+003	6.42E+003	1.778E+004	4.084E+003
		795.86	85.46	6.420E+003		6.277E+002	3.038E+003
+	Cs-137	661.66*	85.10	4.425E+003	4.42E+003	1.030E+004	2.059E+003
	Eu-152	121.78	28.67	2.043E+004	1.87E+004	-1.129E+004	1.005E+004
		344.28	26.60	1.872E+004		-3.437E+004	9.042E+003
		1408.01	21.07	2.304E+004		-3.703E+004	1.053E+004
	Eu-154	123.07	40.40	1.455E+004	1.45E+004	-4.425E+002	7.153E+003
		723.30	20.06	2.791E+004		1.621E+004	1.326E+004
		1274.43	34.80	1.663E+004		-1.131E+003	7.750E+003
	Eu-155	86.55	30.70	2.138E+004	2.14E+004	1.950E+004	1.054E+004
		105.31	21.10	2.917E+004		-2.036E+004	1.436E+004
+	Tl-208	583.19*	85.00	3.669E+003	3.67E+003	8.171E+003	1.692E+003
	Bi-212	727.33	6.67	8.061E+004	8.06E+004	4.451E+004	3.822E+004
+	Pb-212	238.63*	43.60	1.022E+004	1.02E+004	1.272E+004	4.957E+003
+	Bi-214	609.32*	45.49	1.016E+004	1.02E+004	3.900E+004	4.805E+003
		1120.29*	14.92	2.830E+004		6.220E+004	1.294E+004
		1764.49*	15.30	2.907E+004		6.216E+004	1.293E+004
+	Pb-214	295.22*	18.42	2.556E+004	9.34E+003	4.899E+004	1.237E+004
		351.93*	35.60	9.336E+003		3.806E+004	4.426E+003
	Ra-226	186.21	3.64	1.524E+005	1.52E+005	1.314E+004	7.464E+004
+	Ac-228	338.32	11.27	4.837E+004	1.81E+004	3.380E+004	2.344E+004
		911.20*	25.80	1.809E+004		3.591E+004	8.429E+003
		968.97*	15.80	2.040E+004		3.206E+004	9.149E+003
	Am-241	59.54	35.90	1.476E+004	1.48E+004	1.990E+003	7.242E+003

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/20/2018 9:29:00 AM

Sample Title : B109100AFSWC051GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/20/2018 9:18:00 AM
Acquisition Started : 8/20/2018 9:18:58 AM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.16 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1245

R. Massengill Ryan

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSWC051GD
Peak Analysis Performed on: 8/20/2018 9:29:00 AM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	287-	308	301.21	75.43	0.62	1.04E+002	68.86	2.88E+002
2	949-	959	953.99	238.62	1.08	1.39E+001	21.01	4.01E+001
3	1400-	1415	1407.58	352.01	0.41	3.92E+001	21.03	2.38E+001
4	2429-	2442	2435.57	608.99	0.54	3.88E+001	14.58	5.22E+000
5	5836-	5854	5844.00	1461.05	1.37	7.20E+001	16.97	0.00E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC051GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	7.80724E+005	1.96110E+005
Pb-212	1.000	238.63*	43.60	1.10886E+004	1.68005E+004
Bi-214	0.461	609.32*	45.49	5.64737E+004	2.22973E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	4.98567E+004	2.77548E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	7.807244E+005	1.961096E+005
Pb-212	1.000	1.108861E+004	1.680052E+004
Bi-214	0.461	5.647366E+004	2.229728E+004
Pb-214	0.432	4.985666E+004	2.775485E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/20/2018 9:29:00 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.43	1.7276E-001	66.43		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC051GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	2.934E+004	2.93E+004	7.807E+005	0.000E+000
	Co-60	1173.23	99.85	2.302E+004	2.11E+004	-2.456E+004	1.016E+004
		1332.49	99.98	2.105E+004		4.427E+003	9.065E+003
	Nb-94	702.65	99.81	1.634E+004	1.63E+004	-5.458E+003	7.183E+003
		871.09	99.89	1.912E+004		-1.232E+004	8.435E+003
	Ag-108m	433.90	90.50	1.967E+004	1.97E+004	2.551E+003	9.049E+003
		614.30	89.80	3.171E+004		-1.892E+004	1.485E+004
		722.90	90.80	1.998E+004		-3.665E+003	8.886E+003
	Cs-134	604.72	97.62	2.849E+004	2.47E+004	3.141E+004	1.333E+004
		795.86	85.46	2.470E+004		-1.914E+004	1.111E+004
	Cs-137	661.66	85.10	2.584E+004	2.58E+004	1.516E+004	1.180E+004
	Eu-152	121.78	28.67	7.229E+004	6.39E+004	1.496E+004	3.493E+004
		344.28	26.60	6.387E+004		1.313E+004	2.967E+004
		1408.01	21.07	1.138E+005		4.470E+004	4.967E+004
	Eu-154	123.07	40.40	5.041E+004	5.04E+004	-1.947E+004	2.434E+004
		723.30	20.06	9.045E+004		-1.517E+004	4.024E+004
		1274.43	34.80	6.079E+004		-1.727E+003	2.630E+004
	Eu-155	86.55	30.70	8.042E+004	8.04E+004	2.705E+004	3.911E+004
		105.31	21.10	1.079E+005		1.104E+005	5.236E+004
	Tl-208	583.19	85.00	2.318E+004	2.32E+004	5.972E+003	1.057E+004
	Bi-212	727.33	6.67	2.890E+005	2.89E+005	1.948E+005	1.295E+005
+	Pb-212	238.63*	43.60	2.784E+004	2.78E+004	1.109E+004	1.284E+004
+	Bi-214	609.32*	45.49	2.212E+004	2.21E+004	5.647E+004	9.089E+003
		1120.29	14.92	1.692E+005		1.123E+005	7.576E+004
		1764.49	15.30	1.636E+005		3.403E+004	7.003E+004
+	Pb-214	295.22	18.42	1.241E+005	3.88E+004	1.264E+005	5.910E+004
		351.93*	35.60	3.877E+004		4.986E+004	1.766E+004
	Ra-226	186.21	3.64	5.029E+005	5.03E+005	2.185E+005	2.404E+005
	Ac-228	338.32	11.27	1.524E+005	1.06E+005	1.854E+004	7.094E+004
		911.20	25.80	1.064E+005		1.072E+005	4.874E+004
		968.97	15.80	1.585E+005		-7.233E+004	7.163E+004
	Am-241	59.54	35.90	7.156E+004	7.16E+004	4.978E+004	3.466E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/18/2018 2:51:08 PM

Sample Title : B109100AFSWC052GD
Sample Description : WWTF WALL
Sample Identification : 052
Sample Type : GAMMA DIRECT
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : ~~2.826E+001~~ ^{7.83} M²
pm 8/27/18
Sample Taken On : 8/18/2018 2:40:00 PM
Acquisition Started : 8/18/2018 2:41:07 PM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.14 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1250

R. Massengill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSWC052GD
 Peak Analysis Performed on: 8/18/2018 2:51:08 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	306	300.61	75.28	0.39	4.62E+001	43.24	1.76E+002
2	335-	354	339.20	84.92	0.45	5.27E+001	54.02	1.92E+002
3	948-	959	953.90	238.59	0.54	2.56E+001	18.92	2.54E+001
4	1401-	1414	1407.98	352.11	0.73	4.60E+001	17.13	1.00E+001
5	2035-	2050	2042.65	510.76	0.56	3.69E+001	14.90	6.09E+000
6	2431-	2443	2436.71	609.27	0.73	3.58E+001	16.15	1.12E+001
7	2641-	2652	2646.05	661.61	1.09	2.03E+001	12.67	7.69E+000
8	5834-	5853	5844.17	1461.09	0.63	7.70E+001	19.44	5.00E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC052GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M^2)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	8.36141E+005	2.23260E+005
Cs-137	1.000	661.66*	85.10	1.67432E+004	1.06320E+004
Eu-155	0.346	86.55*	30.70	4.33398E+004	4.52291E+004
		105.31	21.10		
Pb-212	1.000	238.63*	43.60	2.03636E+004	1.54230E+004
Bi-214	0.461	609.32*	45.49	5.22466E+004	2.43820E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	5.85438E+004	2.35026E+004
		351.93*	35.60		

*Ac-228
wt 270*

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	8.361414E+005	2.232597E+005
Cs-137	1.000	1.674319E+004	1.063196E+004
Eu-155	0.346	4.333979E+004	4.522906E+004
Pb-212	1.000	2.036355E+004	1.542297E+004
Bi-214	0.461	5.224662E+004	2.438196E+004
Pb-214	0.432	5.854381E+004	2.350256E+004

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/18/2018 2:51:08 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.28	7.6948E-002	93.65		
5	510.76	6.1521E-002	40.36		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC052GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.788E+005	1.79E+005	8.361E+005	7.473E+004
	Co-60	1173.23	99.85	2.784E+004	2.11E+004	7.029E+003	1.256E+004
		1332.49	99.98	2.108E+004		-2.435E+003	9.078E+003
	Nb-94	702.65	99.81	2.232E+004	1.39E+004	7.653E+003	1.017E+004
		871.09	99.89	1.388E+004		-3.957E+003	5.814E+003
	Ag-108m	433.90	90.50	1.866E+004	1.87E+004	1.316E+004	8.543E+003
		614.30	89.80	3.114E+004		-6.758E+003	1.457E+004
		722.90	90.80	2.264E+004		1.284E+004	1.022E+004
	Cs-134	604.72	97.62	2.908E+004	2.07E+004	-1.654E+004	1.363E+004
		795.86	85.46	2.066E+004		3.911E+003	9.083E+003
+	Cs-137	661.66*	85.10	1.430E+004	1.43E+004	1.674E+004	6.032E+003
	Eu-152	121.78	28.67	7.126E+004	6.19E+004	8.370E+004	3.441E+004
		344.28	26.60	6.188E+004		-8.719E+004	2.867E+004
		1408.01	21.07	8.907E+004		4.811E+004	3.730E+004
	Eu-154	123.07	40.40	4.892E+004	4.89E+004	-2.605E+004	2.359E+004
		723.30	20.06	1.025E+005		5.816E+004	4.626E+004
		1274.43	34.80	5.896E+004		1.595E+004	2.538E+004
+	Eu-155	86.55*	30.70	7.256E+004	7.26E+004	4.334E+004	3.517E+004
		105.31	21.10	1.022E+005		1.176E+005	4.951E+004
	Tl-208	583.19	85.00	2.674E+004	2.67E+004	7.983E+003	1.235E+004
	Bi-212	727.33	6.67	2.842E+005	2.84E+005	4.876E+004	1.270E+005
+	Pb-212	238.63*	43.60	2.310E+004	2.31E+004	2.036E+004	1.047E+004
+	Bi-214	609.32*	45.49	2.997E+004	3.00E+004	5.225E+004	1.301E+004
		1120.29	14.92	1.866E+005		1.572E+005	8.449E+004
		1764.49	15.30	1.516E+005		8.702E+004	6.402E+004
+	Pb-214	295.22	18.42	1.023E+005	2.54E+004	1.985E+004	4.823E+004
		351.93*	35.60	2.536E+004		5.854E+004	1.096E+004
	Ra-226	186.21	3.64	5.169E+005	5.17E+005	7.765E+004	2.474E+005
	Ac-228	338.32	11.27	1.671E+005	8.62E+004	2.541E+004	7.824E+004
		911.20	25.80	8.615E+004		5.537E+004	3.859E+004
		968.97	15.80	1.488E+005		6.030E+004	6.678E+004
	Am-241	59.54	35.90	6.914E+004	6.91E+004	-3.320E+004	3.344E+004

+ = Nuclide identified during the nuclide identification
 * = Energy line found in the spectrum
 > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
 @ = Half-life too short to be able to perform the decay correction

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/20/2018 9:53:36 AM

Sample Title : B109100AFSWC053GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/20/2018 9:43:00 AM
Acquisition Started : 8/20/2018 9:43:34 AM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.14 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED
DATE 9-2-18
TIME 1255
R. Massengill / RZ

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSWC053GD
Peak Analysis Performed on: 8/20/2018 9:53:36 AM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	181-	190	185.77	46.57	0.44	9.07E+000	24.88	6.39E+001
2	296-	307	300.74	75.31	0.47	1.48E+001	46.65	2.09E+002
3	949-	972	954.49	238.74	0.87	5.14E+001	31.10	4.76E+001
4	1401-	1413	1406.56	351.75	0.59	2.72E+001	16.32	1.48E+001
5	2430-	2443	2436.17	609.14	0.34	3.84E+001	15.75	8.63E+000
6	5837-	5853	5845.23	1461.36	1.27	6.58E+001	17.78	4.17E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC053GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	7.13916E+005	2.02508E+005
Pb-212	1.000	238.63*	43.60	4.08545E+004	2.56055E+004
Bi-214	0.461	609.32*	45.49	5.58916E+004	2.39093E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	3.45752E+004	2.13738E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	7.139164E+005	2.025076E+005
Pb-212	1.000	4.085450E+004	2.560549E+004
Bi-214	0.461	5.589157E+004	2.390935E+004
Pb-214	0.432	3.457524E+004	2.137376E+004

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/20/2018 9:53:36 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	46.57	1.5120E-002	274.28		
2	75.31	2.4702E-002	314.76		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC053GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.588E+005	1.59E+005	7.139E+005	6.474E+004
	Co-60	1173.23	99.85	2.506E+004	1.80E+004	4.354E+002	1.117E+004
		1332.49	99.98	1.801E+004		-1.630E+004	7.543E+003
	Nb-94	702.65	99.81	1.785E+004	1.79E+004	-8.328E+003	7.942E+003
		871.09	99.89	1.821E+004		-2.470E+004	7.979E+003
	Ag-108m	433.90	90.50	2.026E+004	2.03E+004	-6.233E+003	9.345E+003
		614.30	89.80	2.963E+004		-2.528E+004	1.381E+004
		722.90	90.80	2.038E+004		2.656E+001	9.086E+003
	Cs-134	604.72	97.62	2.793E+004	2.39E+004	-1.176E+004	1.305E+004
		795.86	85.46	2.386E+004		4.043E+003	1.069E+004
	Cs-137	661.66	85.10	3.165E+004	3.16E+004	6.585E+003	1.471E+004
	Eu-152	121.78	28.67	7.166E+004	6.78E+004	4.389E+004	3.462E+004
		344.28	26.60	6.783E+004		4.414E+004	3.165E+004
		1408.01	21.07	1.005E+005		2.713E+004	4.302E+004
	Eu-154	123.07	40.40	5.104E+004	5.10E+004	2.131E+004	2.466E+004
		723.30	20.06	9.226E+004		1.964E+003	4.114E+004
		1274.43	34.80	6.079E+004		-5.418E+004	2.630E+004
	Eu-155	86.55	30.70	7.800E+004	7.80E+004	2.295E+004	3.790E+004
		105.31	21.10	1.010E+005		-1.085E+005	4.889E+004
	Tl-208	583.19	85.00	2.645E+004	2.65E+004	1.259E+004	1.220E+004
	Bi-212	727.33	6.67	2.674E+005	2.67E+005	-1.463E+005	1.186E+005
+	Pb-212	238.63*	43.60	3.827E+004	3.83E+004	4.085E+004	1.806E+004
+	Bi-214	609.32*	45.49	2.726E+004	2.73E+004	5.589E+004	1.166E+004
		1120.29	14.92	1.943E+005		2.215E+005	8.836E+004
		1764.49	15.30	1.801E+005		7.154E+004	7.829E+004
+	Pb-214	295.22	18.42	1.069E+005	2.97E+004	4.154E+004	5.049E+004
		351.93*	35.60	2.967E+004		3.458E+004	1.312E+004
	Ra-226	186.21	3.64	4.798E+005	4.80E+005	-1.167E+005	2.288E+005
	Ac-228	338.32	11.27	1.453E+005	7.06E+004	-8.447E+003	6.736E+004
		911.20	25.80	7.062E+004		8.178E+003	3.083E+004
		968.97	15.80	1.433E+005		-1.218E+004	6.407E+004
	Am-241	59.54	35.90	6.937E+004	6.94E+004	3.926E+004	3.356E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/20/2018 10:18:37 AM

Sample Title : B109100AFSWC054GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/20/2018 10:08:00 AM
Acquisition Started : 8/20/2018 10:08:35 AM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.15 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1300

R. Massengill *R. Massengill*

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSWC054GD
 Peak Analysis Performed on: 8/20/2018 10:18:36 AM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	305	300.99	75.37	1.32	6.81E+001	38.71	1.35E+002
2	950-	959	954.85	238.83	0.42	1.84E+001	19.21	3.26E+001
3	1402-	1415	1407.79	352.06	0.32	2.43E+001	18.65	2.17E+001
4	2430-	2442	2435.95	609.08	1.24	2.53E+001	14.28	9.75E+000
5	5835-	5851	5842.58	1460.70	0.33	6.07E+001	17.27	4.31E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC054GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	6.57992E+005	1.95796E+005
Pb-212	1.000	238.63*	43.60	1.46109E+004	1.54661E+004
Bi-214	0.461	609.32*	45.49	3.67758E+004	2.12696E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	3.09111E+004	2.41594E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	6.579920E+005	1.957961E+005
Pb-212	1.000	1.461085E+004	1.546610E+004
Bi-214	0.461	3.677585E+004	2.126962E+004
Pb-214	0.432	3.091114E+004	2.415936E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/20/2018 10:18:36 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.37	1.1344E-001	56.88		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC054GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.623E+005	1.62E+005	6.580E+005	6.650E+004
	Co-60	1173.23	99.85	2.355E+004	2.03E+004	-2.917E+003	1.042E+004
		1332.49	99.98	2.034E+004		5.133E+003	8.709E+003
	Nb-94	702.65	99.81	1.989E+004	1.99E+004	-2.632E+003	8.959E+003
		871.09	99.89	2.040E+004		-4.575E+003	9.077E+003
	Ag-108m	433.90	90.50	1.905E+004	1.91E+004	-1.920E+004	8.742E+003
		614.30	89.80	2.897E+004		-2.412E+003	1.348E+004
		722.90	90.80	1.998E+004		1.792E+004	8.886E+003
	Cs-134	604.72	97.62	2.617E+004	2.01E+004	1.149E+004	1.217E+004
		795.86	85.46	2.011E+004		8.595E+003	8.814E+003
	Cs-137	661.66	85.10	2.675E+004	2.68E+004	1.808E+004	1.226E+004
	Eu-152	121.78	28.67	7.090E+004	6.74E+004	4.642E+004	3.424E+004
		344.28	26.60	6.735E+004		-1.338E+004	3.141E+004
		1408.01	21.07	1.005E+005		-1.957E+004	4.302E+004
	Eu-154	123.07	40.40	4.996E+004	5.00E+004	-6.735E+003	2.412E+004
		723.30	20.06	9.045E+004		8.113E+004	4.024E+004
		1274.43	34.80	6.783E+004		4.449E+003	2.983E+004
	Eu-155	86.55	30.70	8.268E+004	8.27E+004	8.015E+004	4.024E+004
		105.31	21.10	9.911E+004		3.891E+004	4.795E+004
	Tl-208	583.19	85.00	2.289E+004	2.29E+004	-2.460E+003	1.042E+004
	Bi-212	727.33	6.67	2.498E+005	2.50E+005	-1.538E+005	1.098E+005
+	Pb-212	238.63*	43.60	2.466E+004	2.47E+004	1.461E+004	1.125E+004
+	Bi-214	609.32*	45.49	2.826E+004	2.83E+004	3.678E+004	1.216E+004
		1120.29	14.92	1.565E+005		8.615E+004	6.944E+004
		1764.49	15.30	1.950E+005		8.822E+004	8.577E+004
+	Pb-214	295.22	18.42	1.079E+005	3.65E+004	-9.575E+003	5.099E+004
		351.93*	35.60	3.655E+004		3.091E+004	1.655E+004
	Ra-226	186.21	3.64	5.044E+005	5.04E+005	-2.451E+004	2.411E+005
	Ac-228	338.32	11.27	1.720E+005	9.48E+004	6.450E+004	8.073E+004
		911.20	25.80	9.478E+004		2.981E+004	4.291E+004
		968.97	15.80	1.486E+005		1.095E+005	6.668E+004
	Am-241	59.54	35.90	7.389E+004	7.39E+004	-3.211E+004	3.582E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/20/2018 8:58:44 AM

Sample Title : B109100AFSWC055GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M^2

Sample Taken On : 8/20/2018 8:48:00 AM
Acquisition Started : 8/20/2018 8:48:42 AM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.15 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1305

R. Massengill

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSWC055GD
Peak Analysis Performed on: 8/20/2018 8:58:44 AM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	295-	306	301.28	75.45	0.48	6.90E+001	49.01	2.12E+002
2	1399-	1413	1406.24	351.67	1.01	4.69E+001	19.07	1.51E+001
3	2428-	2440	2434.65	608.76	0.38	3.25E+001	14.11	6.47E+000
4	2638-	2649	2644.00	661.09	0.64	1.18E+001	11.04	7.18E+000
5	5835-	5853	5843.07	1460.82	0.74	5.83E+001	17.44	5.70E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC055GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M^2)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	6.32146E+005	1.96914E+005
Cs-137	0.999	661.66*	85.10	9.72068E+003	9.15335E+003
Bi-214	0.460	609.32*	45.49	4.73649E+004	2.13164E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	5.95492E+004	2.58083E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	6.321458E+005	1.969140E+005
Cs-137	0.999	9.720676E+003	9.153352E+003
Bi-214	0.460	4.736491E+004	2.131641E+004
Pb-214	0.432	5.954919E+004	2.580826E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/20/2018 8:58:44 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.45	1.1503E-001	71.01		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC055GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.796E+005	1.80E+005	6.321E+005	7.514E+004
	Co-60	1173.23	99.85	3.431E+004	2.65E+004	3.156E+004	1.580E+004
		1332.49	99.98	2.651E+004		2.378E+004	1.179E+004
	Nb-94	702.65	99.81	2.082E+004	1.72E+004	-8.745E+002	9.427E+003
		871.09	99.89	1.724E+004		-1.619E+004	7.495E+003
	Ag-108m	433.90	90.50	2.281E+004	2.19E+004	9.679E+003	1.062E+004
		614.30	89.80	3.171E+004		-1.359E+004	1.485E+004
		722.90	90.80	2.189E+004		6.033E+003	9.845E+003
	Cs-134	604.72	97.62	2.657E+004	1.85E+004	-1.182E+003	1.237E+004
		795.86	85.46	1.848E+004		-1.241E+004	7.999E+003
+	Cs-137	661.66*	85.10	1.391E+004	1.39E+004	9.721E+003	5.841E+003
	Eu-152	121.78	28.67	7.116E+004	6.97E+004	-1.861E+004	3.437E+004
		344.28	26.60	6.972E+004		-3.355E+004	3.260E+004
		1408.01	21.07	9.298E+004		-3.069E+004	3.927E+004
	Eu-154	123.07	40.40	5.113E+004	5.11E+004	-2.909E+004	2.470E+004
		723.30	20.06	1.008E+005		5.439E+004	4.539E+004
		1274.43	34.80	6.783E+004		5.439E+004	2.983E+004
	Eu-155	86.55	30.70	8.426E+004	8.43E+004	9.170E+003	4.103E+004
		105.31	21.10	1.015E+005		5.498E+004	4.913E+004
	Tl-208	583.19	85.00	2.670E+004	2.67E+004	2.181E+004	1.233E+004
	Bi-212	727.33	6.67	3.230E+005	3.23E+005	1.043E+004	1.465E+005
	Pb-212	238.63	43.60	4.792E+004	4.79E+004	4.454E+004	2.288E+004
+	Bi-214	609.32*	45.49	2.383E+004	2.38E+004	4.736E+004	9.943E+003
		1120.29	14.92	1.891E+005		1.207E+005	8.572E+004
		1764.49	15.30	1.902E+005		1.477E+005	8.335E+004
+	Pb-214	295.22	18.42	1.017E+005	3.12E+004	1.302E+004	4.790E+004
		351.93*	35.60	3.116E+004		5.955E+004	1.386E+004
	Ra-226	186.21	3.64	5.542E+005	5.54E+005	3.451E+005	2.660E+005
	Ac-228	338.32	11.27	1.751E+005	1.14E+005	8.006E+004	8.225E+004
		911.20	25.80	1.135E+005		3.691E+004	5.227E+004
		968.97	15.80	1.536E+005		7.729E+004	6.920E+004
	Am-241	59.54	35.90	7.574E+004	7.57E+004	-9.334E+002	3.675E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/20/2018 9:15:01 AM

Sample Title : B109100AFSWC056GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/20/2018 9:04:00 AM
Acquisition Started : 8/20/2018 9:04:59 AM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.15 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1310

R. Massengill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSWC056GD
 Peak Analysis Performed on: 8/20/2018 9:15:01 AM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	295-	305	300.29	75.20	0.69	2.29E+001	47.53	2.26E+002
2	948-	961	954.32	238.70	0.60	3.04E+001	22.88	3.56E+001
3	1400-	1415	1407.83	352.07	0.47	5.54E+001	20.21	1.56E+001
4	2430-	2443	2436.80	609.30	0.85	3.27E+001	17.10	1.43E+001
5	5836-	5853	5844.03	1461.06	0.62	7.20E+001	19.06	6.01E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC056GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	7.80623E+005	2.17518E+005
Pb-212	1.000	238.63*	43.60	2.41628E+004	1.86147E+004
Bi-214	0.461	609.32*	45.49	4.76253E+004	2.55636E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	7.03866E+004	2.77669E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	7.806227E+005	2.175179E+005
Pb-212	1.000	2.416279E+004	1.861469E+004
Bi-214	0.461	4.762533E+004	2.556360E+004
Pb-214	0.432	7.038665E+004	2.776691E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/20/2018 9:15:01 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.20	3.8199E-002	207.37		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC056GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M^2)	Nuclide MDA (pCi/M^2)	Activity (pCi/M^2)	Dec. Level (pCi/M^2)
+	K-40	1460.82*	10.66	1.842E+005	1.84E+005	7.806E+005	7.742E+004
	Co-60	1173.23	99.85	2.248E+004	2.03E+004	1.803E+004	9.885E+003
		1332.49	99.98	2.034E+004		6.574E+003	8.709E+003
	Nb-94	702.65	99.81	1.821E+004	1.82E+004	-1.819E+003	8.120E+003
		871.09	99.89	1.999E+004		7.645E+003	8.868E+003
	Ag-108m	433.90	90.50	2.065E+004	2.06E+004	6.448E+003	9.538E+003
		614.30	89.80	3.191E+004		9.416E+003	1.495E+004
		722.90	90.80	2.189E+004		4.962E+003	9.845E+003
	Cs-134	604.72	97.62	2.868E+004	2.16E+004	-5.215E+003	1.343E+004
		795.86	85.46	2.161E+004		-7.926E+002	9.560E+003
	Cs-137	661.66	85.10	2.584E+004	2.58E+004	-2.026E+004	1.180E+004
	Eu-152	121.78	28.67	7.242E+004	6.64E+004	-3.476E+003	3.499E+004
		344.28	26.60	6.638E+004		2.053E+004	3.092E+004
		1408.01	21.07	9.298E+004		2.255E+004	3.927E+004
	Eu-154	123.07	40.40	5.005E+004	5.00E+004	3.984E+003	2.416E+004
		723.30	20.06	9.746E+004		-1.844E+003	4.374E+004
		1274.43	34.80	6.263E+004		-7.152E+003	2.723E+004
	Eu-155	86.55	30.70	7.540E+004	7.54E+004	-2.879E+003	3.660E+004
		105.31	21.10	1.002E+005		3.119E+004	4.850E+004
	Tl-208	583.19	85.00	2.347E+004	2.35E+004	-8.184E+002	1.071E+004
	Bi-212	727.33	6.67	2.890E+005	2.89E+005	4.418E+004	1.295E+005
+	Pb-212	238.63*	43.60	2.839E+004	2.84E+004	2.416E+004	1.312E+004
+	Bi-214	609.32*	45.49	3.442E+004	3.44E+004	4.763E+004	1.524E+004
		1120.29	14.92	1.532E+005		-1.694E+004	6.777E+004
		1764.49	15.30	1.852E+005		1.390E+005	8.086E+004
+	Pb-214	295.22	18.42	1.084E+005	3.20E+004	9.175E+004	5.124E+004
		351.93*	35.60	3.203E+004		7.039E+004	1.430E+004
	Ra-226	186.21	3.64	5.249E+005	5.25E+005	9.128E+004	2.514E+005
	Ac-228	338.32	11.27	1.501E+005	9.34E+004	1.256E+004	6.976E+004
		911.20	25.80	9.339E+004		3.031E+004	4.221E+004
		968.97	15.80	1.561E+005		1.630E+005	7.042E+004
	Am-241	59.54	35.90	7.124E+004	7.12E+004	3.717E+004	3.449E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/22/2018 8:43:04 AM
Sample Title : B109100AFSWC057GD
Sample Description : WWTF WALL
Sample Identification : 057
Sample Type : GAMMA DIRECT
Sample Geometry : 3M90DWTF1.27CM
Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV
Sample Size : ~~2.826E+001~~ ^{2.83} M²
Sample Taken On : 8/22/2018 8:33:00 AM
Acquisition Started : 8/22/2018 8:33:03 AM
Live Time : 600.0 seconds
Real Time : 600.5 seconds
Dead Time : 0.08 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1315

P. Massengill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSWC057GD
 Peak Analysis Performed on: 8/22/2018 8:43:04 AM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	269-	276	272.33	68.21	0.47	2.48E+001	25.50	6.82E+001
2	295-	306	300.39	75.22	0.32	1.18E+001	46.57	2.11E+002
3	950-	961	955.51	238.99	0.53	2.50E+001	20.71	3.20E+001
4	1402-	1414	1407.52	351.99	0.79	3.66E+001	17.11	1.34E+001
5	2430-	2444	2437.46	609.46	0.80	3.58E+001	16.50	1.13E+001
6	5839-	5855	5846.71	1461.73	1.22	6.21E+001	18.56	7.86E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC057GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	0.999	1460.82*	10.66	6.75025E+005	2.09958E+005
Pb-212	1.000	238.63*	43.60	1.99258E+004	1.68244E+004
Bi-214	0.461	609.32*	45.49	5.21643E+004	2.48856E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	4.65496E+004	2.28678E+004
		351.93*	35.60		
Am-241	0.887	59.54*	35.90	1.92372E+004	2.01873E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	0.999	6.750250E+005	2.099583E+005
Pb-212	1.000	1.992577E+004	1.682444E+004
Bi-214	0.461	5.216428E+004	2.488556E+004
Pb-214	0.432	4.654955E+004	2.286782E+004
Am-241	0.887	1.923720E+004	2.018728E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/22/2018 8:43:04 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
2	75.22	1.9623E-002	395.53		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWTF1.27CM
 Sample Title: B109100AFSWC057GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	2.044E+005	2.04E+005	6.750E+005	8.750E+004
	Co-60	1173.23	99.85	2.138E+004	1.63E+004	6.864E+003	9.332E+003
		1332.49	99.98	1.625E+004		-1.461E+004	6.661E+003
	Nb-94	702.65	99.81	1.926E+004	1.93E+004	9.657E+003	8.646E+003
		871.09	99.89	2.124E+004		-5.467E+003	9.494E+003
	Ag-108m	433.90	90.50	1.709E+004	1.71E+004	1.280E+003	7.760E+003
		614.30	89.80	2.879E+004		-2.455E+004	1.339E+004
		722.90	90.80	2.229E+004		1.203E+004	1.004E+004
	Cs-134	604.72	97.62	2.872E+004	2.43E+004	6.282E+003	1.344E+004
		795.86	85.46	2.432E+004		-1.237E+004	1.092E+004
	Cs-137	661.66	85.10	2.179E+004	2.18E+004	-6.341E+002	9.778E+003
	Eu-152	121.78	28.67	6.653E+004	6.24E+004	4.086E+004	3.205E+004
		344.28	26.60	6.241E+004		-4.594E+004	2.893E+004
		1408.01	21.07	8.026E+004		-3.360E+004	3.290E+004
	Eu-154	123.07	40.40	4.691E+004	4.69E+004	5.288E+003	2.259E+004
		723.30	20.06	1.009E+005		3.089E+004	4.546E+004
		1274.43	34.80	5.896E+004		1.199E+004	2.538E+004
	Eu-155	86.55	30.70	7.745E+004	7.74E+004	3.925E+004	3.762E+004
		105.31	21.10	9.715E+004		1.846E+003	4.697E+004
	Tl-208	583.19	85.00	2.518E+004	2.52E+004	3.610E+003	1.156E+004
	Bi-212	727.33	6.67	3.456E+005	3.46E+005	1.919E+005	1.577E+005
+	Pb-212	238.63*	43.60	2.595E+004	2.59E+004	1.993E+004	1.190E+004
+	Bi-214	609.32*	45.49	3.125E+004	3.13E+004	5.216E+004	1.365E+004
		1120.29	14.92	1.893E+005		1.093E+005	8.584E+004
		1764.49	15.30	1.750E+005		5.998E+004	7.575E+004
+	Pb-214	295.22	18.42	1.090E+005	2.88E+004	5.764E+004	5.156E+004
		351.93*	35.60	2.879E+004		4.655E+004	1.267E+004
	Ra-226	186.21	3.64	4.898E+005	4.90E+005	9.865E+004	2.338E+005
	Ac-228	338.32	11.27	1.639E+005	9.35E+004	1.083E+005	7.664E+004
		911.20	25.80	9.352E+004		2.599E+004	4.227E+004
		968.97	15.80	1.408E+005		-2.374E+004	6.281E+004
+	Am-241	59.54*	35.90	3.211E+004	3.21E+004	1.924E+004	1.500E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/22/2018 8:28:15 AM

Sample Title : B109100AFSWC058GD
Sample Description : WWTF WALL
Sample Identification : 058
Sample Type : GAMMA DIRECT
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : ^{2.83}~~2.826~~E+001 M²

Sample Taken On : 8/22/2018 8:18:00 AM
Acquisition Started : 8/22/2018 8:18:14 AM
Rn 8/27/18

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.14 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1320

R. Massengill

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSWC058GD
Peak Analysis Performed on: 8/22/2018 8:28:15 AM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	183-	190	186.40	46.73	0.32	9.24E+000	20.12	4.48E+001
2	287-	306	300.71	75.30	0.43	1.16E+002	62.16	2.43E+002
3	345-	354	349.64	87.54	0.49	4.11E+000	31.68	1.09E+002
4	1075-	1085	1079.99	270.11	0.57	8.45E+000	12.47	1.25E+001
5	1402-	1415	1408.24	352.17	0.95	3.05E+001	17.76	1.75E+001
6	2641-	2652	2646.75	661.78	0.67	1.60E+001	11.23	6.02E+000
7	5838-	5853	5845.95	1461.54	0.80	6.10E+001	17.11	3.98E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC058GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	0.999	1460.82*	10.66	6.62714E+005	1.94576E+005
Cs-137	1.000	661.66*	85.10	1.31718E+004	9.39583E+003
Eu-155	0.348	86.55*	30.70	3.33332E+003	2.56860E+004
		105.31	21.10		
Pb-214	0.432	295.22	18.42		
		351.93*	35.60	3.88373E+004	2.33449E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	0.999	6.627144E+005	1.945762E+005
Cs-137	1.000	1.317183E+004	9.395834E+003
Eu-155	0.348	3.333324E+003	2.568595E+004
Pb-214	0.432	3.883728E+004	2.334495E+004

← Ac-220 RTD

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/22/2018 8:28:15 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	46.73	1.5401E-002	217.69		
2	75.30	1.9405E-001	53.39		
4	270.11	1.4087E-002	147.56		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC058GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.542E+005	1.54E+005	6.627E+005	6.240E+004
	Co-60	1173.23	99.85	2.079E+004	2.08E+004	5.834E+003	9.036E+003
		1332.49	99.98	2.307E+004		1.116E+004	1.007E+004
	Nb-94	702.65	99.81	1.824E+004	1.82E+004	1.822E+003	8.132E+003
		871.09	99.89	1.915E+004		4.384E+003	8.447E+003
	Ag-108m	433.90	90.50	1.949E+004	1.87E+004	-1.539E+004	8.960E+003
		614.30	89.80	2.415E+004		2.783E+004	1.107E+004
		722.90	90.80	1.875E+004		-3.219E+002	8.270E+003
	Cs-134	604.72	97.62	2.363E+004	2.26E+004	1.821E+004	1.090E+004
		795.86	85.46	2.257E+004		-1.235E+004	1.004E+004
+	Cs-137	661.66*	85.10	1.294E+004	1.29E+004	1.317E+004	5.352E+003
	Eu-152	121.78	28.67	6.501E+004	6.50E+004	-2.239E+004	3.129E+004
		344.28	26.60	6.696E+004		3.182E+004	3.121E+004
		1408.01	21.07	9.695E+004		5.880E+004	4.124E+004
	Eu-154	123.07	40.40	4.691E+004	4.69E+004	2.081E+004	2.259E+004
		723.30	20.06	8.489E+004		-2.381E+003	3.745E+004
		1274.43	34.80	6.087E+004		2.070E+004	2.634E+004
+	Eu-155	86.55*	30.70	4.408E+004	4.41E+004	3.333E+003	2.095E+004
		105.31	21.10	9.484E+004		-3.108E+004	4.581E+004
	Tl-208	583.19	85.00	2.436E+004	2.44E+004	2.066E+004	1.115E+004
	Bi-212	727.33	6.67	2.842E+005	2.84E+005	1.902E+005	1.270E+005
	Pb-212	238.63	43.60	4.738E+004	4.74E+004	4.481E+004	2.261E+004
	Bi-214	609.32	45.49	4.948E+004	4.95E+004	2.911E+004	2.277E+004
		1120.29	14.92	1.782E+005		1.321E+005	8.030E+004
		1764.49	15.30	1.307E+005		-2.175E+003	5.356E+004
+	Pb-214	295.22	18.42	1.034E+005	3.26E+004	6.721E+004	4.876E+004
		351.93*	35.60	3.257E+004		3.884E+004	1.456E+004
	Ra-226	186.21	3.64	4.660E+005	4.66E+005	1.582E+005	2.219E+005
	Ac-228	338.32	11.27	1.467E+005	9.07E+004	-3.056E+004	6.806E+004
		911.20	25.80	9.065E+004		7.482E+004	4.084E+004
		968.97	15.80	1.200E+005		6.157E+003	5.238E+004
	Am-241	59.54	35.90	6.616E+004	6.62E+004	-2.663E+004	3.196E+004

+ = Nuclide identified during the nuclide identification
 * = Energy line found in the spectrum
 > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
 @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/21/2018 2:26:55 PM

Sample Title : B109100AFSWC059GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M^2

Sample Taken On : 8/21/2018 2:16:00 PM
Acquisition Started : 8/21/2018 2:16:53 PM

Live Time : 600.0 seconds
Real Time : 600.8 seconds

Dead Time : 0.14 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED
DATE 9-2-18
TIME 1325
R. Massengill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSWC059GD
 Peak Analysis Performed on: 8/21/2018 2:26:55 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	310	300.25	75.19	0.63	1.01E+002	47.94	1.62E+002
2	1176-	1187	1180.84	295.32	0.59	2.22E+001	17.77	2.08E+001
3	1400-	1411	1405.40	351.46	0.73	2.09E+001	15.49	1.51E+001
4	2429-	2441	2435.27	608.92	1.14	2.84E+001	11.44	1.63E+000
5	5833-	5851	5842.38	1460.65	0.75	7.00E+001	16.73	0.00E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC059GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	7.58882E+005	1.93006E+005
Bi-214	0.461	609.32*	45.49	4.13196E+004	1.73894E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	1.000	295.22*	18.42	4.82387E+004	3.93515E+004
		351.93*	35.60	2.65587E+004	2.00610E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	7.588816E+005	1.930058E+005
Bi-214	0.461	4.131964E+004	1.738939E+004
Pb-214	1.000	3.103081E+004	1.787257E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/21/2018 2:26:55 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.19	1.6869E-001	47.36		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC059GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M^2)	Nuclide MDA (pCi/M^2)	Activity (pCi/M^2)	Dec. Level (pCi/M^2)
+	K-40	1460.82*	10.66	2.934E+004	2.93E+004	7.589E+005	0.000E+000
	Co-60	1173.23	99.85	2.248E+004	2.17E+004	1.039E+004	9.885E+003
		1332.49	99.98	2.174E+004		6.311E+003	9.407E+003
	Nb-94	702.65	99.81	1.924E+004	1.92E+004	-1.845E+004	8.633E+003
		871.09	99.89	2.199E+004		-1.248E+003	9.868E+003
	Ag-108m	433.90	90.50	1.863E+004	1.86E+004	-1.087E+004	8.531E+003
		614.30	89.80	2.593E+004		-3.349E+004	1.196E+004
		722.90	90.80	1.998E+004		1.786E+003	8.886E+003
	Cs-134	604.72	97.62	2.360E+004	1.90E+004	2.688E+004	1.089E+004
		795.86	85.46	1.905E+004		7.290E+003	8.279E+003
	Cs-137	661.66	85.10	2.456E+004	2.46E+004	1.236E+004	1.117E+004
	Eu-152	121.78	28.67	6.724E+004	5.68E+004	-4.031E+004	3.241E+004
		344.28	26.60	5.680E+004		-1.721E+004	2.613E+004
		1408.01	21.07	8.469E+004		4.270E+004	3.512E+004
	Eu-154	123.07	40.40	4.714E+004	4.71E+004	-2.293E+004	2.270E+004
		723.30	20.06	9.226E+004		1.387E+004	4.114E+004
		1274.43	34.80	7.261E+004		3.738E+004	3.222E+004
	Eu-155	86.55	30.70	7.922E+004	7.92E+004	2.902E+004	3.851E+004
		105.31	21.10	9.251E+004		-1.960E+004	4.465E+004
	Tl-208	583.19	85.00	2.318E+004	2.32E+004	7.307E+003	1.057E+004
	Bi-212	727.33	6.67	3.230E+005	3.23E+005	-1.404E+005	1.465E+005
	Pb-212	238.63	43.60	4.450E+004	4.45E+004	2.422E+003	2.117E+004
+	Bi-214	609.32*	45.49	1.395E+004	1.40E+004	4.132E+004	5.006E+003
		1120.29	14.92	1.864E+005		2.019E+005	8.437E+004
		1764.49	15.30	1.902E+005		7.667E+004	8.335E+004
+	Pb-214	295.22*	18.42	5.969E+004	2.95E+004	4.824E+004	2.691E+004
		351.93*	35.60	2.954E+004		2.656E+004	1.305E+004
	Ra-226	186.21	3.64	5.073E+005	5.07E+005	3.590E+005	2.426E+005
	Ac-228	338.32	11.27	1.513E+005	9.62E+004	9.150E+004	7.035E+004
		911.20	25.80	9.615E+004		-6.473E+004	4.360E+004
		968.97	15.80	1.379E+005		1.237E+005	6.134E+004
	Am-241	59.54	35.90	6.848E+004	6.85E+004	-2.841E+004	3.312E+004

+ = Nuclide identified during the nuclide identification
 * = Energy line found in the spectrum
 > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
 @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/21/2018 2:40:07 PM

Sample Title : B109100AFSWC060GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M^2

Sample Taken On : 8/21/2018 2:30:00 PM
Acquisition Started : 8/21/2018 2:30:05 PM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.15 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1330

R. Massengill

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSWC060GD
Peak Analysis Performed on: 8/21/2018 2:40:07 PM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	305	301.00	75.38	0.99	5.76E+001	37.53	1.29E+002
2	949-	959	954.17	238.66	0.55	1.64E+001	19.02	3.06E+001
3	1400-	1412	1406.05	351.62	0.91	3.47E+001	16.05	1.13E+001
4	2429-	2442	2435.02	608.85	0.73	2.75E+001	13.20	5.53E+000
5	5833-	5851	5842.34	1460.64	1.72	6.14E+001	17.56	4.63E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC060GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	6.65332E+005	1.98968E+005
Pb-212	1.000	238.63*	43.60	1.30462E+004	1.52727E+004
Bi-214	0.461	609.32*	45.49	3.99986E+004	1.98094E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	4.40411E+004	2.14276E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	6.653323E+005	1.989685E+005
Pb-212	1.000	1.304625E+004	1.527272E+004
Bi-214	0.461	3.999856E+004	1.980944E+004
Pb-214	0.432	4.404108E+004	2.142761E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/21/2018 2:40:07 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.38	9.5980E-002	65.18		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC060GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.708E+005	1.71E+005	6.653E+005	7.075E+004
	Co-60	1173.23	99.85	1.951E+004	1.52E+004	-1.573E+004	8.400E+003
		1332.49	99.98	1.524E+004		-2.648E+004	6.158E+003
	Nb-94	702.65	99.81	1.989E+004	1.82E+004	-1.263E+004	8.959E+003
		871.09	99.89	1.821E+004		-6.055E+003	7.979E+003
	Ag-108m	433.90	90.50	1.610E+004	1.61E+004	1.000E+004	7.264E+003
		614.30	89.80	2.491E+004		-1.591E+004	1.145E+004
		722.90	90.80	1.998E+004		1.490E+003	8.886E+003
	Cs-134	604.72	97.62	2.383E+004	2.21E+004	1.853E+004	1.100E+004
		795.86	85.46	2.208E+004		-4.496E+003	9.796E+003
	Cs-137	661.66	85.10	2.489E+004	2.49E+004	-1.317E+004	1.133E+004
	Eu-152	121.78	28.67	6.778E+004	6.54E+004	-4.655E+003	3.268E+004
		344.28	26.60	6.539E+004		-2.414E+004	3.043E+004
		1408.01	21.07	1.138E+005		1.334E+003	4.967E+004
	Eu-154	123.07	40.40	4.838E+004	4.84E+004	2.219E+004	2.333E+004
		723.30	20.06	9.045E+004		8.004E+003	4.024E+004
		1274.43	34.80	5.481E+004		8.379E+003	2.332E+004
	Eu-155	86.55	30.70	7.472E+004	7.47E+004	-5.971E+003	3.626E+004
		105.31	21.10	9.587E+004		-4.527E+004	4.633E+004
	Tl-208	583.19	85.00	2.318E+004	2.32E+004	-7.344E+003	1.057E+004
	Bi-212	727.33	6.67	3.041E+005	3.04E+005	1.506E+005	1.370E+005
+	Pb-212	238.63*	43.60	2.467E+004	2.47E+004	1.305E+004	1.126E+004
+	Bi-214	609.32*	45.49	2.315E+004	2.31E+004	4.000E+004	9.604E+003
		1120.29	14.92	1.598E+005		9.385E+004	7.107E+004
		1764.49	15.30	1.576E+005		1.955E+004	6.705E+004
+	Pb-214	295.22	18.42	1.006E+005	2.62E+004	1.055E+005	4.736E+004
		351.93*	35.60	2.623E+004		4.404E+004	1.139E+004
	Ra-226	186.21	3.64	4.813E+005	4.81E+005	1.709E+004	2.296E+005
	Ac-228	338.32	11.27	1.636E+005	1.04E+005	1.447E+005	7.653E+004
		911.20	25.80	1.040E+005		2.415E+004	4.751E+004
		968.97	15.80	1.511E+005		-4.247E+004	6.795E+004
	Am-241	59.54	35.90	6.700E+004	6.70E+004	-2.527E+004	3.237E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/22/2018 8:03:50 AM

Sample Title : B109100AFSWC061GD
Sample Description : WWTF WALL
Sample Identification : 061
Sample Type : GAMMA DIRECT
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : ^{2.83}~~2.826E+001~~ M²
Run 8/27/18
Sample Taken On : 8/22/2018 7:53:00 AM
Acquisition Started : 8/22/2018 7:53:48 AM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.14 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1335

R. Massengill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSWC061GD
 Peak Analysis Performed on: 8/22/2018 8:03:49 AM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	305	300.71	75.30	0.99	9.85E+001	39.70	1.30E+002
2	948-	958	953.79	238.56	0.75	2.91E+001	20.72	3.09E+001
3	2036-	2047	2041.88	510.57	0.37	2.61E+001	15.79	1.39E+001
4	2431-	2443	2436.75	609.28	0.47	2.80E+001	11.97	2.95E+000
5	5836-	5854	5845.01	1461.30	0.58	6.40E+001	16.00	0.00E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC061GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	6.95049E+005	1.83946E+005
Pb-212	1.000	238.63*	43.60	2.31963E+004	1.69150E+004
Bi-214	0.461	609.32*	45.49	4.09185E+004	1.81418E+004
		1120.29	14.92		
		1764.49	15.30		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	6.950489E+005	1.839458E+005
Pb-212	1.000	2.319629E+004	1.691503E+004
Bi-214	0.461	4.091847E+004	1.814177E+004

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/22/2018 8:03:49 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.30	1.6417E-001	40.30		
3	510.57	4.3479E-002	60.54		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWTF1.27CM
 Sample Title: B109100AFSWC061GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	2.939E+004	2.94E+004	6.950E+005	0.000E+000
	Co-60	1173.23	99.85	2.017E+004	1.80E+004	-9.921E+003	8.730E+003
		1332.49	99.98	1.803E+004		-6.764E+003	7.553E+003
	Nb-94	702.65	99.81	1.751E+004	1.75E+004	6.013E+003	7.770E+003
		871.09	99.89	2.043E+004		3.692E+002	9.090E+003
	Ag-108m	433.90	90.50	2.086E+004	2.09E+004	-1.328E+004	9.647E+003
		614.30	89.80	2.646E+004		-1.062E+004	1.222E+004
		722.90	90.80	2.299E+004		7.972E+003	1.039E+004
	Cs-134	604.72	97.62	2.408E+004	2.35E+004	-2.011E+003	1.113E+004
		795.86	85.46	2.347E+004		-1.587E+004	1.049E+004
	Cs-137	661.66	85.10	3.041E+004	3.04E+004	2.287E+004	1.409E+004
	Eu-152	121.78	28.67	6.867E+004	6.60E+004	2.900E+003	3.312E+004
		344.28	26.60	6.598E+004		-4.615E+004	3.072E+004
		1408.01	21.07	1.006E+005		6.414E+004	4.308E+004
	Eu-154	123.07	40.40	4.759E+004	4.76E+004	-3.660E+004	2.293E+004
		723.30	20.06	1.041E+005		3.702E+004	4.705E+004
		1274.43	34.80	6.087E+004		6.917E+003	2.634E+004
	Eu-155	86.55	30.70	7.821E+004	7.82E+004	8.885E+004	3.800E+004
		105.31	21.10	9.213E+004		-6.505E+004	4.445E+004
	Tl-208	583.19	85.00	2.545E+004	2.54E+004	-5.307E+003	1.170E+004
	Bi-212	727.33	6.67	2.894E+005	2.89E+005	-1.510E+005	1.296E+005
+	Pb-212	238.63*	43.60	2.531E+004	2.53E+004	2.320E+004	1.158E+004
+	Bi-214	609.32*	45.49	1.733E+004	1.73E+004	4.092E+004	6.690E+003
		1120.29	14.92	1.600E+005		-1.549E+005	7.117E+004
		1764.49	15.30	1.804E+005		1.305E+005	7.840E+004
	Pb-214	295.22	18.42	9.404E+004	5.64E+004	5.690E+004	4.408E+004
		351.93	35.60	5.641E+004		3.023E+004	2.648E+004
	Ra-226	186.21	3.64	4.789E+005	4.79E+005	8.794E+004	2.284E+005
	Ac-228	338.32	11.27	1.584E+005	7.80E+004	-8.317E+004	7.389E+004
		911.20	25.80	7.800E+004		4.147E+001	3.451E+004
		968.97	15.80	1.587E+005		1.277E+005	7.173E+004
	Am-241	59.54	35.90	6.789E+004	6.79E+004	-2.188E+004	3.282E+004

+ = Nuclide identified during the nuclide identification
 * = Energy line found in the spectrum
 > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
 @ = Half-life too short to be able to perform the decay correction

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/21/2018 1:19:31 PM

Sample Title : B109100AFSWC062GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/21/2018 1:09:00 PM
Acquisition Started : 8/21/2018 1:09:29 PM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.14 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1340

R. Massengill/K. Fair

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSWC062GD
Peak Analysis Performed on: 8/21/2018 1:19:30 PM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	295-	308	300.92	75.36	0.32	2.69E+001	52.33	2.37E+002
2	1402-	1414	1407.95	352.10	0.38	1.71E+001	17.01	2.09E+001
3	2431-	2442	2436.04	609.11	0.54	2.43E+001	15.36	1.37E+001
4	5833-	5852	5842.04	1460.56	1.65	7.14E+001	19.82	7.56E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC062GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M^2)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	7.74424E+005	2.25100E+005
Bi-214	0.461	609.32*	45.49	3.54640E+004	2.27764E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42		
		351.93*	35.60	2.17387E+004	2.18720E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	7.744236E+005	2.251004E+005
Bi-214	0.461	3.546402E+004	2.277639E+004
Pb-214	0.432	2.173873E+004	2.187200E+004

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/21/2018 1:19:30 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.36	4.4792E-002	194.71		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC062GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	2.137E+005	2.14E+005	7.744E+005	9.220E+004
	Co-60	1173.23	99.85	2.192E+004	1.96E+004	7.688E+003	9.606E+003
		1332.49	99.98	1.960E+004		1.189E+004	8.339E+003
	Nb-94	702.65	99.81	1.924E+004	1.92E+004	-1.372E+003	8.633E+003
		871.09	99.89	2.160E+004		-7.362E+003	9.676E+003
	Ag-108m	433.90	90.50	2.006E+004	2.00E+004	6.813E+003	9.248E+003
		614.30	89.80	2.984E+004		-5.916E+003	1.392E+004
		722.90	90.80	1.998E+004		-3.665E+003	8.886E+003
	Cs-134	604.72	97.62	2.697E+004	2.43E+004	1.772E+004	1.257E+004
		795.86	85.46	2.429E+004		1.836E+004	1.090E+004
	Cs-137	661.66	85.10	2.320E+004	2.32E+004	1.420E+004	1.049E+004
	Eu-152	121.78	28.67	6.897E+004	6.90E+004	4.066E+004	3.327E+004
		344.28	26.60	7.335E+004		2.461E+004	3.441E+004
		1408.01	21.07	1.005E+005		2.291E+004	4.302E+004
	Eu-154	123.07	40.40	4.828E+004	4.83E+004	1.325E+003	2.328E+004
		723.30	20.06	8.860E+004		-4.175E+004	3.931E+004
		1274.43	34.80	5.887E+004		-5.288E+004	2.535E+004
	Eu-155	86.55	30.70	7.521E+004	7.52E+004	-3.851E+003	3.650E+004
		105.31	21.10	9.620E+004		4.662E+004	4.649E+004
	Tl-208	583.19	85.00	2.568E+004	2.57E+004	2.927E+004	1.181E+004
	Bi-212	727.33	6.67	2.436E+005	2.44E+005	-2.674E+005	1.067E+005
	Pb-212	238.63	43.60	4.319E+004	4.32E+004	5.236E+004	2.052E+004
+	Bi-214	609.32*	45.49	3.215E+004	3.21E+004	3.546E+004	1.410E+004
		1120.29	14.92	1.532E+005		3.827E+004	6.777E+004
		1764.49	15.30	1.801E+005		1.303E+005	7.829E+004
+	Pb-214	295.22	18.42	1.038E+005	3.45E+004	4.306E+004	4.895E+004
		351.93*	35.60	3.453E+004		2.174E+004	1.555E+004
	Ra-226	186.21	3.64	4.554E+005	4.55E+005	-1.195E+005	2.167E+005
	Ac-228	338.32	11.27	1.668E+005	8.45E+004	-1.955E+004	7.813E+004
		911.20	25.80	8.447E+004		9.800E+003	3.775E+004
		968.97	15.80	1.561E+005		8.291E+004	7.042E+004
	Am-241	59.54	35.90	7.026E+004	7.03E+004	-1.938E+004	3.400E+004

+ = Nuclide identified during the nuclide identification
 * = Energy line found in the spectrum
 > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
 @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/21/2018 1:31:51 PM

Sample Title : B109100AFSWC063GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M^2

Sample Taken On : 8/21/2018 1:21:00 PM
Acquisition Started : 8/21/2018 1:21:49 PM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.15 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1345

R. Massengill

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSWC063GD
Peak Analysis Performed on: 8/21/2018 1:31:51 PM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	307	300.90	75.35	0.78	3.57E+001	44.92	1.82E+002
2	347-	356	351.22	87.93	0.41	2.36E+001	30.06	8.34E+001
3	1399-	1413	1407.02	351.87	0.29	3.25E+001	18.58	1.85E+001
4	5837-	5854	5845.29	1461.37	1.74	6.58E+001	17.06	2.16E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC063GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	7.14067E+005	1.95115E+005
Eu-155	0.347	86.55*	30.70	1.90668E+004	2.45754E+004
		105.31	21.10		
Pb-214	0.432	295.22	18.42		
		351.93*	35.60	4.13438E+004	2.44083E+004

AC.228 RFD

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	7.140670E+005	1.951154E+005
Eu-155	0.347	1.906679E+004	2.457541E+004
Pb-214	0.432	4.134377E+004	2.440832E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/21/2018 1:31:51 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.35	5.9520E-002	125.78		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWTF1.27CM
 Sample Title: B109100AFSWC063GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+ K-40	1460.82*	10.66	1.231E+005	1.23E+005	7.141E+005	4.688E+004
Co-60	1173.23	99.85	2.554E+004	2.24E+004	-8.325E+003	1.141E+004
	1332.49	99.98	2.240E+004		-8.736E+003	9.737E+003
Nb-94	702.65	99.81	2.021E+004	1.96E+004	-1.207E+004	9.118E+003
	871.09	99.89	1.956E+004		-1.487E+003	8.654E+003
Ag-108m	433.90	90.50	2.045E+004	2.04E+004	1.331E+003	9.442E+003
	614.30	89.80	2.919E+004		3.655E+004	1.359E+004
	722.90	90.80	2.038E+004		3.514E+003	9.086E+003
Cs-134	604.72	97.62	2.716E+004	2.34E+004	1.275E+004	1.267E+004
	795.86	85.46	2.343E+004		3.542E+003	1.047E+004
Cs-137	661.66	85.10	2.099E+004	2.10E+004	1.371E+004	9.381E+003
Eu-152	121.78	28.67	6.949E+004	6.34E+004	8.572E+003	3.353E+004
	344.28	26.60	6.336E+004		-2.510E+004	2.941E+004
	1408.01	21.07	9.298E+004		1.788E+004	3.927E+004
Eu-154	123.07	40.40	4.885E+004	4.88E+004	1.770E+004	2.356E+004
	723.30	20.06	8.860E+004		-3.451E+004	3.931E+004
	1274.43	34.80	6.442E+004		2.271E+004	2.812E+004
+ Eu-155	86.55*	30.70	3.998E+004	4.00E+004	1.907E+004	1.890E+004
	105.31	21.10	9.537E+004		8.242E+004	4.608E+004
Tl-208	583.19	85.00	2.515E+004	2.51E+004	2.719E+004	1.155E+004
Bi-212	727.33	6.67	2.558E+005	2.56E+005	-3.075E+003	1.129E+005
Pb-212	238.63	43.60	4.498E+004	4.50E+004	2.011E+004	2.142E+004
Bi-214	609.32	45.49	5.774E+004	5.77E+004	-9.597E+002	2.690E+004
	1120.29	14.92	1.661E+005		-9.743E+004	7.423E+004
	1764.49	15.30	1.636E+005		1.043E+005	7.003E+004
+ Pb-214	295.22	18.42	1.063E+005	3.41E+004	6.735E+004	5.024E+004
	351.93*	35.60	3.410E+004		4.134E+004	1.533E+004
Ra-226	186.21	3.64	4.968E+005	4.97E+005	-1.133E+005	2.373E+005
Ac-228	338.32	11.27	1.547E+005	9.20E+004	7.141E+004	7.209E+004
	911.20	25.80	9.197E+004		7.137E+004	4.150E+004
	968.97	15.80	1.511E+005		1.135E+005	6.795E+004
Am-241	59.54	35.90	7.145E+004	7.15E+004	-1.953E+004	3.460E+004

+ = Nuclide identified during the nuclide identification
 * = Energy line found in the spectrum
 > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
 @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/21/2018 1:50:46 PM

Sample Title : B109100AFSWC064GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M^2

Sample Taken On : 8/21/2018 1:40:00 PM
Acquisition Started : 8/21/2018 1:40:44 PM

Live Time : 600.0 seconds
Real Time : 601.0 seconds

Dead Time : 0.17 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED
DATE 9-2-18
TIME 1350
R. Massengill

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSWC064GD
Peak Analysis Performed on: 8/21/2018 1:50:46 PM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	1401-	1414	1407.64	352.02	0.84	3.74E+001	17.89	1.36E+001
2	5834-	5852	5843.08	1460.82	1.33	8.40E+001	18.33	0.00E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC064GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	9.10739E+005	2.13897E+005
Pb-214	0.432	295.22	18.42		
		351.93*	35.60	4.75131E+004	2.38286E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	9.107389E+005	2.138968E+005
Pb-214	0.432	4.751308E+004	2.382862E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/21/2018 1:50:46 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
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All peaks were identified.

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC064GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	2.934E+004	2.93E+004	9.107E+005	0.000E+000
	Co-60	1173.23	99.85	1.951E+004	1.95E+004	-1.647E+004	8.400E+003
		1332.49	99.98	2.034E+004		1.711E+003	8.709E+003
	Nb-94	702.65	99.81	1.989E+004	1.87E+004	-2.092E+003	8.959E+003
		871.09	99.89	1.867E+004		-1.458E+004	8.210E+003
	Ag-108m	433.90	90.50	1.707E+004	1.71E+004	-1.274E+003	7.749E+003
		614.30	89.80	2.807E+004		2.396E+004	1.303E+004
		722.90	90.80	2.330E+004		-1.077E+003	1.055E+004
	Cs-134	604.72	97.62	2.449E+004	2.25E+004	1.625E+004	1.133E+004
		795.86	85.46	2.254E+004		-1.662E+004	1.003E+004
	Cs-137	661.66	85.10	2.489E+004	2.49E+004	1.417E+003	1.133E+004
	Eu-152	121.78	28.67	7.129E+004	6.93E+004	-1.332E+004	3.443E+004
		344.28	26.60	6.926E+004		-2.801E+004	3.236E+004
		1408.01	21.07	1.005E+005		1.568E+004	4.302E+004
	Eu-154	123.07	40.40	5.068E+004	5.07E+004	-2.108E+004	2.448E+004
		723.30	20.06	1.040E+005		-3.595E+004	4.699E+004
		1274.43	34.80	5.688E+004		1.240E+004	2.435E+004
	Eu-155	86.55	30.70	8.178E+004	8.18E+004	5.062E+004	3.979E+004
		105.31	21.10	9.879E+004		-4.923E+004	4.779E+004
	Tl-208	583.19	85.00	2.864E+004	2.86E+004	2.385E+004	1.330E+004
	Bi-212	727.33	6.67	3.408E+005	3.41E+005	2.532E+005	1.553E+005
	Pb-212	238.63	43.60	4.655E+004	4.66E+004	-2.485E+001	2.220E+004
	Bi-214	609.32	45.49	4.992E+004	4.99E+004	-8.694E+003	2.299E+004
		1120.29	14.92	1.864E+005		1.422E+005	8.437E+004
		1764.49	15.30	1.514E+005		1.195E+004	6.393E+004
+	Pb-214	295.22	18.42	1.118E+005	3.08E+004	-5.398E+004	5.296E+004
		351.93*	35.60	3.075E+004		4.751E+004	1.366E+004
	Ra-226	186.21	3.64	4.637E+005	4.64E+005	3.419E+004	2.208E+005
	Ac-228	338.32	11.27	1.740E+005	9.88E+004	7.024E+004	8.174E+004
		911.20	25.80	9.884E+004		2.509E+004	4.494E+004
		968.97	15.80	1.699E+005		-4.357E+004	7.737E+004
	Am-241	59.54	35.90	7.635E+004	7.63E+004	-5.904E+004	3.705E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/21/2018 10:12:39 AM

Sample Title : B109100AFSWC065GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M^2

Sample Taken On : 8/21/2018 10:02:00 AM
Acquisition Started : 8/21/2018 10:02:37 AM

Live Time : 600.0 seconds
Real Time : 600.8 seconds

Dead Time : 0.13 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1355

R. Massengill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSWC065GD
 Peak Analysis Performed on: 8/21/2018 10:12:38 AM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	284-	306	300.03	75.13	0.88	1.41E+002	69.87	2.78E+002
2	1175-	1187	1180.56	295.25	0.81	2.88E+001	17.00	1.63E+001
3	2432-	2444	2437.01	609.35	0.41	3.32E+001	13.88	5.78E+000
4	5835-	5853	5843.99	1461.05	0.52	6.83E+001	18.39	4.74E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC065GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	7.40172E+005	2.09540E+005
Bi-214	0.461	609.32*	45.49	4.84045E+004	2.10473E+004
		1120.29	14.92		
		1764.49	15.30		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	7.401724E+005	2.095399E+005
Bi-214	0.461	4.840446E+004	2.104730E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/21/2018 10:12:38 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.13	2.3543E-001	49.47		
2	295.25	4.7917E-002	59.13	Tol.	Pb-214

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC065GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.734E+005	1.73E+005	7.402E+005	7.204E+004
	Co-60	1173.23	99.85	2.406E+004	1.71E+004	5.758E+003	1.068E+004
		1332.49	99.98	1.715E+004		-9.929E+003	7.111E+003
	Nb-94	702.65	99.81	2.171E+004	2.04E+004	8.413E+003	9.873E+003
		871.09	99.89	2.040E+004		6.863E+003	9.077E+003
	Ag-108m	433.90	90.50	1.842E+004	1.84E+004	-7.025E+003	8.424E+003
		614.30	89.80	2.807E+004		2.072E+004	1.303E+004
		722.90	90.80	2.038E+004		-1.801E+004	9.086E+003
	Cs-134	604.72	97.62	2.677E+004	2.34E+004	-2.536E+004	1.247E+004
		795.86	85.46	2.343E+004		-3.216E+003	1.047E+004
	Cs-137	661.66	85.10	2.389E+004	2.39E+004	1.640E+004	1.083E+004
	Eu-152	121.78	28.67	6.975E+004	6.44E+004	2.674E+004	3.366E+004
		344.28	26.60	6.438E+004		-3.740E+004	2.993E+004
		1408.01	21.07	8.895E+004		4.804E+004	3.725E+004
	Eu-154	123.07	40.40	5.023E+004	5.02E+004	5.530E+004	2.425E+004
		723.30	20.06	9.577E+004		2.626E+004	4.289E+004
		1274.43	34.80	5.688E+004		1.259E+002	2.435E+004
	Eu-155	86.55	30.70	7.885E+004	7.88E+004	1.014E+004	3.832E+004
		105.31	21.10	9.636E+004		1.347E+004	4.657E+004
	Tl-208	583.19	85.00	2.670E+004	2.67E+004	2.744E+004	1.233E+004
	Bi-212	727.33	6.67	3.041E+005	3.04E+005	-5.415E+004	1.370E+005
	Pb-212	238.63	43.60	4.686E+004	4.69E+004	5.838E+004	2.235E+004
+	Bi-214	609.32*	45.49	2.248E+004	2.25E+004	4.840E+004	9.271E+003
		1120.29	14.92	1.692E+005		6.351E+004	7.576E+004
		1764.49	15.30	1.748E+005		-4.096E+004	7.564E+004
	Pb-214	295.22	18.42	1.053E+005	5.70E+004	4.971E+004	4.973E+004
		351.93	35.60	5.699E+004		3.092E+003	2.677E+004
	Ra-226	186.21	3.64	5.013E+005	5.01E+005	-4.154E+004	2.396E+005
	Ac-228	338.32	11.27	1.524E+005	9.75E+004	-6.888E+004	7.094E+004
		911.20	25.80	9.751E+004		1.599E+004	4.427E+004
		968.97	15.80	1.561E+005		1.253E+005	7.042E+004
	Am-241	59.54	35.90	7.080E+004	7.08E+004	-1.476E+003	3.428E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/21/2018 9:58:59 AM

Sample Title : B109100AFSWC066GD
Sample Description : WWTF Wall
Sample Identification :
Sample Type : Gamma Direct
Sample Geometry : 3M90DWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/21/2018 9:48:00 AM
Acquisition Started : 8/21/2018 9:48:58 AM

Live Time : 600.0 seconds
Real Time : 600.8 seconds

Dead Time : 0.13 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1400

R. Massengill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSWC066GD
 Peak Analysis Performed on: 8/21/2018 9:58:59 AM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	306	300.94	75.36	0.84	2.41E+001	40.30	1.59E+002
2	336-	345	340.89	85.35	0.95	2.15E+001	34.42	1.22E+002
3	1403-	1414	1408.35	352.20	0.64	1.81E+001	14.25	1.29E+001
4	2326-	2337	2331.36	582.94	0.63	1.76E+001	10.71	4.44E+000
5	2430-	2444	2436.78	609.29	1.33	4.09E+001	14.70	4.14E+000
6	5834-	5853	5844.73	1461.23	1.14	7.96E+001	18.73	2.37E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSWC066GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M^2)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	8.63585E+005	2.16484E+005
Eu-155	0.348	86.55*	30.70	1.75891E+004	2.83983E+004
		105.31	21.10		
Tl-208	1.000	583.19*	85.00	1.32869E+004	8.26447E+003
Bi-214	0.461	609.32*	45.49	5.95186E+004	2.25773E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42		
		351.93*	35.60	2.30226E+004	1.84451E+004

*Ac-228
 R70*

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	8.635847E+005	2.164836E+005
Eu-155	0.348	1.758913E+004	2.839833E+004
Tl-208	1.000	1.328685E+004	8.264472E+003
Bi-214	0.461	5.951856E+004	2.257730E+004
Pb-214	0.432	2.302257E+004	1.844509E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/21/2018 9:58:59 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.36	4.0102E-002	167.50		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFSWC066GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M^2)	Nuclide MDA (pCi/M^2)	Activity (pCi/M^2)	Dec. Level (pCi/M^2)
+	K-40	1460.82*	10.66	1.305E+005	1.31E+005	8.636E+005	5.058E+004
	Co-60	1173.23	99.85	2.506E+004	1.96E+004	8.338E+003	1.117E+004
		1332.49	99.98	1.960E+004		-4.593E+003	8.339E+003
	Nb-94	702.65	99.81	2.052E+004	1.67E+004	4.003E+003	9.274E+003
		871.09	99.89	1.673E+004		-7.724E+002	7.241E+003
	Ag-108m	433.90	90.50	1.884E+004	1.88E+004	-1.107E+004	8.637E+003
		614.30	89.80	3.006E+004		1.279E+004	1.402E+004
		722.90	90.80	2.077E+004		1.426E+004	9.282E+003
	Cs-134	604.72	97.62	2.657E+004	1.90E+004	-4.867E+003	1.237E+004
		795.86	85.46	1.905E+004		-7.183E+003	8.279E+003
	Cs-137	661.66	85.10	2.320E+004	2.32E+004	1.484E+004	1.049E+004
	Eu-152	121.78	28.67	6.616E+004	6.54E+004	-6.175E+004	3.187E+004
		344.28	26.60	6.539E+004		-3.582E+004	3.043E+004
		1408.01	21.07	9.298E+004		5.338E+004	3.927E+004
	Eu-154	123.07	40.40	4.694E+004	4.69E+004	-1.146E+004	2.261E+004
		723.30	20.06	9.577E+004		6.829E+004	4.289E+004
		1274.43	34.80	6.079E+004		-2.358E+004	2.630E+004
+	Eu-155	86.55*	30.70	4.686E+004	4.69E+004	1.759E+004	2.232E+004
		105.31	21.10	9.734E+004		-4.472E+004	4.706E+004
+	Tl-208	583.19*	85.00	1.036E+004	1.04E+004	1.329E+004	4.156E+003
	Bi-212	727.33	6.67	2.838E+005	2.84E+005	1.009E+005	1.268E+005
	Pb-212	238.63	43.60	4.482E+004	4.48E+004	-1.304E+004	2.134E+004
+	Bi-214	609.32*	45.49	2.133E+004	2.13E+004	5.952E+004	8.694E+003
		1120.29	14.92	2.187E+005		1.876E+005	1.005E+005
		1764.49	15.30	2.088E+005		1.157E+005	9.264E+004
+	Pb-214	295.22	18.42	9.897E+004	2.74E+004	5.040E+004	4.655E+004
		351.93*	35.60	2.735E+004		2.302E+004	1.195E+004
	Ra-226	186.21	3.64	4.798E+005	4.80E+005	1.083E+005	2.288E+005
	Ac-228	338.32	11.27	1.668E+005	9.75E+004	4.830E+004	7.813E+004
		911.20	25.80	9.751E+004		9.012E+004	4.427E+004
		968.97	15.80	1.460E+005		1.405E+005	6.539E+004
	Am-241	59.54	35.90	6.320E+004	6.32E+004	-1.465E+004	3.048E+004

+ = Nuclide identified during the nuclide identification
 * = Energy line found in the spectrum
 > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
 @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 5452A

Report Generated On : 8/16/2018 2:37:40 PM

Sample Title : B109100AFSFC067GD
Sample Description : WWTF SUMP #1
Sample Identification : 067
Sample Type : GAMMA DIRECT
Sample Geometry : WWTF SUMP 1

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 8.260E+000 M^2

Sample Taken On : 8/16/2018 2:27:00 PM
Acquisition Started : 8/16/2018 2:27:37 PM

Live Time : 600.0 seconds
Real Time : 601.1 seconds

Dead Time : 0.18 %

Energy Calibration Used Done On : 3/15/2018
Efficiency Calibration Used Done On : 8/16/2018
Efficiency ID : WWTF_SUMP1

DATA VALIDATED
DATE 9-2-18
TIME 1405
R. Massengill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 5452A
 Sample Title: B109100AFSFC067GD
 Peak Analysis Performed on: 8/16/2018 2:37:39 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	83-	99	91.44	22.86	0.33	-1.21E+001	68.62	3.63E+002
2	285-	309	299.86	74.97	0.86	3.48E+002	132.98	9.84E+002
3	367-	376	371.39	92.85	0.58	-2.24E+001	57.40	3.74E+002
4	672-	687	676.23	169.06	0.59	2.63E+001	60.11	2.91E+002
5	948-	973	955.13	238.78	0.38	8.93E+001	74.13	3.02E+002
6	1174-	1188	1181.12	295.28	1.14	5.23E+001	37.90	1.07E+002
7	1398-	1415	1407.58	351.89	1.21	1.72E+002	42.77	8.77E+001
8	2323-	2339	2331.04	582.76	0.38	5.23E+001	28.17	4.68E+001
9	2426-	2446	2435.61	608.90	1.34	2.16E+002	39.10	4.62E+001
10	2637-	2652	2644.78	661.20	0.76	7.50E+001	24.03	2.30E+001
11	3636-	3649	3642.69	910.67	0.91	3.78E+001	20.96	2.62E+001
12	4473-	4487	4479.20	1119.80	1.29	3.75E+001	19.96	2.15E+001
13	4685-	4698	4691.13	1172.78	0.64	3.58E+001	19.50	2.12E+001
14	5321-	5334	5327.88	1331.97	0.48	3.58E+001	14.17	5.24E+000
15	5830-	5854	5841.92	1460.48	1.86	3.52E+002	42.02	2.17E+001
16	7048-	7065	7057.36	1764.34	1.29	5.45E+001	16.63	4.50E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC067GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	5.72907E+005	8.45194E+004
Co-60	1.000	1173.23*	99.85	5.40050E+003	2.97699E+003
		1332.49*	99.98	5.83580E+003	2.35970E+003
Cs-137	1.000	661.66*	85.10	9.35386E+003	3.20198E+003
Eu-155	0.314	86.55*	30.70	-2.85779E+003	7.32869E+003
		105.31	21.10		
Tl-208	1.000	583.19*	85.00	6.02658E+003	3.32876E+003
Pb-212	1.000	238.63*	43.60	1.10286E+004	9.32532E+003
Bi-214	1.000	609.32*	45.49	4.78224E+004	1.03982E+004
		1120.29*	14.92	3.68423E+004	1.98444E+004
		1764.49*	15.30	7.04237E+004	2.22203E+004
Pb-214	1.000	295.22*	18.42	1.76277E+004	1.30729E+004
		351.93*	35.60	3.37548E+004	9.97026E+003

*- A²²⁸ utl
RFD*

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	5.729070E+005	8.451937E+004
Co-60	1.000	5.667834E+003	1.849231E+003
Cs-137	1.000	9.353857E+003	3.201977E+003
Eu-155	0.314	-2.857792E+003	7.328691E+003
Tl-208	1.000	6.026578E+003	3.328764E+003
Pb-212	1.000	1.102865E+004	9.325322E+003
Bi-214	1.000	4.911771E+004	8.508401E+003
Pb-214	1.000	2.782400E+004	7.927750E+003

*Ac-218 PFD
 wtl.*

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/16/2018 2:37:39 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	22.86	-2.0115E-002	-568.53		
2	74.97	5.8064E-001	38.17		
4	169.06	4.3784E-002	228.83		
11	910.67	6.3034E-002	55.42	Sum	

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 5452A
 Sample Geometry: WWTF SUMP 1
 Sample Title: B109100AFSFC067GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M^2)	Nuclide MDA (pCi/M^2)	Activity (pCi/M^2)	Dec. Level (pCi/M^2)
+	K-40	1460.82*	10.66	5.489E+004	5.49E+004	5.729E+005	2.525E+004
+	Co-60	1173.23*	99.85	4.236E+003	2.48E+003	5.400E+003	1.914E+003
		1332.49*	99.98	2.484E+003		5.836E+003	1.021E+003
	Nb-94	702.65	99.81	5.117E+003	5.12E+003	3.321E+003	2.409E+003
		871.09	99.89	6.039E+003		2.488E+003	2.849E+003
	Ag-108m	433.90	90.50	5.745E+003	5.75E+003	1.611E+003	2.752E+003
		614.30	89.80	9.295E+003		2.570E+002	4.495E+003
		722.90	90.80	6.164E+003		3.809E+003	2.915E+003
	Cs-134	604.72	97.62	8.941E+003	6.23E+003	-3.683E+003	4.332E+003
		795.86	85.46	6.235E+003		9.776E+002	2.929E+003
+	Cs-137	661.66*	85.10	3.758E+003	3.76E+003	9.354E+003	1.710E+003
	Eu-152	121.78	28.67	2.141E+004	1.93E+004	9.835E+003	1.052E+004
		344.28	26.60	1.933E+004		-1.976E+004	9.313E+003
		1408.01	21.07	2.668E+004		9.278E+003	1.225E+004
	Eu-154	123.07	40.40	1.522E+004	1.52E+004	1.539E+004	7.477E+003
		723.30	20.06	2.829E+004		4.077E+004	1.339E+004
		1274.43	34.80	1.609E+004		-1.243E+004	7.429E+003
+	Eu-155	86.55*	30.70	1.253E+004	1.25E+004	-2.858E+003	6.091E+003
		105.31	21.10	3.086E+004		-8.573E+003	1.518E+004
+	Tl-208	583.19*	85.00	4.899E+003	4.90E+003	6.027E+003	2.293E+003
	Bi-212	727.33	6.67	8.146E+004	8.15E+004	-2.730E+004	3.845E+004
+	Pb-212	238.63*	43.60	1.489E+004	1.49E+004	1.103E+004	7.280E+003
+	Bi-214	609.32*	45.49	1.000E+004	1.00E+004	4.782E+004	4.703E+003
		1120.29*	14.92	2.816E+004		3.684E+004	1.275E+004
		1764.49*	15.30	1.978E+004		7.042E+004	8.139E+003
+	Pb-214	295.22*	18.42	2.032E+004	1.14E+004	1.763E+004	9.704E+003
		351.93*	35.60	1.141E+004		3.375E+004	5.441E+003
	Ra-226	186.21	3.64	1.621E+005	1.62E+005	8.487E+004	7.931E+004
	Ac-228	338.32	11.27	4.562E+004	2.83E+004	1.000E+004	2.200E+004
		911.20	25.80	2.825E+004		4.444E+004	1.345E+004
		968.97	15.80	4.226E+004		1.904E+004	1.998E+004
	Am-241	59.54	35.90	1.630E+004	1.63E+004	1.708E+003	7.994E+003

+ = Nuclide identified during the nuclide identification
 * = Energy line found in the spectrum
 > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
 @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 5452A

Report Generated On : 8/16/2018 3:17:00 PM

Sample Title : B109100AFSFC068GD
Sample Description : WWTF SUMP #2
Sample Identification : 068
Sample Type : GAMMA DIRECT
Sample Geometry : WWTF SUMP 2

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 4.270E+000 M^2

Sample Taken On : 8/16/2018 3:06:00 PM
Acquisition Started : 8/16/2018 3:06:59 PM

Live Time : 600.0 seconds
Real Time : 600.6 seconds

Dead Time : 0.09 %

Energy Calibration Used Done On : 3/15/2018
Efficiency Calibration Used Done On : 8/16/2018
Efficiency ID : WWTF_SUMP_2

DATA VALIDATED

DATE 9-2-18

TIME 1410

R. Massengill / D. [Signature]

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 5452A
 Sample Title: B109100AFSFC068GD
 Peak Analysis Performed on: 8/16/2018 3:17:00 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	115-	126	118.64	29.66	0.33	-9.89E+000	59.32	3.54E+002
2	787-	796	791.53	197.88	0.60	-7.54E-001	39.74	1.72E+002
3	944-	972	953.41	238.35	0.59	1.93E+002	91.46	4.10E+002
4	1172-	1190	1179.42	294.85	1.31	1.17E+002	49.03	1.43E+002
5	1343-	1357	1350.19	337.55	1.08	3.77E+001	37.73	1.09E+002
6	1394-	1413	1405.48	351.37	1.27	1.79E+002	49.21	1.22E+002
7	2032-	2047	2038.89	509.72	1.07	6.90E+001	30.80	5.60E+001
8	2322-	2337	2329.46	582.36	0.82	5.57E+001	32.12	6.73E+001
9	2424-	2444	2433.58	608.40	1.02	2.19E+002	38.36	4.14E+001
10	2632-	2650	2641.76	660.44	0.38	1.01E+002	33.29	5.22E+001
11	3631-	3646	3638.95	909.74	1.03	4.87E+001	22.21	2.43E+001
12	3726-	3739	3732.12	933.03	0.38	2.25E+001	19.00	2.45E+001
13	4118-	4131	4124.35	1031.09	0.41	6.08E+000	15.33	1.89E+001
14	4468-	4482	4475.28	1118.82	1.25	6.22E+001	20.47	1.48E+001
15	4937-	4950	4943.80	1235.95	0.43	2.09E+001	19.28	2.61E+001
16	5824-	5849	5836.41	1459.10	2.01	4.96E+002	48.81	2.44E+001
17	7043-	7059	7050.97	1762.74	1.10	5.78E+001	16.86	4.25E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC068GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	0.995	1460.82*	10.66	7.36553E+005	9.67062E+004
Cs-137	0.998	661.66*	85.10	1.14622E+004	4.02882E+003
Tl-208	0.999	583.19*	85.00	5.85331E+003	3.44664E+003
Pb-212	1.000	238.63*	43.60	2.16852E+004	1.08550E+004
Bi-214	0.998	609.32*	45.49	4.41359E+004	9.38585E+003
		1120.29*	14.92	5.57812E+004	1.88953E+004
		1764.49*	15.30	6.84117E+004	2.07155E+004
Pb-214	1.000	295.22*	18.42	3.59516E+004	1.61014E+004
		351.93*	35.60	3.19807E+004	1.01670E+004
Ac-228	0.562	338.32*	11.27	2.07113E+004	2.09848E+004
		911.20*	25.80	2.22403E+004	1.03368E+004
		968.97	15.80		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	0.995	7.365530E+005	9.670620E+004
Cs-137	0.998	1.146222E+004	4.028818E+003
Tl-208	0.999	5.853308E+003	3.446638E+003
Pb-212	1.000	2.168517E+004	1.085495E+004
Bi-214	0.998	4.954685E+004	7.789089E+003
Pb-214	1.000	3.311260E+004	8.596639E+003
Ac-228	0.562	2.194172E+004	9.272852E+003

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/16/2018 3:17:00 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	29.66	-1.6483E-002	-599.78		
2	197.88	-1.2573E-003	-5267.6		
7	509.72	1.1500E-001	44.64		
12	933.03	3.7500E-002	84.45	Sum	
13	1031.09	1.0133E-002	252.20		
15	1235.95	3.4885E-002	92.09	Sum	

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 5452A
 Sample Geometry: WWTF SUMP 2
 Sample Title: B109100AFSFC068GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	5.290E+004	5.29E+004	7.366E+005	2.444E+004
	Co-60	1173.23	99.85	6.693E+003	5.68E+003	3.871E+003	3.160E+003
		1332.49	99.98	5.682E+003		2.966E+003	2.640E+003
	Nb-94	702.65	99.81	5.405E+003	5.31E+003	-2.184E+003	2.566E+003
		871.09	99.89	5.315E+003		-1.680E+003	2.502E+003
	Ag-108m	433.90	90.50	5.762E+003	5.76E+003	-3.861E+003	2.771E+003
		614.30	89.80	8.459E+003		-1.698E+003	4.090E+003
		722.90	90.80	6.460E+003		5.494E+003	3.078E+003
	Cs-134	604.72	97.62	8.340E+003	5.56E+003	-5.172E+002	4.043E+003
		795.86	85.46	5.556E+003		5.554E+002	2.606E+003
+	Cs-137	661.66*	85.10	5.276E+003	5.28E+003	1.146E+004	2.484E+003
	Eu-152	121.78	28.67	2.094E+004	1.99E+004	1.731E+002	1.030E+004
		344.28	26.60	1.991E+004		-1.299E+003	9.638E+003
		1408.01	21.07	2.613E+004		1.062E+004	1.207E+004
	Eu-154	123.07	40.40	1.482E+004	1.48E+004	-3.858E+003	7.288E+003
		723.30	20.06	2.945E+004		2.768E+004	1.404E+004
		1274.43	34.80	1.537E+004		-5.732E+003	7.119E+003
	Eu-155	86.55	30.70	2.132E+004	2.13E+004	-2.440E+003	1.051E+004
		105.31	21.10	3.087E+004		2.448E+004	1.521E+004
+	Tl-208	583.19*	85.00	5.198E+003	5.20E+003	5.853E+003	2.457E+003
	Bi-212	727.33	6.67	8.858E+004	8.86E+004	4.064E+004	4.221E+004
+	Pb-212	238.63*	43.60	1.640E+004	1.64E+004	2.169E+004	8.050E+003
+	Bi-214	609.32*	45.49	8.657E+003	8.66E+003	4.414E+004	4.055E+003
		1120.29*	14.92	2.168E+004		5.578E+004	9.624E+003
		1764.49*	15.30	1.745E+004		6.841E+004	7.120E+003
+	Pb-214	295.22*	18.42	2.302E+004	1.26E+004	3.595E+004	1.110E+004
		351.93*	35.60	1.261E+004		3.198E+004	6.063E+003
	Ra-226	186.21	3.64	1.598E+005	1.60E+005	-1.983E+004	7.836E+004
+	Ac-228	338.32*	11.27	3.370E+004	1.42E+004	2.071E+004	1.611E+004
		911.20*	25.80	1.422E+004		2.224E+004	6.494E+003
		968.97	15.80	4.216E+004		4.484E+004	2.003E+004
	Am-241	59.54	35.90	1.682E+004	1.68E+004	1.579E+003	8.269E+003

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 5452A

Report Generated On : 8/17/2018 2:08:52 PM

Sample Title : B109100AFSFC069GD
Sample Description : WWTF FLOOR
Sample Identification : 069
Sample Type : GAMMA DIRECT
Sample Geometry : #3 SUMP

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 1.041E+001 M²

Sample Taken On : 8/17/2018 1:58:00 PM
Acquisition Started : 8/17/2018 1:58:49 PM

Live Time : 600.0 seconds
Real Time : 601.1 seconds

Dead Time : 0.19 %

Energy Calibration Used Done On : 3/15/2018
Efficiency Calibration Used Done On : 8/16/2018
Efficiency ID : WWTF_SUMP_3

DATA VALIDATED

DATE 9-2-18

TIME 1415

R. Massey / Ozian

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 5452A
 Sample Title: B109100AFSFC069GD
 Peak Analysis Performed on: 8/17/2018 2:08:51 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	287-	305	299.79	74.95	0.70	2.26E+002	100.51	6.80E+002
2	740-	749	744.28	186.07	1.21	3.49E+001	35.16	1.21E+002
3	949-	961	954.81	238.70	0.76	8.08E+001	42.77	1.41E+002
4	1174-	1189	1180.40	295.10	1.19	8.68E+001	36.60	8.22E+001
5	1347-	1358	1353.12	338.28	0.70	1.85E+001	26.94	6.45E+001
6	1402-	1416	1407.66	351.92	0.91	8.73E+001	36.60	8.57E+001
7	2036-	2051	2043.29	510.82	0.95	6.08E+001	26.72	3.93E+001
8	2324-	2339	2330.98	582.75	1.47	5.85E+001	24.51	3.05E+001
9	2429-	2446	2436.31	609.08	1.81	1.25E+002	31.27	3.70E+001
10	2640-	2651	2645.78	661.45	0.62	2.81E+001	17.94	2.09E+001
11	3636-	3652	3643.98	910.99	0.47	4.46E+001	17.56	1.04E+001
12	5831-	5856	5843.98	1461.00	1.54	3.26E+002	40.29	1.89E+001

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC069GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	5.90070E+005	8.91016E+004
Cs-137	1.000	661.66*	85.10	3.89100E+003	2.52629E+003
Tl-208	1.000	583.19*	85.00	7.48530E+003	3.26251E+003
Pb-212	1.000	238.63*	43.60	1.10591E+004	6.12175E+003
Bi-214	0.458	609.32*	45.49	3.07274E+004	8.52824E+003
		1120.29	14.92		
		1764.49	15.30		
Pb-214	1.000	295.22*	18.42	3.24230E+004	1.46157E+004
		351.93*	35.60	1.89695E+004	8.51333E+003
Ra-226	1.000	186.21*	3.64	4.92122E+004	5.01721E+004
Ac-228	0.564	338.32*	11.27	1.23389E+004	1.81218E+004
		911.20*	25.80	2.47965E+004	1.00026E+004
		968.97	15.80		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	5.900704E+005	8.910157E+004
Cs-137	1.000	3.891001E+003	2.526285E+003
Tl-208	1.000	7.485303E+003	3.262514E+003
Pb-212	1.000	1.105910E+004	6.121749E+003
Bi-214	0.458	3.072741E+004	8.528241E+003
Pb-214	1.000	2.237765E+004	7.356370E+003
Ra-226	1.000	4.921221E+004	5.017208E+004
Ac-228	0.564	2.188736E+004	8.757154E+003

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/17/2018 2:08:51 PM
Peak Locate From Channel: 85
Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	74.95	3.7681E-001	44.46		
7	510.82	1.0125E-001	43.99		

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 5452A
 Sample Geometry: #3 SUMP
 Sample Title: B109100AFSFC069GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	5.802E+004	5.80E+004	5.901E+005	2.656E+004
	Co-60	1173.23	99.85	6.450E+003	5.90E+003	-1.897E+003	2.998E+003
		1332.49	99.98	5.900E+003		4.862E+003	2.704E+003
	Nb-94	702.65	99.81	5.029E+003	5.01E+003	-1.158E+003	2.349E+003
		871.09	99.89	5.013E+003		1.470E+003	2.318E+003
	Ag-108m	433.90	90.50	6.016E+003	5.82E+003	-1.191E+003	2.874E+003
		614.30	89.80	9.095E+003		-5.755E+002	4.378E+003
		722.90	90.80	5.815E+003		2.655E+003	2.722E+003
	Cs-134	604.72	97.62	8.424E+003	6.43E+003	-3.101E+003	4.058E+003
		795.86	85.46	6.425E+003		3.875E+003	3.004E+003
+	Cs-137	661.66*	85.10	3.668E+003	3.67E+003	3.891E+003	1.647E+003
	Eu-152	121.78	28.67	2.121E+004	2.12E+004	3.868E+003	1.039E+004
		344.28	26.60	2.135E+004		-4.895E+003	1.029E+004
		1408.01	21.07	2.361E+004		9.157E+003	1.060E+004
	Eu-154	123.07	40.40	1.501E+004	1.50E+004	-2.105E+003	7.357E+003
		723.30	20.06	2.633E+004		1.585E+004	1.233E+004
		1274.43	34.80	1.685E+004		-1.395E+003	7.737E+003
	Eu-155	86.55	30.70	2.263E+004	2.26E+004	1.054E+004	1.112E+004
		105.31	21.10	2.975E+004		-9.850E+003	1.459E+004
+	Tl-208	583.19*	85.00	4.377E+003	4.38E+003	7.485E+003	2.015E+003
	Bi-212	727.33	6.67	7.472E+004	7.47E+004	-1.659E+004	3.483E+004
+	Pb-212	238.63*	43.60	9.110E+003	9.11E+003	1.106E+004	4.370E+003
+	Bi-214	609.32*	45.49	9.505E+003	9.51E+003	3.073E+004	4.420E+003
		1120.29	14.92	4.980E+004		5.128E+004	2.342E+004
		1764.49	15.30	4.977E+004		5.517E+004	2.294E+004
+	Pb-214	295.22*	18.42	2.035E+004	1.18E+004	3.242E+004	9.672E+003
		351.93*	35.60	1.184E+004		1.897E+004	5.625E+003
+	Ra-226	186.21*	3.64	8.056E+004	8.06E+004	4.921E+004	3.837E+004
+	Ac-228	338.32*	11.27	2.989E+004	1.19E+004	1.234E+004	1.404E+004
		911.20*	25.80	1.194E+004		2.480E+004	5.218E+003
		968.97	15.80	4.400E+004		5.712E+004	2.072E+004
	Am-241	59.54	35.90	1.854E+004	1.85E+004	-1.441E+004	9.100E+003

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/18/2018 9:32:04 AM

Sample Title : B109100AFSFC070GD
Sample Description : WWTF FLOOR
Sample Identification : 070
Sample Type : GAMMA DIRECT
Sample Geometry : WWTF_CLARIFIER

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 1.533E+001 M²

Sample Taken On : 8/18/2018 9:22:00 AM
Acquisition Started : 8/18/2018 9:22:02 AM

Live Time : 600.0 seconds
Real Time : 601.0 seconds

Dead Time : 0.16 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 8/17/2018
Efficiency ID : WWTF_Clarifier

DATA VALIDATED

DATE 9-2-18

TIME 1420

R. Massengill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSFC070GD
 Peak Analysis Performed on: 8/18/2018 9:32:04 AM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	287-	305	300.29	75.20	1.27	3.85E+002	89.04	4.73E+002
2	946-	962	953.42	238.47	0.55	6.89E+001	41.50	1.15E+002
3	1400-	1416	1406.85	351.82	0.88	8.78E+001	30.52	4.62E+001
4	2326-	2339	2332.50	583.22	0.39	3.57E+001	19.52	2.13E+001
5	2427-	2447	2435.93	609.08	1.30	1.10E+002	25.81	1.61E+001
6	3637-	3650	3643.34	910.92	1.40	3.03E+001	14.72	8.67E+000
7	5834-	5855	5844.11	1461.08	2.01	1.81E+002	27.63	2.60E+000
8	7052-	7067	7059.66	1764.95	0.37	3.01E+001	11.96	1.91E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC070GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	5.66805E+005	9.93716E+004
Tl-208	1.000	583.19*	85.00	6.92938E+003	3.87905E+003
Pb-212	1.000	238.63*	43.60	1.23691E+004	7.71844E+003
Bi-214	0.720	609.32*	45.49	4.12814E+004	1.08869E+004
		1120.29	14.92		
		1764.49*	15.30	7.64679E+004	3.10020E+004
Pb-214	0.427	295.22	18.42		
		351.93*	35.60	2.65685E+004	1.00560E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	5.668051E+005	9.937164E+004
Tl-208	1.000	6.929379E+003	3.879046E+003
Pb-212	1.000	1.236905E+004	7.718442E+003
Bi-214	0.720	4.514414E+004	1.027194E+004
Pb-214	0.427	2.656853E+004	1.005599E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/18/2018 9:32:04 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.20	6.4207E-001	23.11		
6	910.92	5.0556E-002	48.52	Tol.	Ac-228

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: WWTF_CLARIFIER
 Sample Title: B109100AFSFC070GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	4.001E+004	4.00E+004	5.668E+005	1.578E+004
	Co-60	1173.23	99.85	8.435E+003	8.17E+003	5.301E+003	3.835E+003
		1332.49	99.98	8.167E+003		-1.283E+003	3.665E+003
	Nb-94	702.65	99.81	7.424E+003	6.91E+003	9.580E+002	3.453E+003
		871.09	99.89	6.913E+003		-4.358E+003	3.151E+003
	Ag-108m	433.90	90.50	7.341E+003	7.34E+003	-3.505E+003	3.478E+003
		614.30	89.80	1.114E+004		-4.330E+003	5.309E+003
		722.90	90.80	8.405E+003		9.087E+001	3.911E+003
	Cs-134	604.72	97.62	1.045E+004	8.93E+003	-6.890E+003	4.989E+003
		795.86	85.46	8.927E+003		-1.112E+004	4.130E+003
	Cs-137	661.66	85.10	9.565E+003	9.57E+003	3.701E+003	4.492E+003
	Eu-152	121.78	28.67	2.296E+004	2.18E+004	-4.591E+003	1.122E+004
		344.28	26.60	2.176E+004		-4.803E+004	1.034E+004
		1408.01	21.07	4.123E+004		2.842E+004	1.854E+004
	Eu-154	123.07	40.40	1.614E+004	1.61E+004	1.155E+004	7.889E+003
		723.30	20.06	3.835E+004		-1.757E+003	1.786E+004
		1274.43	34.80	2.461E+004		7.720E+003	1.114E+004
	Eu-155	86.55	30.70	2.452E+004	2.45E+004	4.080E+004	1.204E+004
		105.31	21.10	3.240E+004		4.474E+003	1.587E+004
+	Tl-208	583.19*	85.00	5.453E+003	5.45E+003	6.929E+003	2.464E+003
	Bi-212	727.33	6.67	1.105E+005	1.10E+005	7.518E+003	5.126E+004
+	Pb-212	238.63*	43.60	1.173E+004	1.17E+004	1.237E+004	5.620E+003
+	Bi-214	609.32*	45.49	1.031E+004	1.03E+004	4.128E+004	4.645E+003
		1120.29	14.92	8.007E+004		9.110E+004	3.756E+004
		1764.49*	15.30	2.678E+004		7.647E+004	9.952E+003
+	Pb-214	295.22	18.42	3.628E+004	1.28E+004	-5.318E+004	1.746E+004
		351.93*	35.60	1.281E+004		2.657E+004	5.996E+003
	Ra-226	186.21	3.64	1.804E+005	1.80E+005	-3.940E+004	8.778E+004
	Ac-228	338.32	11.27	5.411E+004	3.79E+004	-5.402E+003	2.581E+004
		911.20	25.80	3.792E+004		3.807E+004	1.774E+004
		968.97	15.80	5.359E+004		2.865E+004	2.470E+004
	Am-241	59.54	35.90	1.697E+004	1.70E+004	7.825E+003	8.294E+003

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/18/2018 9:51:08 AM

Sample Title : B109100AFSFC071GD
Sample Description : WWTF FLOOR
Sample Identification : 071
Sample Type : GAMMA DIRECT
Sample Geometry : WWTF_CLARIFIER

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 1.533E+001 M²

Sample Taken On : 8/18/2018 9:41:00 AM
Acquisition Started : 8/18/2018 9:41:05 AM

Live Time : 600.0 seconds
Real Time : 601.1 seconds

Dead Time : 0.17 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 8/17/2018
Efficiency ID : WWTF_Clarifier

DATA VALIDATED

DATE 9-2-18

TIME 1430

R. Massengill

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSFC071GD
Peak Analysis Performed on: 8/18/2018 9:51:08 AM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	283-	305	300.33	75.21	0.78	2.59E+002	110.87	7.26E+002
2	331-	344	339.76	85.06	1.15	6.82E+001	63.77	3.45E+002
3	546-	556	551.25	137.94	0.25	5.33E+000	41.26	1.76E+002
4	699-	708	703.74	176.06	0.29	1.33E+001	29.61	9.07E+001
5	949-	960	954.73	238.80	0.37	4.53E+001	33.57	9.27E+001
6	1399-	1415	1407.66	352.02	1.42	5.87E+001	30.84	5.73E+001
7	2327-	2339	2332.64	583.26	0.92	2.38E+001	18.99	2.32E+001
8	2428-	2445	2436.83	609.30	1.32	1.00E+002	24.11	1.37E+001
9	3870-	3883	3876.13	969.11	0.53	1.36E+001	13.53	1.14E+001
10	4474-	4489	4481.27	1120.39	0.37	3.27E+001	15.36	8.34E+000
11	4948-	4961	4954.83	1238.77	0.44	1.15E+001	12.74	1.05E+001
12	5833-	5855	5844.75	1461.24	1.81	1.93E+002	28.57	2.84E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC071GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	6.03625E+005	1.03533E+005
Eu-155	0.352	86.55*	30.70	1.10907E+004	1.06044E+004
		105.31	21.10		
Tl-208	1.000	583.19*	85.00	4.61700E+003	3.72651E+003
Pb-212	1.000	238.63*	43.60	8.14551E+003	6.17946E+003
Bi-214	0.759	609.32*	45.49	3.76839E+004	1.01267E+004
		1120.29*	14.92	5.97077E+004	2.84891E+004
		1764.49	15.30		
Pb-214	0.427	295.22	18.42		
		351.93*	35.60	1.77670E+004	9.71016E+003

Ac-228 not RFD

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	6.036251E+005	1.035333E+005
Eu-155	0.352	1.109069E+004	1.060442E+004
Tl-208	1.000	4.617001E+003	3.726515E+003
Pb-212	1.000	8.145509E+003	6.179457E+003
Bi-214	0.759	4.015444E+004	9.541841E+003
Pb-214	0.427	1.776705E+004	9.710163E+003

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/18/2018 9:51:08 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.21	4.3132E-001	42.84		
3	137.94	8.8881E-003	773.78		
4	176.06	2.2103E-002	223.23	Sum	
9	969.11	2.2600E-002	99.78	Sum	
11	1238.77	1.9167E-002	110.81		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: WWTF_CLARIFIER
 Sample Title: B109100AFSFC071GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M^2)	Nuclide MDA (pCi/M^2)	Activity (pCi/M^2)	Dec. Level (pCi/M^2)
+	K-40	1460.82*	10.66	4.243E+004	4.24E+004	6.036E+005	1.699E+004
	Co-60	1173.23	99.85	8.979E+003	8.02E+003	2.156E+002	4.107E+003
		1332.49	99.98	8.024E+003		5.376E+003	3.594E+003
	Nb-94	702.65	99.81	6.947E+003	6.95E+003	2.498E+003	3.214E+003
		871.09	99.89	7.499E+003		9.707E+003	3.444E+003
	Ag-108m	433.90	90.50	6.642E+003	6.64E+003	1.762E+001	3.128E+003
		614.30	89.80	1.143E+004		-1.149E+003	5.457E+003
		722.90	90.80	7.301E+003		-2.440E+002	3.359E+003
	Cs-134	604.72	97.62	1.074E+004	8.69E+003	2.129E+003	5.135E+003
		795.86	85.46	8.685E+003		-9.581E+003	4.010E+003
	Cs-137	661.66	85.10	8.813E+003	8.81E+003	-5.190E+003	4.116E+003
	Eu-152	121.78	28.67	2.296E+004	2.30E+004	7.824E+003	1.122E+004
		344.28	26.60	2.411E+004		-2.402E+004	1.152E+004
		1408.01	21.07	3.526E+004		-7.346E+003	1.555E+004
	Eu-154	123.07	40.40	1.627E+004	1.63E+004	1.768E+003	7.956E+003
		723.30	20.06	3.238E+004		-1.095E+004	1.487E+004
		1274.43	34.80	2.634E+004		-1.846E+003	1.201E+004
+	Eu-155	86.55*	30.70	1.692E+004	1.69E+004	1.109E+004	8.238E+003
		105.31	21.10	3.093E+004		-7.323E+003	1.514E+004
+	Tl-208	583.19*	85.00	5.726E+003	5.73E+003	4.617E+003	2.600E+003
	Bi-212	727.33	6.67	9.568E+004	9.57E+004	1.691E+004	4.386E+004
+	Pb-212	238.63*	43.60	9.585E+003	9.59E+003	8.146E+003	4.549E+003
+	Bi-214	609.32*	45.49	9.310E+003	9.31E+003	3.768E+004	4.147E+003
		1120.29*	14.92	3.582E+004		5.971E+004	1.543E+004
		1764.49	15.30	6.232E+004		1.334E+004	2.772E+004
+	Pb-214	295.22	18.42	3.659E+004	1.42E+004	1.295E+004	1.762E+004
		351.93*	35.60	1.415E+004		1.777E+004	6.667E+003
	Ra-226	186.21	3.64	1.741E+005	1.74E+005	6.392E+004	8.465E+004
	Ac-228	338.32	11.27	5.842E+004	3.56E+004	2.530E+004	2.796E+004
		911.20	25.80	3.560E+004		1.742E+004	1.657E+004
		968.97	15.80	6.273E+004		5.796E+004	2.927E+004
	Am-241	59.54	35.90	1.735E+004	1.73E+004	6.982E+003	8.483E+003

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/17/2018 3:28:04 PM

Sample Title : B109100AFSFC072GD
Sample Description : WWTF FLOK #72
Sample Identification : 072
Sample Type :
Sample Geometry : FLOK #72

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 5.490E+000 M^2

Sample Taken On : 8/17/2018 3:17:00 PM
Acquisition Started : 8/17/2018 3:18:02 PM

Live Time : 600.0 seconds
Real Time : 600.7 seconds

Dead Time : 0.12 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 8/17/2018
Efficiency ID : WWTF_FLOC_TANK

DATA VALIDATED

DATE 9-2-18

TIME 1445

R. Massengill / DJM

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFSFC072GD
 Peak Analysis Performed on: 8/17/2018 3:28:03 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	287-	308	300.83	75.33	0.73	2.18E+002	90.19	4.84E+002
2	328-	344	339.14	84.91	0.30	3.33E+001	66.93	3.43E+002
3	576-	585	580.55	145.26	0.66	8.66E+000	28.05	8.33E+001
4	1401-	1415	1407.06	351.88	0.26	3.89E+001	19.99	2.11E+001
5	2428-	2440	2434.16	608.64	0.78	3.52E+001	17.44	1.48E+001
6	2640-	2651	2645.88	661.56	0.30	1.46E+001	10.90	5.35E+000
7	5833-	5854	5843.23	1460.86	1.40	1.25E+002	23.22	2.59E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC072GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	1.40767E+006	2.87851E+005
Cs-137	1.000	661.66*	85.10	1.23214E+004	9.28561E+003
Eu-155	0.353	86.55*	30.70	2.14163E+004	4.32693E+004
		105.31	21.10		
Bi-214	0.464	609.32*	45.49	5.21462E+004	2.66011E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.428	295.22	18.42	4.80842E+004	2.57207E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	1.407675E+006	2.878515E+005
Cs-137	1.000	1.232140E+004	9.285615E+003
Eu-155	0.353	2.141633E+004	4.326933E+004
Bi-214	0.464	5.214619E+004	2.660110E+004
Pb-214	0.428	4.808417E+004	2.572074E+004

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/17/2018 3:28:03 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.33	3.6344E-001	41.36		
3	145.26	1.4429E-002	323.98		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: FLOK #72
 Sample Title: B109100AFSFC072GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.433E+005	1.43E+005	1.408E+006	5.648E+004
	Co-60	1173.23	99.85	2.518E+004	2.19E+004	-1.008E+004	1.117E+004
		1332.49	99.98	2.187E+004		6.066E+003	9.416E+003
	Nb-94	702.65	99.81	2.346E+004	2.24E+004	8.812E+003	1.072E+004
		871.09	99.89	2.245E+004		1.616E+004	1.005E+004
	Ag-108m	433.90	90.50	2.303E+004	2.30E+004	-4.578E+003	1.073E+004
		614.30	89.80	3.390E+004		-8.448E+003	1.593E+004
		722.90	90.80	2.661E+004		5.547E+003	1.217E+004
	Cs-134	604.72	97.62	3.118E+004	2.33E+004	2.519E+004	1.466E+004
		795.86	85.46	2.331E+004		-2.591E+003	1.037E+004
+	Cs-137	661.66*	85.10	1.301E+004	1.30E+004	1.232E+004	5.367E+003
	Eu-152	121.78	28.67	7.338E+004	7.34E+004	4.967E+004	3.567E+004
		344.28	26.60	7.960E+004		-3.091E+004	3.760E+004
		1408.01	21.07	8.775E+004		-6.948E+004	3.639E+004
	Eu-154	123.07	40.40	5.090E+004	5.09E+004	-1.291E+004	2.473E+004
		723.30	20.06	1.233E+005		3.284E+004	5.650E+004
		1274.43	34.80	8.460E+004		-5.901E+004	3.804E+004
+	Eu-155	86.55*	30.70	7.151E+004	7.15E+004	2.142E+004	3.488E+004
		105.31	21.10	1.071E+005		3.077E+003	5.225E+004
	Tl-208	583.19	85.00	2.839E+004	2.84E+004	1.386E+004	1.316E+004
	Bi-212	727.33	6.67	3.679E+005	3.68E+005	-1.365E+005	1.685E+005
	Pb-212	238.63	43.60	4.724E+004	4.72E+004	9.623E+003	2.262E+004
+	Bi-214	609.32*	45.49	3.518E+004	3.52E+004	5.215E+004	1.559E+004
		1120.29	14.92	1.567E+005		1.295E+005	6.913E+004
		1764.49	15.30	1.856E+005		6.209E+004	8.069E+004
+	Pb-214	295.22	18.42	1.070E+005	3.51E+004	-2.783E+004	5.072E+004
		351.93*	35.60	3.508E+004		4.808E+004	1.587E+004
	Ra-226	186.21	3.64	5.399E+005	5.40E+005	1.733E+005	2.601E+005
	Ac-228	338.32	11.27	1.955E+005	1.06E+005	2.947E+005	9.264E+004
		911.20	25.80	1.057E+005		2.741E+004	4.817E+004
		968.97	15.80	1.822E+005		9.619E+004	8.314E+004
	Am-241	59.54	35.90	7.061E+004	7.06E+004	4.573E+004	3.455E+004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/17/2018 3:43:23 PM

Sample Title : B109100AFSFC073GD
Sample Description : WWTF FLOK #73
Sample Identification : 073
Sample Type :
Sample Geometry : FLOK #73

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 9.230E+000 M²

Sample Taken On : 8/17/2018 3:33:00 PM
Acquisition Started : 8/17/2018 3:33:21 PM

Live Time : 600.0 seconds
Real Time : 601.0 seconds

Dead Time : 0.16 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 8/17/2018
Efficiency ID : WWTF_FLOC_TANK

DATA VALIDATED
DATE 9-2-18
TIME 1459
R. Masejil/Rain

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFSFC073GD
Peak Analysis Performed on: 8/17/2018 3:43:23 PM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	281-	310	300.56	75.26	0.69	3.87E+002	110.52	5.61E+002
2	333-	345	340.54	85.26	1.08	9.05E+001	52.91	2.31E+002
3	2327-	2338	2332.08	583.12	0.38	1.90E+001	10.30	3.00E+000
4	2429-	2444	2436.46	609.21	1.10	3.98E+001	16.85	1.02E+001
5	5834-	5853	5844.11	1461.08	0.79	9.60E+001	19.60	0.00E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC073GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	6.40991E+005	1.42189E+005
Eu-155	0.354	86.55*	30.70	3.46150E+004	2.13914E+004
		105.31	21.10		
Tl-208	1.000	583.19*	85.00	8.69627E+003	4.83007E+003
Bi-214	0.464	609.32*	45.49	3.51405E+004	1.54542E+004
		1120.29	14.92		
		1764.49	15.30		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	6.409912E+005	1.421891E+005
Eu-155	0.354	3.461496E+004	2.139136E+004
Tl-208	1.000	8.696266E+003	4.830074E+003
Bi-214	0.464	3.514047E+004	1.545416E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/17/2018 3:43:23 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.26	6.4461E-001	28.58		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: FLOK #73
 Sample Title: B109100AFSFC073GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.807E+004	1.81E+004	6.410E+005	0.000E+000
	Co-60	1173.23	99.85	1.648E+004	1.42E+004	-1.693E+004	7.395E+003
		1332.49	99.98	1.423E+004		-3.547E+002	6.213E+003
	Nb-94	702.65	99.81	1.068E+004	1.07E+004	-1.096E+003	4.739E+003
		871.09	99.89	1.359E+004		-7.712E+002	6.099E+003
	Ag-108m	433.90	90.50	1.277E+004	1.28E+004	-2.898E+004	5.919E+003
		614.30	89.80	2.028E+004		1.161E+004	9.530E+003
		722.90	90.80	1.294E+004		7.135E+003	5.795E+003
	Cs-134	604.72	97.62	1.633E+004	1.41E+004	-1.124E+004	7.612E+003
		795.86	85.46	1.414E+004		-6.272E+003	6.305E+003
	Cs-137	661.66	85.10	1.748E+004	1.75E+004	8.078E+003	8.064E+003
	Eu-152	121.78	28.67	4.495E+004	4.10E+004	-2.731E+003	2.187E+004
		344.28	26.60	4.102E+004		-7.964E+004	1.920E+004
		1408.01	21.07	4.639E+004		1.974E+004	1.875E+004
	Eu-154	123.07	40.40	3.177E+004	3.18E+004	-1.900E+004	1.545E+004
		723.30	20.06	5.963E+004		4.651E+004	2.676E+004
		1274.43	34.80	4.098E+004		2.588E+003	1.796E+004
+	Eu-155	86.55*	30.70	3.210E+004	3.21E+004	3.461E+004	1.553E+004
		105.31	21.10	6.284E+004		-2.456E+004	3.064E+004
+	Tl-208	583.19*	85.00	5.373E+003	5.37E+003	8.696E+003	2.067E+003
	Bi-212	727.33	6.67	1.861E+005	1.86E+005	1.005E+005	8.384E+004
	Pb-212	238.63	43.60	2.818E+004	2.82E+004	1.527E+004	1.350E+004
+	Bi-214	609.32*	45.49	1.859E+004	1.86E+004	3.514E+004	8.099E+003
		1120.29	14.92	1.126E+005		2.440E+004	5.080E+004
		1764.49	15.30	1.104E+005		7.990E+004	4.799E+004
	Pb-214	295.22	18.42	6.938E+004	3.57E+004	1.809E+004	3.302E+004
		351.93	35.60	3.567E+004		3.864E+004	1.684E+004
	Ra-226	186.21	3.64	3.310E+005	3.31E+005	1.653E+005	1.596E+005
	Ac-228	338.32	11.27	1.086E+005	5.96E+004	3.878E+004	5.124E+004
		911.20	25.80	5.958E+004		3.518E+004	2.701E+004
		968.97	15.80	9.550E+004		-6.774E+004	4.302E+004
	Am-241	59.54	35.90	4.123E+004	4.12E+004	1.630E+004	2.016E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 5452A

Report Generated On : 8/17/2018 2:26:55 PM

Sample Title : B109100AFSFC074GD
Sample Description : WWTF FLOOR
Sample Identification : 074
Sample Type : GAMMA DIRECT
Sample Geometry : #3 SUMP #74

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 1.041E+001 M²

Sample Taken On : 8/17/2018 2:16:00 PM
Acquisition Started : 8/17/2018 2:16:53 PM

Live Time : 600.0 seconds
Real Time : 601.3 seconds

Dead Time : 0.22 %

Energy Calibration Used Done On : 3/15/2018
Efficiency Calibration Used Done On : 8/16/2018
Efficiency ID : WWTF_SUMP_3

DATA VALIDATED

DATE 9-2-18

TIME 1455

R. Massengill / [Signature]

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 5452A
 Sample Title: B109100AFSFC074GD
 Peak Analysis Performed on: 8/17/2018 2:26:55 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	290-	307	300.81	75.20	0.46	1.24E+002	96.02	6.66E+002
2	943-	960	955.44	238.86	1.38	1.22E+002	49.99	1.54E+002
3	1400-	1415	1407.64	351.91	0.84	7.70E+001	38.94	9.90E+001
4	2034-	2050	2042.05	510.51	0.87	6.26E+001	27.08	3.84E+001
5	2326-	2340	2332.64	583.16	0.77	5.65E+001	24.60	3.25E+001
6	2426-	2446	2436.14	609.04	0.84	1.37E+002	31.63	3.13E+001
7	3638-	3651	3644.79	911.20	0.75	4.90E+001	20.69	2.10E+001
8	3868-	3881	3874.66	968.67	1.43	3.06E+001	15.40	1.04E+001
9	5830-	5857	5843.51	1460.88	1.71	3.71E+002	40.00	6.61E+000
10	7055-	7070	7062.02	1765.51	0.29	2.05E+001	15.50	1.25E+001

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC074GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	6.71964E+005	9.29664E+004
Tl-208	1.000	583.19*	85.00	7.23686E+003	3.26618E+003
Pb-212	1.000	238.63*	43.60	1.66698E+004	7.35721E+003
Bi-214	0.712	609.32*	45.49	3.35890E+004	8.75974E+003
		1120.29	14.92		
		1764.49*	15.30	2.95197E+004	2.24235E+004
Pb-214	0.433	295.22	18.42		
		351.93*	35.60	1.67261E+004	8.87389E+003
Ac-228	0.562	338.32	11.27		
		911.20*	25.80	2.72697E+004	1.17515E+004
		968.97*	15.80	2.89186E+004	1.47625E+004

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	6.719636E+005	9.296640E+004
Tl-208	1.000	7.236862E+003	3.266180E+003
Pb-212	1.000	1.666983E+004	7.357206E+003
Bi-214	0.712	3.305021E+004	8.159258E+003
Pb-214	0.433	1.672610E+004	8.873892E+003
Ac-228	0.562	2.790928E+004	9.194137E+003

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/17/2018 2:26:55 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.20	2.0622E-001	77.60		
4	510.51	1.0431E-001	43.27		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 5452A
 Sample Geometry: #3 SUMP #74
 Sample Title: B109100AFSFC074GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M^2)	Nuclide MDA (pCi/M^2)	Activity (pCi/M^2)	Dec. Level (pCi/M^2)
+	K-40	1460.82*	10.66	3.674E+004	3.67E+004	6.720E+005	1.592E+004
	Co-60	1173.23	99.85	6.243E+003	5.90E+003	-1.070E+003	2.895E+003
		1332.49	99.98	5.900E+003		1.387E+003	2.704E+003
	Nb-94	702.65	99.81	4.960E+003	4.96E+003	-8.689E+003	2.314E+003
		871.09	99.89	5.321E+003		-5.070E+002	2.472E+003
	Ag-108m	433.90	90.50	5.187E+003	5.19E+003	-1.405E+003	2.460E+003
		614.30	89.80	9.017E+003		5.007E+002	4.339E+003
		722.90	90.80	6.382E+003		2.142E+003	3.006E+003
	Cs-134	604.72	97.62	8.231E+003	6.51E+003	1.311E+003	3.961E+003
		795.86	85.46	6.510E+003		-6.291E+002	3.046E+003
	Cs-137	661.66	85.10	6.751E+003	6.75E+003	4.725E+003	3.188E+003
	Eu-152	121.78	28.67	2.004E+004	1.92E+004	1.029E+004	9.811E+003
		344.28	26.60	1.920E+004		-2.046E+004	9.214E+003
		1408.01	21.07	2.701E+004		2.425E+004	1.230E+004
	Eu-154	123.07	40.40	1.427E+004	1.43E+004	1.030E+004	6.988E+003
		723.30	20.06	2.828E+004		-1.302E+004	1.330E+004
		1274.43	34.80	1.789E+004		1.648E+003	8.259E+003
	Eu-155	86.55	30.70	2.136E+004	2.14E+004	4.279E+004	1.049E+004
		105.31	21.10	2.750E+004		-2.250E+004	1.347E+004
+	Tl-208	583.19*	85.00	4.444E+003	4.44E+003	7.237E+003	2.049E+003
	Bi-212	727.33	6.67	8.581E+004	8.58E+004	1.216E+005	4.037E+004
+	Pb-212	238.63*	43.60	1.048E+004	1.05E+004	1.667E+004	5.053E+003
+	Bi-214	609.32*	45.49	9.277E+003	9.28E+003	3.359E+004	4.306E+003
		1120.29	14.92	5.115E+004		5.673E+004	2.410E+004
		1764.49*	15.30	3.365E+004		2.952E+004	1.488E+004
+	Pb-214	295.22	18.42	3.185E+004	1.30E+004	1.967E+004	1.542E+004
		351.93*	35.60	1.301E+004		1.673E+004	6.212E+003
	Ra-226	186.21	3.64	1.453E+005	1.45E+005	-5.371E+004	7.072E+004
+	Ac-228	338.32	11.27	4.569E+004	1.54E+004	-2.136E+003	2.194E+004
		911.20*	25.80	1.545E+004		2.727E+004	6.972E+003
		968.97*	15.80	1.918E+004		2.892E+004	8.314E+003
	Am-241	59.54	35.90	1.587E+004	1.59E+004	4.938E+003	7.763E+003

+ = Nuclide identified during the nuclide identification
 * = Energy line found in the spectrum
 > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
 @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 5452A

Report Generated On : 8/17/2018 2:39:54 PM

Sample Title : B109100AFSFC075GD
Sample Description : WWTF FLOOR
Sample Identification : 075
Sample Type : GAMMA DIRECT
Sample Geometry : #3 SUMP #75

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 1.041E+001 M²

Sample Taken On : 8/17/2018 2:29:00 PM
Acquisition Started : 8/17/2018 2:29:52 PM

Live Time : 600.0 seconds
Real Time : 601.4 seconds

Dead Time : 0.22 %

Energy Calibration Used Done On : 3/15/2018
Efficiency Calibration Used Done On : 8/16/2018
Efficiency ID : WWTF_SUMP_3

DATA VALIDATED
DATE 9-2-18
TIME 1500
R. Massengill/Bjm

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 5452A
 Sample Title: B109100AFSFC075GD
 Peak Analysis Performed on: 8/17/2018 2:39:54 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	285-	306	299.67	74.92	0.39	1.46E+002	103.62	6.76E+002
2	948-	975	954.65	238.66	1.21	1.20E+002	68.93	2.34E+002
3	1176-	1191	1182.80	295.70	1.34	8.75E+001	34.84	7.15E+001
4	1346-	1359	1352.85	338.21	0.33	3.73E+001	26.20	4.87E+001
5	1401-	1417	1407.94	351.98	1.34	1.21E+002	36.63	6.85E+001
6	2324-	2340	2332.30	583.07	1.07	5.98E+001	25.90	3.42E+001
7	2426-	2446	2436.45	609.11	1.80	1.08E+002	29.78	3.15E+001
8	3637-	3650	3643.29	910.82	0.74	4.93E+001	19.23	1.57E+001
9	4471-	4487	4479.51	1119.88	0.93	4.70E+001	20.02	1.70E+001
10	5831-	5856	5844.61	1461.15	1.74	3.29E+002	39.20	1.30E+001
11	7053-	7069	7061.40	1765.35	0.30	3.80E+001	12.33	0.00E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFSFC075GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	5.95347E+005	8.77814E+004
Tl-208	1.000	583.19*	85.00	7.64797E+003	3.43949E+003
Pb-212	1.000	238.63*	43.60	1.63648E+004	9.79837E+003
Bi-214	1.000	609.32*	45.49	2.64233E+004	7.97983E+003
		1120.29*	14.92	5.13104E+004	2.22358E+004
		1764.49*	15.30	5.46760E+004	1.82718E+004
Pb-214	1.000	295.22*	18.42	3.27186E+004	1.40389E+004
		351.93*	35.60	2.61895E+004	8.99685E+003
Ac-228	0.564	338.32*	11.27	2.49602E+004	1.79794E+004
		911.20*	25.80	2.74258E+004	1.09622E+004
		968.97	15.80		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	5.953469E+005	8.778144E+004
Tl-208	1.000	7.647968E+003	3.439490E+003
Pb-212	1.000	1.636480E+004	9.798371E+003
Bi-214	1.000	3.293619E+004	6.946806E+003
Pb-214	1.000	2.809030E+004	7.574854E+003
Ac-228	0.564	2.675758E+004	9.359679E+003

? = 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 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 8/17/2018 2:39:54 PM
Peak Locate From Channel: 85
Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	74.92	2.4264E-001	71.18		

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 5452A
 Sample Geometry: #3 SUMP #75
 Sample Title: B109100AFSFC075GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	4.915E+004	4.91E+004	5.953E+005	2.213E+004
	Co-60	1173.23	99.85	7.214E+003	5.70E+003	7.835E+002	3.380E+003
		1332.49	99.98	5.698E+003		5.553E+003	2.603E+003
	Nb-94	702.65	99.81	5.298E+003	5.30E+003	-7.274E+002	2.483E+003
		871.09	99.89	5.691E+003		-1.197E+002	2.657E+003
	Ag-108m	433.90	90.50	5.695E+003	5.70E+003	3.187E+002	2.714E+003
		614.30	89.80	8.218E+003		-8.340E+002	3.940E+003
		722.90	90.80	6.211E+003		-1.198E+003	2.920E+003
	Cs-134	604.72	97.62	7.640E+003	6.25E+003	-2.182E+003	3.666E+003
		795.86	85.46	6.251E+003		2.746E+003	2.917E+003
	Cs-137	661.66	85.10	7.099E+003	7.10E+003	4.175E+003	3.362E+003
	Eu-152	121.78	28.67	1.953E+004	1.92E+004	-1.341E+002	9.557E+003
		344.28	26.60	1.920E+004		5.701E+003	9.214E+003
		1408.01	21.07	2.701E+004		8.392E+003	1.230E+004
	Eu-154	123.07	40.40	1.380E+004	1.38E+004	-5.546E+002	6.750E+003
		723.30	20.06	2.828E+004		-6.749E+002	1.330E+004
		1274.43	34.80	1.720E+004		1.095E+004	7.914E+003
	Eu-155	86.55	30.70	2.145E+004	2.14E+004	1.760E+004	1.053E+004
		105.31	21.10	2.774E+004		1.873E+004	1.359E+004
+	Tl-208	583.19*	85.00	4.720E+003	4.72E+003	7.648E+003	2.187E+003
	Bi-212	727.33	6.67	8.294E+004	8.29E+004	3.935E+004	3.894E+004
+	Pb-212	238.63*	43.60	1.509E+004	1.51E+004	1.636E+004	7.359E+003
+	Bi-214	609.32*	45.49	9.309E+003	3.89E+003	2.642E+004	4.322E+003
		1120.29*	14.92	2.914E+004		5.131E+004	1.309E+004
		1764.49*	15.30	3.894E+003		5.468E+004	0.000E+000
+	Pb-214	295.22*	18.42	1.909E+004	1.11E+004	3.272E+004	9.038E+003
		351.93*	35.60	1.107E+004		2.619E+004	5.241E+003
	Ra-226	186.21	3.64	1.496E+005	1.50E+005	6.771E+004	7.289E+004
+	Ac-228	338.32*	11.27	2.729E+004	1.35E+004	2.496E+004	1.274E+004
		911.20*	25.80	1.353E+004		2.743E+004	6.014E+003
		968.97	15.80	4.604E+004		7.400E+004	2.174E+004
	Am-241	59.54	35.90	1.769E+004	1.77E+004	1.061E+004	8.671E+003

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated

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

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/16/2018 9:38:15 AM

Sample Title : B109100AFQFC009GD
Sample Description : WWTF FLOOR
Sample Identification : 009
Sample Type : GAMMA DIRECT
Sample Geometry : 3M90DWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : ~~2.826E+001~~ ^{~ 8/28/18} M²
2.83

Sample Taken On : 8/16/2018 9:28:00 AM
Acquisition Started : 8/16/2018 9:28:13 AM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.14 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1505

R. Massengill

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFQFC009GD
 Peak Analysis Performed on: 8/16/2018 9:38:14 AM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	295-	307	299.84	75.09	0.69	7.07E+001	46.97	1.81E+002
2	950-	960	954.73	238.80	0.35	2.90E+001	20.32	3.10E+001
3	1175-	1188	1180.36	295.20	1.30	3.52E+001	18.41	1.78E+001
4	2429-	2442	2435.83	609.05	0.85	4.88E+001	18.16	1.22E+001
5	5834-	5854	5844.66	1461.22	1.17	9.34E+001	20.31	2.65E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFQFC009GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	1.01379E+006	2.48040E+005
Pb-212	1.000	238.63*	43.60	2.30954E+004	1.66922E+004
Bi-214	0.461	609.32*	45.49	7.11429E+004	2.82775E+004
		1120.29	14.92		
		1764.49	15.30		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	1.013794E+006	2.480395E+005
Pb-212	1.000	2.309542E+004	1.669216E+004
Bi-214	0.461	7.114292E+004	2.827751E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/16/2018 9:38:14 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.09	1.1781E-001	66.45		
3	295.20	5.8648E-002	52.33	Tol.	Pb-214

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFQFC009GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.408E+005	1.41E+005	1.014E+006	5.571E+004
	Co-60	1173.23	99.85	2.079E+004	1.17E+004	-1.010E+004	9.036E+003
		1332.49	99.98	1.165E+004		-5.231E+003	4.361E+003
	Nb-94	702.65	99.81	2.055E+004	1.87E+004	-1.150E+004	9.287E+003
		871.09	99.89	1.870E+004		-6.248E+003	8.222E+003
	Ag-108m	433.90	90.50	2.067E+004	2.07E+004	-1.918E+004	9.552E+003
		614.30	89.80	3.553E+004		-3.294E+004	1.676E+004
		722.90	90.80	2.192E+004		-5.286E+003	9.859E+003
	Cs-134	604.72	97.62	3.015E+004	2.47E+004	4.787E+004	1.416E+004
		795.86	85.46	2.474E+004		5.402E+003	1.112E+004
	Cs-137	661.66	85.10	2.141E+004	2.14E+004	-1.092E+004	9.588E+003
	Eu-152	121.78	28.67	6.854E+004	6.85E+004	-1.181E+004	3.305E+004
		344.28	26.60	7.389E+004		-4.231E+004	3.468E+004
		1408.01	21.07	1.200E+005		5.256E+004	5.276E+004
	Eu-154	123.07	40.40	4.778E+004	4.78E+004	-1.141E+004	2.303E+004
		723.30	20.06	9.760E+004		-2.770E+004	4.380E+004
		1274.43	34.80	7.116E+004		6.052E+004	3.148E+004
	Eu-155	86.55	30.70	7.639E+004	7.64E+004	4.827E+004	3.709E+004
		105.31	21.10	9.518E+004		-2.147E+004	4.598E+004
	Tl-208	583.19	85.00	2.351E+004	2.35E+004	1.471E+004	1.073E+004
	Bi-212	727.33	6.67	3.045E+005	3.05E+005	8.070E+004	1.372E+005
+	Pb-212	238.63*	43.60	2.474E+004	2.47E+004	2.310E+004	1.129E+004
+	Bi-214	609.32*	45.49	3.177E+004	3.18E+004	7.114E+004	1.391E+004
		1120.29	14.92	1.694E+005		2.192E+004	7.587E+004
		1764.49	15.30	1.855E+005		1.392E+005	8.098E+004
	Pb-214	295.22	18.42	1.129E+005	6.12E+004	1.571E+005	5.351E+004
		351.93	35.60	6.116E+004		4.932E+004	2.886E+004
	Ra-226	186.21	3.64	5.140E+005	5.14E+005	-1.801E+005	2.459E+005
	Ac-228	338.32	11.27	1.897E+005	9.90E+004	2.033E+005	8.958E+004
		911.20	25.80	9.898E+004		9.113E+004	4.500E+004
		968.97	15.80	1.563E+005		8.303E+004	7.052E+004
	Am-241	59.54	35.90	6.267E+004	6.27E+004	4.708E+004	3.021E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: 6279

Report Generated On : 8/18/2018 2:31:10 PM
Sample Title : B109100AFQFC014GD
Sample Description : WWTF FLOOR
Sample Identification : 014 QC
Sample Type : GAMMA DIRECT
Sample Geometry : 3M90DWTF1.27CM
Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV
2.83
Sample Size : ~~2.826E+001~~ M²
Run 8/28/18
Sample Taken On : 8/18/2018 2:21:00 PM
Acquisition Started : 8/18/2018 2:21:08 PM
Live Time : 600.0 seconds
Real Time : 601.0 seconds
Dead Time : 0.16 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED
DATE 9-2-18
TIME 1510
R. Massery

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFQFC014GD
Peak Analysis Performed on: 8/18/2018 2:31:10 PM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	267-	310	300.46	75.24	1.05	1.59E+002	110.62	4.48E+002
2	949-	962	954.51	238.75	0.40	3.82E+001	28.60	5.88E+001
3	1175-	1186	1180.91	295.34	0.53	1.99E+001	18.77	2.71E+001
4	1401-	1415	1407.10	351.89	1.00	4.34E+001	20.55	2.16E+001
5	2429-	2445	2435.95	609.08	0.42	5.15E+001	17.68	8.50E+000
6	5834-	5852	5844.22	1461.11	0.78	8.15E+001	18.99	2.47E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFQFC014GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M ²)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	8.85304E+005	2.20109E+005
Pb-212	1.000	238.63*	43.60	3.04048E+004	2.33089E+004
Bi-214	0.461	609.32*	45.49	7.51145E+004	2.73194E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	1.000	295.22*	18.42	4.32724E+004	4.13872E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	8.853037E+005	2.201095E+005
Pb-212	1.000	3.040481E+004	2.330890E+004
Bi-214	0.461	7.511446E+004	2.731940E+004
Pb-214	1.000	5.162337E+004	2.286197E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/18/2018 2:31:10 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.24	2.6544E-001	69.45		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFQFC014GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.345E+005	1.35E+005	8.853E+005	5.256E+004
	Co-60	1173.23	99.85	2.827E+004	2.04E+004	1.479E+004	1.278E+004
		1332.49	99.98	2.037E+004		1.299E+004	8.722E+003
	Nb-94	702.65	99.81	1.926E+004	1.93E+004	5.081E+003	8.646E+003
		871.09	99.89	2.239E+004		-4.913E+003	1.007E+004
	Ag-108m	433.90	90.50	1.823E+004	1.82E+004	-1.533E+004	8.327E+003
		614.30	89.80	3.135E+004		-3.047E+004	1.467E+004
		722.90	90.80	2.738E+004		1.427E+004	1.259E+004
	Cs-134	604.72	97.62	3.015E+004	2.21E+004	9.999E+002	1.416E+004
		795.86	85.46	2.211E+004		-2.503E+004	9.810E+003
	Cs-137	661.66	85.10	2.524E+004	2.52E+004	3.555E+003	1.151E+004
	Eu-152	121.78	28.67	6.867E+004	6.87E+004	1.336E+004	3.312E+004
		344.28	26.60	7.897E+004		-8.305E+004	3.722E+004
		1408.01	21.07	8.026E+004		-4.677E+004	3.290E+004
	Eu-154	123.07	40.40	4.854E+004	4.85E+004	-6.683E+003	2.341E+004
		723.30	20.06	1.227E+005		6.093E+004	5.633E+004
		1274.43	34.80	5.271E+004		-3.510E+004	2.226E+004
	Eu-155	86.55	30.70	7.821E+004	7.82E+004	1.079E+005	3.800E+004
		105.31	21.10	9.601E+004		-6.650E+004	4.639E+004
	Tl-208	583.19	85.00	2.749E+004	2.75E+004	1.095E+004	1.272E+004
	Bi-212	727.33	6.67	3.456E+005	3.46E+005	1.415E+005	1.577E+005
+	Pb-212	238.63*	43.60	3.596E+004	3.60E+004	3.040E+004	1.690E+004
+	Bi-214	609.32*	45.49	2.871E+004	2.87E+004	7.511E+004	1.238E+004
		1120.29	14.92	1.632E+005		5.672E+002	7.277E+004
		1764.49	15.30	1.750E+005		1.218E+005	7.575E+004
+	Pb-214	295.22*	18.42	6.493E+004	3.64E+004	4.327E+004	2.953E+004
		351.93*	35.60	3.644E+004		5.529E+004	1.650E+004
	Ra-226	186.21	3.64	5.384E+005	5.38E+005	-4.302E+004	2.581E+005
	Ac-228	338.32	11.27	1.783E+005	1.13E+005	8.838E+004	8.385E+004
		911.20	25.80	1.125E+005		5.759E+004	5.177E+004
		968.97	15.80	1.513E+005		7.177E+004	6.805E+004
	Am-241	59.54	35.90	6.744E+004	6.74E+004	3.445E+003	3.259E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/14/2018 3:26:02 PM

Sample Title : B109100AFQFC027GD
Sample Description : WWTF Floor QC
Sample Identification : QC
Sample Type : Gamma Direct
Sample Geometry : 3MWWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M^2

Sample Taken On : 8/14/2018 3:15:00 PM
Acquisition Started : 8/14/2018 3:16:01 PM

Live Time : 600.0 seconds
Real Time : 601.0 seconds

Dead Time : 0.16 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1515

R. Massengill/Rjm

 ***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
 Sample Title: B109100AFQFC027GD
 Peak Analysis Performed on: 8/14/2018 3:26:02 PM
 Peak Analysis From Channel: 85
 Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	281-	305	300.29	75.20	1.16	2.20E+002	71.06	2.54E+002
2	1174-	1186	1179.55	295.00	0.38	1.73E+001	20.12	3.17E+001
3	1401-	1413	1407.32	351.94	0.78	3.78E+001	19.39	2.12E+001
4	2429-	2443	2435.28	608.92	0.52	3.84E+001	15.86	8.57E+000
5	3636-	3649	3642.19	910.63	0.81	2.18E+001	13.39	8.20E+000
6	5833-	5852	5842.30	1460.63	0.94	1.03E+002	21.03	2.34E+000

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFQFC027GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M^2)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	1.11291E+006	2.47622E+005
Bi-214	0.461	609.32*	45.49	5.59631E+004	2.40577E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	1.000	295.22*	18.42	3.75862E+004	4.40633E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M ²)	Wt mean Activity Uncertainty
K-40	1.000	1.112912E+006	2.476216E+005
Bi-214	0.461	5.596310E+004	2.405772E+004
Pb-214	1.000	4.540985E+004	2.218056E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/14/2018 3:26:02 PM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.20	3.6667E-001	32.30		
5	910.63	3.6333E-002	61.42	Sum	

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3MWTF1.27CM
 Sample Title: B109100AFQFC027GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	1.296E+005	1.30E+005	1.113E+006	5.014E+004
	Co-60	1173.23	99.85	3.028E+004	2.11E+004	1.207E+004	1.378E+004
		1332.49	99.98	2.105E+004		7.607E+003	9.065E+003
	Nb-94	702.65	99.81	1.890E+004	1.89E+004	-3.857E+003	8.466E+003
		871.09	99.89	2.199E+004		-7.527E+003	9.868E+003
	Ag-108m	433.90	90.50	2.102E+004	2.10E+004	-1.898E+004	9.727E+003
		614.30	89.80	2.897E+004		3.339E+003	1.348E+004
		722.90	90.80	2.364E+004		-6.312E+003	1.072E+004
	Cs-134	604.72	97.62	3.063E+004	2.70E+004	6.754E+002	1.440E+004
		795.86	85.46	2.705E+004		-1.481E+004	1.228E+004
	Cs-137	661.66	85.10	2.734E+004	2.73E+004	-3.541E+002	1.256E+004
	Eu-152	121.78	28.67	7.850E+004	6.74E+004	4.439E+004	3.804E+004
		344.28	26.60	6.735E+004		-1.317E+004	3.141E+004
		1408.01	21.07	1.005E+005		2.724E+004	4.302E+004
	Eu-154	123.07	40.40	5.391E+004	5.39E+004	-2.121E+004	2.609E+004
		723.30	20.06	1.055E+005		-3.227E+004	4.776E+004
		1274.43	34.80	6.263E+004		-7.555E+002	2.723E+004
	Eu-155	86.55	30.70	8.426E+004	8.43E+004	4.443E+004	4.103E+004
		105.31	21.10	1.060E+005		1.075E+005	5.141E+004
	Tl-208	583.19	85.00	2.933E+004	2.93E+004	1.129E+004	1.364E+004
	Bi-212	727.33	6.67	3.137E+005	3.14E+005	2.024E+005	1.418E+005
	Pb-212	238.63	43.60	4.837E+004	4.84E+004	2.247E+004	2.311E+004
+	Bi-214	609.32*	45.49	2.764E+004	2.76E+004	5.596E+004	1.185E+004
		1120.29	14.92	2.140E+005		3.012E+004	9.820E+004
		1764.49	15.30	1.636E+005		1.043E+005	7.003E+004
+	Pb-214	295.22*	18.42	7.124E+004	3.48E+004	3.759E+004	3.269E+004
		351.93*	35.60	3.477E+004		4.807E+004	1.567E+004
	Ra-226	186.21	3.64	5.542E+005	5.54E+005	1.284E+004	2.660E+005
	Ac-228	338.32	11.27	1.679E+005	1.22E+005	1.718E+004	7.866E+004
		911.20	25.80	1.222E+005		8.843E+004	5.663E+004
		968.97	15.80	1.655E+005		-8.347E+003	7.512E+004
	Am-241	59.54	35.90	7.047E+004	7.05E+004	-2.664E+003	3.411E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: 6279

Report Generated On : 8/20/2018 10:04:21 AM

Sample Title : B109100AFQWC053GD
Sample Description : WWTF Wall QC
Sample Identification : QC
Sample Type : Gamma Direct
Sample Geometry : 3M90DWTF1.27CM

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 85 - 8192
Peak Area Range (in channels) : 85 - 8192
Identification Energy Tolerance : 10.000 keV

Sample Size : 2.830E+001 M²

Sample Taken On : 8/20/2018 9:54:00 AM
Acquisition Started : 8/20/2018 9:54:19 AM

Live Time : 600.0 seconds
Real Time : 600.9 seconds

Dead Time : 0.15 %

Energy Calibration Used Done On : 6/9/2018
Efficiency Calibration Used Done On : 7/31/2018
Efficiency ID : 3MWTF1,27CM

DATA VALIDATED

DATE 9-2-18

TIME 1529

R. Massengill/OZM

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 6279
Sample Title: B109100AFQWC053GD
Peak Analysis Performed on: 8/20/2018 10:04:21 AM
Peak Analysis From Channel: 85
Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	296-	306	301.01	75.38	0.98	5.89E+001	44.29	1.79E+002
2	1401-	1413	1407.18	351.91	1.32	4.54E+001	19.15	1.76E+001
3	2429-	2442	2435.50	608.97	1.38	3.85E+001	16.42	1.05E+001
4	2639-	2652	2644.69	661.27	0.57	4.06E+001	14.95	5.40E+000
5	5836-	5854	5844.83	1461.26	1.07	7.70E+001	17.55	0.00E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: B109100AFQWC053GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/M^2)	Activity Uncertainty
K-40	1.000	1460.82*	10.66	8.35029E+005	2.03666E+005
Cs-137	1.000	661.66*	85.10	3.34051E+004	1.29393E+004
Bi-214	0.461	609.32*	45.49	5.60671E+004	2.48507E+004
		1120.29	14.92		
		1764.49	15.30		
Pb-214	0.432	295.22	18.42	5.77038E+004	2.58287E+004
		351.93*	35.60		

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 10.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/M^2)	Wt mean Activity Uncertainty
K-40	1.000	8.350291E+005	2.036659E+005
Cs-137	1.000	3.340515E+004	1.293925E+004
Bi-214	0.461	5.606710E+004	2.485066E+004
Pb-214	0.432	5.770376E+004	2.582872E+004

? = 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 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 8/20/2018 10:04:21 AM
 Peak Locate From Channel: 85
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	75.38	9.8178E-002	75.19		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 6279
 Sample Geometry: 3M90DWWTF1.27CM
 Sample Title: B109100AFQWC053GD
 Nuclide Library Used: C:\GENIE2K\CAMFILES\Zion Lib-BNL.NLB

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/M ²)	Nuclide MDA (pCi/M ²)	Activity (pCi/M ²)	Dec. Level (pCi/M ²)
+	K-40	1460.82*	10.66	2.935E+004	2.93E+004	8.350E+005	0.000E+000
	Co-60	1173.23	99.85	2.135E+004	1.88E+004	9.201E+003	9.319E+003
		1332.49	99.98	1.883E+004		3.134E+003	7.951E+003
	Nb-94	702.65	99.81	1.890E+004	1.89E+004	8.916E+003	8.466E+003
		871.09	99.89	2.040E+004		1.128E+004	9.077E+003
	Ag-108m	433.90	90.50	1.967E+004	1.96E+004	-7.518E+003	9.049E+003
		614.30	89.80	3.151E+004		-6.051E+003	1.475E+004
		722.90	90.80	1.957E+004		1.266E+004	8.682E+003
	Cs-134	604.72	97.62	2.976E+004	2.06E+004	3.351E+004	1.397E+004
		795.86	85.46	2.063E+004		-2.808E+003	9.070E+003
+	Cs-137	661.66*	85.10	1.281E+004	1.28E+004	3.341E+004	5.291E+003
	Eu-152	121.78	28.67	7.217E+004	6.54E+004	-1.175E+003	3.487E+004
		344.28	26.60	6.539E+004		-1.141E+005	3.043E+004
		1408.01	21.07	1.005E+005		2.691E+004	4.302E+004
	Eu-154	123.07	40.40	5.228E+004	5.23E+004	3.771E+004	2.528E+004
		723.30	20.06	8.671E+004		3.337E+004	3.837E+004
		1274.43	34.80	6.263E+004		4.533E+004	2.723E+004
	Eu-155	86.55	30.70	7.772E+004	7.77E+004	5.502E+004	3.776E+004
		105.31	21.10	1.012E+005		1.294E+004	4.897E+004
	Tl-208	583.19	85.00	2.817E+004	2.82E+004	2.308E+004	1.306E+004
	Bi-212	727.33	6.67	2.436E+005	2.44E+005	-1.057E+005	1.067E+005
	Pb-212	238.63	43.60	4.701E+004	4.70E+004	4.769E+004	2.243E+004
+	Bi-214	609.32*	45.49	2.972E+004	2.97E+004	5.607E+004	1.289E+004
		1120.29	14.92	1.751E+005		7.653E+004	7.874E+004
		1764.49	15.30	1.576E+005		1.995E+004	6.705E+004
+	Pb-214	295.22	18.42	1.084E+005	3.19E+004	-1.913E+004	5.124E+004
		351.93*	35.60	3.189E+004		5.770E+004	1.423E+004
	Ra-226	186.21	3.64	5.044E+005	5.04E+005	-3.002E+005	2.411E+005
	Ac-228	338.32	11.27	1.700E+005	8.91E+004	1.559E+004	7.970E+004
		911.20	25.80	8.905E+004		-7.822E+003	4.004E+004
		968.97	15.80	1.511E+005		-1.166E+004	6.795E+004
	Am-241	59.54	35.90	7.378E+004	7.38E+004	1.565E+004	3.577E+004

- + = Nuclide identified during the nuclide identification
- * = Energy line found in the spectrum
- > = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or MDA has not been calculated
- @ = Half-life too short to be able to perform the decay correction

Analysis Report for 27-Aug-18-10001
B1-09100A-FSFC-001CV 0.0" - 0.5" 0.0"

GAMMA SPECTRUM ANALYSIS

Sample Identification : 27-Aug-18-10001
Sample Description : B1-09100A-FSFC-001CV 0.0" - 0.5" 0.0"
Sample Type : Puck
Unit :
Sample Point :

Sample Size : 9.854E+01 grams
Facility : Default

Sample Taken On : 8/22/2018 8:52:00AM
Acquisition Started : 8/27/2018 9:48:45AM

Procedure : Puck_half_inch
Operator : jewelch
Detector Name : 324
Geometry : Puck_half_inch
Live Time : 1200.0 seconds
Real Time : 1200.3 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 : 8/9/2017
Efficiency Calibration Used Done On : 8/27/2018
Efficiency Calibration Description :

Sample Number : 49639
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2013 12:00:00PM

J. Welch
8-27-18

DATA VALIDATED
DATE 9-2-18
TIME 0700

R. Massengill

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/27/2018 10:08:47AM
Peak Analysis From Channel : 120
Peak Analysis To Channel : 4096

Analysis Report for 27-Aug-18-10001

B1-09100A-FSFC-001CV 0.0" - 0.5" 0.0"

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	351.95	701 -	706	703.85	3.24E+01	16.35	3.91E+01	0.80
2	609.32	1213 -	1223	1218.21	3.72E+01	17.83	3.55E+01	1.24
3	661.58	1317 -	1327	1322.70	3.01E+01	13.67	1.39E+01	0.75
4	1460.89	2916 -	2928	2921.83	3.91E+01	13.65	5.81E+00	1.90

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82 *	10.66	4.84E+00	1.74E+00
Cs-137	0.99	661.66 *	85.10	2.68E-01	1.26E-01
Bi-211	0.88	351.07 *	13.02	1.18E+00	6.26E-01
Bi-214	1.00	609.32 *	45.49	5.86E-01	2.89E-01
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		

[494]

Analysis Report for 27-Aug-18-10001

B1-09100A-FSFC-001CV 0.0" - 0.5" 0.0"

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
Pb-214	1.00	2118.51	1.16		
		241.99	7.25		
		295.22	18.42		
		351.93 *	35.60	4.33E-01	2.29E-01
		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 2.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.999	4.84E+00	1.74E+00	
Cs-137	0.999	2.68E-01	1.26E-01	
? Bi-211	0.883	1.18E+00	6.26E-01	
Bi-214	1.000	5.86E-01	2.89E-01	
? Pb-214	1.000	4.33E-01	2.29E-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 2.000sigma

Analysis Report for 27-Aug-18-10001

B1-09100A-FSFC-001CV 0.0" - 0.5" 0.0"

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/27/2018 10:08:47AM
 Peak Locate From Channel : 120
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

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	3.88E-01	2.98E-01	2.98E-01
	BE-7	477.60	10.44	-6.20E-01	1.52E+00	1.52E+00
+	K-40	1460.82	* 10.66	4.84E+00	1.50E+00	1.50E+00
	Co-60	1173.23	99.85	-2.74E-02	2.19E-01	2.19E-01
		1332.49	99.98	9.82E-02		2.30E-01
	Nb-94	702.65	99.81	6.30E-02	1.43E-01	2.17E-01
		871.09	99.89	-1.97E-02		1.43E-01
	Ag-108m	79.13	6.60	-4.57E-01	1.67E-01	3.17E+00
		433.94	90.50	-1.05E-02		1.82E-01
		614.28	89.80	2.60E-02		2.60E-01
		722.94	90.80	-5.68E-02		1.67E-01
	Sb-125	176.31	6.84	-3.53E-01	5.52E-01	2.23E+00
		380.45	1.52	7.84E+00		1.19E+01
		427.87	29.60	1.87E-02		5.52E-01
		463.36	10.49	1.33E-01		1.65E+00
		600.60	17.65	-7.73E-02		9.58E-01
		606.71	4.98	5.06E-01		6.14E+00
		635.95	11.22	1.21E+00		2.01E+00
		671.44	1.79	9.21E-01		1.07E+01

Analysis Report for 27-Aug-18-10001

B1-09100A-FSFC-001CV 0.0" - 0.5" 0.0"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Ba-133	79.61	2.65	-9.39E-01	3.50E-01	7.78E+00
	81.00	32.90	-3.10E-01		5.52E-01
	276.40	7.16	2.15E-01		2.36E+00
	302.85	18.34	2.86E-01		9.51E-01
	356.01	62.05	-3.42E-01		3.50E-01
Cs-134	383.85	8.94	-5.47E-01	2.24E-01	1.75E+00
	475.36	1.48	1.74E+00		1.11E+01
	563.25	8.34	3.94E-01		2.15E+00
	569.33	15.37	9.77E-02		1.15E+00
	604.72	97.62	-8.93E-03		2.67E-01
	795.86	85.46	5.39E-02		2.24E-01
	801.95	8.69	-3.41E-01		2.02E+00
	1038.61	0.99	-8.72E+00		1.97E+01
	1167.97	1.79	-3.85E+00		1.08E+01
	1365.19	3.02	-3.63E+00		6.07E+00
+ Cs-137	661.66	* 85.10	2.68E-01	1.49E-01	1.49E-01
Eu-152	121.78	28.67	1.29E-01	4.63E-01	4.63E-01
	244.70	7.61	1.88E+00		2.25E+00
	295.94	0.45	1.90E+01		4.20E+01
	344.28	26.60	-3.39E-01		5.56E-01
	367.79	0.86	5.51E-01		1.64E+01
	411.12	2.24	3.40E+00		7.94E+00
	443.96	2.83	-3.89E-01		5.56E+00
	488.68	0.42	-1.77E+01		3.96E+01
	563.99	0.49	1.21E+01		3.77E+01
	586.26	0.46	4.53E+01		5.36E+01
	678.62	0.47	-9.31E+00		3.90E+01
	688.67	0.86	-1.66E+01		1.95E+01
	719.35	0.28	-7.46E+01		5.21E+01
	778.90	12.96	1.02E-01		1.32E+00
	810.45	0.32	4.63E+00		5.84E+01
	867.37	4.26	1.78E+00		4.04E+00
	919.33	0.43	4.23E+00		4.35E+01
	964.08	14.65	1.63E-01		1.40E+00
	1085.87	10.24	9.06E-01		2.03E+00
	1089.74	1.73	-1.87E+00		9.60E+00
	1112.07	13.69	3.90E-01		1.30E+00
	1212.95	1.43	2.89E+00		1.62E+01
	1249.94	0.19	6.35E+01		1.37E+02
1299.14	1.63	-7.95E+00	1.22E+01		
1408.01	21.07	2.47E-01	1.00E+00		
1457.64	0.50	-8.19E-01	9.28E+01		
1528.10	0.28	9.72E+00	4.69E+01		
Eu-154	123.07	40.40	-9.06E-03	3.18E-01	3.18E-01
	247.93	6.89	-1.08E+00		2.11E+00
	591.76	4.95	1.68E+00		3.81E+00
	692.42	1.78	-2.39E+00		1.16E+01
	723.30	20.06	-1.59E-01		7.86E-01
	756.80	4.52	5.64E-01		3.72E+00
	873.18	12.08	2.29E-01		1.11E+00
	996.29	10.48	-2.81E-01		1.94E+00

Analysis Report for 27-Aug-18-10001

B1-09100A-FSFC-001CV 0.0" - 0.5" 0.0"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	1004.76	18.01	-3.82E-01	3.18E-01	1.10E+00
	1274.43	34.80	-1.02E-01		5.31E-01
	1596.48	1.80	-9.98E+00		1.30E+01
Eu-155	45.30	1.31	-3.81E+00	5.69E-01	3.24E+01
	60.01	1.22	-9.95E+00		3.29E+01
	86.55	30.70	3.37E-02		5.69E-01
Ra-226	105.31	21.10	1.54E-01	4.40E+00	6.67E-01
	186.21	3.64	1.57E+00		4.40E+00
Pa-231	27.36	10.30	1.39E+00	3.14E+00	3.14E+00
	283.69	1.70	-7.39E+00		8.37E+00
	300.07	2.47	-2.10E+00		7.06E+00
	302.65	2.20	2.38E+00		7.92E+00
	330.06	1.40	8.12E+00		1.28E+01
U-235	143.76	10.96	-1.38E-01	2.76E-01	1.14E+00
	163.33	5.08	-1.31E+00		3.05E+00
	185.71	57.20	6.42E-02		2.76E-01
	202.11	1.08	8.30E+00		1.53E+01
	205.31	5.01	-7.69E-01		2.94E+00
Am-241	59.54	35.90	3.26E-02	1.18E+00	1.18E+00

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

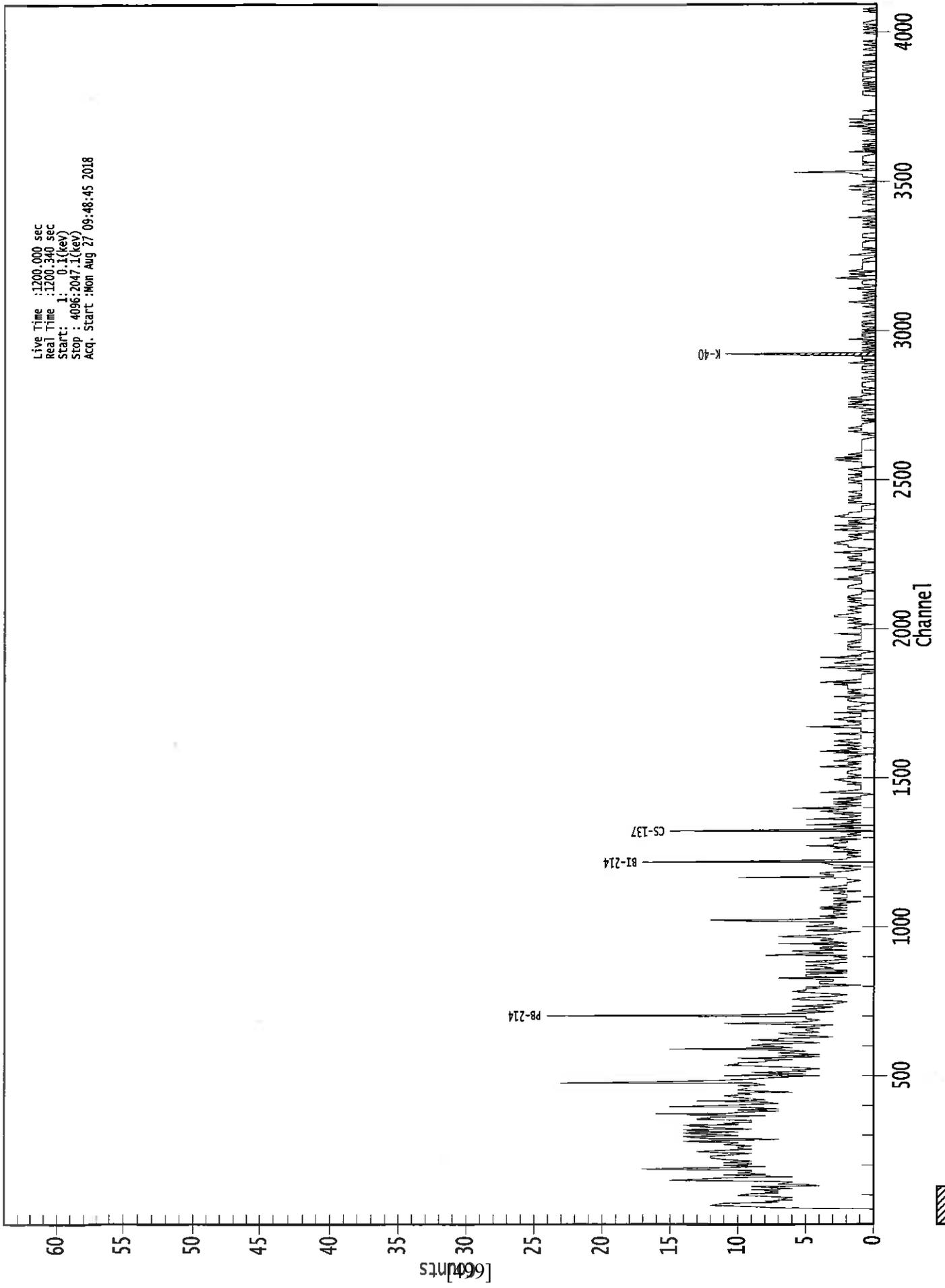
> = MDA value not calculated

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

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

0000049639.CNF

Live Time :1200.000 sec
Real Time :1200.340 sec
Start: 1: 0:1(rev)
Stop : 4096:2047.1(kev)
Acq. Start :Mon Aug 27 09:48:45 2018



ROI Type: 1

Analysis Report for 27-Aug-18-10002

B1-09100A-FSFC-001CV 0.0" - 0.5" 0.5"

GAMMA SPECTRUM ANALYSIS

Sample Identification : 27-Aug-18-10002
Sample Description : B1-09100A-FSFC-001CV 0.0" - 0.5" 0.5"
Sample Type : Puck
Unit :
Sample Point :

Sample Size : 9.854E+01 grams
Facility : Default

Sample Taken On : 8/22/2018 8:52:00AM
Acquisition Started : 8/27/2018 10:28:29AM

Procedure : Puck_half_inch
Operator : jwelch
Detector Name : 324
Geometry : Puck_half_inch
Live Time : 1200.0 seconds
Real Time : 1200.3 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 : 8/9/2017
Efficiency Calibration Used Done On : 8/27/2018
Efficiency Calibration Description :

Sample Number : 49643
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2013 12:00:00PM

J. Welch
8-27-18

DATA VALIDATEDDATE 9-2-18TIME 0710

R. Massag...

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/27/2018 10:48:32AM

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

Analysis Report for 27-Aug-18-10002

B1-09100A-FSFC-001CV 0.0" - 0.5" 0.5"

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.62	472 -	480	477.43	5.08E+01	24.46	9.24E+01	1.07
2	609.34	1212 -	1223	1218.26	6.01E+01	17.32	1.19E+01	1.46
3	661.72	1320 -	1326	1322.97	7.84E+00	10.80	2.23E+01	0.65
4	911.55	1819 -	1826	1822.54	1.83E+01	9.34	3.45E+00	0.93

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Cs-137	0.99	661.66 *	85.10	7.00E-02	9.68E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	4.17E-01	2.12E-01
		300.09	3.30		
Bi-214	1.00	609.32 *	45.49	9.45E-01	2.95E-01
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		

[501]

Analysis Report for 27-Aug-18-10002

B1-09100A-FSFC-001CV 0.0" - 0.5" 0.5"

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	1407.99	2.39		
		1509.21	2.13		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
Ac-228	0.99	2118.51	1.16		
		129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32	11.27		
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	6.72E-01	3.48E-01
		964.77	4.99		
		968.97	15.80		
1588.20	3.22				

* = Energy line found in the spectrum.
 - = Manually added nuclide.
 ? = Manually edited nuclide.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 1.000 keV
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
Cs-137	0.999	7.00E-02	9.68E-02	
Pb-212	1.000	4.17E-01	2.12E-01	
Bi-214	1.000	9.45E-01	2.95E-01	
Ac-228	0.994	6.72E-01	3.48E-01	

Analysis Report for 27-Aug-18-10002

B1-09100A-FSFC-001CV 0.0" - 0.5" 0.5"

- ? = 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 2.00sigma

Analysis Report for 27-Aug-18-10002

B1-09100A-FSFC-001CV 0.0" - 0.5" 0.5"

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/27/2018 10:48:32AM
 Peak Locate From Channel : 120
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

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	4.17E-01	2.94E-01	2.94E-01
BE-7	477.60	10.44	-3.45E-02	1.70E+00	1.70E+00
K-40	1460.82	10.66	5.25E+00	4.64E+00	4.64E+00
Co-60	1173.23	99.85	-7.08E-02	1.94E-01	1.94E-01
	1332.49	99.98	3.37E-02		2.30E-01
Nb-94	702.65	99.81	-2.21E-02	1.65E-01	1.65E-01
	871.09	99.89	5.01E-02		1.97E-01
Ag-108m	79.13	6.60	1.60E+00	1.71E-01	3.36E+00
	433.94	90.50	-9.57E-03		1.71E-01
	614.28	89.80	-6.11E-02		2.72E-01
	722.94	90.80	1.93E-01		2.47E-01
Sb-125	176.31	6.84	-4.91E-01	5.01E-01	2.17E+00
	380.45	1.52	-4.09E+00		1.04E+01
	427.87	29.60	-1.25E-01		5.01E-01
	463.36	10.49	-1.01E-01		1.33E+00
	600.60	17.65	5.44E-01		1.04E+00
	606.71	4.98	-1.44E-01		6.30E+00
	635.95	11.22	2.97E-01		1.37E+00
	671.44	1.79	5.60E+00		1.11E+01

Analysis Report for 27-Aug-18-10002

B1-09100A-FSFC-001CV 0.0" - 0.5" 0.5"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Ba-133	79.61	2.65	2.81E+00	3.14E-01	8.01E+00
	81.00	32.90	-1.52E-01		5.72E-01
	276.40	7.16	-7.38E-01		1.83E+00
	302.85	18.34	3.65E-01		8.78E-01
	356.01	62.05	7.45E-02		3.14E-01
	383.85	8.94	6.73E-01		2.01E+00
Cs-134	475.36	1.48	4.83E+00	1.83E-01	1.16E+01
	563.25	8.34	-1.66E+00		1.80E+00
	569.33	15.37	6.18E-02		1.28E+00
	604.72	97.62	-1.56E-02		2.67E-01
	795.86	85.46	-1.55E-02		1.83E-01
	801.95	8.69	-1.48E-01		1.88E+00
	1038.61	0.99	2.62E-01		1.81E+01
	1167.97	1.79	1.03E+00		1.13E+01
	1365.19	3.02	1.66E+00		5.18E+00
	+ Cs-137	661.66	* 85.10		7.00E-02
Eu-152	121.78	28.67	6.64E-02	4.32E-01	4.32E-01
	244.70	7.61	-4.53E-01		1.96E+00
	295.94	0.45	1.73E+01		3.91E+01
	344.28	26.60	9.93E-02		5.63E-01
	367.79	0.86	-5.70E-01		1.64E+01
	411.12	2.24	2.30E+00		7.85E+00
	443.96	2.83	-4.85E-01		6.26E+00
	488.68	0.42	-1.73E+00		4.53E+01
	563.99	0.49	-2.44E+01		3.20E+01
	586.26	0.46	2.09E+01		4.35E+01
	678.62	0.47	1.11E+01		4.16E+01
	688.67	0.86	9.09E-01		2.21E+01
	719.35	0.28	-3.41E+01		6.37E+01
	778.90	12.96	1.74E-02		1.49E+00
	810.45	0.32	4.18E+00		5.67E+01
	867.37	4.26	-1.59E+00		4.19E+00
	919.33	0.43	7.95E+00		4.35E+01
	964.08	14.65	1.61E-01		1.56E+00
	1085.87	10.24	-7.44E-01		1.88E+00
	1089.74	1.73	-4.15E+00		1.07E+01
	1112.07	13.69	-4.30E-01		1.59E+00
	1212.95	1.43	9.01E+00		1.67E+01
	1249.94	0.19	-2.40E+01		1.21E+02
1299.14	1.63	1.82E+00	1.08E+01		
1408.01	21.07	6.08E-01	1.10E+00		
1457.64	0.50	1.20E+02	9.82E+01		
1528.10	0.28	1.58E+01	7.11E+01		
Eu-154	123.07	40.40	-1.29E-01	2.88E-01	2.88E-01
	247.93	6.89	-8.99E-03		2.11E+00
	591.76	4.95	-9.13E-01		3.29E+00
	692.42	1.78	-4.43E+00		1.00E+01
	723.30	20.06	4.98E-01		1.08E+00
	756.80	4.52	-1.85E+00		3.72E+00
	873.18	12.08	5.72E-02		1.64E+00
	996.29	10.48	-3.70E-03		1.94E+00

Analysis Report for 27-Aug-18-10002

B1-09100A-FSFC-001CV 0.0" - 0.5" 0.5"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	1004.76	18.01	1.28E-01	2.88E-01	1.31E+00
	1274.43	34.80	-2.39E-01		5.61E-01
	1596.48	1.80	5.93E-01		9.86E+00
Eu-155	45.30	1.31	-1.20E+00	5.53E-01	3.14E+01
	60.01	1.22	-1.33E+01		3.16E+01
	86.55	30.70	1.29E-01		5.53E-01
	105.31	21.10	-1.43E-02		7.16E-01
Ra-226	186.21	3.64	3.86E+00	4.34E+00	4.34E+00
Pa-231	27.36	10.30	1.43E+00	3.25E+00	3.25E+00
	283.69	1.70	1.83E+00		8.62E+00
	300.07	2.47	-7.01E+00		6.00E+00
	302.65	2.20	3.04E+00		7.31E+00
	330.06	1.40	6.93E+00		1.20E+01
U-235	143.76	10.96	-3.02E-01	2.72E-01	1.16E+00
	163.33	5.08	-9.94E-01		3.08E+00
	185.71	57.20	2.04E-01		2.72E-01
	202.11	1.08	-1.05E+01		1.33E+01
	205.31	5.01	5.64E-01		3.21E+00
Am-241	59.54	35.90	-2.12E-01	1.12E+00	1.12E+00

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

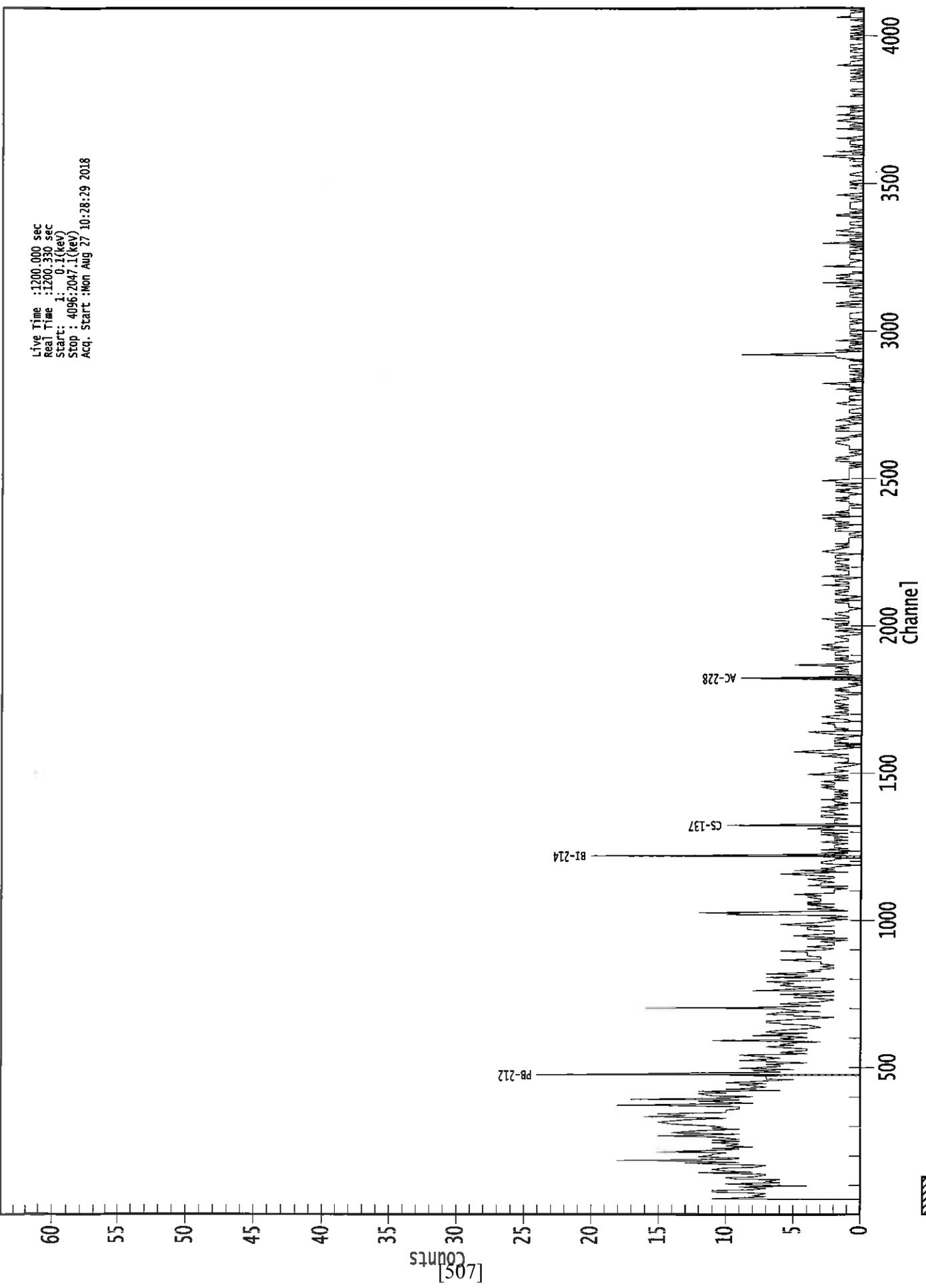
> = MDA value not calculated

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

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

0000049643.CNF

Live Time :1200.000 sec
Real Time :1200.330 sec
Start : 1: 0:11(key)
Stop : 4096:2047.1(kev)
Acq. Start :Mon Aug 27 10:28:29 2018



ROI Type: 1

Analysis Report for 27-Aug-18-10003
B1-09100A-FSFC-010CV 0.0" - 0.5" 0.0"

GAMMA SPECTRUM ANALYSIS

Sample Identification : 27-Aug-18-10003
Sample Description : B1-09100A-FSFC-010CV 0.0" - 0.5" 0.0"
Sample Type : Puck
Unit :
Sample Point :

Sample Size : 1.001E+02 grams
Facility : Default

Sample Taken On : 8/22/2018 12:40:00PM
Acquisition Started : 8/27/2018 9:48:50AM

Procedure : Puck_half_inch
Operator : jwelch
Detector Name : P40818B
Geometry : Puck_half_inch
Live Time : 1200.0 seconds
Real Time : 1200.9 seconds

Dead Time : 0.08 %

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

Energy Calibration Used Done On : 12/23/2017
Efficiency Calibration Used Done On : 8/27/2018
Efficiency Calibration Description :

Sample Number : 49640
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2012 12:00:00PM

J. Welch
8-27-18
DATA VALIDATED

DATE 9-2-18

TIME 0715

R. Massaghi

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/27/2018 10:08:53AM

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

Analysis Report for 27-Aug-18-10003

B1-09100A-FSFC-010CV 0.0" - 0.5" 0.0"

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	609.53	2432 -	2442	2437.27	2.38E+01	13.20	1.65E+01	0.48

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	609.32 *	45.49	4.36E-01	2.48E-01
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		
		1238.12	5.83		
		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		

[509]

Analysis Report for 27-Aug-18-10003

B1-09100A-FSFC-010CV 0.0" - 0.5" 0.0"

* = 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 2.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
Bi-214	0.997	4.36E-01	2.48E-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 2.000sigma

Analysis Report for 27-Aug-18-10003

B1-09100A-FSFC-010CV 0.0" - 0.5" 0.0"

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/27/2018 10:08:53AM
 Peak Locate From Channel : 120
 Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE MDA REPORT

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

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
An Pk	511.00	100.00	2.66E-01	3.26E-01	3.26E-01
BE-7	477.60	10.44	-2.88E-01	1.80E+00	1.80E+00
K-40	1460.82	10.66	5.91E+00	4.91E+00	4.91E+00
Co-60	1173.23	99.85	-7.16E-02	1.66E-01	1.66E-01
Nb-94	1332.49	99.98	7.28E-02		1.98E-01
	702.65	99.81	1.07E-02	1.88E-01	1.88E-01
Ag-108m	871.09	99.89	1.63E-01		2.33E-01
	79.13	6.60	7.16E-01	1.85E-01	6.08E+00
	433.94	90.50	-5.89E-02		1.85E-01
	614.28	89.80	-1.82E-01		2.81E-01
Sb-125	722.94	90.80	1.03E-01		2.24E-01
	176.31	6.84	-1.43E+00	6.21E-01	2.43E+00
	380.45	1.52	-1.45E+00		1.09E+01
	427.87	29.60	-1.98E-01		6.21E-01
	463.36	10.49	5.51E-02		2.03E+00
	600.60	17.65	-1.73E-02		1.06E+00
	606.71	4.98	3.29E+00		5.70E+00
	635.95	11.22	4.82E-01		1.70E+00
671.44	1.79	-1.46E+01		9.08E+00	

Analysis Report for 27-Aug-18-10003

B1-09100A-FSFC-010CV 0.0" - 0.5" 0.0"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Ba-133	79.61	2.65	6.57E-02	3.29E-01	1.45E+01
	81.00	32.90	-6.97E-02		1.05E+00
	276.40	7.16	1.09E+00		2.53E+00
	302.85	18.34	7.59E-01		1.06E+00
	356.01	62.05	-3.73E-01		3.29E-01
Cs-134	383.85	8.94	-7.30E-01	2.49E-01	1.80E+00
	475.36	1.48	-3.36E+00		1.24E+01
	563.25	8.34	-5.13E-01		1.56E+00
	569.33	15.37	-1.97E-01		9.75E-01
	604.72	97.62	-1.85E-01		2.64E-01
	795.86	85.46	1.08E-01		2.49E-01
	801.95	8.69	1.67E-01		2.46E+00
	1038.61	0.99	-1.55E+01		2.33E+01
	1167.97	1.79	-4.92E+00		9.26E+00
	1365.19	3.02	3.53E-02		7.70E+00
Cs-137	661.66	85.10	4.19E-02	2.49E-01	2.49E-01
Eu-152	121.78	28.67	-1.39E-01	6.38E-01	6.38E-01
	244.70	7.61	-1.34E+00		2.30E+00
	295.94	0.45	-2.92E+01		4.24E+01
	344.28	26.60	-3.04E-01		6.43E-01
	367.79	0.86	-3.26E+01		1.67E+01
	411.12	2.24	-8.31E-01		8.07E+00
	443.96	2.83	-2.27E+00		6.45E+00
	488.68	0.42	-2.81E+01		4.60E+01
	563.99	0.49	-1.08E+01		2.64E+01
	586.26	0.46	2.16E+01		4.74E+01
	678.62	0.47	4.43E+00		4.35E+01
	688.67	0.86	1.39E+01		2.15E+01
	719.35	0.28	3.13E+00		6.83E+01
	778.90	12.96	8.82E-02		1.20E+00
	810.45	0.32	3.53E+01		6.02E+01
	867.37	4.26	-1.10E+00		5.12E+00
	919.33	0.43	5.60E+00		4.33E+01
	964.08	14.65	8.19E-01		1.98E+00
	1085.87	10.24	9.38E-01		2.48E+00
	1089.74	1.73	2.02E+00		1.47E+01
	1112.07	13.69	-4.43E-01		1.76E+00
	1212.95	1.43	-1.05E+01		1.49E+01
	1249.94	0.19	-2.02E+01		1.33E+02
1299.14	1.63	6.15E+00	1.37E+01		
1408.01	21.07	-2.31E-01	9.03E-01		
1457.64	0.50	1.10E+02	1.03E+02		
1528.10	0.28	-2.00E+01	7.24E+01		
Eu-154	123.07	40.40	7.97E-02	4.50E-01	4.50E-01
	247.93	6.89	8.09E-01		2.49E+00
	591.76	4.95	6.90E-01		3.93E+00
	692.42	1.78	-1.80E+00		9.72E+00
	723.30	20.06	1.80E-01		1.01E+00
	756.80	4.52	1.95E+00		3.74E+00
	873.18	12.08	8.17E-01		1.93E+00
	996.29	10.48	9.23E-01		2.21E+00

Analysis Report for 27-Aug-18-10003

B1-09100A-FSFC-010CV 0.0" - 0.5" 0.0"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	1004.76	18.01	-4.53E-01	4.50E-01	1.51E+00
	1274.43	34.80	-2.73E-01		5.93E-01
	1596.48	1.80	-5.05E+00		1.38E+01
Eu-155	45.30	1.31	-2.08E+01	8.74E-01	9.61E+01
	60.01	1.22	-1.32E+00		9.71E+01
	86.55	30.70	3.02E-01		8.74E-01
	105.31	21.10	-5.95E-01		8.84E-01
Ra-226	186.21	3.64	5.50E+00	5.09E+00	5.09E+00
Pa-231	27.36	10.30	4.89E+00	7.50E+00	1.02E+01
	283.69	1.70	4.97E+00		9.90E+00
	300.07	2.47	-3.64E+00		7.50E+00
	302.65	2.20	5.25E+00		8.83E+00
	330.06	1.40	2.78E+00		1.33E+01
U-235	143.76	10.96	1.24E+00	3.22E-01	1.64E+00
	163.33	5.08	1.88E+00		3.41E+00
	185.71	57.20	2.21E-01		3.22E-01
	202.11	1.08	-8.87E-01		1.60E+01
	205.31	5.01	2.62E-01		3.66E+00
Am-241	59.54	35.90	-7.09E-01	3.36E+00	3.36E+00

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

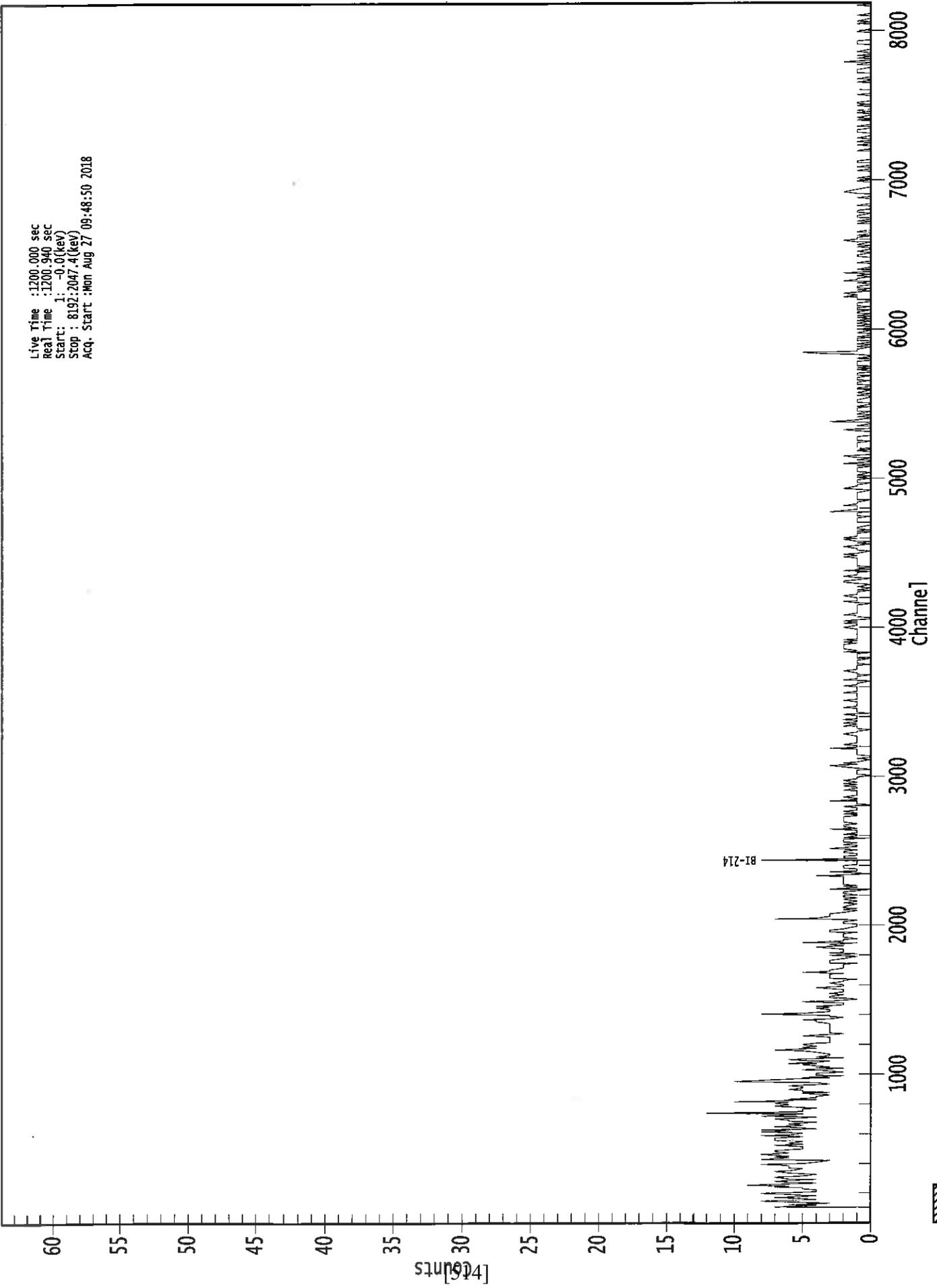
> = MDA value not calculated

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

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

0000049640.CNF

Live Time :1200.000 sec
Real Time :1200.940 sec
Start : 1: -0.0(key)
Stop : 8192.2047.4(key)
Acq. Start :Mon Aug 27 09:48:50 2018



ROI Type: 1

Analysis Report for 27-Aug-18-10004

B1-09100A-FSFC-010CV 0.0" - 0.5" 0.5"

GAMMA SPECTRUM ANALYSIS

Sample Identification : 27-Aug-18-10004
Sample Description : B1-09100A-FSFC-010CV 0.0" - 0.5" 0.5"
Sample Type : Puck
Unit :
Sample Point :

Sample Size : 1.001E+02 grams
Facility : Default

Sample Taken On : 8/22/2018 12:40:00PM
Acquisition Started : 8/27/2018 10:28:35AM

Procedure : Puck_half_inch
Operator : jwelch
Detector Name : P40818B
Geometry : Puck_half_inch
Live Time : 1200.0 seconds
Real Time : 1200.9 seconds

Dead Time : 0.07 %

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

Energy Calibration Used Done On : 12/23/2017
Efficiency Calibration Used Done On : 8/27/2018
Efficiency Calibration Description :

Sample Number : 49644
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2012 12:00:00PM

J.P. Welch
8-27-18
DATA VALIDATED

DATE 9-7-18TIME 0720

R. Massie
R. J. Welch

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/27/2018 10:48:40AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Analysis Report for 27-Aug-18-10004

B1-09100A-FSFC-010CV 0.0" - 0.5" 0.5"

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.60	949 -	959	954.49	4.30E+01	20.20	4.80E+01	0.97
2	351.92	1401 -	1412	1407.40	3.09E+01	17.57	3.62E+01	0.58
3	1460.92	5837 -	5851	5843.53	3.53E+01	13.59	7.50E+00	0.51

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82	*	10.66	5.21E+00	2.06E+00
Bi-211	0.89	351.07	*	13.02	1.30E+00	7.69E-01
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	4.11E-01	2.04E-01
		300.09		3.30		
Pb-214	1.00	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	4.76E-01	2.81E-01
		785.96		1.06		

Analysis Report for 27-Aug-18-10004

B1-09100A-FSFC-010CV 0.0" - 0.5" 0.5"

- * = 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 2.000sigma

INTERFERENCE CORRECTED REPORT

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
	0.998	5.21E+00	2.06E+00	
? K-40				
? Bi-211	0.892	1.30E+00	7.69E-01	
Pb-212	1.000	4.11E-01	2.04E-01	
? Pb-214	1.000	4.76E-01	2.81E-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 2.000sigma

Analysis Report for 27-Aug-18-10004

B1-09100A-FSFC-010CV 0.0" - 0.5" 0.5"

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/27/2018 10:48:39AM
 Peak Locate From Channel : 120
 Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE MDA REPORT

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

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
An Pk	511.00	100.00	2.59E-01	3.00E-01	3.00E-01
BE-7	477.60	10.44	3.47E-01	1.52E+00	1.52E+00
+ K-40	1460.82	* 10.66	5.21E+00	2.08E+00	2.08E+00
Co-60	1173.23	99.85	4.99E-02	2.52E-01	2.94E-01
	1332.49	99.98	-5.58E-02		2.52E-01
Nb-94	702.65	99.81	-3.61E-02	1.88E-01	1.88E-01
	871.09	99.89	9.18E-02		2.19E-01
Ag-108m	79.13	6.60	-7.02E-01	1.92E-01	5.46E+00
	433.94	90.50	-4.09E-02		1.92E-01
	614.28	89.80	-8.66E-02		3.07E-01
	722.94	90.80	-3.73E-02		2.36E-01
Sb-125	176.31	6.84	-8.52E-01	6.11E-01	2.19E+00
	380.45	1.52	8.45E+00		1.19E+01
	427.87	29.60	1.38E-01		6.11E-01
	463.36	10.49	4.12E-01		1.95E+00
	600.60	17.65	1.04E-02		1.06E+00
	606.71	4.98	4.12E+00		6.06E+00
	635.95	11.22	-1.51E-01		1.56E+00
	671.44	1.79	3.65E+00		1.14E+01

Analysis Report for 27-Aug-18-10004

B1-09100A-FSFC-010CV 0.0" -0.5" 0.5"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Ba-133	79.61	2.65	-1.29E+01	3.55E-01	1.29E+01
	81.00	32.90	-4.72E-01		9.92E-01
	276.40	7.16	3.66E-01		2.36E+00
	302.85	18.34	2.72E-02		9.34E-01
	356.01	62.05	-1.46E-01		3.55E-01
Cs-134	383.85	8.94	6.05E-01	1.75E-01	1.70E+00
	475.36	1.48	-2.82E+00		1.01E+01
	563.25	8.34	1.27E+00		2.64E+00
	569.33	15.37	4.52E-01		1.34E+00
	604.72	97.62	-1.07E-01		2.71E-01
	795.86	85.46	-2.49E-03		1.75E-01
	801.95	8.69	-6.42E-01		1.94E+00
	1038.61	0.99	-6.72E-01		2.42E+01
	1167.97	1.79	1.79E+00		1.64E+01
	1365.19	3.02	1.48E+00		5.53E+00
Cs-137	661.66	85.10	9.32E-02	2.11E-01	2.11E-01
Eu-152	121.78	28.67	-1.85E-01	5.57E-01	5.57E-01
	244.70	7.61	-7.66E-01		2.33E+00
	295.94	0.45	1.87E+00		4.34E+01
	344.28	26.60	-6.51E-01		6.18E-01
	367.79	0.86	-7.57E+00		1.71E+01
	411.12	2.24	-3.67E+00		7.83E+00
	443.96	2.83	-2.18E+00		6.24E+00
	488.68	0.42	3.00E+00		3.81E+01
	563.99	0.49	4.74E+00		4.39E+01
	586.26	0.46	1.90E+01		4.30E+01
	678.62	0.47	-3.59E+01		3.61E+01
	688.67	0.86	-2.22E+01		1.45E+01
	719.35	0.28	4.76E+01		8.05E+01
	778.90	12.96	-4.85E-01		1.20E+00
	810.45	0.32	1.82E+01		6.25E+01
	867.37	4.26	-2.28E+00		3.95E+00
	919.33	0.43	2.99E+00		4.95E+01
	964.08	14.65	-1.05E+00		1.75E+00
	1085.87	10.24	-6.16E-02		1.80E+00
	1089.74	1.73	-5.28E-01		1.26E+01
	1112.07	13.69	-7.70E-01		1.62E+00
	1212.95	1.43	3.14E+00		1.79E+01
	1249.94	0.19	8.82E+01		1.43E+02
1299.14	1.63	-4.40E-01	1.65E+01		
1408.01	21.07	-7.85E-02	8.10E-01		
1457.64	0.50	7.41E+01	1.07E+02		
1528.10	0.28	-9.44E+00	7.24E+01		
Eu-154	123.07	40.40	1.91E-02	4.01E-01	4.01E-01
	247.93	6.89	3.69E-01		2.49E+00
	591.76	4.95	1.23E+00		3.55E+00
	692.42	1.78	4.41E+00		1.01E+01
	723.30	20.06	-1.35E-01		1.10E+00
	756.80	4.52	-1.68E+00		4.07E+00
	873.18	12.08	7.79E-01		1.87E+00
	996.29	10.48	-1.14E+00		1.77E+00

Analysis Report for 27-Aug-18-10004

B1-09100A-FSFC-010CV 0.0" - 0.5" 0.5"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	1004.76	18.01	6.65E-01	4.01E-01	1.20E+00
	1274.43	34.80	5.06E-02		8.44E-01
	1596.48	1.80	5.68E+00		1.38E+01
Eu-155	45.30	1.31	1.20E+01	8.05E-01	8.44E+01
	60.01	1.22	7.59E+00		9.08E+01
	86.55	30.70	-5.94E-01		8.05E-01
	105.31	21.10	3.33E-01		9.12E-01
Ra-226	186.21	3.64	2.19E+00	4.87E+00	4.87E+00
Pa-231	27.36	10.30	5.61E+00	7.09E+00	1.08E+01
	283.69	1.70	-1.80E+00		9.30E+00
	300.07	2.47	-2.41E+00		7.09E+00
	302.65	2.20	3.00E-01		7.69E+00
	330.06	1.40	-1.93E+00		1.38E+01
U-235	143.76	10.96	3.13E-01	3.19E-01	1.65E+00
	163.33	5.08	-4.04E-01		3.20E+00
	185.71	57.20	3.04E-01		3.19E-01
	202.11	1.08	-1.43E+01		1.40E+01
	205.31	5.01	2.17E-01		3.31E+00
Am-241	59.54	35.90	4.45E-01	3.23E+00	3.23E+00

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

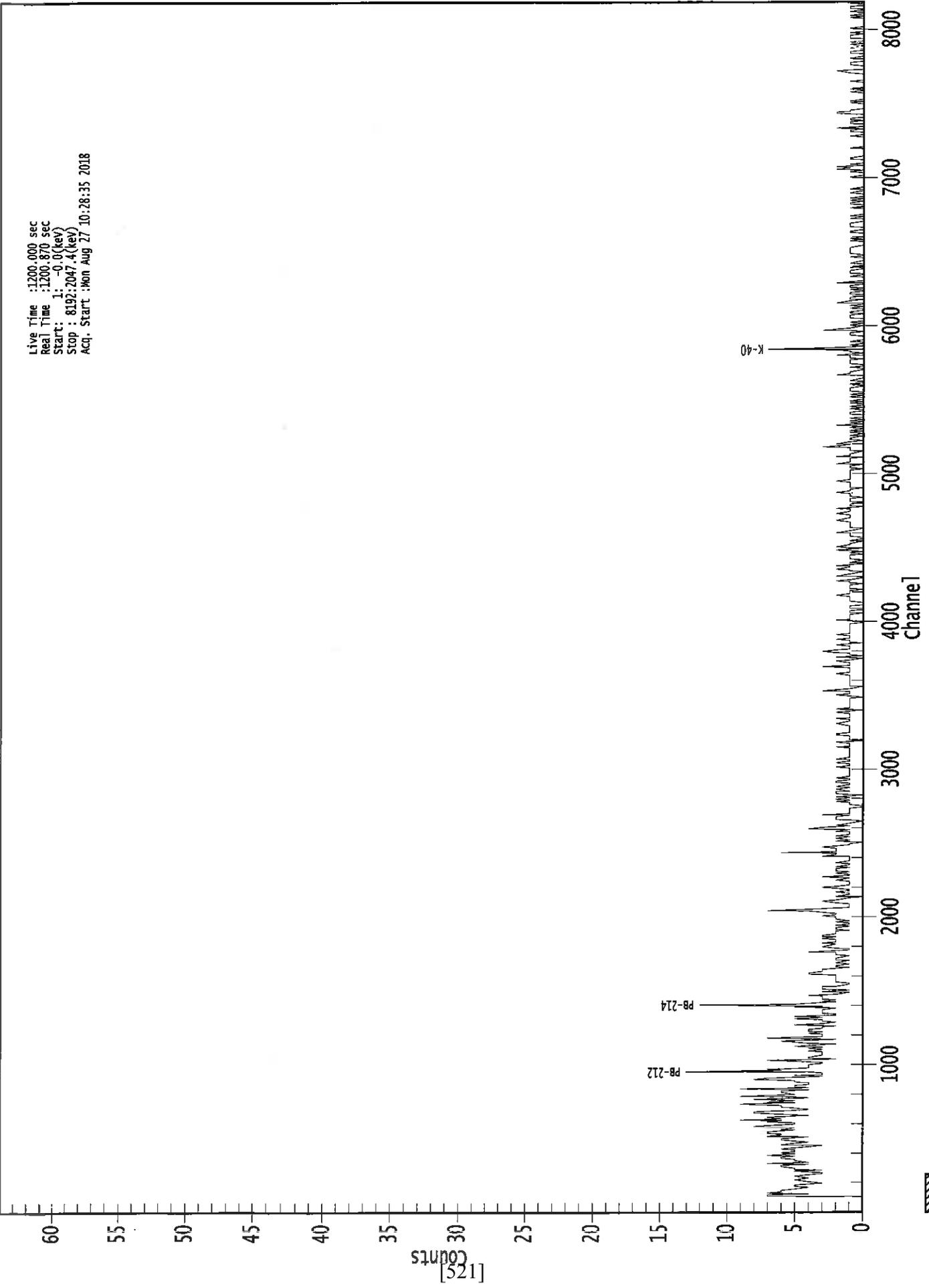
> = MDA value not calculated

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

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

0000049644.CNF

Live Time :1200.000 sec
Real Time :1200.870 sec
Start: 1: 0.0(key)
Stop : 8192:2047.4(key)
Acq. Start :Mon Aug 27 10:28:35 2018

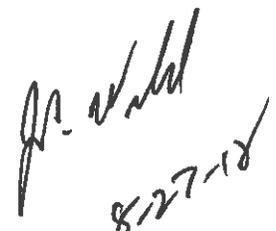
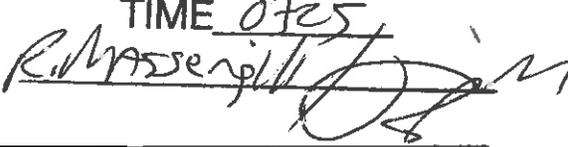


ROI Type: 1

Analysis Report for 27-Aug-18-10005
 B1-09100A-FSFC-021CV 0.0" - 0.5" 0.0"

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 27-Aug-18-10005
Sample Description	: B1-09100A-FSFC-021CV 0.0" - 0.5" 0.0"
Sample Type	: Puck
Unit	:
Sample Point	:
Sample Size	: 1.171E+02 grams
Facility	: Default
Sample Taken On	: 8/22/2018 12:59:00PM
Acquisition Started	: 8/27/2018 9:48:56AM
Procedure	: Puck_half_inch
Operator	: jwelch
Detector Name	: P11314
Geometry	: Puck_half_inch
Live Time	: 1200.0 seconds
Real Time	: 1200.3 seconds
Dead Time	: 0.02 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 12/15/2017
Efficiency Calibration Used Done On	: 8/27/2018
Efficiency Calibration Description	:
Sample Number	: 49641
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM


 8-27-18
DATA VALIDATED
 DATE 9-2-18
 TIME 0725


PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/27/2018 10:09:06AM
 Peak Analysis From Channel : 120
 Peak Analysis To Channel : 8192

Analysis Report for 27-Aug-18-10005

B1-09100A-FSFC-021CV 0.0" - 0.5" 0.0"

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	1460.58	5834 -	5848	5840.24	4.17E+01	15.07	1.06E+01	0.39

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82 *	10.66	4.91E+00	1.82E+00

* = 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 2.000sigma

Analysis Report for 27-Aug-18-10005

B1-09100A-FSFC-021CV 0.0" - 0.5" 0.0"

INTERFERENCE CORRECTED REPORT

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	0.990	4.91E+00	1.82E+00	

- ? = 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 2.000sigma

Analysis Report for 27-Aug-18-10005

B1-09100A-FSFC-021CV 0.0" - 0.5" 0.0"

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/27/2018 10:09:06AM
 Peak Locate From Channel : 120
 Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00	100.00	1.36E-01	2.14E-01	2.14E-01
	BE-7	477.60	10.44	-4.22E-02	1.27E+00	1.27E+00
+	K-40	1460.82	* 10.66	4.91E+00	1.89E+00	1.89E+00
	Co-60	1173.23	99.85	5.31E-02	1.44E-01	1.44E-01
		1332.49	99.98	6.41E-02		2.18E-01
	Nb-94	702.65	99.81	2.44E-02	1.68E-01	1.72E-01
		871.09	99.89	1.51E-02		1.68E-01
	Ag-108m	79.13	6.60	7.32E-01	1.34E-01	2.37E+00
		433.94	90.50	-2.22E-02		1.34E-01
		614.28	89.80	-7.76E-02		1.85E-01
		722.94	90.80	-4.93E-02		1.37E-01
	Sb-125	176.31	6.84	5.71E-02	3.34E-01	9.47E-01
		380.45	1.52	-1.76E+00		6.55E+00
		427.87	29.60	-9.43E-02		3.34E-01
		463.36	10.49	3.57E-01		1.25E+00
		600.60	17.65	-3.74E-02		7.78E-01
		606.71	4.98	2.37E-01		3.10E+00
		635.95	11.22	1.84E-01		6.86E-01
		671.44	1.79	-4.63E+00		6.91E+00

Analysis Report for 27-Aug-18-10005

B1-09100A-FSFC-021CV 0.0" - 0.5" 0.0"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Ba-133	79.61	2.65	-5.37E-01	1.64E-01	5.55E+00
	81.00	32.90	-3.31E-01		3.73E-01
	276.40	7.16	-4.47E-01		1.33E+00
	302.85	18.34	-1.00E-01		4.79E-01
	356.01	62.05	-2.03E-01		1.64E-01
Cs-134	383.85	8.94	4.20E-01	1.42E-01	1.12E+00
	475.36	1.48	-2.38E+00		8.67E+00
	563.25	8.34	4.71E-03		1.66E+00
	569.33	15.37	3.04E-01		8.84E-01
	604.72	97.62	-1.86E-01		1.42E-01
	795.86	85.46	-1.33E-01		1.78E-01
	801.95	8.69	5.68E-01		1.76E+00
	1038.61	0.99	-3.22E+00		1.63E+01
	1167.97	1.79	-8.10E+00		9.22E+00
	1365.19	3.02	-5.37E+00		4.91E+00
Cs-137	661.66	85.10	2.40E-01	2.88E-01	2.88E-01
Eu-152	121.78	28.67	9.62E-02	2.72E-01	2.72E-01
	244.70	7.61	6.65E-02		1.30E+00
	295.94	0.45	6.81E+00		2.73E+01
	344.28	26.60	1.81E-01		3.82E-01
	367.79	0.86	-3.26E+00		1.18E+01
	411.12	2.24	-1.86E+00		4.97E+00
	443.96	2.83	-4.05E+00		3.71E+00
	488.68	0.42	-1.60E+01		3.46E+01
	563.99	0.49	4.05E+00		2.89E+01
	586.26	0.46	-7.24E+00		2.64E+01
	678.62	0.47	-1.36E+01		2.23E+01
	688.67	0.86	-6.74E-01		1.59E+01
	719.35	0.28	2.42E+01		4.65E+01
	778.90	12.96	-1.58E-01		1.24E+00
	810.45	0.32	2.30E+01		4.41E+01
	867.37	4.26	-3.69E+00		3.49E+00
	919.33	0.43	1.57E+00		4.09E+01
	964.08	14.65	8.09E-02		1.09E+00
	1085.87	10.24	-4.66E-01		1.53E+00
	1089.74	1.73	1.06E+00		9.07E+00
	1112.07	13.69	3.73E-02		1.02E+00
	1212.95	1.43	5.32E+00		1.18E+01
	1249.94	0.19	2.34E+01		7.31E+01
1299.14	1.63	-1.88E+00	8.74E+00		
1408.01	21.07	2.31E-01	7.20E-01		
1457.64	0.50	1.32E+02	9.42E+01		
1528.10	0.28	1.39E+01	5.18E+01		
Eu-154	123.07	40.40	-3.52E-02	1.81E-01	1.81E-01
	247.93	6.89	4.14E-01		1.35E+00
	591.76	4.95	1.38E+00		2.74E+00
	692.42	1.78	-4.04E+00		7.11E+00
	723.30	20.06	-2.42E-01		6.19E-01
	756.80	4.52	-1.08E-01		2.15E+00
	873.18	12.08	4.43E-01		1.44E+00
	996.29	10.48	-3.62E-01		1.56E+00

Analysis Report for 27-Aug-18-10005

B1-09100A-FSFC-021CV 0.0" - 0.5" 0.0"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	1004.76	18.01	2.52E-01	1.81E-01	9.15E-01
	1274.43	34.80	-8.53E-02		5.03E-01
	1596.48	1.80	3.77E+00		1.03E+01
Eu-155	45.30	1.31	-1.70E+01	4.42E-01	2.25E+01
	60.01	1.22	7.72E+00		2.41E+01
	86.55	30.70	3.68E-02		4.42E-01
Ra-226	105.31	21.10	2.91E-02	2.74E+00	4.66E-01
	186.21	3.64	3.65E-01		2.74E+00
Pa-231	27.36	10.30	1.82E+00	3.37E+00	3.37E+00
	283.69	1.70	-4.72E+00		4.52E+00
	300.07	2.47	-3.87E+00		3.87E+00
	302.65	2.20	-2.92E+00		3.89E+00
	330.06	1.40	-4.94E-01		8.07E+00
U-235	143.76	10.96	2.71E-01	1.79E-01	7.43E-01
	163.33	5.08	1.05E-01		1.45E+00
	185.71	57.20	5.25E-02		1.79E-01
	202.11	1.08	-3.03E+00		6.56E+00
	205.31	5.01	-6.17E-01		1.52E+00
Am-241	59.54	35.90	3.29E-02	8.17E-01	8.17E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

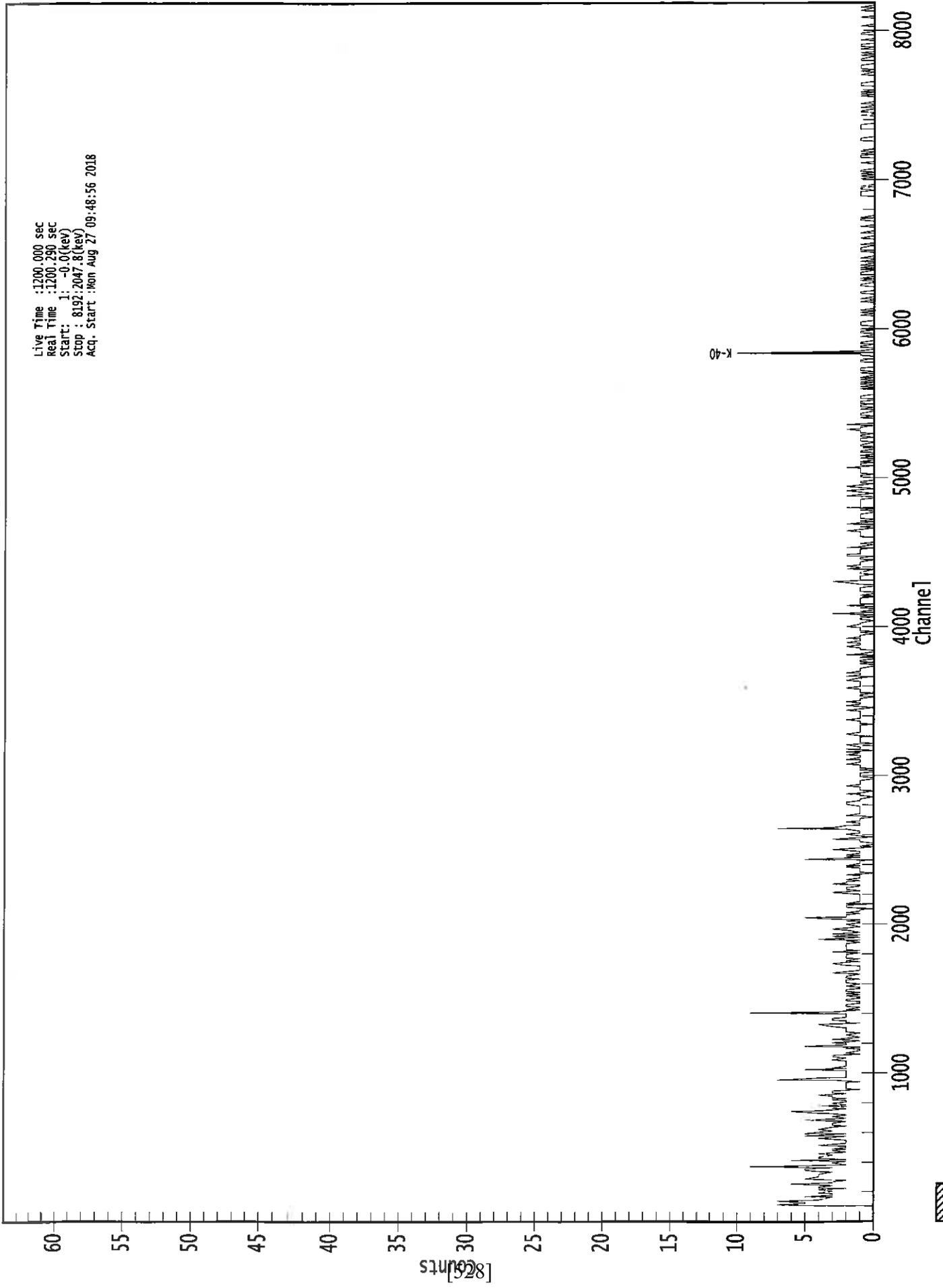
> = MDA value not calculated

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

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

0000049641.CNF

Live Time :1200.000 sec
Real Time :1200.290 sec
Start : 1: -0.0(keV)
Stop : 8192.2047.8(keV)
Acq. Start :Mon Aug 27 09:48:56 2018



ROI Type: 1

Analysis Report for 27-Aug-18-10006

B1-09100A-FSFC-021CV 0.0" - 0.5" 0.5"

GAMMA SPECTRUM ANALYSIS

Sample Identification : 27-Aug-18-10006
Sample Description : B1-09100A-FSFC-021CV 0.0" - 0.5" 0.5"
Sample Type : Puck
Unit :
Sample Point :

Sample Size : 1.171E+02 grams
Facility : Default

Sample Taken On : 8/22/2018 12:59:00PM
Acquisition Started : 8/27/2018 10:28:41AM

Procedure : Puck_half_inch
Operator : jwelch
Detector Name : P11314
Geometry : Puck_half_inch
Live Time : 1200.0 seconds
Real Time : 1200.3 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 : 12/15/2017
Efficiency Calibration Used Done On : 8/27/2018
Efficiency Calibration Description :

Sample Number : 49645
Certificate Name : Eu155-Na22
Certificate Date : 12/22/2008 12:00:00PM

J.P. Wood
DATA VALIDATED ^{8/27/18}

DATE 9-2-18TIME 0739

R. Masserill

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/27/2018 10:48:48AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Analysis Report for 27-Aug-18-10006

B1-09100A-FSFC-021CV 0.0" - 0.5" 0.5"

 No peak analysis results available for reporting purposes.

 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
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* = 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 2.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
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Analysis Report for 27-Aug-18-10006

B1-09100A-FSFC-021CV 0.0" - 0.5" 0.5"

- ? = 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 2.000sigma

Analysis Report for 27-Aug-18-10006

B1-09100A-FSFC-021CV 0.0" - 0.5" 0.5"

 No peak search results available for nuclide analysis.

NUCLIDE MDA REPORT

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

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
An Pk	511.00	100.00	2.30E-01	2.19E-01	2.19E-01
BE-7	477.60	10.44	-4.97E-02	1.13E+00	1.13E+00
K-40	1460.82	10.66	4.79E+00	4.21E+00	4.21E+00
Co-60	1173.23	99.85	-2.12E-02	1.70E-01	1.75E-01
	1332.49	99.98	-4.40E-02		1.70E-01
Nb-94	702.65	99.81	4.20E-02	1.34E-01	1.34E-01
	871.09	99.89	5.55E-02		1.62E-01
Ag-108m	79.13	6.60	5.68E-01	1.31E-01	2.50E+00
	433.94	90.50	-1.59E-02		1.31E-01
	614.28	89.80	-2.84E-01		1.96E-01
	722.94	90.80	-1.02E-01		1.67E-01
Sb-125	176.31	6.84	-2.84E-01	4.85E-01	1.11E+00
	380.45	1.52	-5.68E+00		6.55E+00
	427.87	29.60	1.85E-01		4.85E-01
	463.36	10.49	-2.57E-02		1.17E+00
	600.60	17.65	-1.87E-02		8.68E-01
	606.71	4.98	3.63E+00		4.43E+00
	635.95	11.22	-1.24E+00		8.35E-01
	671.44	1.79	8.37E-01		7.52E+00
Ba-133	79.61	2.65	2.18E+00	2.24E-01	6.06E+00
	81.00	32.90	-7.22E-01		3.67E-01
	276.40	7.16	6.34E-01		1.31E+00
	302.85	18.34	5.33E-01		5.98E-01
	356.01	62.05	-2.83E-02		2.24E-01
	383.85	8.94	2.84E-01		1.21E+00
Cs-134	475.36	1.48	3.90E-01	1.78E-01	8.46E+00
	563.25	8.34	-1.07E+00		1.75E+00
	569.33	15.37	3.80E-01		1.07E+00
	604.72	97.62	-1.61E-01		1.98E-01
	795.86	85.46	7.12E-03		1.78E-01
	801.95	8.69	4.23E-02		1.70E+00
	1038.61	0.99	-7.82E+00		1.63E+01
	1167.97	1.79	5.92E+00		1.07E+01
	1365.19	3.02	-1.12E+00		4.41E+00

Analysis Report for 27-Aug-18-10006

B1-09100A-FSFC-021CV 0.0" - 0.5" 0.5"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Cs-137	661.66	85.10	1.54E-01	2.53E-01	2.53E-01
Eu-152	121.78	28.67	-3.17E-02	2.38E-01	2.38E-01
	244.70	7.61	5.76E-01		1.32E+00
	295.94	0.45	-1.70E-01		2.66E+01
	344.28	26.60	-7.36E-02		3.13E-01
	367.79	0.86	4.94E+00		1.05E+01
	411.12	2.24	-9.97E-02		4.12E+00
	443.96	2.83	-1.10E-01		3.95E+00
	488.68	0.42	-6.31E+00		2.31E+01
	563.99	0.49	-4.74E+00		3.04E+01
	586.26	0.46	2.09E+01		3.56E+01
	678.62	0.47	6.23E+00		2.98E+01
	688.67	0.86	1.06E+00		1.59E+01
	719.35	0.28	-1.35E+01		5.06E+01
	778.90	12.96	3.69E-01		8.98E-01
	810.45	0.32	4.47E+00		4.98E+01
	867.37	4.26	1.00E+00		4.46E+00
	919.33	0.43	8.51E+00		3.62E+01
	964.08	14.65	-8.77E-01		1.14E+00
	1085.87	10.24	5.62E-01		1.84E+00
	1089.74	1.73	4.19E-01		9.58E+00
	1112.07	13.69	3.73E-01		1.02E+00
	1212.95	1.43	3.46E+00		1.43E+01
	1249.94	0.19	-2.69E+00		8.57E+01
	1299.14	1.63	5.84E-02		1.02E+01
	1408.01	21.07	-2.21E-01		6.46E-01
	1457.64	0.50	1.20E+02		9.00E+01
	1528.10	0.28	1.39E+01		5.18E+01
Eu-154	123.07	40.40	8.39E-02	1.65E-01	1.65E-01
	247.93	6.89	2.72E-01		1.28E+00
	591.76	4.95	-3.99E-02		2.74E+00
	692.42	1.78	2.25E+00		7.73E+00
	723.30	20.06	-4.20E-02		8.07E-01
	756.80	4.52	8.48E-01		2.98E+00
	873.18	12.08	6.44E-01		1.24E+00
	996.29	10.48	-5.66E-01		1.32E+00
	1004.76	18.01	3.76E-02		1.03E+00
	1274.43	34.80	2.56E-01		6.29E-01
	1596.48	1.80	-4.95E+00		9.41E+00
Eu-155	45.30	1.31	-7.62E+00	4.00E-01	2.39E+01
	60.01	1.22	8.43E+00		2.29E+01
	86.55	30.70	-1.86E-01		4.00E-01
	105.31	21.10	-5.76E-02		4.20E-01
Ra-226	186.21	3.64	2.30E+00	2.77E+00	2.77E+00
Pa-231	27.36	10.30	1.96E+00	3.08E+00	3.08E+00
	283.69	1.70	1.68E+00		4.66E+00
	300.07	2.47	-5.23E-01		4.47E+00
	302.65	2.20	2.45E+00		4.90E+00
	330.06	1.40	2.79E+00		7.79E+00
U-235	143.76	10.96	1.91E-01	1.74E-01	8.42E-01
	163.33	5.08	3.14E-01		1.55E+00

Analysis Report for 27-Aug-18-10006

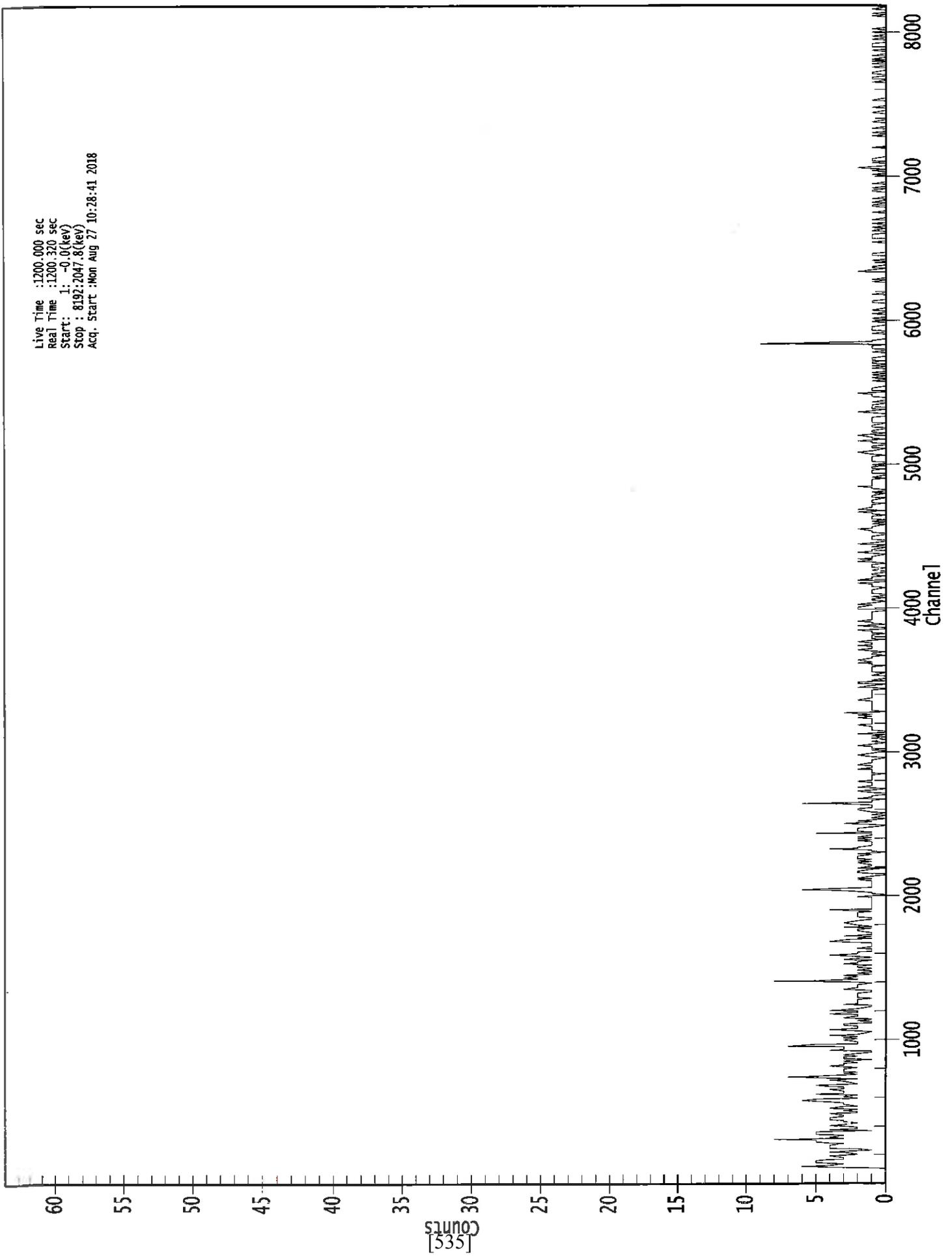
B1-09100A-FSFC-021CV 0.0" - 0.5" 0.5"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
U-235	185.71	57.20	1.57E-01	1.74E-01	1.74E-01
	202.11	1.08	1.96E+00		8.10E+00
	205.31	5.01	-5.59E-01		1.74E+00
Am-241	59.54	35.90	3.38E-01	7.75E-01	7.75E-01

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

0000049645.CNF

Live Time :1200.000 sec
Real Time :1200.320 sec
Start: 1: -0.0(kev)
Stop : 8192:2047.8(kev)
Acq. Start :Mon Aug 27 10:28:41 2018



Analysis Report for 27-Aug-18-10007

B1-09100A-FSWC-031CV 0.0" - 0.5" 0.0"

GAMMA SPECTRUM ANALYSIS

Sample Identification : 27-Aug-18-10007
Sample Description : B1-09100A-FSWC-031CV 0.0" - 0.5" 0.0"
Sample Type : Puck
Unit :
Sample Point :

Sample Size : 1.205E+02 grams
Facility : Default

Sample Taken On : 8/22/2018 1:30:00PM
Acquisition Started : 8/27/2018 9:49:03AM

Procedure : Puck_half_inch
Operator : jwelch
Detector Name : 352
Geometry : Puck_half_inch
Live Time : 1200.0 seconds
Real Time : 1200.2 seconds

Dead Time : 0.02 %

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

Energy Calibration Used Done On : 3/12/2018
Efficiency Calibration Used Done On : 8/27/2018
Efficiency Calibration Description : install

Sample Number : 49642
Certificate Name : Eu155-Na22
Certificate Date : 1/7/2013 12:00:00PM

J. Welch
8-27-18

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/27/2018 10:09:06AM

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

DATA VALIDATED

DATE 9-2-18TIME 0735

R. Massengill

Analysis Report for 27-Aug-18-10007

B1-09100A-FSWC-031CV 0.0" - 0.5" 0.0"

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	185.80	739 -	750	743.93	2.09E+01	16.05	3.43E+01	0.96
2	238.72	950 -	961	955.34	2.83E+01	18.56	4.35E+01	0.78
3	352.07	1400 -	1414	1408.28	3.65E+01	15.24	1.50E+01	0.92

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.00sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb-212	0.99	115.18	0.60	2.14E-01	1.45E-01
		238.63 *	43.60		
		300.09	3.30		
Pb-214	0.99	241.99	7.25	4.46E-01	2.00E-01
		295.22	18.42		
		351.93 *	35.60		
Ra-226	0.97	785.96	1.06	1.63E+00	1.28E+00
		186.21 *	3.64		
U-235	0.99	143.76	10.96	1.04E-01	8.16E-02
		163.33	5.08		
		185.71 *	57.20		
		202.11	1.08		
		205.31	5.01		

Analysis Report for 27-Aug-18-10007

B1-09100A-FSWC-031CV 0.0" - 0.5" 0.0"

- * = 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 2.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
Pb-212	0.999	2.14E-01	1.45E-01	
Pb-214	0.998	4.46E-01	2.00E-01	
? Ra-226	0.974	1.63E+00	1.28E+00	
? U-235 <i>Re-226</i>	0.999	1.04E-01	8.16E-02	

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

Errors quoted at 2.000sigma

U-235 only 1 peak JFW 8-27-18

Analysis Report for 27-Aug-18-10007

B1-09100A-FSWC-031CV 0.0" - 0.5" 0.0"

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/27/2018 10:09:06AM
 Peak Locate From Channel : 120
 Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

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	1.80E-01	2.15E-01	2.15E-01
BE-7	477.60	10.44	-2.08E-01	1.09E+00	1.09E+00
K-40	1460.82	10.66	3.47E+00	3.68E+00	3.68E+00
Co-60	1173.23	99.85	-7.35E-02	1.75E-01	1.93E-01
	1332.49	99.98	-2.52E-02		1.75E-01
Nb-94	702.65	99.81	3.35E-02	1.45E-01	1.77E-01
	871.09	99.89	7.56E-02		1.45E-01
Ag-108m	79.13	6.60	-1.80E+00	1.46E-01	3.01E+00
	433.94	90.50	-3.52E-02		1.46E-01
	614.28	89.80	4.29E-02		2.58E-01
	722.94	90.80	8.48E-03		1.89E-01
Sb-125	176.31	6.84	-5.96E-02	4.91E-01	1.34E+00
	380.45	1.52	6.42E+00		7.60E+00
	427.87	29.60	1.63E-01		4.91E-01
	463.36	10.49	5.65E-01		1.30E+00
	600.60	17.65	8.80E-02		9.36E-01
	606.71	4.98	3.82E+00		4.80E+00
	635.95	11.22	7.21E-01		1.37E+00
	671.44	1.79	-4.01E+00		9.15E+00

Analysis Report for 27-Aug-18-10007

B1-09100A-FSWC-031CV 0.0" - 0.5" 0.0"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Ba-133	79.61	2.65	4.65E+00	2.77E-01	7.83E+00
	81.00	32.90	-1.29E-01		5.65E-01
	276.40	7.16	-1.02E-01		1.56E+00
	302.85	18.34	-6.24E-01		6.40E-01
	356.01	62.05	-1.37E-02		2.77E-01
Cs-134	383.85	8.94	-3.50E-01	2.05E-01	1.30E+00
	475.36	1.48	-2.75E+00		7.24E+00
	563.25	8.34	-1.25E-01		1.50E+00
	569.33	15.37	3.96E-02		9.24E-01
	604.72	97.62	8.10E-02		2.25E-01
	795.86	85.46	-1.21E-01		2.05E-01
	801.95	8.69	9.30E-01		2.02E+00
	1038.61	0.99	2.46E+00		1.58E+01
	1167.97	1.79	1.37E+00		1.08E+01
	1365.19	3.02	-2.58E-01		5.93E+00
Cs-137	661.66	85.10	2.45E-01	2.59E-01	2.59E-01
Eu-152	121.78	28.67	5.66E-02	3.35E-01	3.35E-01
	244.70	7.61	-3.08E-01		1.67E+00
	295.94	0.45	2.97E+01		3.44E+01
	344.28	26.60	-6.63E-02		4.48E-01
	367.79	0.86	4.88E+00		1.35E+01
	411.12	2.24	-1.83E+00		4.84E+00
	443.96	2.83	-2.61E+00		3.94E+00
	488.68	0.42	-5.97E+00		2.93E+01
	563.99	0.49	4.74E+00		2.63E+01
	586.26	0.46	9.66E+00		4.10E+01
	678.62	0.47	2.55E+01		3.40E+01
	688.67	0.86	6.33E+00		1.62E+01
	719.35	0.28	1.25E+01		5.83E+01
	778.90	12.96	-1.31E-01		1.13E+00
	810.45	0.32	5.60E+00		5.19E+01
	867.37	4.26	2.36E+00		3.83E+00
	919.33	0.43	-2.86E+01		3.68E+01
	964.08	14.65	5.97E-01		1.28E+00
	1085.87	10.24	-2.62E-01		1.72E+00
	1089.74	1.73	-1.84E+00		1.02E+01
	1112.07	13.69	1.09E-01		1.13E+00
	1212.95	1.43	1.17E+00		1.21E+01
	1249.94	0.19	-6.07E+01		9.80E+01
1299.14	1.63	1.61E+00	1.22E+01		
1408.01	21.07	2.79E-01	7.58E-01		
1457.64	0.50	9.61E+01	7.98E+01		
1528.10	0.28	2.23E+01	6.06E+01		
Eu-154	123.07	40.40	6.46E-03	2.34E-01	2.34E-01
	247.93	6.89	-1.16E+00		1.48E+00
	591.76	4.95	-1.44E+00		2.79E+00
	692.42	1.78	-6.51E+00		7.88E+00
	723.30	20.06	3.23E-01		8.98E-01
	756.80	4.52	1.01E+00		3.17E+00
	873.18	12.08	2.61E-01		1.20E+00
	996.29	10.48	3.49E-01		1.37E+00

Analysis Report for 27-Aug-18-10007

B1-09100A-FSWC-031CV 0.0" - 0.5" 0.0"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	1004.76	18.01	3.50E-01	2.34E-01	1.04E+00
	1274.43	34.80	3.75E-01		6.09E-01
	1596.48	1.80	5.08E+00		1.13E+01
Eu-155	45.30	1.31	-2.90E+01	4.64E-01	3.07E+01
	60.01	1.22	-4.71E+01		3.08E+01
	86.55	30.70	-3.23E-01		4.64E-01
+ Ra-226	105.31	21.10	9.65E-02	1.97E+00	5.23E-01
	186.21	* 3.64	1.63E+00		1.97E+00
	Pa-231	27.36	10.30		9.49E+00
+ U-235	283.69	1.70	-9.33E-01	1.26E-01	6.00E+00
	300.07	2.47	-3.08E+00		5.40E+00
	302.65	2.20	-2.09E+00		5.33E+00
	330.06	1.40	-1.44E+00		7.98E+00
	143.76	10.96	-1.66E-01		9.04E-01
	163.33	5.08	1.36E-01		1.93E+00
	185.71	* 57.20	1.04E-01		1.26E-01
202.11	1.08	-3.95E+00	9.20E+00		
205.31	5.01	-7.95E-01	2.11E+00		
Am-241	59.54	35.90	1.00E-01	1.16E+00	1.16E+00

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

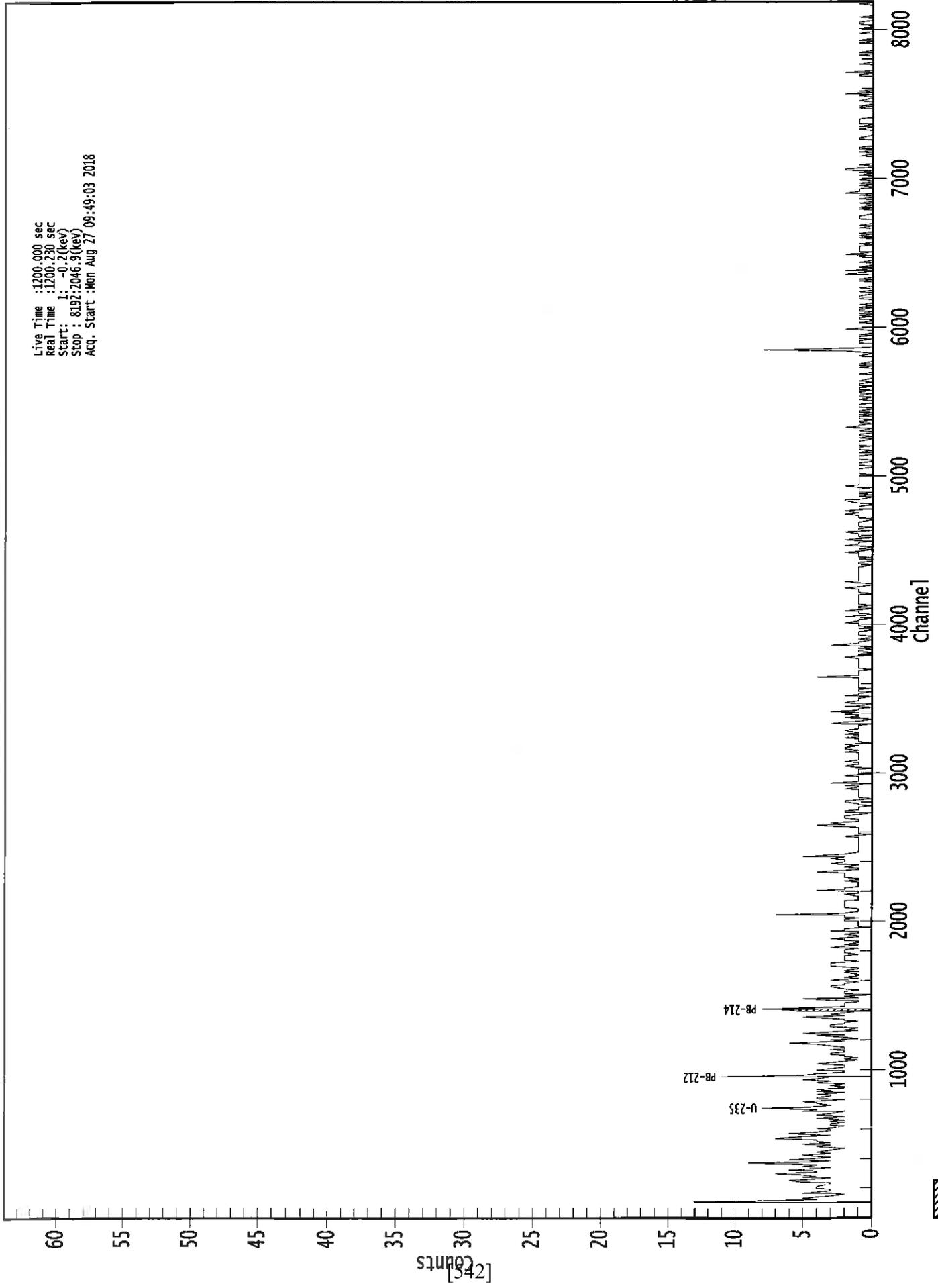
> = MDA value not calculated

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

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

27-AUG-18-1000712E2.CNF

Live Time : 1200.000 sec
Real Time : 1200.230 sec
Start : 1: -0.2 (kev)
Stop : 8192.2046:9 (kev)
Acq. Start : Mon Aug 27 09:49:03 2018



ROI Type: 1

Analysis Report for 27-Aug-18-10008

B1-09100A-FSWC-031CV 0.0" - 0.5" 0.5"

GAMMA SPECTRUM ANALYSIS

Sample Identification : 27-Aug-18-10008
Sample Description : B1-09100A-FSWC-031CV 0.0" - 0.5" 0.5"
Sample Type : Puck
Unit :
Sample Point :

Sample Size : 1.205E+02 grams
Facility : Default

Sample Taken On : 8/22/2018 1:30:00PM
Acquisition Started : 8/27/2018 10:28:48AM

Procedure : Puck_half_inch
Operator : jwelch
Detector Name : 352
Geometry : Puck_half_inch
Live Time : 1200.0 seconds
Real Time : 1200.3 seconds

Dead Time : 0.02 %

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

Energy Calibration Used Done On : 3/12/2018
Efficiency Calibration Used Done On : 8/27/2018
Efficiency Calibration Description : install

Sample Number : 49646
Certificate Name : Eu155-Na22
Certificate Date : 1/7/2013 12:00:00PM

J.P. Welch
8-27-18

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/27/2018 10:49:01AM

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

DATA VALIDATED

DATE 9-2-18TIME 0739

R. Massogill
R. Jones

Analysis Report for 27-Aug-18-10008

B1-09100A-FSWC-031CV 0.0" - 0.5" 0.5"

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.81	952 -	961	955.71	2.75E+01	16.19	3.29E+01	0.87
2	295.36	1176 -	1186	1181.67	2.29E+01	15.35	3.03E+01	0.62
3	351.86	1403 -	1412	1407.43	2.78E+01	13.98	1.84E+01	0.76

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	2.08E-01	1.27E-01
		300.09	3.30		
Pb-214	0.99	241.99	7.25		
		295.22 *	18.42	4.72E-01	3.25E-01
		351.93 *	35.60	3.40E-01	1.79E-01
		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 2.000sigma

Analysis Report for 27-Aug-18-10008

B1-09100A-FSWC-031CV 0.0" - 0.5" 0.5"

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
X	Bi-211	0.905			
	Pb-212	0.995	2.08E-01	1.27E-01	
	Pb-214	0.999	3.71E-01	1.57E-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 2.000sigma

Analysis Report for 27-Aug-18-10008

B1-09100A-FSWC-031CV 0.0" - 0.5" 0.5"

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/27/2018 10:49:01AM
 Peak Locate From Channel : 120
 Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

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	1.21E-01	2.06E-01	2.06E-01
BE-7	477.60	10.44	1.03E+00	1.47E+00	1.47E+00
K-40	1460.82	10.66	3.62E+00	4.02E+00	4.02E+00
Co-60	1173.23	99.85	6.26E-02	2.08E-01	2.08E-01
	1332.49	99.98	1.23E-01		2.11E-01
Nb-94	702.65	99.81	7.81E-02	1.45E-01	1.84E-01
	871.09	99.89	1.52E-02		1.45E-01
Ag-108m	79.13	6.60	-4.39E-02	1.31E-01	3.09E+00
	433.94	90.50	-1.22E-01		1.31E-01
	614.28	89.80	2.15E-01		2.44E-01
	722.94	90.80	-3.66E-02		1.89E-01
Sb-125	176.31	6.84	9.36E-02	4.16E-01	1.43E+00
	380.45	1.52	1.21E+00		7.10E+00
	427.87	29.60	1.07E-02		4.16E-01
	463.36	10.49	4.30E-01		1.03E+00
	600.60	17.65	1.01E-01		7.44E-01
	606.71	4.98	2.96E+00		4.62E+00
	635.95	11.22	-1.36E-01		1.04E+00
	671.44	1.79	3.05E+00		9.37E+00

Analysis Report for 27-Aug-18-10008

B1-09100A-FSWC-031CV 0.0" - 0.5" 0.5"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Ba-133	79.61	2.65	1.37E+00	2.53E-01	7.51E+00
	81.00	32.90	-6.23E-01		5.12E-01
	276.40	7.16	-5.08E-02		1.57E+00
	302.85	18.34	-1.25E-01		5.58E-01
	356.01	62.05	-2.11E-01		2.53E-01
Cs-134	383.85	8.94	5.73E-01	1.44E-01	1.12E+00
	475.36	1.48	2.47E+00		9.42E+00
	563.25	8.34	8.84E-01		1.81E+00
	569.33	15.37	6.05E-01		1.03E+00
	604.72	97.62	-2.92E-03		2.10E-01
	795.86	85.46	1.66E-02		1.44E-01
	801.95	8.69	3.39E-01		1.65E+00
	1038.61	0.99	-9.01E-02		1.58E+01
	1167.97	1.79	-3.67E+00		1.08E+01
	1365.19	3.02	1.52E+00		4.75E+00
Cs-137	661.66	85.10	1.24E-01	2.27E-01	2.27E-01
Eu-152	121.78	28.67	-7.45E-03	3.16E-01	3.16E-01
	244.70	7.61	3.09E-02		1.48E+00
	295.94	0.45	3.97E+01		3.51E+01
	344.28	26.60	8.05E-03		5.03E-01
	367.79	0.86	4.41E+00		1.40E+01
	411.12	2.24	-5.31E+00		5.33E+00
	443.96	2.83	1.05E-01		4.46E+00
	488.68	0.42	1.34E+01		2.93E+01
	563.99	0.49	9.07E+00		3.14E+01
	586.26	0.46	2.89E+01		4.28E+01
	678.62	0.47	2.05E+01		3.65E+01
	688.67	0.86	2.96E+00		1.50E+01
	719.35	0.28	-1.43E+01		5.99E+01
	778.90	12.96	-4.58E-01		9.87E-01
	810.45	0.32	-5.30E+01		4.10E+01
	867.37	4.26	-2.16E-01		3.55E+00
	919.33	0.43	-6.87E+01		2.77E+01
	964.08	14.65	2.47E-01		1.50E+00
	1085.87	10.24	4.76E-01		1.30E+00
	1089.74	1.73	4.00E-01		8.27E+00
	1112.07	13.69	-1.63E-01		1.36E+00
	1212.95	1.43	-3.50E+00		1.27E+01
	1249.94	0.19	-4.40E+01		8.30E+01
1299.14	1.63	-1.82E+00	8.45E+00		
1408.01	21.07	2.23E-01	6.95E-01		
1457.64	0.50	1.13E+02	8.59E+01		
1528.10	0.28	1.34E+01	4.98E+01		
Eu-154	123.07	40.40	-2.58E-01	2.23E-01	2.23E-01
	247.93	6.89	-5.34E-01		1.45E+00
	591.76	4.95	6.85E-01		2.44E+00
	692.42	1.78	-7.88E+00		7.30E+00
	723.30	20.06	5.33E-01		8.98E-01
	756.80	4.52	4.22E-02		3.29E+00
	873.18	12.08	-2.96E-01		1.15E+00
	996.29	10.48	6.49E-01		1.83E+00

Analysis Report for 27-Aug-18-10008

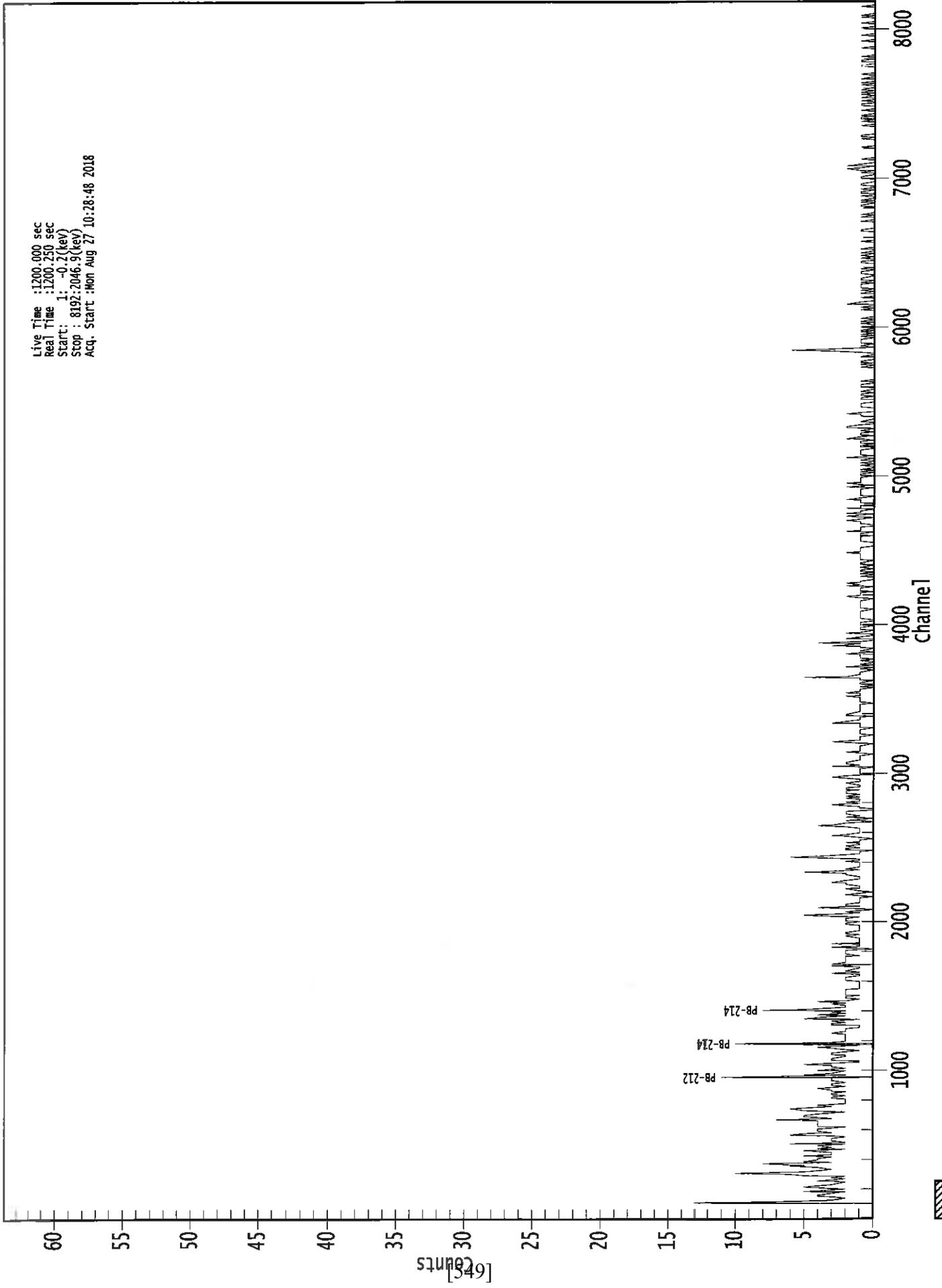
B1-09100A-FSWC-031CV 0.0" - 0.5" 0.5"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)		
Eu-154	1004.76	18.01	-4.96E-01	2.23E-01	1.00E+00		
	1274.43	34.80	-1.11E-01		4.25E-01		
	1596.48	1.80	1.36E-01		9.04E+00		
Eu-155	45.30	1.31	1.03E+01	5.06E-01	3.24E+01		
	60.01	1.22	-2.85E+01		2.84E+01		
	86.55	30.70	7.82E-02		5.06E-01		
	105.31	21.10	5.56E-02		5.40E-01		
Ra-226	186.21	3.64	4.14E+00	3.52E+00	3.52E+00		
Pa-231	27.36	10.30	7.47E+00	4.64E+00	6.01E+00		
	283.69	1.70	-3.60E+00		6.25E+00		
	300.07	2.47	-3.88E+00		4.99E+00		
	302.65	2.20	-2.31E-01		4.64E+00		
	330.06	1.40	3.91E+00		9.25E+00		
	U-235	143.76	10.96		-3.07E-01	2.22E-01	9.47E-01
	163.33	5.08	-3.40E-01		2.16E+00		
185.71	57.20	1.47E-01	2.22E-01				
202.11	1.08	-3.22E+00	9.09E+00				
205.31	5.01	-5.01E-02	1.93E+00				
Am-241	59.54	35.90	-1.04E-01	1.03E+00	1.03E+00		

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

27-AUG-18-10008A362.CNF

Live Time : 1200.000 sec
Real Time : 1200.250 sec
Start : 1: -0.2 (kev)
Stop : 8192.2046.9 (kev)
Acq. Start : Mon Aug 27 10:28:48 2018



ROI Type: 1

Analysis Report for 27-Aug-18-10009

B1-09100A-FSWC-041CV 0.0" - 0.5" 0.0"

GAMMA SPECTRUM ANALYSIS

Sample Identification : 27-Aug-18-10009
Sample Description : B1-09100A-FSWC-041CV 0.0" - 0.5" 0.0"
Sample Type : Puck
Unit :
Sample Point :

Sample Size : 1.316E+02 grams
Facility : Default

Sample Taken On : 8/22/2018 8:34:00AM
Acquisition Started : 8/27/2018 10:59:43AM

Procedure : Puck_half_inch
Operator : jewelch
Detector Name : 324
Geometry : Puck_half_inch
Live Time : 1200.0 seconds
Real Time : 1200.3 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 : 8/9/2017
Efficiency Calibration Used Done On : 8/27/2018
Efficiency Calibration Description :

Sample Number : 49647
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2013 12:00:00PM

J.P. Welch
8-27-18

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/27/2018 11:19:52AM

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

DATA VALIDATED

DATE 9-2-18TIME 0745

R. Masserjill / [Signature]

Analysis Report for 27-Aug-18-10009

B1-09100A-FSWC-041CV 0.0" - 0.5" 0.0"

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.77	473 -	480	477.71	2.68E+01	25.86	1.32E+02	0.71
2	294.87	585 -	594	589.80	3.25E+01	22.65	8.50E+01	0.66
3	351.88	699 -	708	703.71	4.50E+01	21.68	6.39E+01	0.94
4	1461.18	2916 -	2928	2922.42	6.65E+01	16.77	2.98E+00	1.44

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.00sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.82	*	10.66	6.17E+00
Pb-212	0.99	115.18		0.60	
		238.63	*	43.60	1.65E-01
		300.09		3.30	
Pb-214	0.99	241.99		7.25	
		295.22	*	18.42	5.46E-01
		351.93	*	35.60	4.49E-01
		785.96		1.06	

Analysis Report for 27-Aug-18-10009

B1-09100A-FSWC-041CV 0.0" - 0.5" 0.0"

* = 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 2.000sigma

INTERFERENCE CORRECTED REPORT

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
	0.980	6.17E+00	1.64E+00	
X K-40	0.900			
	0.997	1.65E-01	1.61E-01	
Pb-211	0.994	4.74E-01	1.97E-01	
Pb-212				
Pb-214				

? = 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 2.000sigma

Analysis Report for 27-Aug-18-10009

B1-09100A-FSWC-041CV 0.0" - 0.5" 0.0"

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/27/2018 11:19:52AM
 Peak Locate From Channel : 120
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE MDA REPORT

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

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
An Pk	511.00	100.00	2.66E-01	2.25E-01	2.25E-01
BE-7	477.60	10.44	2.84E-02	1.31E+00	1.31E+00
+ K-40	1460.82	* 10.66	6.17E+00	8.76E-01	8.76E-01
Co-60	1173.23	99.85	8.62E-02	1.85E-01	1.85E-01
	1332.49	99.98	1.01E-01		1.91E-01
Nb-94	702.65	99.81	2.71E-02	1.39E-01	1.51E-01
	871.09	99.89	2.41E-02		1.39E-01
Ag-108m	79.13	6.60	3.07E-01	1.34E-01	2.87E+00
	433.94	90.50	-5.75E-03		1.34E-01
	614.28	89.80	-8.72E-02		1.88E-01
	722.94	90.80	-8.99E-02		1.72E-01
Sb-125	176.31	6.84	-2.91E-01	4.59E-01	1.67E+00
	380.45	1.52	-2.69E-01		8.10E+00
	427.87	29.60	2.57E-01		4.59E-01
	463.36	10.49	2.98E-01		1.36E+00
	600.60	17.65	3.65E-01		7.95E-01
	606.71	4.98	2.88E+00		4.31E+00
	635.95	11.22	-2.82E-02		1.23E+00
	671.44	1.79	-4.23E+00		6.49E+00

Analysis Report for 27-Aug-18-10009

B1-09100A-FSWC-041CV 0.0" - 0.5" 0.0"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Ba-133	79.61	2.65	3.40E+00	2.50E-01	7.22E+00
	81.00	32.90	5.79E-03		5.11E-01
	276.40	7.16	-3.59E-01		1.61E+00
	302.85	18.34	3.56E-03		6.11E-01
	356.01	62.05	-6.49E-02		2.50E-01
Cs-134	383.85	8.94	-1.76E-01	1.25E-01	1.40E+00
	475.36	1.48	3.14E-01		8.71E+00
	563.25	8.34	-2.32E-01		1.31E+00
	569.33	15.37	2.09E-01		8.28E-01
	604.72	97.62	-3.16E-02		1.98E-01
	795.86	85.46	-3.08E-02		1.25E-01
	801.95	8.69	-3.75E-01		1.46E+00
	1038.61	0.99	1.17E+01		1.82E+01
	1167.97	1.79	2.54E-01		9.14E+00
	1365.19	3.02	-4.44E-01		4.84E+00
Cs-137	661.66	85.10	4.84E-02	1.92E-01	1.92E-01
Eu-152	121.78	28.67	-4.57E-02	3.27E-01	3.27E-01
	244.70	7.61	1.88E-01		1.73E+00
	295.94	0.45	-4.21E-01		3.34E+01
	344.28	26.60	-1.59E-01		4.31E-01
	367.79	0.86	-3.86E+00		1.32E+01
	411.12	2.24	-9.79E-01		5.37E+00
	443.96	2.83	4.11E-02		4.43E+00
	488.68	0.42	2.37E+00		3.11E+01
	563.99	0.49	-1.29E+01		2.08E+01
	586.26	0.46	2.69E+01		3.85E+01
	678.62	0.47	-5.62E+00		2.85E+01
	688.67	0.86	-3.28E+00		1.50E+01
	719.35	0.28	1.67E+01		5.48E+01
	778.90	12.96	-5.23E-01		9.23E-01
	810.45	0.32	-1.45E+01		4.25E+01
	867.37	4.26	8.05E-02		2.90E+00
	919.33	0.43	-1.19E+01		2.88E+01
	964.08	14.65	1.01E-01		9.08E-01
	1085.87	10.24	6.61E-01		1.76E+00
	1089.74	1.73	4.45E-01		9.62E+00
	1112.07	13.69	5.05E-01		1.30E+00
	1212.95	1.43	2.22E+00		1.17E+01
	1249.94	0.19	3.45E+01		1.02E+02
	1299.14	1.63	5.54E+00		9.99E+00
	1408.01	21.07	-1.05E-01		7.86E-01
	1457.64	0.50	-1.69E+01		8.66E+01
	1528.10	0.28	3.18E+00		4.54E+01
Eu-154	123.07	40.40	-3.30E-02	2.33E-01	2.33E-01
	247.93	6.89	-2.58E-01		1.70E+00
	591.76	4.95	-5.64E-01		2.28E+00
	692.42	1.78	1.46E+00		6.88E+00
	723.30	20.06	-1.75E-01		8.10E-01
	756.80	4.52	3.53E-01		2.88E+00
	873.18	12.08	-6.52E-01		1.03E+00
	996.29	10.48	-4.47E-01		1.54E+00

Analysis Report for 27-Aug-18-10009

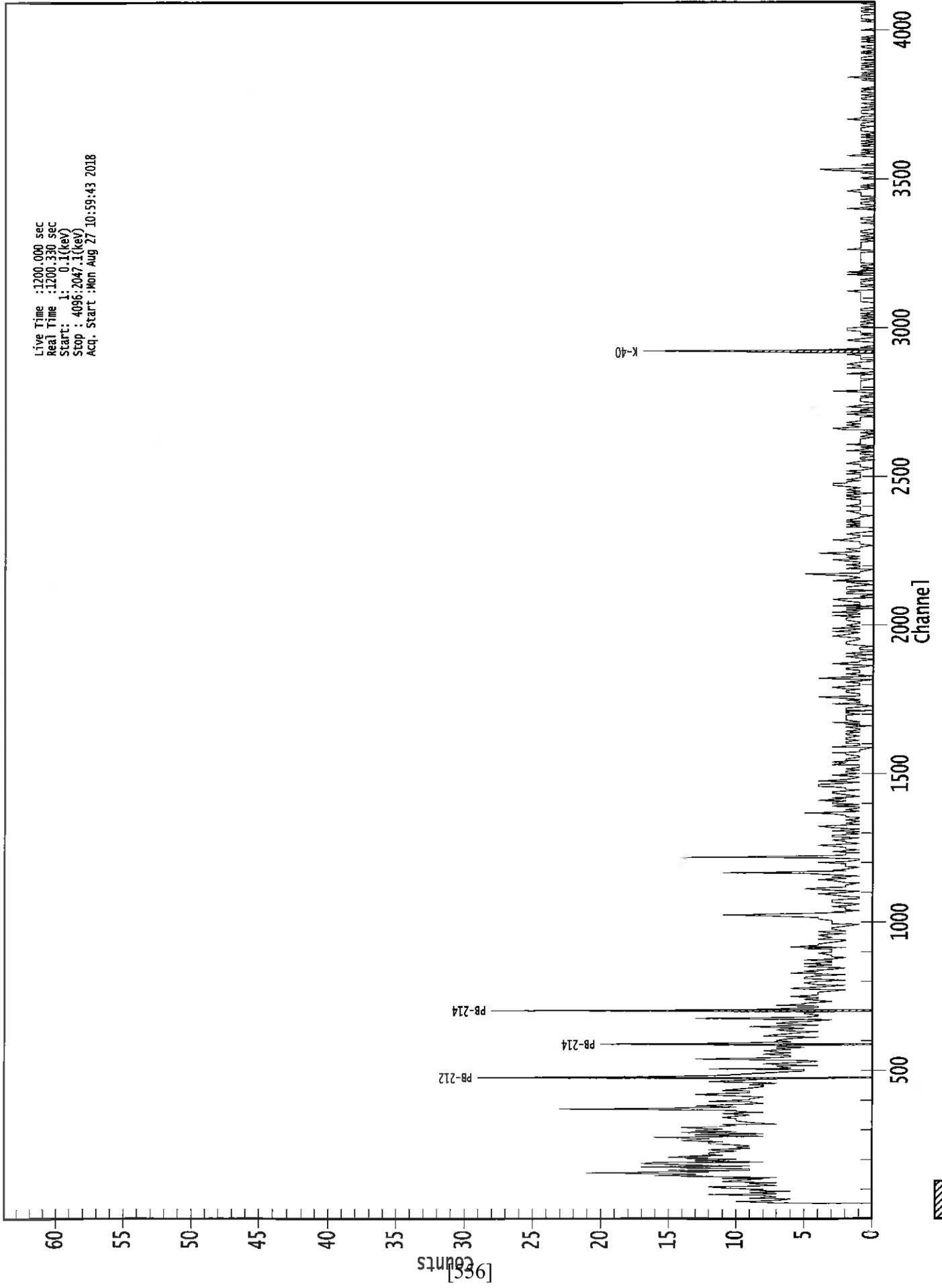
B1-09100A-FSWC-041CV 0.0" - 0.5" 0.0"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	1004.76	18.01	4.23E-01	2.33E-01	9.78E-01
	1274.43	34.80	-1.59E-01		4.61E-01
	1596.48	1.80	-2.11E+00		9.73E+00
Eu-155	45.30	1.31	-1.65E+00	4.48E-01	2.50E+01
	60.01	1.22	-5.69E+00		2.44E+01
	86.55	30.70	9.13E-02		4.48E-01
Ra-226	105.31	21.10	-2.03E-01	3.51E+00	5.00E-01
	186.21	3.64	1.40E+00		3.51E+00
Pa-231	27.36	10.30	1.51E+00	2.73E+00	2.73E+00
	283.69	1.70	4.43E-01		7.15E+00
	300.07	2.47	-1.51E+00		4.84E+00
	302.65	2.20	2.96E-02		5.08E+00
	330.06	1.40	1.05E+00		9.44E+00
U-235	143.76	10.96	-1.41E-02	2.20E-01	8.80E-01
	163.33	5.08	-1.61E+00		1.97E+00
	185.71	57.20	4.34E-02		2.20E-01
	202.11	1.08	-1.32E+00		1.08E+01
	205.31	5.01	-1.05E+00		2.31E+00
Am-241	59.54	35.90	-2.07E-01	8.28E-01	8.28E-01

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

27-AUG-18-10009C17.CNF

Live Time : 1200.000 sec
Real Time : 1200.330 sec
Start : 0.1(keV)
Stop : 4096.2047.1(keV)
Acq. Start : Mon Aug 27 10:59:43 2018



ROI Type: 1

Analysis Report for 27-Aug-18-10010
B1-09100A-FSWC-041CV 0.0" - 0.5" 0.5"

GAMMA SPECTRUM ANALYSIS

Sample Identification : 27-Aug-18-10010
Sample Description : B1-09100A-FSWC-041CV 0.0" - 0.5" 0.5"
Sample Type : Puck
Unit :
Sample Point :

Sample Size : 1.316E+02 grams
Facility : Default

Sample Taken On : 8/22/2018 8:34:00AM
Acquisition Started : 8/27/2018 11:23:32AM

Procedure : Puck_half_inch
Operator : jwelch
Detector Name : 324
Geometry : Puck_half_inch
Live Time : 1200.0 seconds
Real Time : 1200.3 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 : 8/9/2017
Efficiency Calibration Used Done On : 8/27/2018
Efficiency Calibration Description :

Sample Number : 49651
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2013 12:00:00PM

J.P. Minkal
8-27-18

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/27/2018 11:43:34AM

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

DATA VALIDATED

DATE 9-2-18

TIME 0750

R. Massoglia

Analysis Report for 27-Aug-18-10010

B1-09100A-FSWC-041CV 0.0" - 0.5" 0.5"

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	352.01	699 -	708	703.96	7.50E+01	21.62	3.61E+01	1.44
2	609.59	1213 -	1224	1218.76	5.21E+01	16.70	1.37E+01	0.72
3	1461.00	2915 -	2928	2922.05	7.35E+01	18.23	7.00E+00	1.22

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82 *	10.66	6.81E+00	1.79E+00
Bi-211	0.86	351.07 *	13.02	2.05E+00	6.76E-01
Bi-214	0.99	609.32 *	45.49	6.14E-01	2.10E-01
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		
		1238.12	5.83		
		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		

[558]

Analysis Report for 27-Aug-18-10010

B1-09100A-FSWC-041CV 0.0" - 0.5" 0.5"

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
Pb-214	0.99	241.99	7.25		
		295.22	18.42		
		351.93 *	35.60	7.48E-01	2.47E-01
		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 2.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.995	6.81E+00	1.79E+00	
? Bi-211	0.869	2.05E+00	6.76E-01	
Bi-214	0.995	6.14E-01	2.10E-01	
? Pb-214	0.999	7.48E-01	2.47E-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 2.000sigma

Analysis Report for 27-Aug-18-10010

B1-09100A-FSWC-041CV 0.0" - 0.5" 0.5"

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/27/2018 11:43:34AM
 Peak Locate From Channel : 120
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

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	3.44E-01	2.41E-01	2.41E-01
BE-7	477.60	10.44	1.20E-01	1.36E+00	1.36E+00
+ K-40	1460.82	* 10.66	6.81E+00	1.24E+00	1.24E+00
Co-60	1173.23	99.85	-2.16E-02	1.58E-01	1.90E-01
	1332.49	99.98	-4.46E-02		1.58E-01
Nb-94	702.65	99.81	5.81E-03	1.54E-01	1.54E-01
	871.09	99.89	6.71E-02		1.81E-01
Ag-108m	79.13	6.60	1.10E+00	1.09E-01	2.75E+00
	433.94	90.50	-3.15E-02		1.09E-01
	614.28	89.80	1.42E-02		2.19E-01
	722.94	90.80	-2.88E-02		1.51E-01
Sb-125	176.31	6.84	6.17E-02	3.95E-01	1.64E+00
	380.45	1.52	-1.66E+00		8.29E+00
	427.87	29.60	-3.96E-02		3.95E-01
	463.36	10.49	-3.10E-01		1.06E+00
	600.60	17.65	1.72E-01		8.24E-01
	606.71	4.98	-2.42E-01		4.57E+00
	635.95	11.22	-9.88E-02		1.12E+00
	671.44	1.79	9.94E-02		7.29E+00

Analysis Report for 27-Aug-18-10010

B1-09100A-FSWC-041CV 0.0" - 0.5" 0.5"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Ba-133	79.61	2.65	3.26E+00	2.60E-01	6.71E+00
	81.00	32.90	-1.98E-01		4.52E-01
	276.40	7.16	2.58E-01		1.74E+00
	302.85	18.34	2.27E-01		7.01E-01
	356.01	62.05	-8.67E-02		2.60E-01
Cs-134	383.85	8.94	3.99E-01	1.63E-01	1.40E+00
	475.36	1.48	-2.41E+00		8.57E+00
	563.25	8.34	9.72E-02		1.75E+00
	569.33	15.37	6.34E-02		9.86E-01
	604.72	97.62	-2.01E-02		1.78E-01
	795.86	85.46	-6.96E-02		1.63E-01
	801.95	8.69	2.82E-01		1.74E+00
	1038.61	0.99	-2.89E+00		1.78E+01
	1167.97	1.79	4.19E+00		1.14E+01
	1365.19	3.02	-9.72E-01		4.55E+00
	Cs-137	661.66	85.10		0.00E+00
Eu-152	121.78	28.67	3.76E-02	3.53E-01	3.53E-01
	244.70	7.61	5.26E-02		1.75E+00
	295.94	0.45	2.50E+01		3.56E+01
	344.28	26.60	9.96E-02		4.42E-01
	367.79	0.86	1.63E+00		1.33E+01
	411.12	2.24	3.41E+00		6.01E+00
	443.96	2.83	-5.43E-01		3.95E+00
	488.68	0.42	3.06E+00		3.06E+01
	563.99	0.49	1.11E+01		3.10E+01
	586.26	0.46	6.39E+00		3.72E+01
	678.62	0.47	3.79E-01		2.78E+01
	688.67	0.86	8.00E+00		1.86E+01
	719.35	0.28	8.07E+00		4.77E+01
	778.90	12.96	3.12E-02		9.91E-01
	810.45	0.32	2.29E+00		3.97E+01
	867.37	4.26	2.77E+00		4.25E+00
	919.33	0.43	1.53E+01		3.58E+01
	964.08	14.65	-4.03E-01		1.02E+00
	1085.87	10.24	-7.05E-02		1.28E+00
	1089.74	1.73	-8.35E+00		7.19E+00
	1112.07	13.69	1.92E-01		1.02E+00
	1212.95	1.43	-3.40E+00		1.29E+01
	1249.94	0.19	-2.09E+01		7.22E+01
1299.14	1.63	1.52E+00	9.56E+00		
1408.01	21.07	3.07E-01	9.18E-01		
1457.64	0.50	-5.23E+00	8.98E+01		
1528.10	0.28	1.36E+01	5.66E+01		
Eu-154	123.07	40.40	1.87E-02	2.50E-01	2.50E-01
	247.93	6.89	1.29E+00		1.83E+00
	591.76	4.95	-1.67E+00		2.75E+00
	692.42	1.78	6.05E-01		9.34E+00
	723.30	20.06	-6.03E-02		6.83E-01
	756.80	4.52	3.80E-01		2.69E+00
	873.18	12.08	2.81E-01		1.42E+00
	996.29	10.48	5.30E-01		1.54E+00

Analysis Report for 27-Aug-18-10010

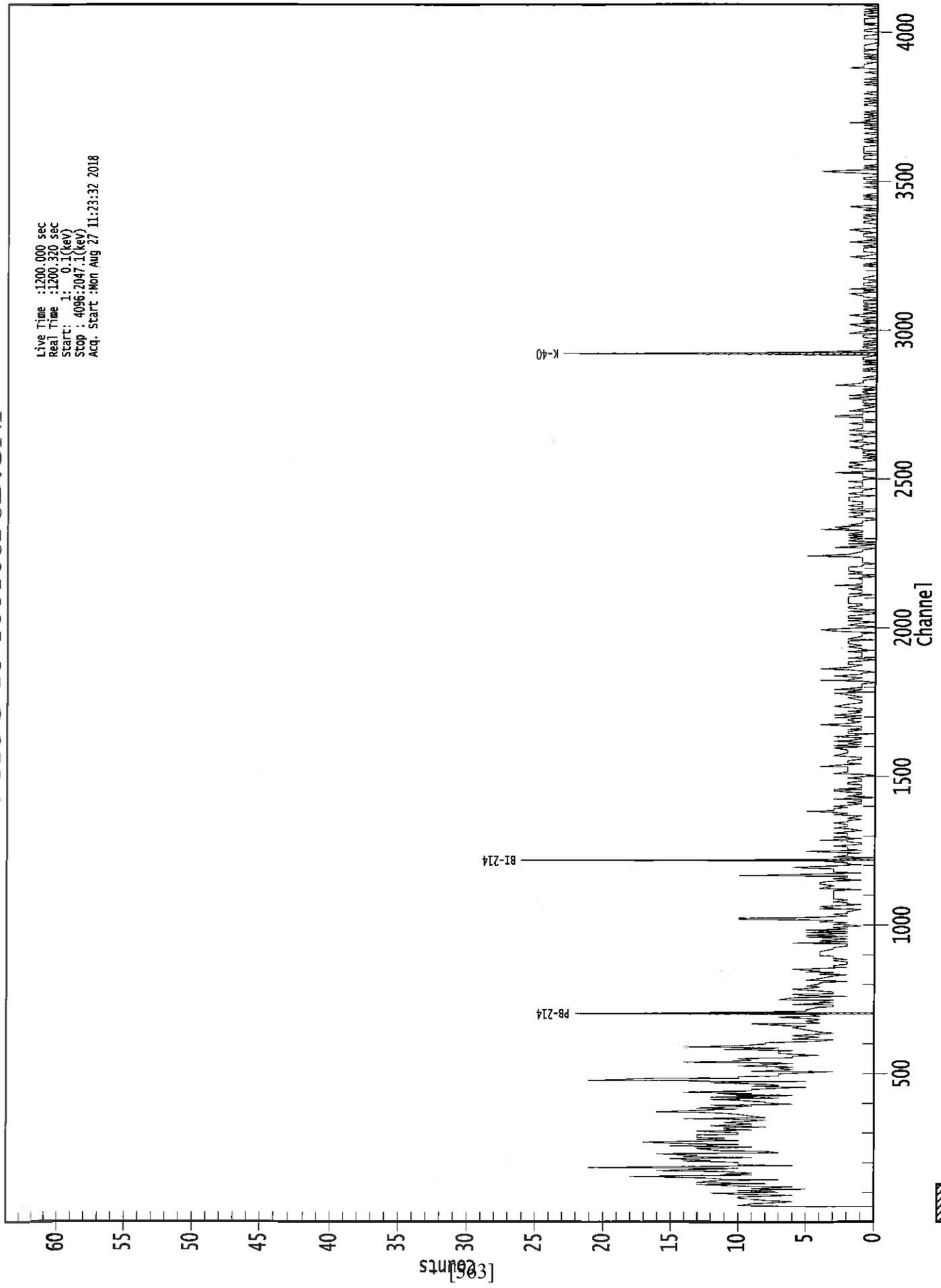
B1-09100A-FSWC-041CV 0.0" - 0.5" 0.5"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	1004.76	18.01	-3.97E-01	2.50E-01	6.92E-01
	1274.43	34.80	2.91E-01		5.31E-01
	1596.48	1.80	0.00E+00		1.70E+00
Eu-155	45.30	1.31	-2.45E+00	4.56E-01	2.45E+01
	60.01	1.22	-8.70E+00		2.66E+01
	86.55	30.70	1.51E-01		4.56E-01
	105.31	21.10	2.37E-01		5.85E-01
Ra-226	186.21	3.64	8.59E-01	3.53E+00	3.53E+00
Pa-231	27.36	10.30	1.16E+00	2.51E+00	2.51E+00
	283.69	1.70	-8.08E-01		6.20E+00
	300.07	2.47	-4.19E+00		5.32E+00
	302.65	2.20	1.89E+00		5.84E+00
	330.06	1.40	-3.08E+00		9.08E+00
U-235	143.76	10.96	3.41E-01	2.26E-01	9.78E-01
	163.33	5.08	-1.13E+00		2.20E+00
	185.71	57.20	7.67E-02		2.26E-01
	202.11	1.08	-3.53E+00		1.04E+01
	205.31	5.01	4.96E-01		2.39E+00
Am-241	59.54	35.90	1.53E-01	9.63E-01	9.63E-01

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

27-AUG-18-100108F8D.CNF

Live Time :1200.000 sec
Real Time :1200.320 sec
Start : 1: 0.1(keV)
Stop : 4096.2047.1(keV)
Acq. Start :Mon Aug 27 11:23:32 2018



ROI Type: 1

Analysis Report for 27-Aug-18-10011
B1-09100A-FSWC-051CV 0.0" - 0.5" 0.0"

GAMMA SPECTRUM ANALYSIS

Sample Identification : 27-Aug-18-10011
Sample Description : B1-09100A-FSWC-051CV 0.0" - 0.5" 0.0"
Sample Type : Puck
Unit :
Sample Point :

Sample Size : 1.109E+02 grams
Facility : Default

Sample Taken On : 8/22/2018 2:05:00PM
Acquisition Started : 8/27/2018 10:59:49AM

Procedure : Puck_half_inch
Operator : jwelch
Detector Name : P40818B
Geometry : Puck_half_inch
Live Time : 1200.0 seconds
Real Time : 1200.9 seconds

Dead Time : 0.07 %

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

Energy Calibration Used Done On : 12/23/2017
Efficiency Calibration Used Done On : 8/27/2018
Efficiency Calibration Description :

Sample Number : 49648
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2012 12:00:00PM

J. P. Welch
8-27-18

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/27/2018 11:19:52AM
Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192

DATA VALIDATED

DATE 9-2-18

TIME 0755

R. Massengill

Analysis Report for 27-Aug-18-10011

B1-09100A-FSWC-051CV 0.0" - 0.5" 0.0"

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	295.47	1176 - 1185		1181.77	2.25E+01	15.73	3.50E+01	0.34
2	351.86	1402 - 1412		1407.19	2.91E+01	17.08	3.59E+01	0.35
3	661.65	2639 - 2652		2645.69	4.60E+01	16.16	1.40E+01	1.35
4	1461.32	5840 - 5851		5845.12	1.81E+01	11.81	1.18E+01	0.46

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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	2.41E+00	1.59E+00
Cs-137	1.00	661.66	*	85.10	4.34E-01	1.61E-01
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	5.27E-01	3.78E-01
		351.93	*	35.60	4.04E-01	2.46E-01
		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 2.000sigma

Analysis Report for 27-Aug-18-10011

B1-09100A-FSWC-051CV 0.0" - 0.5" 0.0"

INTERFERENCE CORRECTED REPORT

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
	K-40	0.961	2.41E+00	1.59E+00
	Cs-137	1.000	4.34E-01	1.61E-01
X	Bi-211	0.904		
	Pb-214	0.997	4.41E-01	2.06E-01

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

Errors quoted at 2.000sigma

Analysis Report for 27-Aug-18-10011

B1-09100A-FSWC-051CV 0.0" - 0.5" 0.0"

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/27/2018 11:19:52AM
 Peak Locate From Channel : 120
 Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

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	3.09E-01	2.94E-01	2.94E-01
BE-7	477.60	10.44	-1.80E-01	1.56E+00	1.56E+00
+ K-40	1460.82	* 10.66	2.41E+00	2.23E+00	2.23E+00
Co-60	1173.23	99.85	-3.91E-02	1.92E-01	2.07E-01
	1332.49	99.98	7.89E-02		1.92E-01
Nb-94	702.65	99.81	1.60E-02	1.38E-01	1.38E-01
	871.09	99.89	-5.96E-02		1.84E-01
Ag-108m	79.13	6.60	-1.42E+00	2.09E-01	4.84E+00
	433.94	90.50	-1.02E-02		2.09E-01
	614.28	89.80	-2.35E-01		2.39E-01
	722.94	90.80	3.81E-02		2.34E-01
Sb-125	176.31	6.84	-1.40E+00	5.86E-01	2.07E+00
	380.45	1.52	-5.35E+00		1.16E+01
	427.87	29.60	1.88E-01		5.86E-01
	463.36	10.49	3.51E-01		1.76E+00
	600.60	17.65	-1.48E-01		9.36E-01
	606.71	4.98	2.95E+00		4.97E+00
	635.95	11.22	-4.53E-01		1.40E+00
	671.44	1.79	1.48E+00		9.16E+00

[567]

Analysis Report for 27-Aug-18-10011

B1-09100A-FSWC-051CV 0.0" - 0.5" 0.0"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Ba-133	79.61	2.65	-1.83E+00	3.15E-01	1.17E+01
	81.00	32.90	7.45E-02		9.33E-01
	276.40	7.16	-1.33E+00		1.85E+00
	302.85	18.34	3.16E-01		8.24E-01
	356.01	62.05	-2.58E-01		3.15E-01
Cs-134	383.85	8.94	-1.41E+00	2.21E-01	1.81E+00
	475.36	1.48	-4.14E+00		1.06E+01
	563.25	8.34	1.34E+00		2.26E+00
	569.33	15.37	-1.34E+00		9.44E-01
	604.72	97.62	-4.48E-02		2.21E-01
	795.86	85.46	-3.95E-02		2.31E-01
	801.95	8.69	-7.13E-01		2.53E+00
	1038.61	0.99	8.96E+00		1.84E+01
	1167.97	1.79	4.69E+00		1.04E+01
	1365.19	3.02	5.35E+00		8.69E+00
+ Cs-137	661.66	* 85.10	4.34E-01	1.68E-01	1.68E-01
Eu-152	121.78	28.67	1.29E-01	5.53E-01	5.53E-01
	244.70	7.61	-4.43E-02		2.24E+00
	295.94	0.45	1.57E+01		4.12E+01
	344.28	26.60	4.50E-01		6.80E-01
	367.79	0.86	5.75E+00		1.65E+01
	411.12	2.24	-2.81E+00		8.20E+00
	443.96	2.83	6.65E-01		6.46E+00
	488.68	0.42	-1.82E+00		4.36E+01
	563.99	0.49	-2.82E+00		3.68E+01
	586.26	0.46	2.87E+01		4.20E+01
	678.62	0.47	-2.64E+01		3.61E+01
	688.67	0.86	-7.74E+00		2.12E+01
	719.35	0.28	-6.96E+00		7.10E+01
	778.90	12.96	5.57E-01		1.15E+00
	810.45	0.32	1.95E+01		6.38E+01
	867.37	4.26	2.98E+00		4.62E+00
	919.33	0.43	2.16E-01		4.47E+01
	964.08	14.65	2.55E-01		1.54E+00
	1085.87	10.24	-1.15E+00		1.73E+00
	1089.74	1.73	-5.91E+00		1.08E+01
	1112.07	13.69	1.06E-01		1.70E+00
	1212.95	1.43	-2.16E+01		1.34E+01
	1249.94	0.19	3.98E+01		9.71E+01
1299.14	1.63	2.38E+00	8.87E+00		
1408.01	21.07	0.00E+00	8.89E-01		
1457.64	0.50	6.76E+01	8.59E+01		
1528.10	0.28	-4.06E+01	7.66E+01		
Eu-154	123.07	40.40	-1.03E-01	3.74E-01	3.74E-01
	247.93	6.89	-1.24E+00		2.26E+00
	591.76	4.95	1.52E+00		3.20E+00
	692.42	1.78	7.94E+00		1.06E+01
	723.30	20.06	1.94E-01		1.06E+00
	756.80	4.52	-8.99E-01		4.32E+00
	873.18	12.08	4.63E-01		1.52E+00
	996.29	10.48	-1.90E-01		2.20E+00

Analysis Report for 27-Aug-18-10011

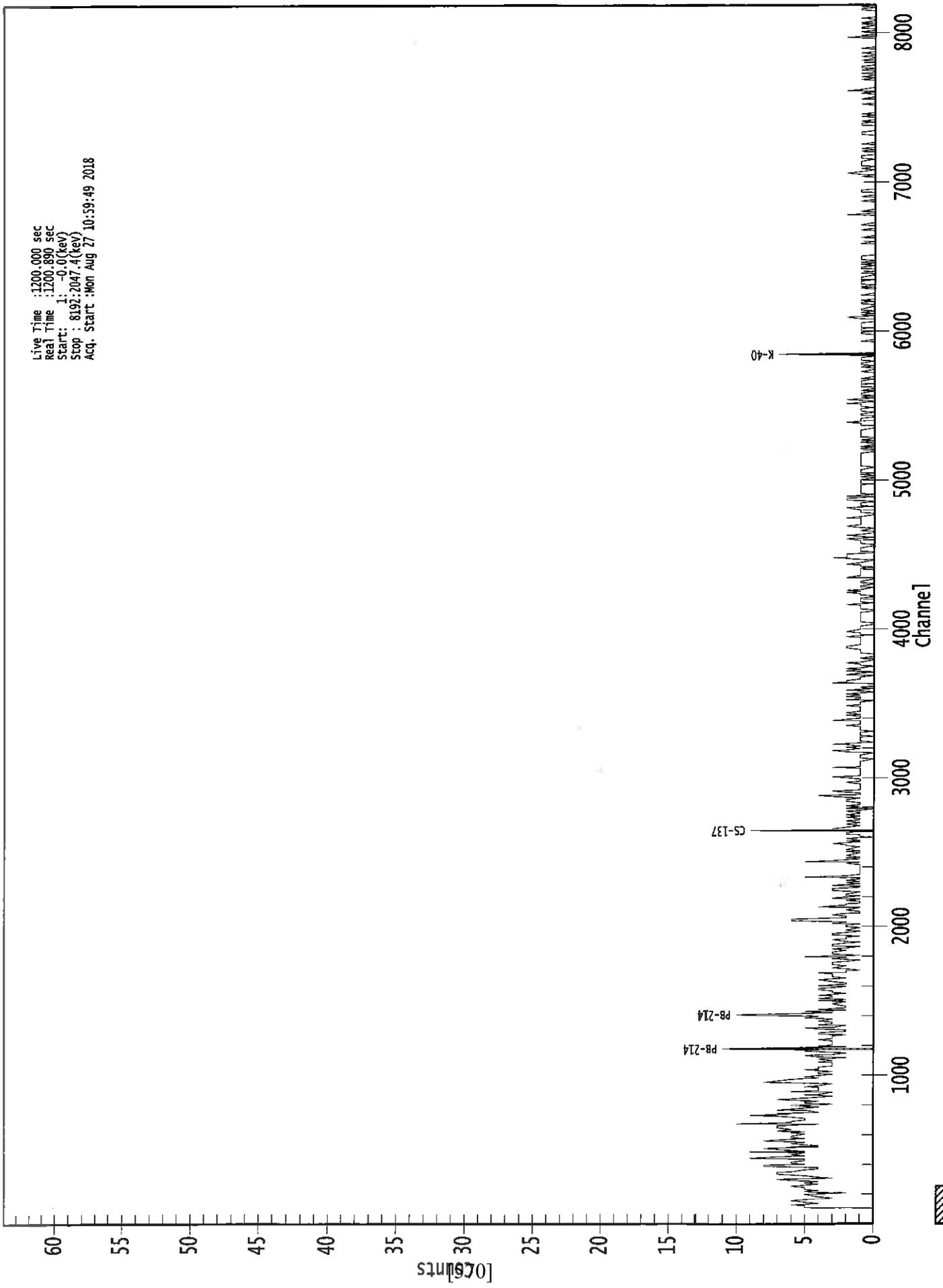
B1-09100A-FSWC-051CV 0.0" -0.5" 0.0"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	1004.76	18.01	-1.95E-01	3.74E-01	9.87E-01
	1274.43	34.80	9.23E-02		6.60E-01
	1596.48	1.80	1.71E+00		8.25E+00
Eu-155	45.30	1.31	8.96E+00	8.17E-01	7.35E+01
	60.01	1.22	1.86E+01		8.44E+01
	86.55	30.70	4.79E-01		8.79E-01
Ra-226	105.31	21.10	-3.06E-01	4.35E+00	8.17E-01
	186.21	3.64	-2.45E-01		4.35E+00
Pa-231	27.36	10.30	4.66E+00	6.07E+00	8.86E+00
	283.69	1.70	4.50E+00		9.18E+00
	300.07	2.47	-7.59E+00		6.07E+00
	302.65	2.20	9.37E-01		6.86E+00
	330.06	1.40	-5.86E-01		1.17E+01
U-235	143.76	10.96	-7.51E-02	2.86E-01	1.49E+00
	163.33	5.08	3.42E-01		3.17E+00
	185.71	57.20	1.66E-01		2.86E-01
	202.11	1.08	2.46E+00		1.31E+01
	205.31	5.01	-8.08E-01		2.82E+00
Am-241	59.54	35.90	-5.18E-01	2.89E+00	2.89E+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

27-AUG-18-10011368.CNF

Live Time :1200.000 sec
Real Time :1200.890 sec
Start: 1: -0.0(kev)
Stop : 8192:2047.4(kev)
Acq. Start :Mon Aug 27 10:59:49 2018



ROI Type: 1

Analysis Report for 27-Aug-18-10012
B1-09100A-FSWC-051CV 0.0" - 0.5" 0.5"

GAMMA SPECTRUM ANALYSIS

Sample Identification : 27-Aug-18-10012
Sample Description : B1-09100A-FSWC-051CV 0.0" - 0.5" 0.5"
Sample Type : Puck
Unit :
Sample Point :

Sample Size : 1.109E+02 grams
Facility : Default

Sample Taken On : 8/22/2018 2:05:00PM
Acquisition Started : 8/27/2018 11:23:37AM

Procedure : Puck_half_inch
Operator : jwelch
Detector Name : P40818B
Geometry : Puck_half_inch
Live Time : 1200.0 seconds
Real Time : 1200.9 seconds

Dead Time : 0.07 %

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

Energy Calibration Used Done On : 12/23/2017
Efficiency Calibration Used Done On : 8/27/2018
Efficiency Calibration Description :

Sample Number : 49652
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2012 12:00:00PM

Handwritten:
M. W. Welch
8-27-18

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/27/2018 11:43:40AM
Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192

DATA VALIDATED

DATE 9-2-18

TIME 0800

Handwritten signature:
R. Massey

Analysis Report for 27-Aug-18-10012

B1-09100A-FSWC-051CV 0.0" - 0.5" 0.5"

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	295.33	1177 - 1187		1181.22	2.79E+01	15.81	2.82E+01	0.42
2	352.03	1400 - 1413		1407.85	3.21E+01	16.78	2.78E+01	0.87
3	1461.08	5839 - 5850		5844.16	2.00E+01	11.05	8.00E+00	0.96

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.82	*	10.66	2.67E+00	1.49E+00
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	6.53E-01	3.85E-01
		351.93	*	35.60	4.47E-01	2.44E-01
		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 2.000sigma

Analysis Report for 27-Aug-18-10012

B1-09100A-FSWC-051CV 0.0" - 0.5" 0.5"

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.989	2.67E+00	1.49E+00	
X	Bi-211	0.863			
	Pb-214	0.999	5.06E-01	2.06E-01	

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

Errors quoted at 2.000sigma

Analysis Report for 27-Aug-18-10012

B1-09100A-FSWC-051CV 0.0" - 0.5" 0.5"

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/27/2018 11:43:40AM
 Peak Locate From Channel : 120
 Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

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	3.51E-01	2.77E-01	2.77E-01
BE-7	477.60	10.44	2.10E-01	1.75E+00	1.75E+00
+ K-40	1460.82	* 10.66	2.67E+00	1.85E+00	1.85E+00
Co-60	1173.23	99.85	1.56E-01	2.27E-01	2.42E-01
	1332.49	99.98	3.76E-02		2.27E-01
Nb-94	702.65	99.81	-1.69E-01	1.23E-01	1.23E-01
	871.09	99.89	1.37E-01		2.04E-01
Ag-108m	79.13	6.60	-1.10E+00	1.79E-01	5.37E+00
	433.94	90.50	-3.91E-02		1.79E-01
	614.28	89.80	-1.86E-01		2.23E-01
	722.94	90.80	-2.26E-01		2.08E-01
Sb-125	176.31	6.84	-1.79E-01	5.86E-01	2.02E+00
	380.45	1.52	2.85E+00		1.06E+01
	427.87	29.60	2.83E-01		5.86E-01
	463.36	10.49	-4.68E-01		1.63E+00
	600.60	17.65	-5.03E-01		1.01E+00
	606.71	4.98	3.06E+00		4.67E+00
	635.95	11.22	-9.71E-01		1.49E+00
	671.44	1.79	8.47E-01		9.16E+00

[574]

Analysis Report for 27-Aug-18-10012

B1-09100A-FSWC-051CV 0.0" - 0.5" 0.5"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Ba-133	79.61	2.65	-4.33E+00	2.94E-01	1.28E+01
	81.00	32.90	-3.07E-01		9.33E-01
	276.40	7.16	-8.59E-01		1.96E+00
	302.85	18.34	-1.78E-01		8.06E-01
	356.01	62.05	-4.92E-03		2.94E-01
Cs-134	383.85	8.94	3.32E-01	2.07E-01	1.78E+00
	475.36	1.48	-3.24E+00		1.10E+01
	563.25	8.34	1.34E+00		2.08E+00
	569.33	15.37	-7.29E-01		9.75E-01
	604.72	97.62	-3.73E-02		2.07E-01
	795.86	85.46	-1.69E-02		2.44E-01
	801.95	8.69	6.21E-02		2.08E+00
	1038.61	0.99	-1.01E+01		2.02E+01
	1167.97	1.79	4.15E+00		1.21E+01
	1365.19	3.02	3.12E+00		6.94E+00
Cs-137	661.66	85.10	8.44E-02	2.87E-01	2.87E-01
Eu-152	121.78	28.67	3.93E-01	5.65E-01	5.85E-01
	244.70	7.61	2.51E-02		2.12E+00
	295.94	0.45	2.27E+01		4.07E+01
	344.28	26.60	-4.61E-01		5.65E-01
	367.79	0.86	-1.18E+01		1.76E+01
	411.12	2.24	7.00E-01		6.08E+00
	443.96	2.83	3.04E+00		6.29E+00
	488.68	0.42	-3.26E+01		3.53E+01
	563.99	0.49	1.34E+01		3.45E+01
	586.26	0.46	4.05E+01		4.50E+01
	678.62	0.47	-1.39E+01		2.85E+01
	688.67	0.86	-1.03E+01		2.00E+01
	719.35	0.28	1.81E+01		6.55E+01
	778.90	12.96	6.96E-02		1.02E+00
	810.45	0.32	-8.98E+00		5.64E+01
	867.37	4.26	-1.87E+00		3.95E+00
	919.33	0.43	1.09E+01		4.29E+01
	964.08	14.65	-4.66E-01		1.58E+00
	1085.87	10.24	-2.86E-01		1.73E+00
	1089.74	1.73	5.93E+00		1.14E+01
	1112.07	13.69	1.01E+00		1.65E+00
	1212.95	1.43	-8.67E+00		1.34E+01
	1249.94	0.19	-1.32E+02		1.03E+02
1299.14	1.63	-7.14E+00	9.89E+00		
1408.01	21.07	2.51E-01	1.13E+00		
1457.64	0.50	4.73E+01	8.22E+01		
1528.10	0.28	3.67E+01	8.16E+01		
Eu-154	123.07	40.40	2.25E-01	4.12E-01	4.12E-01
	247.93	6.89	2.26E+00		2.45E+00
	591.76	4.95	1.38E+00		3.55E+00
	692.42	1.78	7.00E+00		1.00E+01
	723.30	20.06	1.86E-01		1.02E+00
	756.80	4.52	1.10E+00		4.65E+00
	873.18	12.08	6.32E-01		1.64E+00
	996.29	10.48	5.66E-01		2.07E+00

Analysis Report for 27-Aug-18-10012

B1-09100A-FSWC-051CV 0.0" - 0.5" 0.5"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	1004.76	18.01	-1.11E+00	4.12E-01	9.87E-01
	1274.43	34.80	-2.83E-01		4.97E-01
	1596.48	1.80	5.12E+00		1.25E+01
Eu-155	45.30	1.31	1.21E+01	8.01E-01	8.44E+01
	60.01	1.22	5.62E+01		8.84E+01
	86.55	30.70	1.57E-01		8.01E-01
Ra-226	105.31	21.10	-2.17E-01		8.23E-01
	186.21	3.64	6.43E-01	4.16E+00	4.16E+00
Pa-231	27.36	10.30	1.63E+00	6.51E+00	9.10E+00
	283.69	1.70	4.37E+00		8.58E+00
	300.07	2.47	1.21E+00		6.51E+00
	302.65	2.20	8.23E-01		6.71E+00
	330.06	1.40	-6.34E+00		1.05E+01
U-235	143.76	10.96	-3.84E-01	2.58E-01	1.26E+00
	163.33	5.08	3.48E-01		2.99E+00
	185.71	57.20	-1.24E-01		2.58E-01
	202.11	1.08	-3.14E+00		1.16E+01
	205.31	5.01	-1.60E+00		2.42E+00
Am-241	59.54	35.90	1.12E+00	3.03E+00	3.03E+00

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

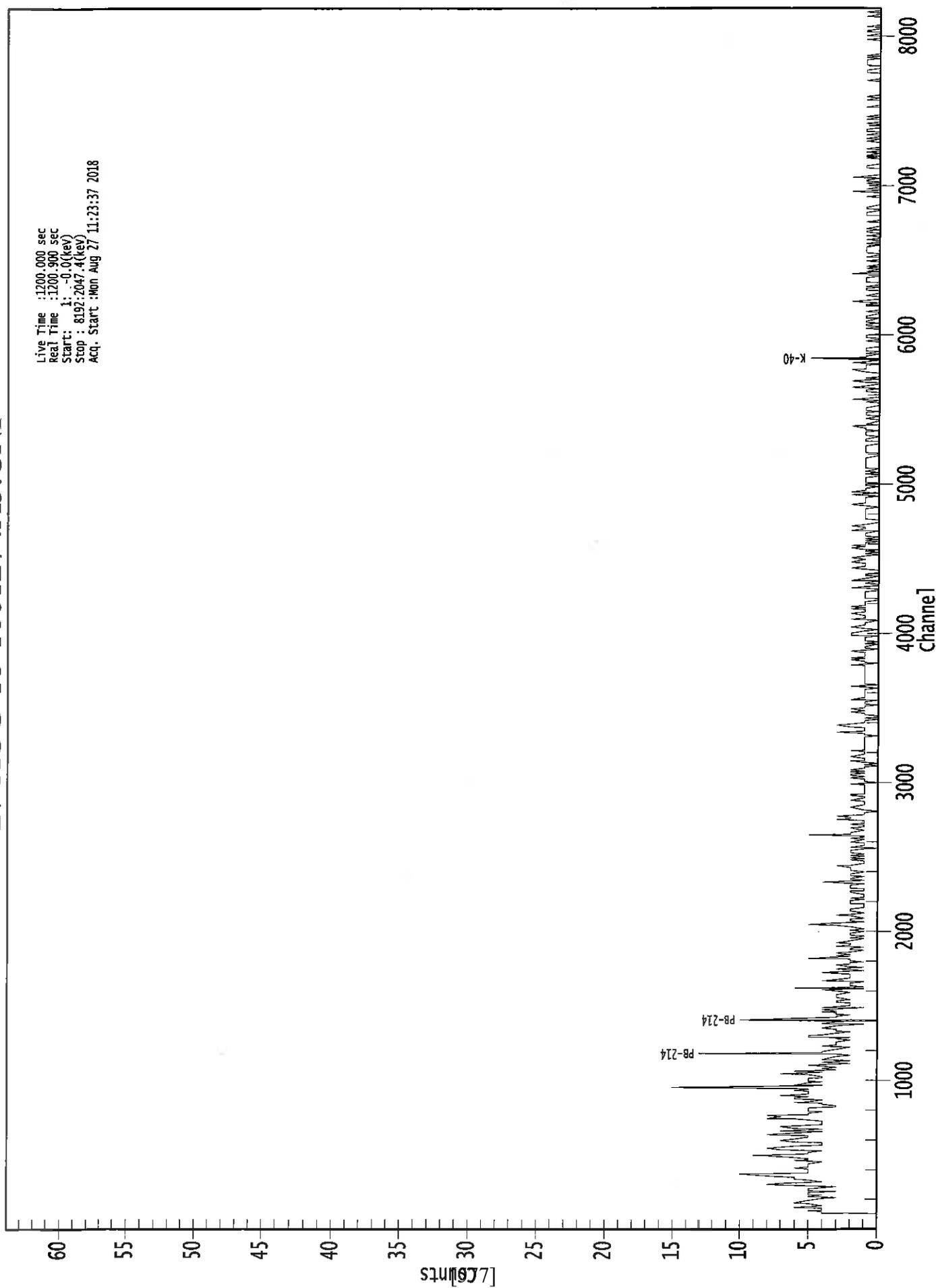
> = MDA value not calculated

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

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

27-AUG-18-1001274A5.CNF

Live Time : 1200.000 sec
Real Time : 1200.900 sec
Start: 1: -0.0(rev)
Stop : 8192:2047.4(rev)
Acq. Start : Mon Aug 27 11:23:37 2018



Analysis Report for 27-Aug-18-10013
B1-09100A-FSFC-067CV 0.0" - 0.5" 0.0"

GAMMA SPECTRUM ANALYSIS

Sample Identification : 27-Aug-18-10013
Sample Description : B1-09100A-FSFC-067CV 0.0" - 0.5" 0.0"
Sample Type : Puck
Unit :
Sample Point :

Sample Size : 9.620E+01 grams
Facility : Default

Sample Taken On : 8/22/2018 9:20:00AM
Acquisition Started : 8/27/2018 10:59:55AM

Procedure : Puck_half_inch
Operator : jwelch
Detector Name : P11314
Geometry : Puck_half_inch
Live Time : 1200.0 seconds
Real Time : 1200.3 seconds

Dead Time : 0.02 %

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

Energy Calibration Used Done On : 12/15/2017
Efficiency Calibration Used Done On : 8/27/2018
Efficiency Calibration Description :

Sample Number : 49649
Certificate Name : Eu155-Na22
Certificate Date : 12/22/2008 12:00:00PM

jwelch
8-27-18

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/27/2018 11:20:09AM
Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192

DATA VALIDATED
DATE 9-2-18
TIME 0805

R. Marsesini / Ogin

Analysis Report for 27-Aug-18-10013

B1-09100A-FSFC-067CV 0.0" - 0.5" 0.0"

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.90	951 -	960	955.19	2.40E+01	15.26	3.00E+01	0.52
2	583.17	2326 -	2335	2330.81	1.25E+01	8.52	5.00E+00	0.28
3	609.22	2429 -	2441	2434.90	2.20E+01	11.90	9.94E+00	0.40
4	1460.40	5833 -	5845	5839.55	3.23E+01	14.50	1.55E+01	0.35

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.00sigma

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	4.62E+00	2.12E+00
Tl-208	1.00	583.19	*	85.00	1.15E-01	7.96E-02
Pb-212	0.98	115.18		0.60		
		238.63	*	43.60	2.17E-01	1.43E-01
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	3.91E-01	2.17E-01
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		

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Analysis Report for 27-Aug-18-10013

B1-09100A-FSFC-067CV 0.0" - 0.5" 0.0"

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	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 2.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.972	4.62E+00	2.12E+00	
Tl-208	1.000	1.15E-01	7.96E-02	
Pb-212	0.989	2.17E-01	1.43E-01	
Bi-214	0.999	3.91E-01	2.17E-01	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 2.000sigma

Analysis Report for 27-Aug-18-10013

B1-09100A-FSFC-067CV 0.0" - 0.5" 0.0"

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/27/2018 11:20:09AM
 Peak Locate From Channel : 120
 Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

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	3.08E-01	2.64E-01	2.64E-01
BE-7	477.60	10.44	7.31E-01	1.63E+00	1.63E+00
+ K-40	1460.82	* 10.66	4.62E+00	2.60E+00	2.60E+00
Co-60	1173.23	99.85	4.34E-02	2.01E-01	2.01E-01
	1332.49	99.98	9.89E-02		2.20E-01
Nb-94	702.65	99.81	1.11E-01	2.04E-01	2.04E-01
	871.09	99.89	8.67E-02		2.19E-01
Ag-108m	79.13	6.60	2.13E+00	1.56E-01	3.45E+00
	433.94	90.50	2.91E-02		1.56E-01
	614.28	89.80	-1.65E-01		2.15E-01
	722.94	90.80	1.11E-01		1.90E-01
Sb-125	176.31	6.84	-3.39E-01	3.92E-01	1.13E+00
	380.45	1.52	2.48E+00		9.80E+00
	427.87	29.60	-2.07E-01		3.92E-01
	463.36	10.49	-8.30E-01		1.26E+00
	600.60	17.65	1.25E-01		8.86E-01
	606.71	4.98	3.88E+00		5.21E+00
	635.95	11.22	7.70E-01		1.78E+00
	671.44	1.79	3.13E-01		7.59E+00

Analysis Report for 27-Aug-18-10013

B1-09100A-FSFC-067CV 0.0" - 0.5" 0.0"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Ba-133	79.61	2.65	2.46E+00	2.47E-01	8.14E+00
	81.00	32.90	-1.00E+00		5.08E-01
	276.40	7.16	-1.30E+00		1.11E+00
	302.85	18.34	-1.30E-01		6.92E-01
	356.01	62.05	-1.90E-01		2.47E-01
Cs-134	383.85	8.94	8.36E-01	1.80E-01	1.54E+00
	475.36	1.48	-1.73E+00		1.06E+01
	563.25	8.34	3.44E-01		1.85E+00
	569.33	15.37	-1.60E-02		9.43E-01
	604.72	97.62	-4.59E-02		2.30E-01
	795.86	85.46	-3.72E-02		1.80E-01
	801.95	8.69	9.15E-01		1.88E+00
	1038.61	0.99	6.46E+00		2.08E+01
	1167.97	1.79	-1.23E+01		9.81E+00
	1365.19	3.02	3.36E+00		7.46E+00
Cs-137	661.66	85.10	1.76E-01	2.62E-01	2.62E-01
Eu-152	121.78	28.67	-6.69E-02	3.06E-01	3.06E-01
	244.70	7.61	7.85E-01		1.70E+00
	295.94	0.45	3.33E+00		2.83E+01
	344.28	26.60	3.55E-01		5.78E-01
	367.79	0.86	6.35E+00		1.67E+01
	411.12	2.24	1.00E+00		5.21E+00
	443.96	2.83	9.82E-01		4.52E+00
	488.68	0.42	3.66E+00		3.05E+01
	563.99	0.49	-1.48E+01		3.03E+01
	586.26	0.46	3.70E+00		4.51E+01
	678.62	0.47	-5.11E+00		2.89E+01
	688.67	0.86	-6.92E+00		1.51E+01
	719.35	0.28	1.71E+01		6.61E+01
	778.90	12.96	-8.10E-01		1.09E+00
	810.45	0.32	-7.53E+01		3.00E+01
	867.37	4.26	-1.88E+00		4.44E+00
	919.33	0.43	9.21E+00		3.98E+01
	964.08	14.65	1.35E-01		1.55E+00
	1085.87	10.24	1.68E-01		1.97E+00
	1089.74	1.73	-7.80E+00		1.10E+01
	1112.07	13.69	-5.52E-01		1.41E+00
	1212.95	1.43	-3.93E+00		1.52E+01
	1249.94	0.19	5.71E+01		1.17E+02
1299.14	1.63	5.97E+00	1.33E+01		
1408.01	21.07	4.92E-01	1.09E+00		
1457.64	0.50	1.46E+02	1.10E+02		
1528.10	0.28	1.69E+01	6.30E+01		
Eu-154	123.07	40.40	-1.39E-02	2.38E-01	2.38E-01
Eu-154	247.93	6.89	-6.45E-01	2.38E-01	1.61E+00
	591.76	4.95	-3.00E+00		2.76E+00
	692.42	1.78	6.01E+00		9.77E+00
	723.30	20.06	2.01E-01		8.60E-01
	756.80	4.52	-1.96E+00		3.27E+00
	873.18	12.08	4.14E-01		1.92E+00
	996.29	10.48	5.91E-01		2.07E+00

Analysis Report for 27-Aug-18-10013

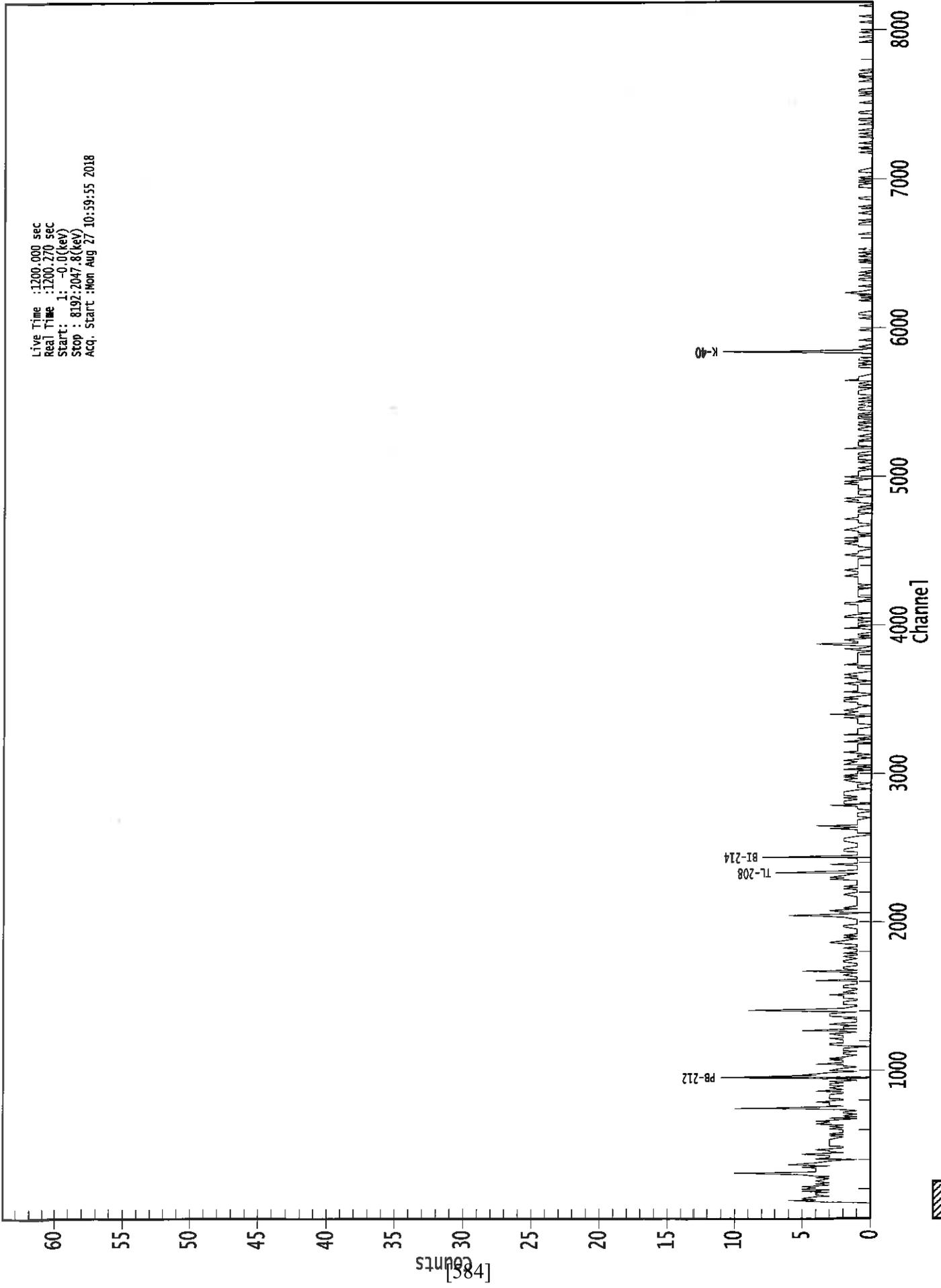
B1-09100A-FSFC-067CV 0.0" - 0.5" 0.0"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	1004.76	18.01	1.75E-01	2.38E-01	1.06E+00
	1274.43	34.80	-5.16E-02		4.90E-01
	1596.48	1.80	-2.07E+00		7.05E+00
Eu-155	45.30	1.31	7.04E+00	4.72E-01	2.91E+01
	60.01	1.22	5.67E+00		2.84E+01
	86.55	30.70	1.55E-01		4.98E-01
Ra-226	105.31	21.10	-5.78E-02	3.00E+00	4.72E-01
	186.21	3.64	2.06E+00		3.00E+00
Pa-231	27.36	10.30	2.34E+00	3.24E+00	3.24E+00
	283.69	1.70	4.20E+00		6.84E+00
	300.07	2.47	-5.70E+00		4.72E+00
	302.65	2.20	6.97E-01		5.76E+00
	330.06	1.40	5.84E+00		9.48E+00
U-235	143.76	10.96	-3.06E-01	1.90E-01	8.31E-01
	163.33	5.08	7.45E-01		2.07E+00
	185.71	57.20	1.52E-01		1.90E-01
	202.11	1.08	-1.40E+00		9.13E+00
	205.31	5.01	-1.10E+00		2.15E+00
Am-241	59.54	35.90	-2.09E-01	9.61E-01	9.61E-01

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

0000049649.CNF

Live Time :1200.000 sec
Real Time :1200.270 sec
Start: 1: -0.0(keV)
Stop : 8192:2047.8(keV)
Acq. Start :Mon Aug 27 10:59:55 2018



ROI Type: 1

Analysis Report for 27-Aug-18-10014

B1-09100A-FSFC-067CV 0.0" - 0.5" 0.5"

GAMMA SPECTRUM ANALYSIS

Sample Identification : 27-Aug-18-10014
Sample Description : B1-09100A-FSFC-067CV 0.0" - 0.5" 0.5"
Sample Type : Puck
Unit :
Sample Point :

Sample Size : 9.620E+01 grams
Facility : Default

Sample Taken On : 8/22/2018 9:20:00AM
Acquisition Started : 8/27/2018 11:23:43AM

Procedure : Puck_half_inch
Operator : jwelch
Detector Name : P11314
Geometry : Puck_half_inch
Live Time : 1200.0 seconds
Real Time : 1200.4 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 : 12/15/2017
Efficiency Calibration Used Done On : 8/27/2018
Efficiency Calibration Description :

Sample Number : 49653
Certificate Name : Eu155-Na22
Certificate Date : 12/22/2008 12:00:00PM

J.P. Welch
8-27-18

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/27/2018 11:44:01AM

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

DATA VALIDATED

DATE 9-2-18TIME 0810

R. Massengill
RJM

Analysis Report for 27-Aug-18-10014

B1-09100A-FSFC-067CV 0.0" - 0.5" 0.5"

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.76	950 -	961	954.64	4.43E+01	16.96	2.15E+01	0.89
2	1460.56	5835 -	5846	5840.17	2.75E+01	11.60	5.03E+00	0.39

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.82	*	10.66	3.94E+00	1.70E+00
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	4.01E-01	1.67E-01
		300.09		3.30		

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 2.000sigma

Analysis Report for 27-Aug-18-10014

B1-09100A-FSFC-067CV 0.0" - 0.5" 0.5"

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.989	3.94E+00	1.70E+00	
Pb-212	0.997	4.01E-01	1.67E-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 2.000sigma

Analysis Report for 27-Aug-18-10014

B1-09100A-FSFC-067CV 0.0" - 0.5" 0.5"

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/27/2018 11:44:01AM
 Peak Locate From Channel : 120
 Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

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	3.30E-01	2.72E-01	2.72E-01
BE-7	477.60	10.44	6.84E-01	1.43E+00	1.43E+00
+ K-40	1460.82	* 10.66	3.94E+00	1.62E+00	1.62E+00
Co-60	1173.23	99.85	-2.00E-01	2.13E-01	2.13E-01
	1332.49	99.98	1.41E-01		2.55E-01
Nb-94	702.65	99.81	1.17E-01	1.64E-01	1.82E-01
	871.09	99.89	7.36E-02		1.64E-01
Ag-108m	79.13	6.60	-2.70E-01	1.43E-01	2.88E+00
	433.94	90.50	-2.41E-02		1.43E-01
	614.28	89.80	-1.81E-01		2.48E-01
	722.94	90.80	1.26E-01		2.40E-01
Sb-125	176.31	6.84	3.95E-01	3.60E-01	1.30E+00
	380.45	1.52	-9.69E-01		7.74E+00
	427.87	29.60	-1.56E-01		3.60E-01
	463.36	10.49	1.44E+00		1.62E+00
	600.60	17.65	-7.13E-02		8.54E-01
	606.71	4.98	1.96E+00		5.21E+00
	635.95	11.22	1.12E-02		1.60E+00
	671.44	1.79	-8.53E-01		8.01E+00

Analysis Report for 27-Aug-18-10014

B1-09100A-FSFC-067CV 0.0" - 0.5" 0.5"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Ba-133	79.61	2.65	4.47E-01	2.35E-01	7.15E+00
	81.00	32.90	-1.66E-01		4.95E-01
	276.40	7.16	1.13E-01		1.50E+00
	302.85	18.34	3.13E-01		7.16E-01
	356.01	62.05	-1.49E-01		2.35E-01
Cs-134	383.85	8.94	-9.50E-02	2.38E-01	1.36E+00
	475.36	1.48	4.06E-01		9.46E+00
	563.25	8.34	-8.05E-01		1.66E+00
	569.33	15.37	-1.08E+00		9.05E-01
	604.72	97.62	-8.55E-02		2.38E-01
	795.86	85.46	6.65E-02		2.55E-01
	801.95	8.69	-8.68E-01		1.88E+00
	1038.61	0.99	-1.12E+01		1.35E+01
	1167.97	1.79	-8.22E+00		1.19E+01
	1365.19	3.02	1.92E+00		5.98E+00
Cs-137	661.66	85.10	1.20E-01	2.29E-01	2.29E-01
Eu-152	121.78	28.67	-1.17E-01	2.95E-01	2.95E-01
	244.70	7.61	1.03E+00		1.70E+00
	295.94	0.45	5.18E+00		2.93E+01
	344.28	26.60	-1.81E-01		4.07E-01
	367.79	0.86	-4.94E+00		1.40E+01
	411.12	2.24	6.36E-02		6.64E+00
	443.96	2.83	1.76E+00		5.45E+00
	488.68	0.42	2.03E+00		2.93E+01
	563.99	0.49	-2.19E+01		2.55E+01
	586.26	0.46	8.52E+00		4.25E+01
	678.62	0.47	-3.19E+01		3.75E+01
	688.67	0.86	3.39E+00		2.15E+01
	719.35	0.28	4.26E+01		6.61E+01
	778.90	12.96	2.62E-02		1.02E+00
	810.45	0.32	-3.76E+01		4.23E+01
	867.37	4.26	-2.35E+00		4.04E+00
	919.33	0.43	-2.21E+01		3.98E+01
	964.08	14.65	-2.51E-01		1.27E+00
	1085.87	10.24	-2.04E+00		1.63E+00
	1089.74	1.73	2.84E+00		8.84E+00
	1112.07	13.69	-1.10E+00		1.24E+00
	1212.95	1.43	-3.93E+00		8.94E+00
	1249.94	0.19	-3.03E+01		1.17E+02
1299.14	1.63	9.95E-01	1.25E+01		
1408.01	21.07	4.22E-01	1.03E+00		
1457.64	0.50	7.26E+01	9.23E+01		
1528.10	0.28	1.13E+01	5.44E+01		
Eu-154	123.07	40.40	-2.66E-03	2.27E-01	2.27E-01
	247.93	6.89	7.49E-01		1.67E+00
	591.76	4.95	-2.43E+00		2.63E+00
	692.42	1.78	2.48E+00		9.04E+00
	723.30	20.06	5.82E-01		1.09E+00
	756.80	4.52	-1.17E-01		3.63E+00
	873.18	12.08	6.97E-01		1.43E+00
	996.29	10.48	3.15E-01		1.72E+00

Analysis Report for 27-Aug-18-10014

B1-09100A-FSFC-067CV 0.0" - 0.5" 0.5"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	1004.76	18.01	-1.37E-01	2.27E-01	9.44E-01
	1274.43	34.80	2.36E-01		5.75E-01
	1596.48	1.80	-4.59E+00		7.05E+00
Eu-155	45.30	1.31	8.13E+00	4.38E-01	3.00E+01
	60.01	1.22	-1.50E+01		2.64E+01
	86.55	30.70	1.88E-01		4.92E-01
	105.31	21.10	-2.51E-02		4.38E-01
Ra-226	186.21	3.64	1.54E+00	3.14E+00	3.14E+00
Pa-231	27.36	10.30	1.50E+00	4.15E+00	4.15E+00
	283.69	1.70	2.96E+00		6.71E+00
	300.07	2.47	-5.51E+00		4.72E+00
	302.65	2.20	1.62E+00		5.86E+00
	330.06	1.40	5.90E-01		8.93E+00
	U-235	143.76	10.96		-4.61E-01
U-235	163.33	5.08	7.14E-01	1.95E-01	2.16E+00
	185.71	57.20	8.80E-02		1.95E-01
	202.11	1.08	-4.98E+00		8.82E+00
	205.31	5.01	-9.82E-01		1.78E+00
	Am-241	59.54	35.90		-1.82E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

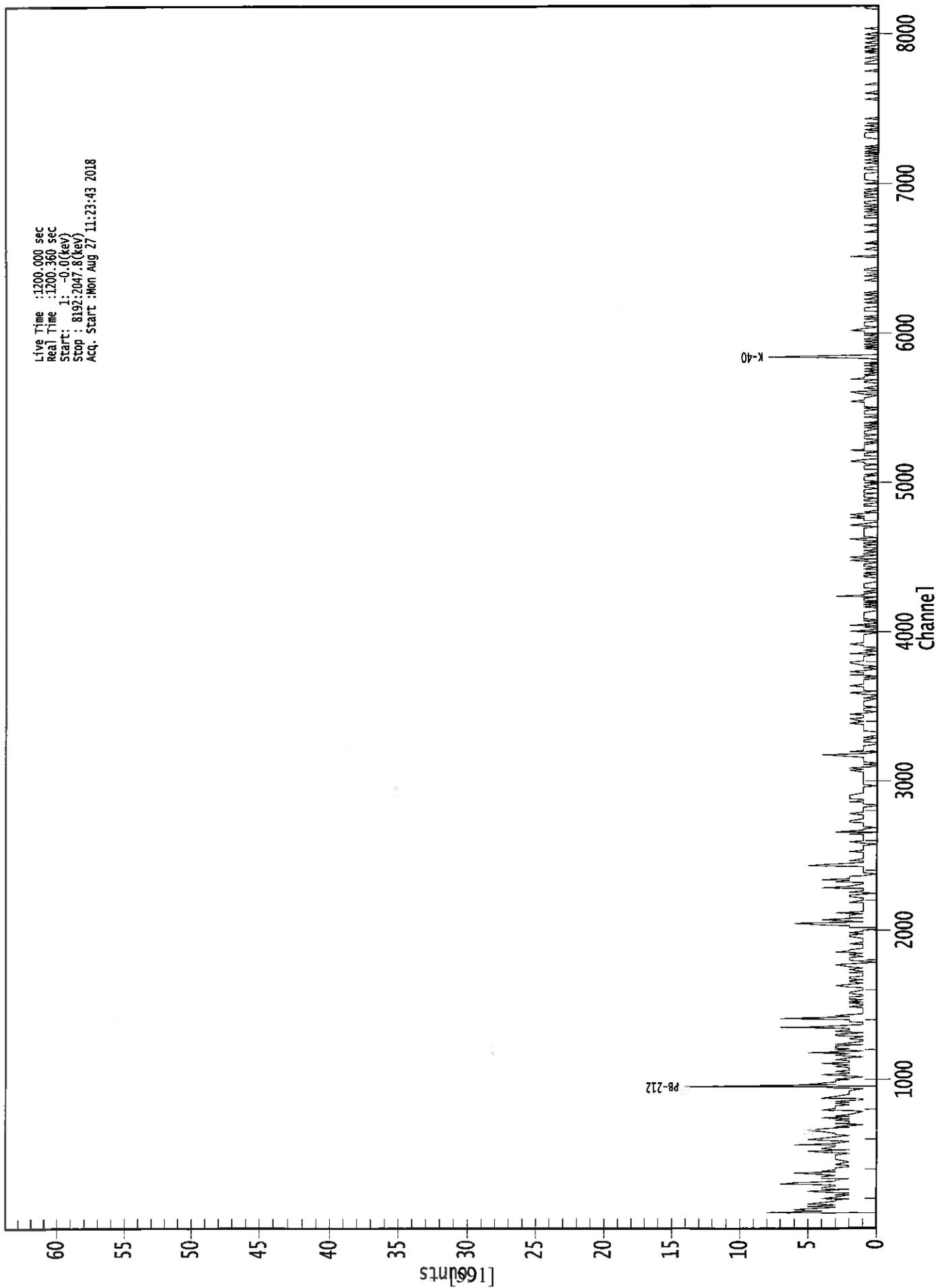
> = MDA value not calculated

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

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

0000049653.CNF

Live Time :1200.000 sec
Real Time :1200.360 sec
Start: 1: -0.0(rev)
Stop : 8192:2047.8(rev)
Acq. Start :Mon Aug 27 11:23:43 2018



ROI Type: 1

Analysis Report for 27-Aug-18-10015

B1-09100A-FSFC-068CV 0.0" - 0.5" 0.0"

GAMMA SPECTRUM ANALYSIS

Sample Identification : 27-Aug-18-10015
Sample Description : B1-09100A-FSFC-068CV 0.0" - 0.5" 0.0"
Sample Type : Puck
Unit :
Sample Point :

Sample Size : 8.219E+01 grams
Facility : Default

Sample Taken On : 8/22/2018 1:40:00PM
Acquisition Started : 8/27/2018 11:00:02AM

Procedure : Puck_half_inch
Operator : jwelch
Detector Name : 352
Geometry : Puck_half_inch
Live Time : 1200.0 seconds
Real Time : 1200.2 seconds

Dead Time : 0.02 %

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

Energy Calibration Used Done On : 3/12/2018
Efficiency Calibration Used Done On : 8/27/2018
Efficiency Calibration Description : install

Sample Number : 49650
Certificate Name : Eu155-Na22
Certificate Date : 1/7/2013 12:00:00PM

J. Welch
8-27-18

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/27/2018 11:20:07AM

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

DATA VALIDATED

DATE 9-2-18TIME 0815

R. Massey
R. Jones

Analysis Report for 27-Aug-18-10015

B1-09100A-FSFC-068CV 0.0" - 0.5" 0.0"

 No peak analysis results available for reporting purposes.

 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

<i>Nuclide Name</i>	<i>Id Confidence</i>	<i>Energy (keV)</i>	<i>Yield(%)</i>	<i>Activity (pCi/grams)</i>	<i>Activity Uncertainty</i>
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* = 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 2.000sigma

INTERFERENCE CORRECTED REPORT

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
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Analysis Report for 27-Aug-18-10015

B1-09100A-FSFC-068CV 0.0" - 0.5" 0.0"

- ? = 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 2.000sigma

Analysis Report for 27-Aug-18-10015

B1-09100A-FSFC-068CV 0.0" - 0.5" 0.0"

 No peak search results available for nuclide analysis.

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	3.13E-01	3.15E-01	3.15E-01
BE-7	477.60	10.44	9.22E-02	1.99E+00	1.99E+00
K-40	1460.82	10.66	5.66E+00	5.13E+00	5.13E+00
Co-60	1173.23	99.85	-1.26E-02	2.21E-01	2.21E-01
	1332.49	99.98	1.48E-01		2.84E-01
Nb-94	702.65	99.81	-6.35E-02	2.15E-01	2.15E-01
	871.09	99.89	7.24E-02		2.40E-01
Ag-108m	79.13	6.60	-1.38E+00	1.86E-01	3.72E+00
	433.94	90.50	8.01E-02		2.10E-01
	614.28	89.80	1.64E-01		3.37E-01
	722.94	90.80	8.36E-02		1.86E-01
Sb-125	176.31	6.84	4.57E-01	6.10E-01	2.01E+00
	380.45	1.52	-1.34E+00		9.89E+00
	427.87	29.60	2.77E-01		6.10E-01
	463.36	10.49	-4.10E-01		1.79E+00
	600.60	17.65	-2.64E-01		1.02E+00
	606.71	4.98	3.71E+00		6.27E+00
	635.95	11.22	-3.99E-01		1.53E+00
	671.44	1.79	4.33E-01		1.13E+01
Ba-133	79.61	2.65	-1.71E+00	3.37E-01	9.10E+00
	81.00	32.90	2.31E-01		6.89E-01
	276.40	7.16	1.31E+00		1.91E+00
	302.85	18.34	3.21E-01		8.10E-01
	356.01	62.05	8.63E-02		3.37E-01
	383.85	8.94	1.48E-01		1.69E+00
Cs-134	475.36	1.48	-4.23E+00	2.45E-01	1.23E+01
	563.25	8.34	-1.69E+00		2.05E+00
	569.33	15.37	-3.63E-01		1.55E+00
	604.72	97.62	-1.76E-01		2.64E-01
	795.86	85.46	3.40E-02		2.45E-01
	801.95	8.69	-1.73E+00		1.97E+00
	1038.61	0.99	8.45E+00		2.06E+01
	1167.97	1.79	-1.16E+00		1.05E+01
	1365.19	3.02	5.58E-01		4.28E+00

Analysis Report for 27-Aug-18-10015

B1-09100A-FSFC-068CV 0.0" - 0.5" 0.0"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Cs-137	661.66	85.10	1.85E-01	3.33E-01	3.33E-01
Eu-152	121.78	28.67	-6.94E-04	3.95E-01	3.95E-01
	244.70	7.61	-5.81E-01		1.83E+00
	295.94	0.45	8.85E+00		3.62E+01
	344.28	26.60	-7.73E-01		5.22E-01
	367.79	0.86	-5.02E+00		1.74E+01
	411.12	2.24	-5.95E+00		6.27E+00
	443.96	2.83	4.46E-01		5.94E+00
	488.68	0.42	-5.28E+00		4.05E+01
	563.99	0.49	1.60E+01		3.74E+01
	586.26	0.46	2.80E+01		4.73E+01
	678.62	0.47	9.49E+00		3.62E+01
	688.67	0.86	-2.03E+01		2.38E+01
	719.35	0.28	-2.81E+01		4.83E+01
	778.90	12.96	9.34E-01		1.94E+00
	810.45	0.32	2.35E+00		5.69E+01
	867.37	4.26	-1.92E-01		4.98E+00
	919.33	0.43	-2.89E+01		4.37E+01
	964.08	14.65	3.18E-01		2.04E+00
	1085.87	10.24	8.38E-01		2.04E+00
	1089.74	1.73	2.03E+00		1.43E+01
	1112.07	13.69	9.56E-01		1.83E+00
	1212.95	1.43	8.64E+00		1.78E+01
	1249.94	0.19	5.83E+01		1.30E+02
	1299.14	1.63	4.97E+00		1.35E+01
	1408.01	21.07	2.45E-01		9.14E-01
	1457.64	0.50	1.23E+02		1.10E+02
	1528.10	0.28	1.96E+01		7.31E+01
Eu-154	123.07	40.40	-4.09E-02	2.74E-01	2.74E-01
	247.93	6.89	3.15E-01		2.07E+00
	591.76	4.95	-1.15E+00		3.29E+00
	692.42	1.78	-1.59E+00		1.23E+01
	723.30	20.06	3.79E-01		8.42E-01
	756.80	4.52	2.48E+00		4.47E+00
	873.18	12.08	5.36E-01		1.92E+00
	996.29	10.48	1.88E-01		2.42E+00
	1004.76	18.01	6.79E-01		1.30E+00
	1274.43	34.80	-5.50E-02		6.23E-01
	1596.48	1.80	3.19E+00		1.19E+01
Eu-155	45.30	1.31	-4.37E+00	5.30E-01	4.17E+01
	60.01	1.22	-7.93E+00		4.52E+01
	86.55	30.70	7.62E-04		5.42E-01
	105.31	21.10	-1.60E-01		5.30E-01
Ra-226	186.21	3.64	6.29E-01	4.26E+00	4.26E+00
Pa-231	27.36	10.30	1.08E+01	5.97E+00	8.81E+00
	283.69	1.70	-1.69E+00		8.00E+00
	300.07	2.47	-1.21E+00		5.97E+00
	302.65	2.20	1.18E-01		6.61E+00
	330.06	1.40	5.89E+00		1.31E+01
U-235	143.76	10.96	2.50E-01	2.78E-01	1.16E+00
	163.33	5.08	1.86E-01		2.26E+00

Analysis Report for 27-Aug-18-10015

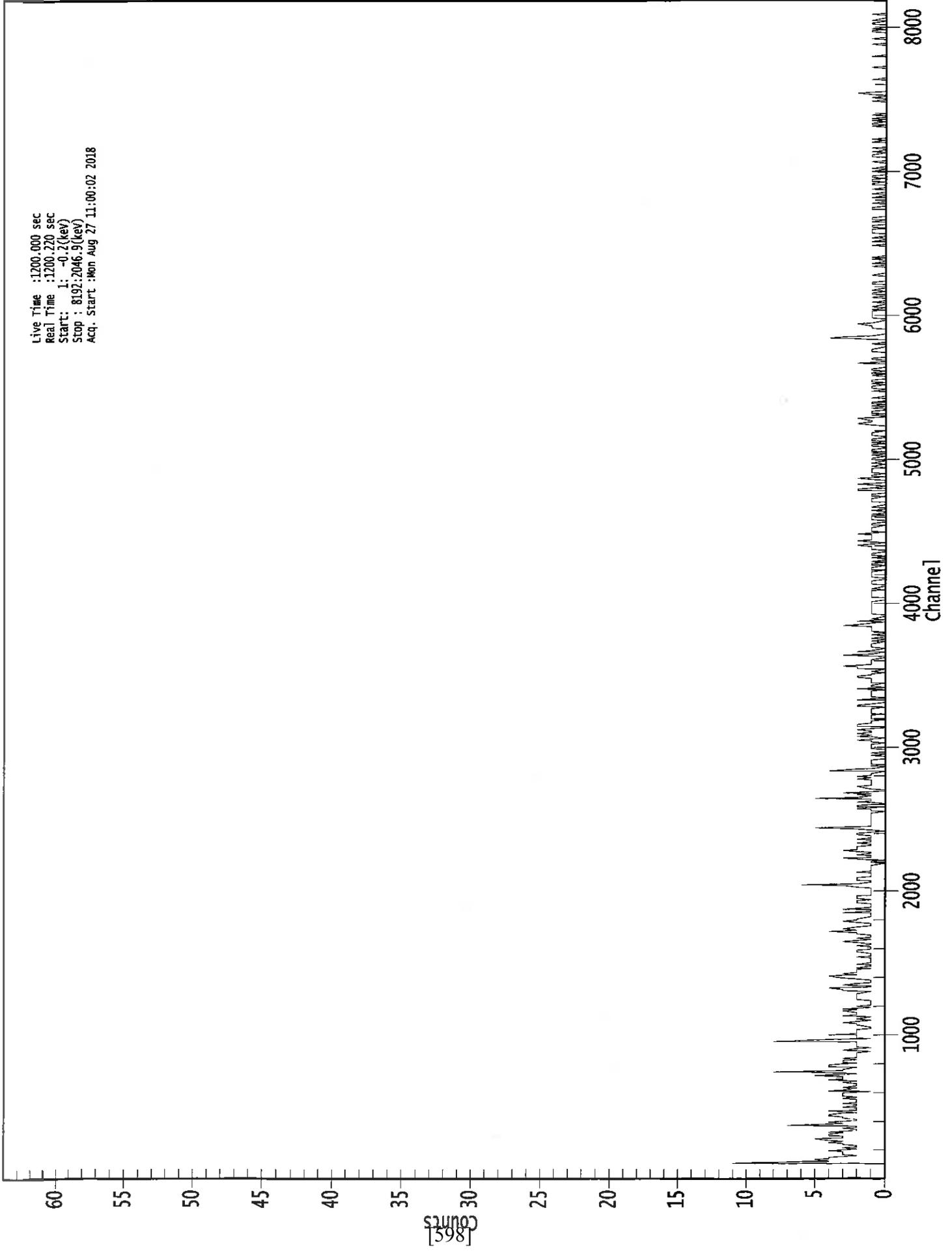
B1-09100A-FSFC-068CV 0.0" - 0.5" 0.0"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
U-235	185.71	57.20	1.41E-01	2.78E-01	2.78E-01
	202.11	1.08	-1.48E+00		1.27E+01
	205.31	5.01	-1.37E+00		2.61E+00
Am-241	59.54	35.90	-9.85E-01	1.51E+00	1.51E+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

0000049650.CNF

Live Time :1200.000 sec
Real Time :1200.220 sec
Start: 1: -0.7(kev)
Stop : 8192.2046.9(kev)
Acq. Start :Mon Aug 27 11:00:02 2018



Analysis Report for 27-Aug-18-10016

B1-09100A-FSFC-068CV 0.0" - 0.5" 0.5"

GAMMA SPECTRUM ANALYSIS

Sample Identification : 27-Aug-18-10016
Sample Description : B1-09100A-FSFC-068CV 0.0" - 0.5" 0.5"
Sample Type : Puck
Unit :
Sample Point :

Sample Size : 8.219E+01 grams
Facility : Default

Sample Taken On : 8/22/2018 1:40:00PM
Acquisition Started : 8/27/2018 11:23:50AM

Procedure : Puck_half_inch
Operator : jwelch
Detector Name : 352
Geometry : Puck_half_inch
Live Time : 1200.0 seconds
Real Time : 1200.2 seconds

Dead Time : 0.02 %

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

Energy Calibration Used Done On : 3/12/2018
Efficiency Calibration Used Done On : 8/27/2018
Efficiency Calibration Description : install

Sample Number : 49654
Certificate Name : Eu155-Na22
Certificate Date : 1/7/2013 12:00:00PM

J. P. Welch
8-27-18

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/27/2018 11:43:53AM

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

DATA VALIDATED

DATE 9-2-18TIME 0820

R. Massey

Analysis Report for 27-Aug-18-10016

B1-09100A-FSFC-068CV 0.0" - 0.5" 0.5"

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	1461.17	5839 -	5852	5845.07	2.50E+01	11.17	4.00E+00	0.43

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.82 *	10.66	4.16E+00	1.89E+00

* = 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 2.000sigma

Analysis Report for 27-Aug-18-10016

B1-09100A-FSFC-068CV 0.0" - 0.5" 0.5"

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.980	4.16E+00	1.89E+00	

- ? = 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 2.000sigma

Analysis Report for 27-Aug-18-10016

B1-09100A-FSFC-068CV 0.0" - 0.5" 0.5"

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/27/2018 11:43:53AM
 Peak Locate From Channel : 120
 Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

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	9.32E-02	3.19E-01	3.19E-01
BE-7	477.60	10.44	1.79E-01	1.71E+00	1.71E+00
+ K-40	1460.82	* 10.66	4.16E+00	1.88E+00	1.88E+00
Co-60	1173.23	99.85	-1.32E-01	1.26E-01	2.05E-01
	1332.49	99.98	-4.11E-02		1.26E-01
Nb-94	702.65	99.81	-3.33E-02	1.92E-01	2.22E-01
	871.09	99.89	-6.47E-02		1.92E-01
Ag-108m	79.13	6.60	-5.24E-01	2.10E-01	3.86E+00
	433.94	90.50	1.45E-01		2.10E-01
	614.28	89.80	1.48E-01		2.89E-01
	722.94	90.80	-1.31E-01		2.56E-01
Sb-125	176.31	6.84	-6.81E-01	6.24E-01	1.68E+00
	380.45	1.52	-1.01E+01		8.09E+00
	427.87	29.60	6.06E-02		6.24E-01
	463.36	10.49	-1.88E-01		1.70E+00
	600.60	17.65	5.27E-01		1.32E+00
	606.71	4.98	-3.36E-01		5.37E+00
	635.95	11.22	9.92E-01		2.01E+00
	671.44	1.79	2.89E+00		7.85E+00

[602]

Analysis Report for 27-Aug-18-10016

B1-09100A-FSFC-068CV 0.0" - 0.5" 0.5"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Ba-133	79.61	2.65	4.37E-01	3.07E-01	9.56E+00
	81.00	32.90	-8.23E-01		6.80E-01
	276.40	7.16	-4.69E-01		1.83E+00
	302.85	18.34	-1.14E-02		7.94E-01
	356.01	62.05	-1.15E-01		3.07E-01
Cs-134	383.85	8.94	-3.97E-01	2.35E-01	1.64E+00
	475.36	1.48	-5.40E+00		1.10E+01
	563.25	8.34	-5.47E-02		2.21E+00
	569.33	15.37	-5.68E-01		1.12E+00
	604.72	97.62	1.45E-01		2.83E-01
	795.86	85.46	4.00E-02		2.35E-01
	801.95	8.69	-1.01E-01		2.53E+00
	1038.61	0.99	9.86E+00		2.19E+01
	1167.97	1.79	-1.47E+00		1.05E+01
	1365.19	3.02	2.23E+00		6.96E+00
	Cs-137	661.66	85.10		1.95E-01
Eu-152	121.78	28.67	-2.89E-02	4.02E-01	4.02E-01
	244.70	7.61	-3.78E-01		1.86E+00
	295.94	0.45	9.87E+00		3.73E+01
	344.28	26.60	1.18E-02		5.49E-01
	367.79	0.86	5.17E+00		1.69E+01
	411.12	2.24	-3.25E+00		8.79E+00
	443.96	2.83	-2.02E+00		5.24E+00
	488.68	0.42	-2.04E+01		3.51E+01
	563.99	0.49	6.95E+00		3.86E+01
	586.26	0.46	3.75E+01		5.46E+01
	678.62	0.47	1.76E+01		3.62E+01
	688.67	0.86	1.71E+01		2.54E+01
	719.35	0.28	3.39E+01		9.43E+01
	778.90	12.96	-2.42E-01		1.52E+00
	810.45	0.32	2.48E+00		5.69E+01
	867.37	4.26	2.88E+00		5.20E+00
	919.33	0.43	-6.35E+01		4.92E+01
	964.08	14.65	9.92E-01		1.69E+00
	1085.87	10.24	-1.08E+00		1.90E+00
	1089.74	1.73	4.97E+00		1.21E+01
	1112.07	13.69	-8.87E-01		1.65E+00
	1212.95	1.43	-1.05E+01		1.35E+01
	1249.94	0.19	-5.89E+00		1.22E+02
1299.14	1.63	-2.73E+00	1.35E+01		
1408.01	21.07	-4.29E-01	7.89E-01		
1457.64	0.50	8.96E+01	1.01E+02		
1528.10	0.28	2.61E+01	8.15E+01		
Eu-154	123.07	40.40	-1.17E-01	2.89E-01	2.89E-01
	247.93	6.89	-4.35E-01		1.87E+00
	591.76	4.95	-2.19E+00		3.58E+00
	692.42	1.78	-5.56E+00		1.27E+01
	723.30	20.06	6.16E-01		1.26E+00
	756.80	4.52	2.23E+00		4.28E+00
	873.18	12.08	4.97E-01		1.92E+00
	996.29	10.48	2.50E-01		2.12E+00

Analysis Report for 27-Aug-18-10016

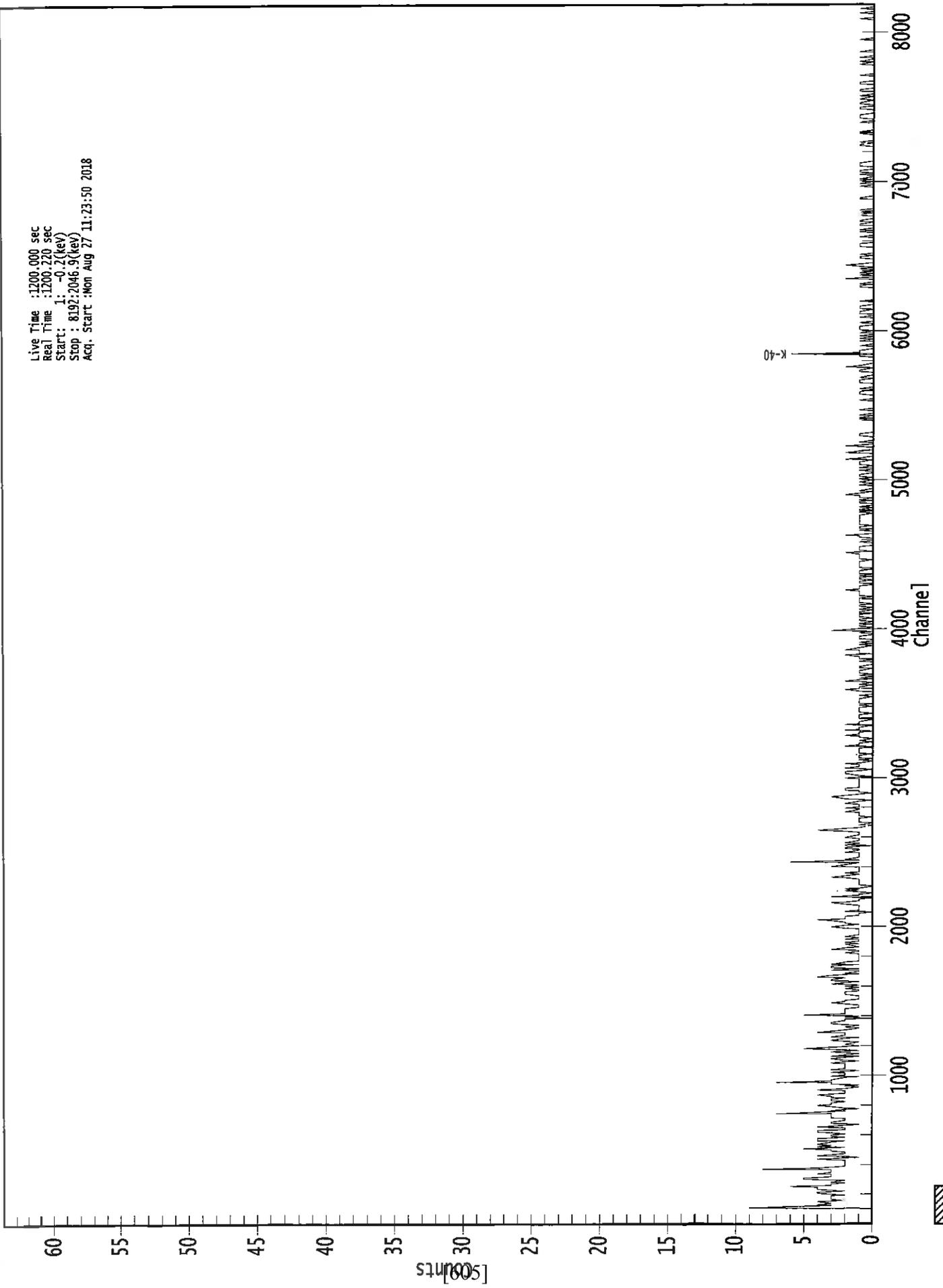
B1-09100A-FSFC-068CV 0.0" - 0.5" 0.5"

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	1004.76	18.01	5.28E-01	2.89E-01	1.18E+00
	1274.43	34.80	1.31E-01		7.13E-01
	1596.48	1.80	4.25E+00		1.33E+01
Eu-155	45.30	1.31	-1.74E+00	6.02E-01	3.80E+01
	60.01	1.22	-2.88E+01		5.03E+01
	86.55	30.70	2.39E-01		6.73E-01
Ra-226	105.31	21.10	-8.68E-02	4.10E+00	6.02E-01
	186.21	3.64	1.35E+00		4.10E+00
Pa-231	27.36	10.30	8.26E+00	6.08E+00	7.96E+00
	283.69	1.70	4.01E+00		8.65E+00
	300.07	2.47	-8.63E+00		6.08E+00
	302.65	2.20	-2.87E+00		6.34E+00
	330.06	1.40	4.03E+00		1.01E+01
U-235	143.76	10.96	-4.74E-01	2.61E-01	1.00E+00
	163.33	5.08	1.31E+00		2.36E+00
	185.71	57.20	3.06E-02		2.61E-01
	202.11	1.08	2.66E-02		1.38E+01
	205.31	5.01	1.77E-01		2.69E+00
Am-241	59.54	35.90	-6.72E-01	1.68E+00	1.68E+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

0000049654.CNF

Live Time :1200.000 sec
Real Time :1200.320 sec
Start: 1: -0.2(kev)
Stop : 8192.2046.9(kev)
Acq. Start :Mon Aug 27 11:23:50 2018



ROI Type: 1