


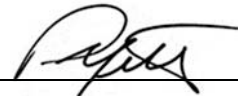



**LA CROSSE BOILING WATER REACTOR
FINAL STATUS SURVEY RELEASE RECORD**

**L1-010-104 WEST EXCAVATION
SURVEY UNIT L1-SUB-DRS**



PREPARED BY / DATE:  8/28/19
R. F. Yetter III, Survey Design Specialist

REVIEWED BY / DATE:  8/28/19
R. Yetter, Director, Radiological Site Closure

REVIEWED BY / DATE:  8/28/19
P. Hollenbeck, Radiological Engineer

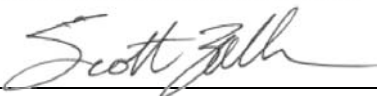
APPROVED BY / DATE:  8/28/19
S. Zoller, FSS Manager

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY	6
2. SURVEY UNIT DESCRIPTION	6
3. CLASSIFICATION BASIS.....	7
4. DATA QUALITY OBJECTIVES	10
5. SURVEY DESIGN.....	13
6. SURVEY IMPLEMENTATION	18
7. SURVEY RESULTS.....	20
8. QUALITY CONTROL.....	27
9. INVESTIGATIONS AND RESULTS.....	27
10. REMEDIATION AND RESULTS	27
11. CHANGES FROM THE FINAL STATUS SURVEY PLAN	28
12. DATA QUALITY ASSESSMENT (DQA).....	28
13. ANOMALIES.....	28
14. CONCLUSION	29
15. REFERENCES.....	29
16. ATTACHMENTS	30
<i>ATTACHMENT 1 – FIGURES AND MAPS.....</i>	<i>31</i>
<i>ATTACHMENT 2 – SCAN DATA.....</i>	<i>34</i>
<i>ATTACHMENT 3 – SIGN TEST.....</i>	<i>38</i>
<i>ATTACHMENT 4 – QUALITY CONTROL ASSESSMENT.....</i>	<i>40</i>
<i>ATTACHMENT 5 – CONSULTATION TRIGGERS FOR RESIDENTIAL SOIL CONCENTRATIONS.....</i>	<i>42</i>
<i>ATTACHMENT 6 – GRAPHICAL PRESENTATIONS.....</i>	<i>44</i>
<i>ATTACHMENT 7 – SAMPLE ANALYTICAL REPORTS.....</i>	<i>48</i>
<i>ATTACHMENT 8 – GEL LABORATORIES ANALYTICAL REPORTS</i>	<i>49</i>

LIST OF TABLES

Table 3-1 - Statistical Quantities for Cs-137 and Co-60 from the Characterization Survey.....	8
Table 4-1 - Dose Significant Radionuclides and Mixture for Soil	11
Table 4-2 - Base Case DCGLs for Soil (DCGLs).....	12
Table 4-3 - Operational DCGLs for Soil (OpDCGLs).....	12
Table 5-1 – Soil Surrogate Ratio	13
Table 5-2 – Action Levels for Survey Unit L1-SUB-DRS.....	14
Table 5-3 – Systematic Sample Locations.....	16
Table 5-4 – Judgmental Sample Locations	16
Table 5-5 – Investigation Levels	17
Table 5-6 – Synopsis of Survey Design.....	18
Table 7-1 – Synopsis of Scan Results	20
Table 7-2 - Summary of Gamma Spectroscopy Results for Soil Samples Comprising the Statistical Sample Population.....	23
Table 7-3 - Basic Statistical Properties of Systematic Sample Population.....	23
Table 7-4 - Off-Site Analysis Results for Sr-90	24
Table 7-5 – Summary of Gamma Spectroscopy Results for Judgmental Soil Samples.....	24
Table 7-6 - Summary of Gamma Spectroscopy Results for QC Soil Samples.....	25
Table 7-7 - Sum-of-Fractions for Individual Soil Samples (Systematic and QC)	25
Table 7-8 - Sum-of-Fractions for Individual Soil Samples (Judgmental).....	27
Table 16-1 – L1-SUB-DRS Complete Scan Data	35
Table 16-2 – L1-SUB-DRS Sign Test	39
Table 16-3 – L1-SUB-DRS QC Assessment.....	41

LIST OF FIGURES

Figure 16-1 – L1-SUB-DRS Scan and Systematic Sample Locations Map.....	32
Figure 16-2 – L1-SUB-DRS Judgmental Sample Locations	33
Figure 16-3 – Quantile Plot for Cs-137 Concentration.....	45
Figure 16-4 - Histogram for Cs-137 Concentration.....	46
Figure 16-5 - Retrospective Power Curve for L1-SUB-DRS.....	47

LIST OF ACRONYMS AND ABBREVIATIONS

ALARA	As Low As Reasonably Achievable
ASP	Alarm Set Point
DQA	Data Quality Assessment
DQO	Data Quality Objective
DCGL	Derived Concentration Guideline Level
DCGL _s	Soil Derived Concentration Guideline Level
FSS	Final Status Survey
GPS	Global Positioning System
HPSW	High Pressure Service Water
HSA	Historical Site Assessment
IC	Insignificant Contributors
LACBWR	La Crosse Boiling Water Reactor
LBGR	Lower Bound of the Gray Region
LPSW	Low Pressure Service Water
LTP	License Termination Plan
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	Minimum Detectable Concentration
NaI	Sodium Iodide
OpDCGL _s	Soil Operational Derived Concentration Guideline Level
QAPP	Quality Assurance Project Plan
QC	Quality Control
RASS	Remedial Action Support Survey
RCA	Radiologically Controlled Area
ROC	Radionuclides of Concern
SOF	Sum-of-Fraction
TEDE	Total Effective Dose Equivalent
UBGR	Upper Bound of the Gray Region

UCL Upper Confidence Limit

1. EXECUTIVE SUMMARY

This Final Status Survey (FSS) Release Record for survey unit L1-SUB-DRS, L1-010-104 West Excavation (within the west portion of open land survey unit L1-010-104), has been generated in accordance with LaCrosseSolutions procedure LC-FS-PR-009, *Final Status Survey Data Reporting* (Reference 1) and satisfies the requirements of Section 5.11 of the *La Crosse Boiling Water Reactor License Termination Plan* (LTP) (Reference 2).

An FSS sample plan for this survey unit was developed in accordance with LaCrosseSolutions procedure LC-FS-PR-002, *Final Status Survey Package Development* (Reference 3), the LACBWR LTP, and with guidance from NUREG-1575, Revision 1, *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM) (Reference 4).

This survey unit has a MARSSIM classification of 1. A survey plan was designed based upon use of the Sign Test as the nonparametric statistical test for compliance. Both the Type I (α) and Type II (β) decision error rates were set at 0.05. As a systematic sample population, fourteen (14) soil samples were acquired from the survey unit. In addition, soil scanning was performed on 100% of the total surface area in the survey unit. The analytical results for all soil samples taken in survey unit L1-SUB-DRS indicate that the maximum Sum-of-Fraction (SOF), considering the concentration of all applicable Radionuclides of Concern (ROC) either by direct measurement or by inference, is equal to 0.0587 when applying the respective Operational Derived Concentration Guideline Levels (OpDCGLs) for soil. Therefore, the null hypothesis is rejected and survey unit L1-SUB-DRS is acceptable for unrestricted release. The mean SOF when applying the respective Base Case DCGLs (DCGLs) is 0.0105. This SOF equates to a dose for the survey unit of 0.2620 mrem/yr.

2. SURVEY UNIT DESCRIPTION

L1-SUB-DRS is an impacted Class 1 excavation survey unit. The survey unit consists of the underlying soil post-removal of the Radiologically Controlled Area (RCA) roadway, rail lines, storm drains, High Pressure Service Water (HPSW) lines, Low Pressure Service Water (LPSW) lines, and well water lines located in open land survey unit L1-010-104 West. The surface area of the survey unit is 1,125 m².

The boundary of the survey unit and the location of the soil samples were defined using a Global Positioning System (GPS). Refer to Attachment 1 of this report for figures and maps depicting survey unit L1-SUB-DRS.

3. CLASSIFICATION BASIS

Based on the Historical Site Assessment (HSA) (Reference 5), survey unit L1-010-104 was identified as a Class 1 area. As survey unit L1-SUB-DRS consists of the underlying soils from the west portion of L1-010-104, it is also deemed Class 1. The following summarizes the results of the characterization surveys for survey unit L1-010-104.

The initial site characterization surveys performed by EnergySolutions were conducted between October 9, 2014, and August 6, 2015. In total, one (1) surface soil sample, fourteen (14) subsurface soil samples, and ten (10) asphalt samples were collected in the survey unit. All samples were analyzed by the on-site gamma spectroscopy system. No ROC were detected at concentrations above Minimum Detectable Concentration (MDC) for the surface soil samples. For subsurface soil samples, Cs-137 was detected at concentrations above MDC in three (3) of the samples, at a maximum concentration of 0.051 pCi/g. Co-60 was not detected at concentrations above MDC for subsurface soil samples. Cs-137 was detected at a concentration above MDC in one (1) asphalt sample, at a maximum concentration of 0.057 pCi/g. No other ROC were identified in the asphalt samples for the characterization of this survey unit. A summary of the analyses for the surface soil, subsurface soil, and asphalt samples taken during site characterization are presented in Table 3-1.

Table 3-1 - Statistical Quantities for Cs-137 and Co-60 from the Characterization Survey

Surface Soil	Co-60	Cs-137
# of Samples	1	
# >MDC	0	0
Mean (pCi/g)	0.045	0.049
Median (pCi/g)	0.045	0.049
Max (pCi/g)	0.045	0.049
Min (pCi/g)	0.045	0.049
Standard Deviation (pCi/g)	N/A	N/A
Subsurface Soil	Co-60	Cs-137
# of Samples	14	
# >MDC	0	3
Mean (pCi/g)	0.048	0.041
Median (pCi/g)	0.048	0.042
Max (pCi/g)	0.050	0.051
Min (pCi/g)	0.043	0.027
Standard Deviation (pCi/g)	0.002	0.009
Asphalt	Co-60	Cs-137
# of Samples	10	
# >MDC	0	1
Mean (pCi/g)	0.053	0.051
Median (pCi/g)	0.054	0.053
Max (pCi/g)	0.062	0.057
Min (pCi/g)	0.042	0.037
Standard Deviation (pCi/g)	0.006	0.006

Two (2) subsurface soil samples and two (2) asphalt samples from characterization were sent to Test America Laboratories for off-site analysis. Each sample was analyzed for the full suite of initial ROC. No ROC were identified at concentrations greater than their respective MDCs.

Section 5.1 of the LTP states that the actual IC dose will be calculated for each individual sample result using the DCGLs from TSD RS-TD-313196-004, *LACBWR Soil DCGL*, *Basement Concrete DCGL*, and *Buried Pipe DCGL*, Table 4 (Reference 6) for soil. If the IC dose calculated is less than the IC dose assigned for DCGL adjustment, then no further action will be taken. If the actual IC dose calculated from the sample result is greater than the IC dose assigned for DCGL adjustment, then a minimum of five (5) additional investigation samples will be taken around the original sample location. Each investigation sample will be analyzed by the on-site gamma spectroscopy system and sent for hard-to-detect (HTD) analysis (full suite of radionuclides from LTP Table 5-1). As with the original sample, the actual IC dose will be calculated for each investigation sample. In this case, the actual calculated maximum IC dose from an individual sample observed in the survey unit will be used to readjust the DCGLs in that survey unit. If the maximum IC dose exceeds 10%, then the additional radionuclides that were the cause of the IC dose exceeding 10% will be added as additional ROC for that survey unit. The survey unit-specific DCGLs used for compliance, the ROC for that survey unit, and the survey data serving as the basis for the IC dose adjustment will be documented in the release record for the survey unit.

An assessment of the results of continuing characterization confirmed that the IC dose is unchanged (dose fraction less than 10%).

Based upon review of the historical information, the results of the characterization survey data, and completion of a final Survey Unit Classification Worksheet, the correct final classification of survey unit L1-SUB-DRS was determined to be Class 1.

Between February 15, 2018, and February 23, 2018, a Remedial Action Support Survey (RASS) was performed in the survey unit after the excavation was complete and before FSS was performed. The purpose of the RASS was to ensure that residual radionuclide concentrations in the excavation were below the Operational DCGL for soil. 100% of the surface area of soil in the excavation was scanned using a Ludlum Model 2350-1 data logger paired with a Ludlum Model 44-10 detector. The alarm set point (ASP) was set at average background plus 3,525 cpm, which is equivalent to the Operational DCGL. Five (5) alarms were produced and verified during the RASS scan survey. Seven (7) judgmental soil samples were collected in the excavation at areas where scan alarms occurred. The seven (7) samples were analyzed using the on-site gamma spectroscopy system. Gamma spectroscopy revealed Cs-137 concentrations ranging between 5.30E-02 pCi/g and 8.13E+00 pCi/g. Co-60 concentrations ranged between 5.60E-02 pCi/g and 2.90E-01 pCi/g. Areas that alarmed and where judgmental samples were collected were bounded and remediated to levels below the Operational DCGL. Remediation was deemed sufficient as no further alarms were produced upon rescan of the elevated areas.

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 LACBWR LTP in accordance with MARSSIM. The appropriate design for a given survey was developed using the DQO process as outlined in Appendix D of MARSSIM. A summary of seven steps of the DQO process are outlined as follows.

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

The primary objective of the FSS sample plan is to demonstrate that the level of residual radioactivity in survey unit L1-SUB-DRS did not exceed the release criteria specified in the LTP and that the potential dose from residual radioactivity is As Low As Reasonably Achievable (ALARA).

LaCrosseSolutions TSD RS-TD-313196-001, *Radionuclides of Concern during LACBWR Decommissioning* (Reference 7) established the basis for an initial suite of potential ROC for decommissioning. LTP Chapter 2 provides detailed characterization data that describes the results of surveys taken of soil. Surface and subsurface soil samples were taken in each impacted open land survey units and analyzed for the presence of plant-derived radionuclides. The results of surface and subsurface soil characterization in the impacted area surrounding LACBWR indicate that there is minimal residual radioactivity in soil.

Insignificant dose contributors were determined consistent with the guidance contained in Section 3.3 of NUREG-1757, Volume 2, Revision 1, *Consolidated Decommissioning Guidance – Characterization, Survey, and Determination of Radiological Criteria, Final Report* (Reference 8). In all soil and concrete scenarios, Cs-137, Co-60, Sr-90, Eu-152 and Eu-154 contribute nearly 100% of the total dose. The remaining radionuclides were designated as insignificant dose contributors and are eliminated from further detailed evaluation. Therefore, the final ROCs for LACBWR soil, basement concrete and buried piping are Cs-137, Co-60, Sr-90, Eu-152 and Eu-154.

LTP Chapter 6, Section 6.14.1 discusses the process used to derive the ROC for the decommissioning of LACBWR, including the elimination of insignificant dose contributors (IC) from the initial suite. Table 4-1 presents the ROC for the decommissioning of soil at LACBWR and the normalized mixture fractions based on the radionuclide mixture.

Table 4-1 - Dose Significant Radionuclides and Mixture for Soil

Radionuclide	Fraction of Total Activity (normalized)⁽¹⁾
Co-60	0.064
Sr-90	0.098
Cs-137	0.829
Eu-152	0.005
Eu-154	0.003

(1) Based on maximum percent of total activity from Table 22 of RS-TD-313196-001, normalized to one for the dose significant radionuclides.

LTP, Section 5.2 states that each radionuclide-specific Base Case DCGL 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/yr to an Average Member of the Critical Group. To ensure that the summation of dose from each source term is 25 mrem/yr or less after all FSS is completed, the Base Case DCGLs are reduced based on an expected, or *a priori*, fraction of the 25 mrem/yr dose limit from each source term. The reduced DCGLs, or “Operational” DCGLs can be related to the Base Case DCGLs 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 Operational DCGL is then used as the DCGL for the FSS design of the survey unit (calculation of surrogate DCGLs, investigations levels, etc.). Details of the Operational DCGLs derived for each dose component and the basis for the applied *a priori* dose fractions are provided in LC-FS-TSD-002, *Operational Derived Concentration Guideline Levels for Final Status Survey* (Reference 9).

Multiple ROCs are known to be present at LACBWR. The dose contribution from each ROC is accounted for using the SOF to ensure that the total dose from all ROC does not exceed the dose criterion. A Base Case DCGL that is established for the average residual radioactivity in a survey unit is equivalent to a DCGL_W. The DCGL_W can be multiplied by Area Factors (AF) to obtain a Base Case DCGL that represents the same dose to an individual for residual radioactivity over a smaller area within a survey unit.

At LACBWR, compliance is demonstrated through the summation of dose from five (5) distinct source terms for the end-state (basements, soils, buried pipe, above-ground

structures, and groundwater). When applied to soil, the DCGLs are expressed in units of activity per unit of mass (pCi/g).

For LACBWR, soil is defined as a layer of soil beginning at the surface but extending to a depth of 1 m to allow for flexibility in compliance demonstration if contamination deeper than 0.15 m is encountered. Based on characterization data and historical information, there are no expectations of encountering a source term geometry that is comprised of a clean surface layer of soil over a contaminated subsurface soil layer. EnergySolutions TSD RS-TD-313196-004 and LTP Chapter 6, Section 6.8 provide the exposure scenarios and modeling parameters that were used to calculate the site-specific soil DCGLs. The adjusted soil DCGLs for the unrestricted release of open land survey units as provided in Chapter 6, Section 6.16.1 are reproduced in Table 4-2. The insignificant dose contributor percentages for the most limiting basement scenario was used to adjust the DCGLs for soil to account for the dose from the eliminated insignificant contributor radionuclides.

Table 4-2 - Base Case DCGLs for Soil (DCGLs)

Radionuclide	DCGLs (pCi/g)
Co-60	10.6
Sr-90	5470
Cs-137	48.3
Eu-152	23.6
Eu-154	21.9

The Operational DCGLs are then used as the DCGL for the FSS design of the survey unit (calculation of surrogate DCGLs, investigation levels, etc.). The Operational DCGLs (OpDCGLs) for the unrestricted release of soil are provided in Table 4-3.

Table 4-3 - Operational DCGLs for Soil (OpDCGLs)

Radionuclide	OpDCGLs (pCi/g)
Co-60	3.83
Sr-90	1970.45
Cs-137	17.39
Eu-152	8.51
Eu-154	7.89

Instrument DQOs included a verification of the ability of the survey instrument to detect the radiation(s) of interest relative to the Operational DCGL. Survey instrument response

checks were required prior to issuance and after the instrument had been used. Control and accountability of survey instruments was required to assure the quality and prevent the loss of data.

As part of the DQOs applied to laboratory processes, analysis results were reported as actual calculated results. The actual recorded value was used as the recorded FSS result for measurement and/or sample values that are less than MDC. Negative values were recorded as “zero.” Results were not reported as “less than MDC” ($< \text{MDC}$). 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 minimum acceptable MDC for measurements obtained using field instruments was 50% of the applicable Operational DCGL.

5. SURVEY DESIGN

The level of effort associated with planning a survey is based on the complexity of the survey and nature of the hazards. Guidance for preparing FSS plans is provided in procedure LC-FS-PR-002, *Final Status Survey Package Development*.

The DQO process validated that Co-60, Sr-90, Cs-137, Eu-152, and Eu-154 would be the ROC in survey unit L1-SUB-DRS as presented in LTP Section 5.1. During the data analysis of the FSS results, concentrations for the HTD ROC Sr-90 are inferred using a surrogate approach. Cs-137 is the principle surrogate radionuclide for Sr-90. During characterization, both Sr-90 and Cs-137 was positively detected in all thirty (30) concrete core samples assessed in the Reactor Building, Tunnel, and Waste Treatment Building. The 95% Upper Confidence Limit (UCL) of the Cs-137 fractions was chosen to represent the overall nuclide mix for soils/buried pipe, the Reactor Building, and the Waste Gas Tank Vault. The surrogate ratio for soil is given in Table 5-1.

Table 5-1 – Soil Surrogate Ratio

Radionuclides	Ratio
Sr-90/Cs-137	0.502

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 presented in Table 4-3 and the ratio from Table 5-1, the following surrogate calculation was performed:

Equation 2

$$Surrogate_{DCGL (Cs-137)} = \frac{1}{\left[\left(\frac{1}{17.39_{(Cs-137)}}\right) + \left(\frac{0.502}{1970.45_{(Sr-90)}}\right)\right]} = 17.31 \text{ pCi/g}$$

The surrogate Operational DCGL that was used for Cs-137 in this survey unit for direct comparison of sample results to demonstrate compliance was 17.31 pCi/g.

The action levels for survey unit L1-SUB-DRS are based on the Operational DCGL and are presented in Table 5-2.

Table 5-2 – Action Levels for Survey Unit L1-SUB-DRS

ROC	Action Level (pCi/g)
Co-60	3.83 ⁽¹⁾
Cs-137	17.31 ⁽²⁾
Eu-152	8.51 ⁽¹⁾
Eu-154	7.89 ⁽¹⁾

- (1) Based on the Operational DCGL.
(2) Based on the surrogate adjusted DCGL of Cs-137 while inferring Sr-90.

The Sign Test was selected as the non-parametric statistical test. The use of the Sign Test did not require the selection or use of a background reference area, which simplified survey

design and implementation. This approach was conservative since it included background Cs-137 as part of the sample set.

The number of soil samples for FSS was determined in accordance with procedure LC-FS-PR-002. The relative shift (Δ/σ) for the survey unit data set is defined as shift (Δ), which is the Upper Boundary of the Gray Region (UBGR), or the DCGL (SOF of 1), minus the Lower Bound of the Gray Region (LBGR) (SOF of 0.5), divided by sigma (σ), which is the standard deviation of the data set used for survey design. The optimal value for Δ/σ should range between one (1) and three (3). The largest value the Δ/σ can have is three (3). If the Δ/σ exceeds three (3), then the value of three (3) will be used for Δ/σ . The Δ/σ for survey unit L1-SUB-DRS, based on Cs-137 and Co-60 data for subsurface soil samples collected during characterization of L1-010-104, was calculated as follows:

Equation 3

$$\Delta/\sigma = 0.5/0.001 = 500$$

As the calculated relative shift (500) was greater than three (3), then a value of three (3) was used as the adjusted Δ/σ . Both the Type I error, or α value, and the Type II error, or β value, was set at 0.05. The sample size from Table 5.5 of MARSSIM that equates to the Type I and Type II error of 0.05 for use with the Sign Test is an N value of fourteen (14).

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. The survey design specified fourteen (14) soil samples for non-parametric statistical testing.

As the survey unit was classified as Class 1, sample locations were selected based on a systematic triangular grid with a random starting point. The systematic locations of the soil samples were selected using Visual Sample Plan (VSP), in accordance with LC-FS-PR-002. Input parameters included use of aerial photographs, the GPS route of the boundary of the excavation, and sixty (60) 20' by 20' grids. The systematic coordinates generated with VSP were integrated with a GPS to identify sample locations in the field. Table 5-3 lists the systematic samples collected for FSS and the corresponding GPS coordinates, based on the Wisconsin State Plane North American Datum 1983 coordinate system.

Table 5-3 – Systematic Sample Locations

Sample ID	Northing	Easting
L1-SUB-DRS-FSGS-W01-SB	571114.6130	1642058.2443
L1-SUB-DRS-FSGS-W02-SB	571114.6130	1642089.8429
L1-SUB-DRS-FSGS-W03-SB	571141.9782	1642010.8464
L1-SUB-DRS-FSGS-W04-SB	571141.9782	1642042.4450
L1-SUB-DRS-FSGS-W05-SB	571169.3434	1641963.4485
L1-SUB-DRS-FSGS-W06-SB	571169.3434	1641995.0471
L1-SUB-DRS-FSGS-W07-SB	571169.3434	1642026.6457
L1-SUB-DRS-FSGS-W08-SB	571169.3434	1642058.2443
L1-SUB-DRS-FSGS-W09-SB	571196.7086	1641979.2478
L1-SUB-DRS-FSGS-W10-SB	571196.7086	1642010.8464
L1-SUB-DRS-FSGS-W11-SB	571196.7086	1642042.4450
L1-SUB-DRS-FSGS-W12-SB	571196.7086	1642074.0436
L1-SUB-DRS-FSGS-W13-SB	571224.0737	1641995.0471
L1-SUB-DRS-FSGS-W14-SB	571224.0737	1642026.6457

Although one (1) judgmental sample was required for survey design, six (6) judgmental soil samples were collected at locations of higher scan readings. This is described in detail in Section 6 of this release record. In total, twenty (20) soil samples were collected for the FSS of survey unit L1-SUB-DRS. The coordinates for the judgmental samples are provided in Table 5-4.

Table 5-4 – Judgmental Sample Locations

Sample ID	Northing	Easting
L1-SUB-DRS-FJGS-W01-SB	571110.341	1642056.525
L1-SUB-DRS-FJGS-W02-SB	571125.633	1642062.774
L1-SUB-DRS-FJGS-W03-SB	571132.815	1642053.991
L1-SUB-DRS-FJGS-W04-SB	571135.415	1642077.386
L1-SUB-DRS-FJGS-W05-SB	571157.199	1642045.527
L1-SUB-DRS-FJGS-W06-SB	571135.462	1642040.286

The LACBWR LTP Chapter 5, Section 5.1 states that soil samples will be collected during FSS to confirm the HTD to surrogate radionuclide ratio. Ten percent (10%) of the FSS samples collected from open land survey units (including excavations where major sub-grade structures previously resided) will be analyzed for HTD ROC. In addition, if any

sample has a SOF of 10% of the Operational DCGL or more, it must be sent for HTD ROC analysis. Only the HTD radionuclide included as ROC (Sr-90) will be analyzed in the FSS confirmatory samples. For samples with positive results for both the HTD ROC and the corresponding surrogate radionuclide (Cs-137), the HTD surrogate ratio will be derived and compared against the 95% UCL ratio (see Table 5-1). If the derived ratio from the confirmatory samples exceeds the 95% UCL ratio, then the area-specific ratio as determined by actual survey data will be used.

The selection of two (2) soil sample met the requirement that a minimum of 10% of the samples collected for the FSS of survey unit L1-SUB-DRS be analyzed for HTD ROC. Sample L1-SUB-DRS-FSGS-W12-SB and L1-SUB-DRS-FSGS-W14-SB were selected. The selected samples were sent off-site (GEL Laboratories) for analysis of the HTD ROC as specified in LTP Chapter 5, Section 5.1.

The implementation of quality control measures as referenced by LTP Chapter 5, Section 5.9 and LaCrosseSolutions LC-QA-PN-001, *Final Status Survey Quality Assurance Project Plan* (QAPP) (Reference 10) includes the collection of a soil sample for “split sample” analysis on 5% of the soil samples taken in a survey unit with the locations selected at random. One (1) soil sample, L1-SUB-DRS-QSGS-W14-SB, was designated for split sample QC analysis for the FSS of this survey unit.

LTP Chapter 5, Section 5.6.4.4 and Table 5-15 specifies that for Class 1 survey units, surface scans will be performed on 100% of the surface area in the survey unit. For survey unit L1-SUB-DRS, 100% scan coverage equates to 1,125 m². To encapsulate the entire area of the survey unit, a 20’ by 20’ grid pattern was overlaid on a map of the survey unit. The survey unit spanned through portions of forty-five (45) of the sixty (60) total grids. A map of the scan grid locations is provided in Attachment 1.

For this Class 1 excavation survey unit, the “Investigation Levels” for area scanning and soil sample measurement results are those levels specified in LTP Chapter 5, Table 5-16, and are reproduced below in Table 5-5.

Table 5-5 – Investigation Levels

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

Table 5-6 provides a synopsis of the survey design for survey unit L1-SUB-DRS.

Table 5-6 – Synopsis of Survey Design

Feature	Design Criteria	Basis
Survey Unit Surface Area	1,125 m ²	GPS
Number of Systematic Samples (N)	14	<ul style="list-style-type: none"> • $\sigma = 0.001$ • UBGR = SOF of 1 • LBGR = SOF of 0.5 • Type I error = 0.05 • Type II error = 0.05 • $\Delta/\sigma = 3$ (adjusted) • MARSSIM Table 5.5
DCGLS and Action Levels	<ul style="list-style-type: none"> • Co-60: 3.83 pCi/g • Sr-90: 1970.45 pCi/g • Cs-137: 17.39 pCi/g (Surrogate Cs-137 DCGL: 17.31 pCi/g) • Eu-152: 8.51 pCi/g • Eu-154: 7.89 pCi/g 	Operational DCGLs for soil, LTP Chapter 5, Table 5-6, Release Record Table 5-2
Scan and Direct Investigation Levels	>Operational DCGL	LTP Chapter 5, Table 5-16
Scan Areal Coverage	1,125 m ² or 100% areal coverage	LTP Chapter 5, Table 5-15
Number of Judgmental Samples	1 6	Per Sample Plan Actual Number Obtained
HTD ROC Analysis	2 samples	LTP Chapter 5, Section 5.1
QC	1 split sample selected at random 4	LTP Chapter 5, Section 5.9 Actual Number Obtained

6. SURVEY IMPLEMENTATION

For survey unit L1-SUB-DRS, compliance with the unrestricted release criteria was demonstrated through a combination of soil scanning with a Ludlum Model 44-10 gamma detector and the sampling of soil for isotopic analysis.

An FSS Supervisor performed a visual inspection and walk-down of the survey unit on February 22, 2018, prior to performing FSS. The purpose of the walk-down was to assess the physical condition of the survey unit, evaluate access points and travel paths, and identify potentially hazardous conditions.

FSS field activities were conducted under the FSS Sample Plan, which included DQOs, survey design, detailed FSS instructions, job safety analysis, and related procedures for reference. A “Field Log” was used to document field activities and other information pertaining to the performance of the FSS. FSS field activities commenced on February 27, 2018.

FSS field activities were projected to take four (4) working days to complete. Daily briefings were conducted to discuss the expectations for job performance and to review safety aspects of the job. The survey-required field activities were performed during normal working hours and concluded on March 2, 2018.

The fourteen (14) systematic soil sample locations were marked with flags based on GPS coordinates provided. Each soil sample consisted of approximately one (1) liter of soil. The sample media was sifted to remove stones and other media larger than one (1) centimeter in diameter. All soil samples were collected, controlled, transported, stored and transferred to the on-site laboratory using the Chain-of-Custody (CoC) process from LC-FS-PR-012, *Chain of Custody Protocol* (Reference 11), and in accordance with LC-FS-PR-004, *Sample Media Collection for Site Characterization and Final Status Survey* (Reference 12), LC-FS-PR-005, *Sample Media Preparation for Site Characterization and Final Status Survey* (Reference 13), and LC-FS-PR-001, *Sample Storage* (Reference 14).

A total of forty-five (45) scan grids, constituting a total scan coverage of 1,125 m², or approximately 100% of the surface area in the survey unit, were established. Background was assessed in the survey unit using a Ludlum 2350-1 paired with a Ludlum Model 44-10 (2”x 2”) sodium iodide (NaI) detector. The background was established as the average of five (5) 1-minute static measurements, while maintaining the detector 6” from the soil. In survey unit L1-SUB-DRS, background ranged from 7,357 counts per minute (cpm) up to 11,975 cpm.

All designated scan areas as denoted on Figure 16-1 in Attachment 1 were scanned using a Ludlum 2350-1 paired with a Model 44-10 2”x 2” NaI detector operated in the rate-meter mode and using audio response. The probe was positioned no more than 3” from the ground and was moved at a scan speed of approximately 0.5 meters per second. In accordance with RS-TD-313196-006, *Ludlum Model 44-10 Detector Sensitivity* (Reference 15), scan MDC was sufficient to detect residual radioactivity at the action level (adjusted surrogate DCGL

of 17.31 pCi/g, which was based on the surrogate adjusted DCGL of Cs-137 while inferring Sr-90). Complete scan results are provided in Attachment 2.

Six (6) judgmental soil samples were collected during implementation of FSS. Although no ASPs were exceeded, these judgmental samples were collected to investigate locations where scanning revealed higher readings than readings that had been observed in other scan grids (see Table 7-1). The higher readings were determined to be due to a gap in the shielding that was placed at the outside edge of the survey unit, the side closest to the Reactor Building.

The survey design specified that a minimum of one (1) sample was required for HTD ROC analysis. In total, two (2) samples (L1-SUB-DRS-FSGS-W12-SB and L1-SUB-DRS-FSGS-W14-SB) were selected for HTD radionuclide analysis.

The survey design specified one (1) sample to be collected for QC split analysis. The implementation of survey specific QC measures included the collection of four (4) samples (L1-SUB-DRS-QJGS-W06-SB, L1-SUB-DRS-QSGS-W14-SB, L1-SUB-DRS-FJGS-W03-SB SPLIT, and L1-SUB-DRS-FSGS-W05-SB SPLIT) for split sample analysis.

7. SURVEY RESULTS

All areas identified in the FSS plan were scanned for elevated radiation levels. No elevated measurement locations were identified by surface scan. Table 7-1 provides an overview of the scan results for all scan grids (identified as A01 through H06), the 1 m² scan areas around each sample location (identified as J SP01 through SP14), and QC locations (identified with a Q). Complete scan results are provided in Attachment 2.

Table 7-1 – Synopsis of Scan Results

Scan Area	Highest Logged Reading (cpm)	Action Level ⁽¹⁾ (cpm)	# of Scan Alarms	Judgmental Samples	Investigation Samples
A01	9031	11823	0	0	0
A02	9832	11823	0	0	0
A03	8591	11823	0	0	0
A04	8781	11823	0	0	0
A05	8266	11333	0	0	0
A06	9868	11823	0	0	0
B01	9123	11823	0	0	0
B02	8992	11333	0	0	0
B03	9417	11823	0	0	0

Scan Area	Highest Logged Reading (cpm)	Action Level ⁽¹⁾ (cpm)	# of Scan Alarms	Judgmental Samples	Investigation Samples
B04	8337	14792	0	0	0
B05	8696	11333	0	0	0
B06	8436	11333	0	0	0
C01	9440	11823	0	0	0
C02	9220	11333	0	0	0
C03	10016	14792	0	0	0
C03 Q	8780	10995	0	0	0
C04	9993	14792	0	0	0
C04 Q	9109	10995	0	0	0
C05	9763	11581	0	0	0
C06	8754	11581	0	0	0
D01	10135	11823	0	0	0
D02	9636	11333	0	0	0
D03	10615	11333	0	0	0
D04	11111	11333	0	0	0
D05	9945	11581	0	0	0
D06	9501	11333	0	0	0
E01	9760	11823	0	0	0
E02	10379	11823	0	0	0
E03	12408	14792	0	0	0
E04	12785	14792	0	1	0
E05	12285	14792	0	0	0
E06	10463	15672	0	0	0
F01	10411	11823	0	0	0
F02	11591	11823	0	0	0
F03	11151	14792	0	0	0
F04	11554	15672	0	0	0
F05	12974	15672	0	2	0
F06	11224	15672	0	0	0
G01	9366	11823	0	0	0
G02	9295	11823	0	0	0
G03	11354	14792	0	0	0
G04	12805	13750	0	1	0

Scan Area	Highest Logged Reading (cpm)	Action Level ⁽¹⁾ (cpm)	# of Scan Alarms	Judgmental Samples	Investigation Samples
G05	13752	15672	0	1	0
G06	13422	15672	0	1	0
H04	10908	13750	0	0	0
H05	11219	13750	0	0	0
H06	11781	15672	0	0	0
J SP01	10414	12360	0	0	0
J SP02	10546	12360	0	0	0
J SP03	10684	12360	0	0	0
J SP04	10152	12360	0	0	0
J SP05	8703	12360	0	0	0
J SP06	9017	12360	0	0	0
J SP06 Q	9256	11581	0	0	0
SP01	11044	13698	0	0	0
SP02	9042	13698	0	0	0
SP03	9031	10882	0	0	0
SP04	9526	10882	0	0	0
SP05	7256	10882	0	0	0
SP06	8805	10882	0	0	0
SP07	8883	10882	0	0	0
SP08	10058	10882	0	0	0
SP09	7138	10882	0	0	0
SP10	8257	10882	0	0	0
SP11	8869	10882	0	0	0
SP12	8903	10882	0	0	0
SP13	8128	10882	0	0	0
SP14	7535	10882	0	0	0
SP14 Q	7972	10992	0	0	0

(1) Action Level based on the average background plus 3,525 cpm (OpDCGL equivalent).

The on-site laboratory analyzed the fourteen (14) soil samples taken for non-parametric statistical testing using the on-site gamma spectroscopy system. A summary of the fourteen (14) samples collected for non-parametric statistical testing results is provided in Table 7-2. Gamma spectroscopy results revealed four (4) samples above MDC for Cs-137 and no samples above MDC for any other ROC. The concentration for Sr-90 was inferred based on

the ratio specified in Table 5-1. The complete gamma spectroscopy reports are presented in Attachment 7. The basic statistics for the systematic sample population is summarized in Table 7-3.

Table 7-2 - Summary of Gamma Spectroscopy Results for Soil Samples Comprising the Statistical Sample Population

Sample ID	Co-60 (pCi/g)	Cs-137 (pCi/g)	Eu-152 (pCi/g)	Eu-154 (pCi/g)	Sr-90 (pCi/g)
L1-SUB-DRS-FSGS-W01-SB	6.18E-02	6.27E-02	1.15E-01	2.01E-01	3.15E-02
L1-SUB-DRS-FSGS-W02-SB	7.15E-02	3.31E-02	7.01E-02	4.42E-06	1.66E-02
L1-SUB-DRS-FSGS-W03-SB	2.12E-02	6.37E-02	8.16E-02	2.77E-02	3.20E-02
L1-SUB-DRS-FSGS-W04-SB	4.28E-02	6.32E-02	0.00E+00	1.45E-02	3.17E-02
L1-SUB-DRS-FSGS-W05-SB	2.14E-02	4.23E-02	0.00E+00	4.18E-02	2.12E-02
L1-SUB-DRS-FSGS-W06-SB	4.67E-02	4.88E-02	1.72E-01	6.80E-02	2.45E-02
L1-SUB-DRS-FSGS-W07-SB	2.18E-02	9.49E-02	9.35E-03	1.91E-02	4.76E-02
L1-SUB-DRS-FSGS-W08-SB	3.67E-02	5.80E-02	1.08E-01	1.22E-01	2.91E-02
L1-SUB-DRS-FSGS-W09-SB	6.65E-02	6.83E-02	7.68E-02	0.00E+00	3.43E-02
L1-SUB-DRS-FSGS-W10-SB	5.79E-02	5.41E-02	8.93E-02	3.78E-02	2.72E-02
L1-SUB-DRS-FSGS-W11-SB	4.64E-02	3.20E-02	7.54E-02	7.91E-02	1.61E-02
L1-SUB-DRS-FSGS-W12-SB	4.51E-02	5.27E-02	4.38E-02	4.71E-02	2.65E-02
L1-SUB-DRS-FSGS-W13-SB	3.44E-02	4.70E-02	2.33E-02	5.95E-02	2.36E-02
L1-SUB-DRS-FSGS-W14-SB	6.45E-02	6.83E-02	5.72E-03	8.49E-03	3.43E-02

Note: Bold values indicate concentrations greater than MDC.

Table 7-3 - Basic Statistical Properties of Systematic Sample Population

ROC	Mean (pCi/g)	Median (pCi/g)	Max (pCi/g)	Min (pCi/g)	Std. Dev. (pCi/g)	BcDCGL (pCi/g)	Avg. SOF per ROC	Avg. Dose Per ROC
Co-60	4.56E-02	4.58E-02	7.15E-02	2.12E-02	0.0172	1.06E+01	0.0043	0.1076
Cs-137	5.64E-02	5.61E-02	9.49E-02	3.20E-02	0.0162	4.83E+01	0.0012	0.0292
Eu-152	6.22E-02	7.28E-02	1.72E-01	0.00E+00	0.0512	2.36E+01	0.0026	0.0659
Eu-154	5.19E-02	3.98E-02	2.01E-01	0.00E+00	0.0547	2.19E+01	0.0024	0.0592
Sr-90	2.83E-02	2.81E-02	4.76E-02	1.61E-02	0.0081	5.47E+03	0.0000	0.0001

The off-site laboratory, GEL Laboratories, processed the two (2) samples selected for HTD ROC analysis as specified in the survey design. Samples L1-SUB-DRS-FSGS-W12-SB and

L1-SUB-DRS-FSGS-W14-SB were selected. Only the HTD ROC Sr-90 was included in the analysis. All analyses met the required MDC.

Sr-90 was not detected in the off-site analysis of samples L1-SUB-DRS-FSGS-W12-SB and L1-SUB-DRS-FSGS-W14-SB. The results are provided in Table 7-4.

Table 7-4 - Off-Site Analysis Results for Sr-90

Sample ID	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
L1-SUB-DRS-FSGS-W12-SB	-0.022	0.076	0.134	No
L1-SUB-DRS-FSGS-W14-SB	0.103	0.092	0.153	No

The on-site laboratory analyzed the six (6) judgmental soil using the on-site gamma spectroscopy system. A summary of the analytical results for the judgmental soil samples is provided in Table 7-5. Gamma spectroscopy results revealed four (4) samples above MDC for Cs-137 and no samples above MDC for any other ROC. The concentration for Sr-90 was inferred based on the ratio specified in Table 5-1. The complete gamma spectroscopy reports are presented in Attachment 7.

Table 7-5 – Summary of Gamma Spectroscopy Results for Judgmental Soil Samples

Sample ID	Co-60 (pCi/g)	Cs-137 (pCi/g)	Eu-152 (pCi/g)	Eu-154 (pCi/g)	Sr-90 (pCi/g)
L1-SUB-DRS-FJGS-W01-SB	4.07E-02	2.91E-02	1.44E-01	2.07E-01	1.46E-02
L1-SUB-DRS-FJGS-W02-SB	4.53E-02	8.40E-02	0.00E+00	1.36E-01	4.22E-02
L1-SUB-DRS-FJGS-W03-SB	4.95E-02	2.87E-02	1.63E-02	1.98E-02	1.44E-02
L1-SUB-DRS-FJGS-W04-SB	6.23E-02	5.78E-02	8.80E-02	1.22E-01	2.90E-02
L1-SUB-DRS-FJGS-W05-SB	3.02E-02	2.99E-02	8.34E-02	2.67E-02	1.50E-02
L1-SUB-DRS-FJGS-W06-SB	6.05E-02	5.28E-02	0.00E+00	0.00E+00	2.65E-02

Note: Bold values indicate concentrations greater than MDC.

The implementation of survey specific QC measures included the collection of four (4) samples (L1-SUB-DRS-QJGS-W06-SB, L1-SUB-DRS-QSGS-W14-SB, L1-SUB-DRS-FJGS-W03-SB SPLIT, and L1-SUB-DRS-FSGS-W05-SB SPLIT) for split and duplicate sample analysis. The on-site laboratory analyzed the designated QC samples using the on-site gamma spectroscopy system. A summary of the analytical results for the QC samples is provided in Table 7-6. Gamma spectroscopy results revealed three (3) samples above MDC for Cs-137 and no samples above MDC for any other ROC. The concentration for Sr-90 was inferred based on the ratio specified in Table 5-1.

Table 7-6 - Summary of Gamma Spectroscopy Results for QC Soil Samples

Sample ID	Co-60 (pCi/g)	Cs-137 (pCi/g)	Eu-152 (pCi/g)	Eu-154 (pCi/g)	Sr-90 (pCi/g)
L1-SUB-DRS-QJGS-W06-SB	4.24E-02	5.14E-02	2.46E-01	0.00E+00	2.58E-02
L1-SUB-DRS-QSGS-W14-SB	3.05E-02	4.65E-02	9.33E-02	3.32E-02	2.33E-02
L1-SUB-DRS-FJGS-W03-SB SPLIT	9.89E-02	3.41E-02	1.56E-02	1.10E-01	1.71E-02
L1-SUB-DRS-FSGS-W05-SB SPLIT	3.07E-02	2.51E-02	1.61E-01	8.15E-02	1.26E-02

Note: Bold values indicate concentrations greater than MDC.

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

Equation 4

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

Where: C_n = concentration of radionuclide n

$DCGL_n$ = DCGL of radionuclide n .

The results of the unity rule calculation for the ROC in the systematic sample population for survey unit L1-SUB-DRS are provided in Table 7-7.

Table 7-7 - Sum-of-Fractions for Individual Soil Samples (Systematic and QC)

Sample ID	Fraction of Operational DCGL					SOF
	Co-60	Cs-137	Eu-152	Eu-154	Sr-90	
L1-SUB-DRS-FSGS-W01-SB	0.0161	0.0036	0.0135	0.0255	0.0000	0.0587
L1-SUB-DRS-FSGS-W02-SB	0.0187	0.0019	0.0082	0.0000	0.0000	0.0288
L1-SUB-DRS-FSGS-W03-SB	0.0055	0.0037	0.0096	0.0035	0.0000	0.0223
L1-SUB-DRS-FSGS-W04-SB	0.0112	0.0036	0.0000	0.0018	0.0000	0.0167
L1-SUB-DRS-FSGS-W05-SB	0.0056	0.0024	0.0000	0.0053	0.0000	0.0133
L1-SUB-DRS-FSGS-W06-SB	0.0122	0.0028	0.0202	0.0086	0.0000	0.0438
L1-SUB-DRS-FSGS-W07-SB	0.0057	0.0055	0.0011	0.0024	0.0000	0.0147

Sample ID	Fraction of Operational DCGL					SOF
	Co-60	Cs-137	Eu-152	Eu-154	Sr-90	
L1-SUB-DRS-FSGS-W08-SB	0.0096	0.0033	0.0127	0.0155	0.0000	0.0411
L1-SUB-DRS-FSGS-W09-SB	0.0174	0.0039	0.0090	0.0000	0.0000	0.0303
L1-SUB-DRS-FSGS-W10-SB	0.0151	0.0031	0.0105	0.0048	0.0000	0.0335
L1-SUB-DRS-FSGS-W11-SB	0.0121	0.0018	0.0089	0.0100	0.0000	0.0328
L1-SUB-DRS-FSGS-W12-SB	0.0118	0.0030	0.0051	0.0060	0.0000	0.0259
L1-SUB-DRS-FSGS-W13-SB	0.0090	0.0027	0.0027	0.0075	0.0000	0.0220
L1-SUB-DRS-FSGS-W14-SB	0.0168	0.0039	0.0007	0.0011	0.0000	0.0225
L1-SUB-DRS-QJGS-W06-SB	0.0111	0.0030	0.0289	0.0000	0.0000	0.0429
L1-SUB-DRS-QSGS-W14-SB	0.0080	0.0027	0.0110	0.0042	0.0000	0.0258
L1-SUB-DRS-FJGS-W03-SB SPLIT	0.0258	0.0020	0.0018	0.0139	0.0000	0.0436
L1-SUB-DRS-FSGS-W05-SB SPLIT	0.0080	0.0014	0.0189	0.0103	0.0000	0.0387

Systematic Measurements

Number of Systematic Measurements =	14
# of Systematic Measurements with SOF ≥ 1 =	0
# of Systematic Measurements with SOF > 0.1 (HTD Assessment) =	0
Max Individual Systematic Measurement SOF =	0.0587
Mean Systematic Measurement SOF =	0.0290

The results of the unity rule calculation for the ROC in the judgmental sample population for survey unit L1-SUB-DRS are provided in Table 7-8.

Table 7-8 - Sum-of-Fractions for Individual Soil Samples (Judgmental)

Sample ID	Fraction of Operational DCGL					SOF
	Co-60	Cs-137	Eu-152	Eu-154	Sr-90	
L1-SUB-DRS-FJGS-W01-SB	0.0106	0.0017	0.0169	0.0262	0.0000	0.0555
L1-SUB-DRS-FJGS-W02-SB	0.0118	0.0048	0.0000	0.0172	0.0000	0.0339
L1-SUB-DRS-FJGS-W03-SB	0.0129	0.0017	0.0019	0.0025	0.0000	0.0190
L1-SUB-DRS-FJGS-W04-SB	0.0163	0.0033	0.0103	0.0155	0.0000	0.0454
L1-SUB-DRS-FJGS-W05-SB	0.0079	0.0017	0.0098	0.0034	0.0000	0.0228
L1-SUB-DRS-FJGS-W06-SB	0.0158	0.0030	0.0000	0.0000	0.0000	0.0188

Judgmental Measurements

Number of Judgmental Measurements =	6
# of Judgmental Measurements with SOF ≥ 1 =	0
# of Judgmental Measurements with SOF > 0.1 (HTD Assessment) =	0
Max Individual Judgmental Measurement SOF =	0.0555

8. QUALITY CONTROL

The on-site laboratory processed four (4) split and duplicate samples (L1-SUB-DRS-QJGS-W06-SB, L1-SUB-DRS-QSGS-W14-SB, L1-SUB-DRS-FJGS-W03-SB SPLIT, and L1-SUB-DRS-FSGS-W05-SB SPLIT) using gamma spectroscopy analysis. The data was evaluated using USNRC acceptance criteria specified in Inspection Procedure No. 84750, *Radioactive Waste Treatment, and Effluent and Environmental Monitoring* (Reference 16). There was acceptable agreement between field split and duplicate results. Refer to Attachment 4 for data and quality control analysis results.

9. INVESTIGATIONS AND RESULTS

No investigations were performed during the performance or analyses of the survey.

10. REMEDIATION AND RESULTS

The purpose of the excavation of the west portion of survey unit L1-010-104 was to remove the RCA roadway, rail lines, storm drains, HPSW lines, LPSW lines, and well water lines. The purpose of the excavation was not to support removal of contaminated subsurface soil.

11. CHANGES FROM THE FINAL STATUS SURVEY PLAN

There were no addendums to the FSS plan.

12. DATA QUALITY ASSESSMENT (DQA)

The DQO sample design and data were reviewed in accordance with LC-FS-PR-008, *Final Status Survey Data Assessment* (Reference 17) for completeness and consistency. Documentation was complete and legible. Surveys and the collection of samples 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 6).

The analytical results indicated that all samples were less than a SOF of one (1) when compared to the OpDCGLs. Additionally, the maximum activity for each ROC did not exceed 10% of their respective OpDCGLs.

Although MARSSIM states that the Sign Test need not be performed in the instance that no measurements surpass the DCGL, the test was conducted to demonstrate coherence to the statistical principles of the DQO process. The Sign Test was performed on the data and compared to the original assumptions of the DQOs. The evaluation of the Sign Test results clearly demonstrates that the survey unit passes the unrestricted release criteria, thus, the null hypothesis is rejected. The results of the Sign Test are provided in Attachment 3.

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 mean of all identified isotopes are less than the Consultation Triggers for Residential Soil Concentration depicted in Table H.1 of NUREG 1757, Vol.1, Rev. 2 (MOU Table 1). The full table is included in Attachment 5 of this release record.

The data for Cs-137 is presented graphically through a frequency plot and quantile plot. All graphical presentations are provided in Attachment 6.

13. ANOMALIES

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

14. CONCLUSION

Survey unit L1-SUB-DRS has met the DQOs of the FSS plan. The ALARA criteria as specified in Chapter 4 of the LTP were achieved. The Elevated Measurement Comparison for soils was not applicable and remediation was not required.

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 systematic ROC concentration values exceeds the OpDCGLs; therefore, in accordance with LTP Section 5.11, the survey unit meets the release criteria.

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 soil in survey unit L1-SUB-DRS is 0.2620 mrem/yr TEDE, based on the average concentration of the ROC in samples used for non-parametric statistical sampling.

Survey unit L1-SUB-DRS is acceptable for unrestricted release.

15. REFERENCES

1. LC-FS-PR-009, Final Status Survey Data Reporting
2. *La Crosse Boiling Water Reactor License Termination Plan (LTP)*
3. LC-FS-PR-002, *Final Status Survey Package Development*
4. NUREG-1575, Revision 1, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*
5. *La Crosse Boiling Water Reactor Historical Site Assessment (HSA)*
6. RS-TD-313196-004, *LACBWR Soil DCGL, Basement Concrete DCGL, and Buried Pipe DCGL*
7. RS-TD-313196-001, *Radionuclides of Concern during LACBWR Decommissioning*
8. NUREG-1757, Volume 2, Revision 1, *Consolidated Decommissioning Guidance – Characterization, Survey, and Determination of Radiological Criteria, Final Report*
9. LC-FS-TSD-002, *Operational Derived Concentration Guideline Levels for Final Status Survey*
10. LC-QA-PN-001, *Final Status Survey Quality Assurance Project Plan (QAPP)*
11. LC-FS-PR-012, *Chain of Custody Protocol*
12. LC-FS-PR-004, *Sample Media Collection for Site Characterization and Final Status Survey*
13. LC-FS-PR-005, *Sample Media Preparation for Site Characterization and Final Status Survey*

- 14. LC-FS-PR-001, *Sample Storage*
- 15. RS-TD-313196-006, *Ludlum Model 44-10 Detector Sensitivity*
- 16. USNRC Inspection Procedure No. 84750, *Radioactive Waste Treatment, and Effluent and Environmental Monitoring*
- 17. LC-FS-PR-008, *Final Status Survey Data Assessment*

16. ATTACHMENTS

Attachment 1 – Figures and Maps

Attachment 2 – Scan Data

Attachment 3 – Sign Test

Attachment 4 – Quality Control Assessment

Attachment 5 – Consultation Triggers for Residential Soil Concentrations

Attachment 6 – Graphical Presentations

Attachment 7 – Sample Analytical Reports

Attachment 8 – GEL Laboratories Analytical Reports

ATTACHMENT 1

FIGURES AND MAPS

Figure 16-1 – L1-SUB-DRS Scan and Systematic Sample Locations Map

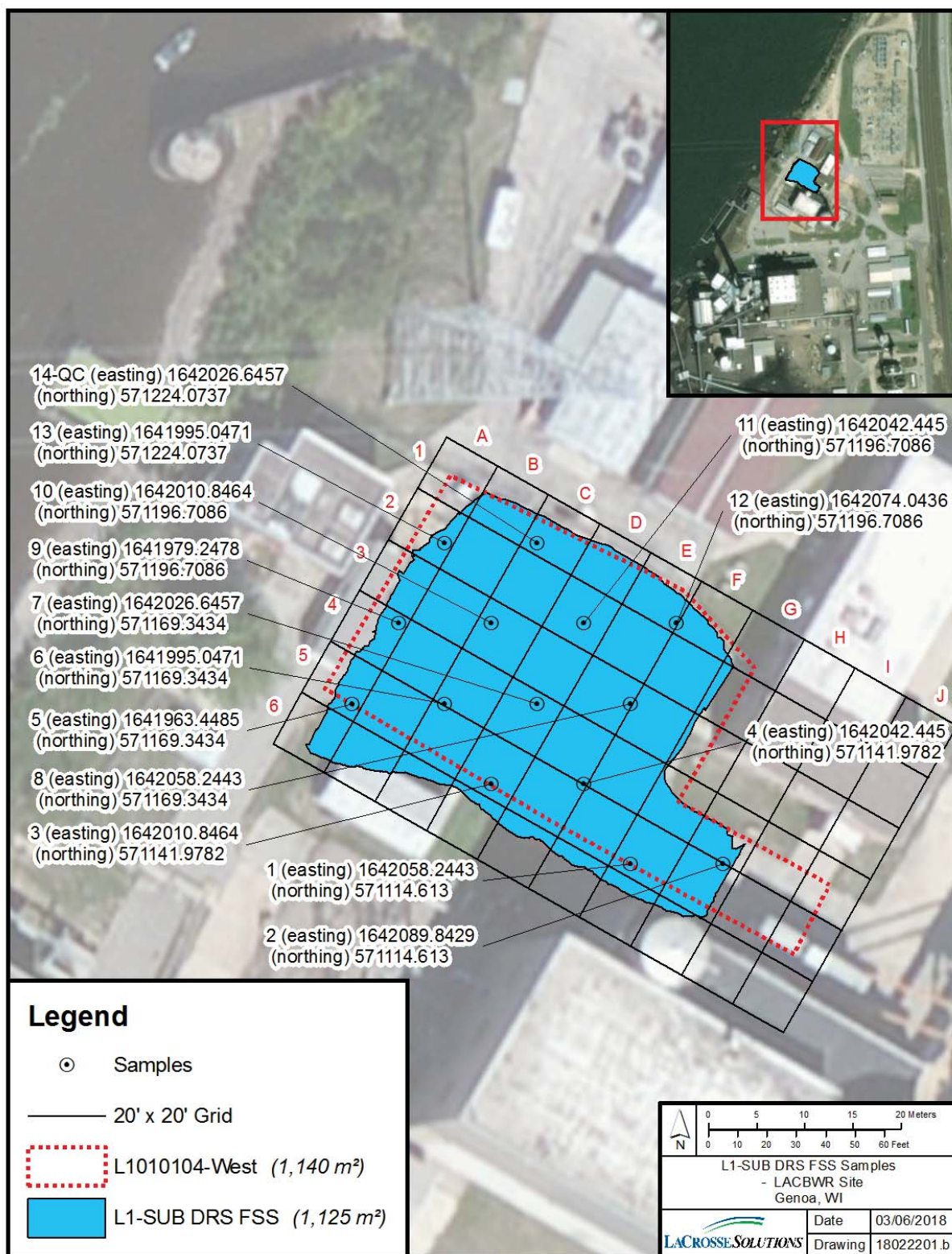
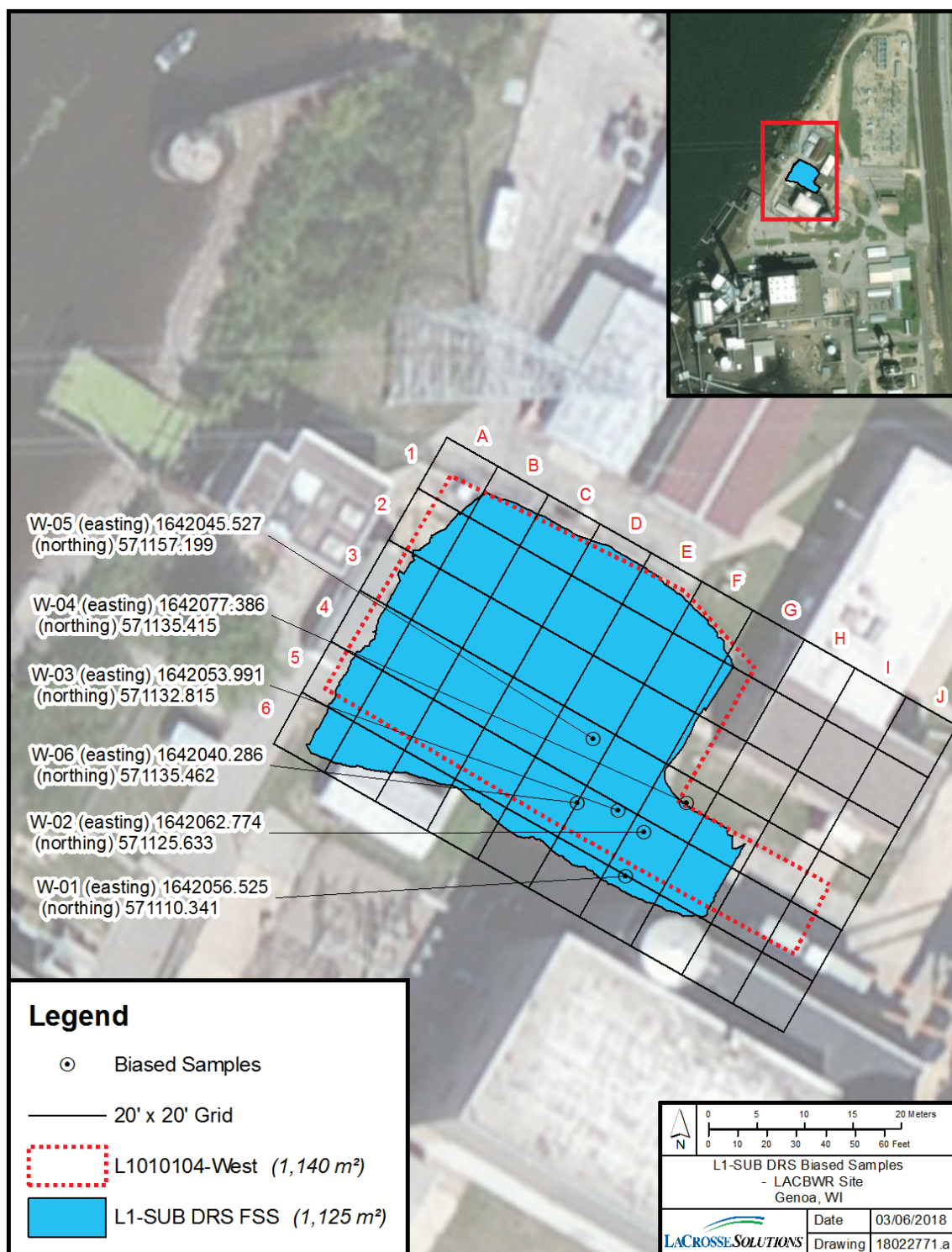


Figure 16-2 – L1-SUB-DRS Judgmental Sample Locations



ATTACHMENT 2

SCAN DATA

Table 16-1 – L1-SUB-DRS Complete Scan Data

Detector Type	Detector ID	M2350-1 ID	Location	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	162398	126195	A01	9031	8298	11823	No
44-10	162398	126195	A02	9832	8298	11823	No
44-10	162398	126195	A03	8591	8298	11823	No
44-10	162398	126195	A04	8781	8298	11823	No
44-10	357776	325246	A05	8266	7808	11333	No
44-10	162398	126195	A06	9868	8298	11823	No
44-10	162398	126195	B01	9123	8298	11823	No
44-10	357776	325246	B02	8992	7808	11333	No
44-10	162398	126195	B03	9417	8298	11823	No
44-10	162398	126195	B04	8337	11267	14792	No
44-10	357776	325246	B05	8696	7808	11333	No
44-10	357776	325246	B06	8436	7808	11333	No
44-10	162398	126195	C01	9440	8298	11823	No
44-10	357776	325246	C02	9220	7808	11333	No
44-10	162398	126195	C03	10016	11267	14792	No
44-10	357776	325246	C03 Q	8780	7470	10995	No
44-10	162398	126195	C04	9993	11267	14792	No
44-10	357776	325246	C04 Q	9109	7470	10995	No
44-10	162398	126195	C05	9763	8056	11581	No
44-10	162398	126195	C06	8754	8056	11581	No
44-10	162398	126195	D01	10135	8298	11823	No
44-10	357776	325246	D02	9636	7808	11333	No
44-10	357776	325246	D03	10615	7808	11333	No
44-10	357776	325246	D04	11111	7808	11333	No
44-10	162398	126195	D05	9945	8056	11581	No
44-10	357776	325246	D06	9501	7808	11333	No
44-10	162398	126195	E01	9760	8298	11823	No
44-10	162398	126195	E02	10379	8298	11823	No
44-10	162398	126195	E03	12408	11267	14792	No
44-10	162398	126195	E04	12785	11267	14792	No
44-10	162398	126195	E05	12285	11267	14792	No
44-10	357776	325246	E06	10463	11975	15672	No

FSS RELEASE RECORD
L1-010-104 WEST EXCAVATION
SURVEY UNIT L1-SUB-DRS



Detector Type	Detector ID	M2350-1 ID	Location	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	162398	126195	F01	10411	8298	11823	No
44-10	162398	126195	F02	11591	8298	11823	No
44-10	162398	126195	F03	11151	11267	14792	No
44-10	357776	325246	F04	11554	11975	15672	No
44-10	357776	325246	F05	12974	11975	15672	No
44-10	357776	325246	F06	11224	11975	15672	No
44-10	162398	126195	G01	9366	8298	11823	No
44-10	162398	126195	G02	9295	8298	11823	No
44-10	162398	126195	G03	11354	11267	14792	No
44-10	357776	325246	G04	12805	10225	13750	No
44-10	357776	325246	G05	13752	11975	15672	No
44-10	357776	325246	G06	13422	11975	15672	No
44-10	357776	325246	H04	10908	10225	13750	No
44-10	357776	325246	H05	11219	10225	13750	No
44-10	357776	325246	H06	11781	11975	15672	No
44-10	357776	325246	J SP01	9923	8835	12360	No
44-10	357776	325246	J SP01	10414	8835	12360	No
44-10	357776	325246	J SP02	10546	8835	12360	No
44-10	357776	325246	J SP02	10136	8835	12360	No
44-10	357776	325246	J SP03	10684	8835	12360	No
44-10	357776	325246	J SP03	9733	8835	12360	No
44-10	357776	325246	J SP04	9898	8835	12360	No
44-10	357776	325246	J SP04	10152	8835	12360	No
44-10	357776	325246	J SP05	8423	8835	12360	No
44-10	357776	325246	J SP05	8703	8835	12360	No
44-10	357776	325246	J SP06	9017	8835	12360	No
44-10	357776	325246	J SP06	8347	8835	12360	No
44-10	162398	126195	J SP06 Q	9256	8056	11581	No
44-10	162398	126195	J SP06 Q	9920	8056	11581	No
44-10	357776	325246	SP01	10357	10173	13698	No
44-10	357776	325246	SP01	11044	10173	13698	No
44-10	357776	325246	SP02	9042	10173	13698	No
44-10	357776	325246	SP02	8595	10173	13698	No

FSS RELEASE RECORD
L1-010-104 WEST EXCAVATION
SURVEY UNIT L1-SUB-DRS



Detector Type	Detector ID	M2350-1 ID	Location	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	357776	325246	SP03	8824	7357	10882	No
44-10	357776	325246	SP03	9031	7357	10882	No
44-10	357776	325246	SP04	9340	7357	10882	No
44-10	357776	325246	SP04	9526	7357	10882	No
44-10	357776	325246	SP05	7169	7357	10882	No
44-10	357776	325246	SP05	7256	7357	10882	No
44-10	357776	325246	SP06	8805	7357	10882	No
44-10	357776	325246	SP06	8278	7357	10882	No
44-10	357776	325246	SP07	8883	7357	10882	No
44-10	357776	325246	SP07	7804	7357	10882	No
44-10	357776	325246	SP08	10058	7357	10882	No
44-10	357776	325246	SP08	8517	7357	10882	No
44-10	357776	325246	SP09	7138	7357	10882	No
44-10	357776	325246	SP09	6920	7357	10882	No
44-10	357776	325246	SP10	8257	7357	10882	No
44-10	357776	325246	SP10	8043	7357	10882	No
44-10	357776	325246	SP11	8869	7357	10882	No
44-10	357776	325246	SP11	8078	7357	10882	No
44-10	357776	325246	SP12	8903	7357	10882	No
44-10	357776	325246	SP12	8201	7357	10882	No
44-10	357776	325246	SP13	8128	7357	10882	No
44-10	357776	325246	SP13	7706	7357	10882	No
44-10	357776	325246	SP14	7535	7357	10882	No
44-10	357776	325246	SP14	7489	7357	10882	No
44-10	3577783	325261	SP14 Q	7972	7467	10992	No
44-10	3577783	325261	SP14 Q	7739	7467	10992	No

ATTACHMENT 3

SIGN TEST

Table 16-2 – L1-SUB-DRS Sign Test

#	SOF (W _s)	1-W _s	Sign
1	0.0587	0.94	+1
2	0.0288	0.97	+1
3	0.0223	0.98	+1
4	0.0167	0.98	+1
5	0.0133	0.99	+1
6	0.0438	0.96	+1
7	0.0147	0.99	+1
8	0.0411	0.96	+1
9	0.0303	0.97	+1
10	0.0335	0.97	+1
11	0.0328	0.97	+1
12	0.0259	0.97	+1
13	0.0220	0.98	+1
14	0.0225	0.98	+1

Number of positive differences (S+) 14

Critical Value 10

Survey Unit Meets the Acceptance
Criteria

ATTACHMENT 4

QUALITY CONTROL ASSESSMENT

Table 16-3 – L1-SUB-DRS QC Assessment

STANDARD						COMPARISON																		
Sample ID	Radionuclide	Activity Value	Standard Error	Resolution	Agreement Range (Low to High)	Sample ID	Activity Value	Standard Error	Comparison Ratio	Acceptable (Y/N)														
L1-SUB-DRS-FJGS-W06-SB	K-40*	5.39E+00	6.69E-01	8.06	0.6	L1-SUB-DRS-QJGS-W06-SB	5.41E+00	6.66E-01	1.00	Y														
L1-SUB-DRS-FJGS-W14-SB	Cs-137	6.83E-02	2.85E-02	2.40	0.4	L1-SUB-DRS-QSGS-W14-SB	4.65E-02	2.74E-02	0.68	Y														
L1-SUB-DRS-FJGS-W03-SB	Cs-137	2.87E-02	2.72E-02	1.06	0.4	L1-SUB-DRS-FJGS-W03-SB SPLIT	3.41E-02	3.60E-02	1.19	Y														
L1-SUB-DRS-FJGS-W05-SB	Cs-137	2.99E-02	2.85E-02	1.05	0.4	L1-SUB-DRS-FJGS-W05-SB SPLIT	2.51E-02	2.61E-02	0.84	Y														
Comments/Corrective Actions: * K-40 was substituted in the comparison, because Cs-137 was not identified in either sample.						Table is provided to show acceptance criteria used to assess split samples.																		
						<table><tr><td>Resolution</td><td>Acceptable Ratio</td></tr><tr><td><4</td><td>0.4-2.5</td></tr><tr><td>4-7</td><td>0.5-2.0</td></tr><tr><td>8-15</td><td>0.6-1.66</td></tr><tr><td>16-50</td><td>0.75-1.33</td></tr><tr><td>51-200</td><td>0.80-1.25</td></tr><tr><td>>200</td><td>0.85-1.18</td></tr></table>					Resolution	Acceptable Ratio	<4	0.4-2.5	4-7	0.5-2.0	8-15	0.6-1.66	16-50	0.75-1.33	51-200	0.80-1.25	>200	0.85-1.18
Resolution	Acceptable Ratio																							
<4	0.4-2.5																							
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																							

ATTACHMENT 5

CONSULTATION TRIGGERS FOR RESIDENTIAL SOIL CONCENTRATION

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

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

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

ATTACHMENT 6

GRAPHICAL PRESENTATIONS

Figure 16-3 – Quantile Plot for Cs-137 Concentration

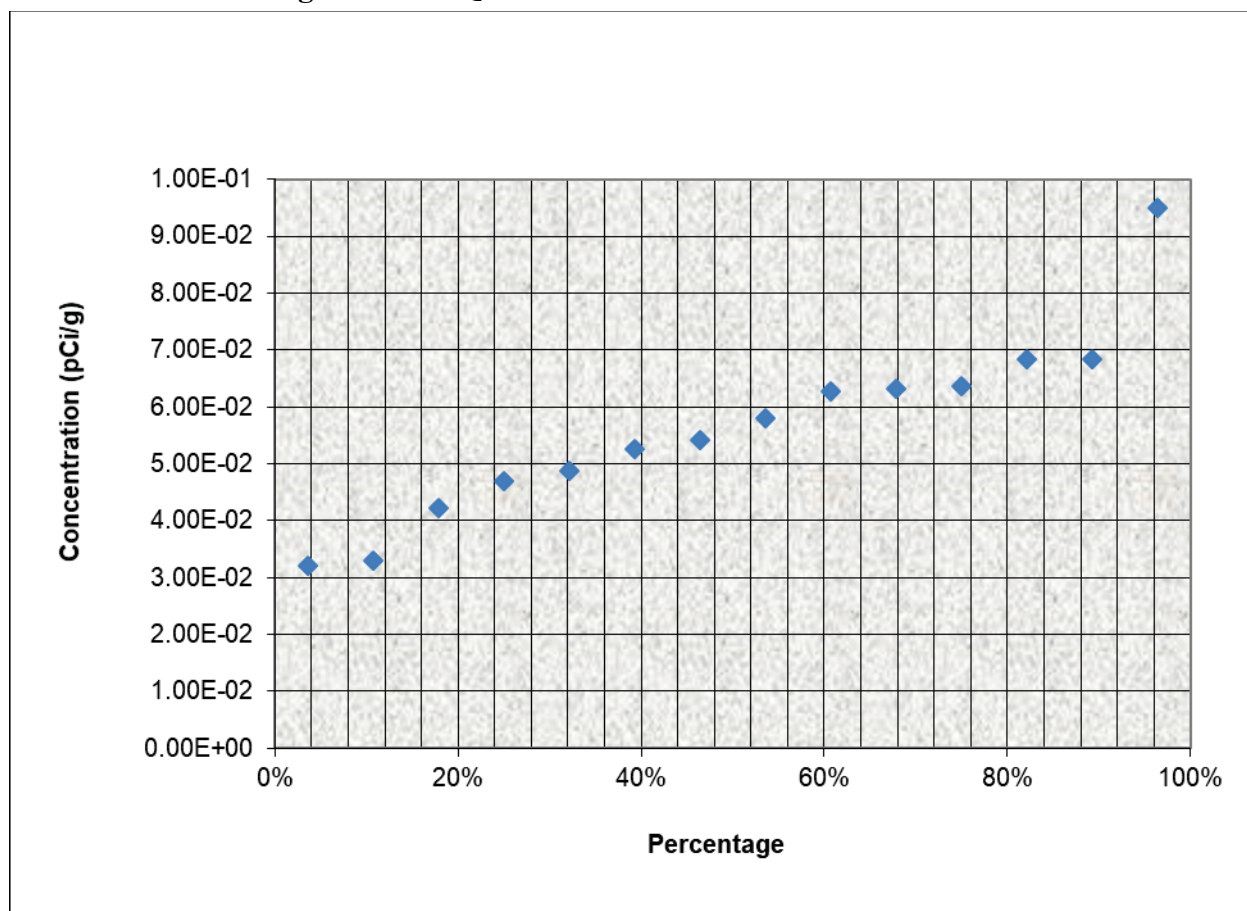


Figure 16-4 - Histogram for Cs-137 Concentration

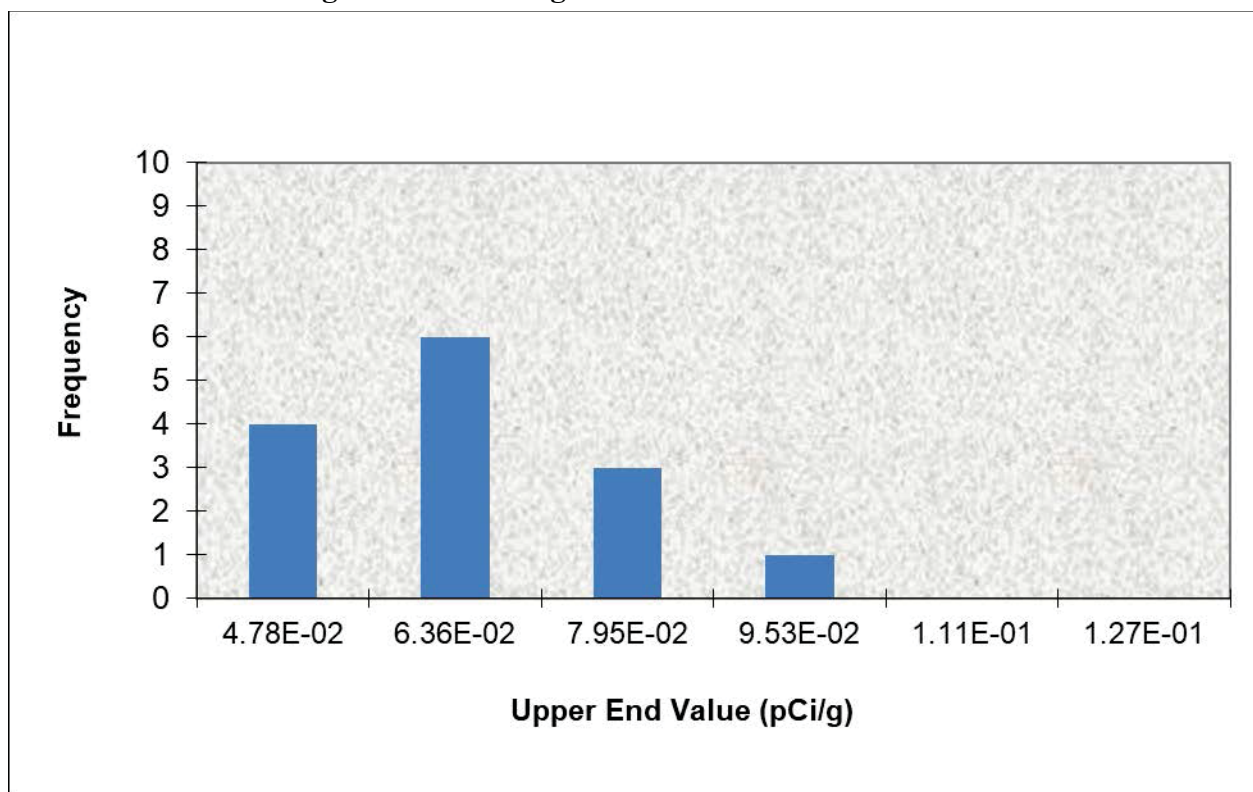
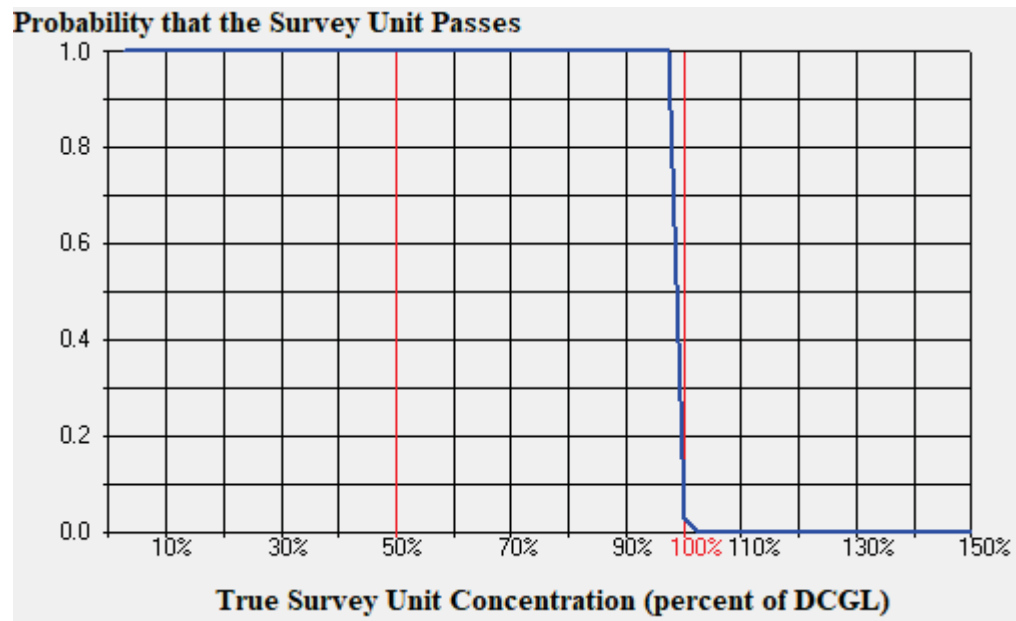


Figure 16-5 - Retrospective Power Curve for L1-SUB-DRS



ATTACHMENT 7

SAMPLE ANALYTICAL REPORTS

Analysis Report for L1-SUB-DRS-FSGS-W01-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-DRS-FSGS-W01-SB
Sample Description	: L1-010-104 WEST
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 8.381E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 2/27/2018 10:02:00AM
Acquisition Started	: 2/28/2018 8:45:38AM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 3600.0 seconds
Real Time	: 3610.6 seconds
Dead Time	: 0.29 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 5341

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 12:57:58PM

Peak Analysis From Channel : 100

Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-DRS-FSGS-W01-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.32	147 -	160	153.18	1.96E+02	59.39	1.32E+03	3.06
F	2	238.56	474 -	485	477.60	3.11E+02	46.16	5.78E+02	1.68
F	3	294.75	584 -	597	589.95	7.52E+01	30.81	4.85E+02	1.75
F	4	351.81	698 -	712	704.04	1.86E+02	35.21	3.36E+02	1.91
F	5	583.13	1162 -	1173	1166.60	7.72E+01	22.67	1.19E+02	1.84
F	6	609.09	1214 -	1225	1218.51	1.39E+02	28.09	1.31E+02	2.03
F	7	910.88	1815 -	1831	1821.99	5.20E+01	19.16	1.05E+02	2.34
F	8	1119.98	2235 -	2244	2240.14	1.98E+01	11.64	6.81E+01	0.79
F	9	1460.44	2912 -	2930	2921.00	4.97E+02	44.87	1.84E+01	2.70

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 12:57:58PM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	76.32	1.96E+02	59.39			1.96E+02	5.94E+01
F	2	238.56	3.11E+02	46.16			3.11E+02	4.62E+01
F	3	294.75	7.52E+01	30.81			7.52E+01	3.08E+01
F	4	351.81	1.86E+02	35.21	8.36E+01	3.72E+01	1.03E+02	5.12E+01
F	5	583.13	7.72E+01	22.67			7.72E+01	2.27E+01
F	6	609.09	1.39E+02	28.09	4.12E+01	2.42E+01	9.79E+01	3.71E+01
F	7	910.88	5.20E+01	19.16			5.20E+01	1.92E+01
F	8	1119.98	1.98E+01	11.64			1.98E+01	1.16E+01
F	9	1460.44	4.97E+02	44.87	5.63E+01	1.71E+01	4.40E+02	4.80E+01

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-FSGS-W01-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.75 *	10.67	5.72E+00	7.00E-01
PB-212	0.97	77.11 *	17.50	3.34E-01	1.04E-01
		238.63 *	44.60	1.91E-01	3.01E-02
BI-214	0.57	609.31 *	46.30	1.35E-01	5.15E-02
		1120.29 *	15.10	1.45E-01	8.51E-02
		1238.11	5.94		
		1377.67	4.11		
		1407.98	2.48		
		1509.19	2.19		
		1764.49	15.80		
PB-214	0.97	77.11 *	10.70	5.47E-01	1.70E-01
		295.21 *	19.20	1.28E-01	5.29E-02
		351.92 *	37.20	1.06E-01	5.31E-02

* = 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	0.985	5.72E+00	7.00E-01	
PB-212	0.972	1.96E-01	2.89E-02	
BI-214	0.578	1.37E-01	4.41E-02	

Analysis Report for L1-SUB-DRS-FSGS-W01-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-214	0.973	1.22E-01	3.66E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-FSGS-W01-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 12:57:58PM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	5	583.13	2.14554E-02		
F	7	910.88	1.44396E-02		
				Tol.	AC-228 PA-228

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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.72E+00	5.76E-01
+	AR-41	1293.64		99.16	-2.35E+02	3.21E+02
+	CO-60	1173.22		100.00	6.18E-02	5.88E-02
		1332.49		100.00	4.78E-02	5.88E-02
+	KR-85	513.99		0.43	1.33E+01	1.02E+01
+	Y-88	898.04		93.70	1.63E-02	3.42E-02
		1836.06		99.20	-7.72E-03	5.07E-02
+	NB-94	702.63		100.00	2.40E-03	3.42E-02
		871.10		100.00	-4.63E-02	4.19E-02
+	I-131	284.30		6.06	-3.54E-01	4.27E-02
		364.48		81.20	1.87E-03	5.68E-01
		636.97		7.27	-2.12E-01	4.34E-02
+	CS-134	604.70		97.60	-5.48E-02	6.23E-01
		795.84		85.40	-1.03E-03	5.41E-02
						5.14E-02

Analysis Report for L1-SUB-DRS-FSGS-W01-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-137	661.65	85.12	6.27E-02	5.91E-02	5.91E-02
+	CE-144	80.12	1.36	-1.62E+00	2.70E-01	3.41E+00
		133.51	11.09	-3.86E-02		2.70E-01
+	EU-152	121.78	28.40	-2.70E-02	1.06E-01	1.06E-01
		344.28	26.60	1.15E-01		1.44E-01
		1408.00	20.74	8.22E-02		2.22E-01
+	EU-154	123.07	40.40	-1.14E-03	7.51E-02	7.51E-02
		723.30	19.70	2.01E-01		2.27E-01
		1274.51	35.50	-5.39E-02		1.59E-01
+	EU-155	86.54	32.80	-1.63E-02	1.22E-01	1.22E-01
		105.31	21.80	-8.31E-02		1.46E-01
+	BI-214	609.31	*	46.30	8.93E-02	8.93E-02
		1120.29	*	15.10		2.31E-01
		1238.11		5.94		1.07E+00
		1377.67		4.11		1.05E+00
		1407.98		2.48		1.86E+00
		1509.19		2.19		1.75E+00
		1764.49		15.80		3.23E-01
+	PB-214	77.11	*	10.70	1.05E-01	4.00E-01
		295.21	*	19.20		1.50E-01
		351.92	*	37.20		1.05E-01
+	PA-228	89.95		22.00	3.90E-01	2.17E-01
		93.35		35.00		2.17E-01
		105.00		16.30		4.03E-01
		129.22		2.97		2.13E+00
		338.32		5.30		1.39E+00
		463.00		13.80		5.76E-01
		911.23		16.70		6.83E-01
+	AM-241	59.54	36.30	-6.64E-02	2.20E-01	2.20E-01
+	CM-243	103.76	23.00	-1.01E-01	1.39E-01	1.39E-01
		228.18	10.60	-2.14E-01		2.85E-01
		277.60	14.00	-1.82E-01		2.33E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

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

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

Analysis Report for L1-SUB-DRS-FSGS-W02-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-DRS-FSGS-W02-SB
Sample Description	: L1-010-104 WEST PACKAGE: L1-SUB-DRS
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 8.315E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 2/27/2018 9:58:00AM
Acquisition Started	: 2/28/2018 4:22:12PM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 3600.0 seconds
Real Time	: 3610.7 seconds
Dead Time	: 0.30 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 5343

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 2:21:31PM

Peak Analysis From Channel : 100

Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-DRS-FSGS-W02-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.71	472 -	485	477.89	3.14E+02	45.75	5.72E+02	1.85
F	2	295.27	585 -	595	590.99	8.32E+01	30.50	3.43E+02	1.71
F	3	338.12	673 -	680	676.68	5.42E+01	24.55	2.00E+02	1.45
F	4	351.88	695 -	710	704.19	1.96E+02	34.54	3.15E+02	1.72
F	5	510.21	1012 -	1026	1020.79	7.60E+01	25.55	1.68E+02	2.72
F	6	582.95	1160 -	1172	1166.23	7.09E+01	20.50	1.13E+02	1.41
F	7	609.15	1213 -	1225	1218.63	1.08E+02	24.76	1.06E+02	1.83
F	8	661.37	1315 -	1329	1323.05	1.07E+02	25.01	1.28E+02	1.98
F	9	859.91	1716 -	1724	1720.08	2.06E+01	12.54	4.50E+01	1.35
F	10	911.39	1817 -	1829	1823.03	5.34E+01	19.67	9.20E+01	2.10
F	11	1377.79	2751 -	2760	2755.70	1.40E+01	8.69	1.29E+01	1.21
F	12	1460.70	2913 -	2931	2921.51	5.68E+02	48.65	2.33E+01	2.63

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 2:21:31PM

Env. Background File : C:\Canberra\Apex\Root\Daairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	238.71	3.14E+02	45.75			3.14E+02	4.57E+01
F	2	295.27	8.32E+01	30.50			8.32E+01	3.05E+01
F	3	338.12	5.42E+01	24.55			5.42E+01	2.45E+01
F	4	351.88	1.96E+02	34.54	8.36E+01	3.72E+01	1.12E+02	5.08E+01
F	5	510.21	7.60E+01	25.55			7.60E+01	2.55E+01
F	6	582.95	7.09E+01	20.50			7.09E+01	2.05E+01
F	7	609.15	1.08E+02	24.76	4.12E+01	2.42E+01	6.65E+01	3.46E+01
F	8	661.37	1.07E+02	25.01	6.61E+01	2.54E+01	4.07E+01	3.56E+01
F	9	859.91	2.06E+01	12.54			2.06E+01	1.25E+01
F	10	911.39	5.34E+01	19.67			5.34E+01	1.97E+01
F	11	1377.79	1.40E+01	8.69			1.40E+01	8.69E+00
F	12	1460.70	5.68E+02	48.65	5.63E+01	1.71E+01	5.12E+02	5.16E+01

Analysis Report for L1-SUB-DRS-FSGS-W02-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Daityland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.75	*	10.67	6.71E+00	7.72E-01
CS-137	0.98	661.65	*	85.12	3.31E-02	2.90E-02
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	1.95E-01	3.01E-02
BI-214	0.40	609.31	*	46.30	9.21E-02	4.82E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67	*	4.11	4.52E-01	2.82E-01
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.72	77.11		10.70		
		295.21	*	19.20	1.43E-01	5.30E-02
		351.92	*	37.20	1.16E-01	5.31E-02
AC-228	0.30	209.28		4.40		
		338.32	*	11.40	1.77E-01	8.07E-02
		794.70		4.60		
		911.60	*	27.70	1.78E-01	6.61E-02
		964.60		5.20		
		969.11		16.60		

* = 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 L1-SUB-DRS-FSGS-W02-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	1.000	6.71E+00	7.72E-01	
CS-137	0.987	3.31E-02	2.90E-02	
PB-212	0.559	1.95E-01	3.01E-02	
BI-214	0.406	1.02E-01	4.75E-02	
PB-214	0.721	1.30E-01	3.75E-02	
AC-228	0.307	1.78E-01	5.11E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-FSGS-W02-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 2:21:31PM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	5	510.21	2.11147E-02		
F	6	582.95	1.96982E-02		
F	9	859.91	5.72327E-03		

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\Daq\land_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	6.71E+00	5.95E-01	5.95E-01
+	AR-41	1293.64		99.16	-2.60E+03	6.28E+03	6.28E+03
+	CO-60	1173.22		100.00	4.87E-02	6.02E-02	6.31E-02
		1332.49		100.00	7.15E-02		6.02E-02
+	KR-85	513.99		0.43	-4.00E+00	1.02E+01	1.02E+01
+	Y-88	898.04		93.70	1.30E-03	4.04E-02	4.88E-02
		1836.06		99.20	1.18E-02		4.04E-02
+	NB-94	702.63		100.00	2.31E-03	4.16E-02	4.16E-02
		871.10		100.00	-2.16E-02		4.37E-02
+	I-131	284.30		6.06	2.89E-01	4.45E-02	5.85E-01
		364.48		81.20	-1.77E-02		4.45E-02
		636.97		7.27	-5.05E-01		5.87E-01
+	CS-134	604.70		97.60	-1.12E-02	4.89E-02	4.89E-02
		795.84		85.40	2.78E-04		5.40E-02
+	CS-137	661.65	*	85.12	3.31E-02	5.64E-02	5.64E-02

Analysis Report for L1-SUB-DRS-FSGS-W02-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CE-144	80.12	1.36	3.60E+00	2.78E-01	3.40E+00
		133.51	11.09	1.12E-01		2.78E-01
+	EU-152	121.78	28.40	-1.10E-01	1.03E-01	1.03E-01
		344.28	26.60	-7.03E-02		1.37E-01
		1408.00	20.74	7.01E-02		2.22E-01
+	EU-154	123.07	40.40	4.42E-06	7.36E-02	7.36E-02
		723.30	19.70	2.07E-01		2.29E-01
		1274.51	35.50	2.51E-02		1.61E-01
+	EU-155	86.54	32.80	-3.54E-02	1.17E-01	1.17E-01
		105.31	21.80	-3.08E-02		1.42E-01
+	BI-214	609.31	* 46.30	9.21E-02	8.62E-02	8.62E-02
		1120.29	15.10	2.51E-01		4.32E-01
		1238.11	5.94	-5.71E-01		1.17E+00
		1377.67	* 4.11	4.52E-01		5.00E-01
		1407.98	2.48	5.86E-01		1.85E+00
		1509.19	2.19	-1.21E+00		1.67E+00
		1764.49	15.80	2.22E-01		3.21E-01
+	PB-214	77.11	10.70	4.76E-01	1.06E-01	4.63E-01
		295.21	* 19.20	1.43E-01		1.19E-01
		351.92	* 37.20	1.16E-01		1.06E-01
+	PA-228	89.95	22.00	4.76E-01	2.65E-01	4.44E-01
		93.35	35.00	1.47E-01		2.65E-01
		105.00	16.30	-2.55E-01		5.01E-01
		129.22	2.97	1.19E+00		2.69E+00
		338.32	5.30	2.23E+00		1.78E+00
		463.00	13.80	2.32E-01		7.21E-01
		911.23	16.70	1.42E+00		9.12E-01
+	AM-241	59.54	36.30	1.66E-01	2.18E-01	2.18E-01
+	CM-243	103.76	23.00	9.77E-03	1.37E-01	1.37E-01
		228.18	10.60	3.59E-01		2.97E-01
		277.60	14.00	1.66E-01		2.37E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

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

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

Analysis Report for L1-SUB-DRS-FSGS-W03-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-DRS-FSGS-W03-SB
Sample Description	: L1-010-104 WEST PACKAGE: L1-SUB-DRS
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 9.094E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 2/27/2018 9:31:00AM
Acquisition Started	: 2/28/2018 12:06:37PM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 3600.0 seconds
Real Time	: 3610.5 seconds
Dead Time	: 0.29 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 5344

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 2:23:28PM

Peak Analysis From Channel : 100

Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-DRS-FSGS-W03-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.66	473 -	485	477.81	2.93E+02	45.86	5.80E+02	1.92
F	2	295.11	583 -	595	590.68	8.63E+01	27.95	4.02E+02	1.28
F	3	351.86	699 -	712	704.15	1.63E+02	33.80	3.09E+02	1.93
F	4	583.18	1160 -	1175	1166.70	1.21E+02	26.43	1.34E+02	2.26
F	5	609.32	1214 -	1224	1218.97	8.82E+01	24.64	1.21E+02	2.09
F	6	911.18	1817 -	1829	1822.61	6.50E+01	19.79	7.05E+01	2.04
F	7	1460.61	2913 -	2930	2921.33	4.80E+02	44.47	2.70E+01	2.58

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 2:23:28PM

Env. Background File : C:\Canberra\Apex\Root\Daityland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	238.66	2.93E+02	45.86			2.93E+02	4.59E+01
F	2	295.11	8.63E+01	27.95			8.63E+01	2.79E+01
F	3	351.86	1.63E+02	33.80	8.36E+01	3.72E+01	7.90E+01	5.03E+01
F	4	583.18	1.21E+02	26.43			1.21E+02	2.64E+01
F	5	609.32	8.82E+01	24.64	4.12E+01	2.42E+01	4.71E+01	3.45E+01
F	6	911.18	6.50E+01	19.79			6.50E+01	1.98E+01
F	7	1460.61	4.80E+02	44.47	5.63E+01	1.71E+01	4.24E+02	4.77E+01

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-FSGS-W03-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75 *	10.67	5.07E+00	6.37E-01
PB-212	0.56	77.11	17.50		
		238.63 *	44.60	1.66E-01	2.74E-02
BI-214	0.35	609.31 *	46.30	5.96E-02	4.39E-02
		1120.29	15.10		
		1238.11	5.94		
		1377.67	4.11		
		1407.98	2.48		
		1509.19	2.19		
		1764.49	15.80		
PB-214	0.72	77.11	10.70		
		295.21 *	19.20	1.36E-01	4.45E-02
		351.92 *	37.20	7.50E-02	4.79E-02

* = 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	0.997	5.07E+00	6.37E-01	
PB-212	0.560	1.66E-01	2.74E-02	
BI-214	0.350	5.96E-02	4.39E-02	

Analysis Report for L1-SUB-DRS-FSGS-W03-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-214	0.721	1.08E-01	3.26E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-FSGS-W03-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 2:23:28PM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F 4	583.18	3.35558E-02	10.94		
F 6	911.18	1.80594E-02	15.22	Tol.	AC-228 PA-228

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\Daityland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.07E+00	5.52E-01
+	AR-41	1293.64	99.16	-5.73E+02	1.36E+03	1.36E+03
+	CO-60	1173.22	100.00	1.86E-02	4.82E-02	5.63E-02
		1332.49	100.00	2.12E-02		4.82E-02
+	KR-85	513.99	0.43	1.38E+01	9.20E+00	9.20E+00
+	Y-88	898.04	93.70	1.70E-02	3.77E-02	4.15E-02
		1836.06	99.20	-1.65E-02		3.77E-02
+	NB-94	702.63	100.00	7.63E-03	3.90E-02	3.90E-02
		871.10	100.00	-4.34E-02		4.12E-02
+	I-131	284.30	6.06	3.86E-01	4.00E-02	5.60E-01
		364.48	81.20	2.68E-02		4.00E-02
		636.97	7.27	4.54E-01		5.14E-01
+	CS-134	604.70	97.60	-2.57E-02	4.48E-02	4.48E-02
		795.84	85.40	-4.42E-02		4.67E-02

Analysis Report for L1-SUB-DRS-FSGS-W03-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-137	661.65	85.12	6.37E-02	5.15E-02	5.15E-02
+	CE-144	80.12	1.36	1.77E+00	2.58E-01	3.19E+00
		133.51	11.09	5.33E-02		2.58E-01
+	EU-152	121.78	28.40	-3.81E-02	9.76E-02	9.76E-02
		344.28	26.60	-4.01E-02		1.29E-01
		1408.00	20.74	8.16E-02		2.07E-01
+	EU-154	123.07	40.40	-9.17E-03	6.94E-02	6.94E-02
		723.30	19.70	2.77E-02		2.01E-01
		1274.51	35.50	-5.56E-02		1.42E-01
+	EU-155	86.54	32.80	-4.85E-02	1.11E-01	1.11E-01
		105.31	21.80	-5.84E-02		1.34E-01
+	BI-214	609.31	* 46.30	5.96E-02	7.94E-02	7.94E-02
		1120.29	15.10	8.07E-02		3.65E-01
		1238.11	5.94	7.69E-01		1.02E+00
		1377.67	4.11	8.63E-03		1.03E+00
		1407.98	2.48	6.82E-01		1.73E+00
		1509.19	2.19	-1.02E+00		1.53E+00
		1764.49	15.80	2.92E-01		3.08E-01
+	PB-214	77.11	10.70	5.56E-01	9.41E-02	4.32E-01
		295.21	* 19.20	1.36E-01		1.23E-01
		351.92	* 37.20	7.50E-02		9.41E-02
+	PA-228	89.95	22.00	1.55E-01	2.19E-01	3.67E-01
		93.35	35.00	-6.86E-02		2.19E-01
		105.00	16.30	-9.82E-02		4.20E-01
		129.22	2.97	-3.62E-02		2.22E+00
		338.32	5.30	1.61E+00		1.46E+00
		463.00	13.80	3.62E-02		5.78E-01
		911.23	16.70	5.85E-01		6.88E-01
+	AM-241	59.54	36.30	-1.33E-02	1.99E-01	1.99E-01
+	CM-243	103.76	23.00	6.78E-02	1.29E-01	1.29E-01
		228.18	10.60	-1.81E-03		2.59E-01
		277.60	14.00	-3.48E-02		2.19E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

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

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

Analysis Report for L1-SUB-DRS-FSGS-W04-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-DRS-FSGS-W04-SB
Sample Description	: L1-010-104 WEST PACKAGE: L1-SUB-DRS
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 9.350E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 2/27/2018 9:31:00AM
Acquisition Started	: 2/28/2018 10:24:57AM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 3600.0 seconds
Real Time	: 3610.4 seconds
Dead Time	: 0.29 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 5345

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 2:24:06PM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-SUB-DRS-FSGS-W04-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.33	142 -	156	153.20	2.39E+02	62.89	1.24E+03	5.14
F	2	238.59	471 -	485	477.66	2.72E+02	44.19	6.34E+02	1.87
F	3	351.89	699 -	711	704.21	1.37E+02	32.05	3.14E+02	1.77
F	4	583.00	1163 -	1171	1166.34	5.46E+01	20.75	1.15E+02	1.65
F	5	609.13	1212 -	1225	1218.59	1.26E+02	26.05	1.17E+02	1.82
F	6	911.27	1818 -	1828	1822.78	3.84E+01	16.24	8.33E+01	1.31
F	7	1460.52	2913 -	2930	2921.16	5.24E+02	46.90	4.24E+01	2.56

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 2:24:06PM

Env. Background File : C:\Canberra\Apex\Root\Daityland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	76.33	2.39E+02	62.89			2.39E+02	6.29E+01
F	2	238.59	2.72E+02	44.19			2.72E+02	4.42E+01
F	3	351.89	1.37E+02	32.05	8.36E+01	3.72E+01	5.39E+01	4.91E+01
F	4	583.00	5.46E+01	20.75			5.46E+01	2.08E+01
F	5	609.13	1.26E+02	26.05	4.12E+01	2.42E+01	8.52E+01	3.56E+01
F	6	911.27	3.84E+01	16.24			3.84E+01	1.62E+01
F	7	1460.52	5.24E+02	46.90	5.63E+01	1.71E+01	4.68E+02	4.99E+01

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-FSGS-W04-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	5.45E+00	6.56E-01
PB-212	0.97	77.11	*	17.50	3.67E-01	9.92E-02
		238.63	*	44.60	1.50E-01	2.56E-02
BI-214	0.34	609.31	*	46.30	1.05E-01	4.42E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.51	77.11	*	10.70	6.00E-01	1.62E-01
		295.21		19.20		
		351.92	*	37.20	4.98E-02	4.54E-02

* = 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	0.992	5.45E+00	6.56E-01	
PB-212	0.973	1.61E-01	2.48E-02	
BI-214	0.347	1.05E-01	4.42E-02	

Analysis Report for L1-SUB-DRS-FSGS-W04-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-214	0.511	7.07E-02	4.39E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-FSGS-W04-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 2:24:06PM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F 4	583.00	1.51694E-02	19.00		
F 6	911.27	1.06571E-02	21.16	Tol.	AC-228 PA-228

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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.45E+00	5.69E-01
+	AR-41	1293.64	99.16	1.17E+02	6.66E+02	6.66E+02
+	CO-60	1173.22	100.00	1.21E-02	4.97E-02	5.50E-02
		1332.49	100.00	4.28E-02		4.97E-02
+	KR-85	513.99	0.43	7.26E+00	8.99E+00	8.99E+00
+	Y-88	898.04	93.70	-1.09E-02	3.16E-02	4.53E-02
		1836.06	99.20	6.31E-03		3.16E-02
+	NB-94	702.63	100.00	-7.78E-03	3.54E-02	3.54E-02
		871.10	100.00	-2.13E-02		3.90E-02
+	I-131	284.30	6.06	2.59E-01	3.83E-02	5.39E-01
		364.48	81.20	3.06E-03		3.83E-02
		636.97	7.27	1.51E-01		5.53E-01
+	CS-134	604.70	97.60	-2.06E-02	4.37E-02	4.55E-02
		795.84	85.40	-3.90E-03		4.37E-02

Analysis Report for L1-SUB-DRS-FSGS-W04-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-137	661.65	85.12	6.32E-02	5.40E-02	5.40E-02
+	CE-144	80.12	1.36	-2.52E+00	2.34E-01	3.01E+00
		133.51	11.09	3.52E-02		2.34E-01
+	EU-152	121.78	28.40	-6.79E-02	9.21E-02	9.21E-02
		344.28	26.60	-8.09E-02		1.20E-01
		1408.00	20.74	-6.83E-02		1.80E-01
+	EU-154	123.07	40.40	1.45E-02	6.53E-02	6.53E-02
		723.30	19.70	6.00E-03		1.91E-01
		1274.51	35.50	8.79E-03		1.26E-01
+	EU-155	86.54	32.80	-4.85E-02	1.05E-01	1.05E-01
		105.31	21.80	-2.00E-02		1.27E-01
+	BI-214	609.31	*	46.30	7.90E-02	7.90E-02
		1120.29	15.10	1.42E-02		3.60E-01
		1238.11	5.94	2.58E-01		9.62E-01
		1377.67	4.11	3.53E-01		9.86E-01
		1407.98	2.48	-5.71E-01		1.51E+00
		1509.19	2.19	-5.40E-01		1.34E+00
		1764.49	15.80	2.57E-01		2.71E-01
+	PB-214	77.11	*	10.70	9.09E-02	3.55E-01
		295.21	19.20	9.84E-02		1.64E-01
		351.92	*	37.20	4.98E-02	9.09E-02
+	PA-228	89.95	22.00	3.50E-01	2.02E-01	3.41E-01
		93.35	35.00	2.10E-01		2.02E-01
		105.00	16.30	1.19E-01		3.80E-01
		129.22	2.97	4.49E-01		1.95E+00
		338.32	5.30	9.45E-01		1.28E+00
		463.00	13.80	1.87E-01		5.06E-01
		911.23	16.70	2.74E-02		6.74E-01
+	AM-241	59.54	36.30	-1.45E-02	1.90E-01	1.90E-01
+	CM-243	103.76	23.00	4.45E-02	1.22E-01	1.22E-01
		228.18	10.60	-5.01E-02		2.51E-01
		277.60	14.00	1.58E-01		2.13E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

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

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

Analysis Report for L1-SUB-DRS-FSGS-W05-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

GAMMA SPECTRUM ANALYSIS

Sample Identification : L1-SUB-DRS-FSGS-W05-SB
Sample Description : L1-010-104 WEST PACKAGE: L1-SUB-DRS
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 9.936E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 2/27/2018 9:27:00AM
Acquisition Started : 2/28/2018 1:15:00PM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3610.9 seconds

Dead Time : 0.30 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 100 - 4096
Peak Area Range (in channels) : 100 - 4096
Identification Energy Tolerance : 1.000 keV

Energy Calibration Used Done On : 7/8/2014
Efficiency Calibration Used Done On : 7/8/2014
Efficiency Calibration Description :

Sample Number : 5346

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 2:24:47PM

Peak Analysis From Channel : 100
Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-DRS-FSGS-W05-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.02	147 -	160	152.59	1.92E+02	60.58	1.37E+03	3.38
F	2	186.01	367 -	379	372.51	9.01E+01	38.56	7.69E+02	1.79
F	3	238.60	470 -	485	477.68	3.43E+02	48.00	6.84E+02	1.90
F	4	295.17	587 -	595	590.78	6.83E+01	27.57	2.87E+02	1.44
F	5	327.90	652 -	660	656.24	2.59E+01	19.94	2.19E+02	1.16
F	6	338.50	674 -	681	677.43	4.49E+01	22.85	1.85E+02	1.43
F	7	351.76	699 -	710	703.94	1.72E+02	33.59	2.81E+02	1.68
F	8	583.06	1163 -	1171	1166.47	8.31E+01	22.14	9.49E+01	1.34
F	9	609.18	1210 -	1228	1218.69	1.13E+02	25.68	1.44E+02	2.43
F	10	910.97	1817 -	1829	1822.18	8.26E+01	21.33	6.66E+01	2.13
F	11	968.87	1933 -	1946	1937.97	4.11E+01	18.33	1.10E+02	1.96
F	12	1460.64	2912 -	2930	2921.39	5.14E+02	45.57	1.42E+01	2.57

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 2:24:47PM

Env. Background File : C:\Canberra\Apex\Root\Daityland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	76.02	1.92E+02	60.58			1.92E+02	6.06E+01
F	2	186.01	9.01E+01	38.56			9.01E+01	3.86E+01
F	3	238.60	3.43E+02	48.00			3.43E+02	4.80E+01
F	4	295.17	6.83E+01	27.57			6.83E+01	2.76E+01
F	5	327.90	2.59E+01	19.94			2.59E+01	1.99E+01
F	6	338.50	4.49E+01	22.85			4.49E+01	2.29E+01
F	7	351.76	1.72E+02	33.59	8.36E+01	3.72E+01	8.81E+01	5.01E+01
F	8	583.06	8.31E+01	22.14			8.31E+01	2.21E+01
F	9	609.18	1.13E+02	25.68	4.12E+01	2.42E+01	7.22E+01	3.53E+01
F	10	910.97	8.26E+01	21.33			8.26E+01	2.13E+01
F	11	968.87	4.11E+01	18.33			4.11E+01	1.83E+01
F	12	1460.64	5.14E+02	45.57	5.63E+01	1.71E+01	4.57E+02	4.87E+01

Analysis Report for L1-SUB-DRS-FSGS-W05-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\ Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	5.01E+00	6.02E-01
PB-212	0.56	77.11		17.50		
		238.63	*	44.60	1.78E-01	2.66E-02
BI-214	0.34	609.31	*	46.30	8.37E-02	4.12E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.71	77.11		10.70		
		295.21	*	19.20	9.83E-02	4.00E-02
		351.92	*	37.20	7.66E-02	4.37E-02
RA-226	0.99	186.21	*	3.28	5.35E-01	2.31E-01
AC-228	0.60	209.28		4.40		
		338.32	*	11.40	1.23E-01	6.29E-02
		794.70		4.60		
		911.60	*	27.70	2.31E-01	6.03E-02
		964.60		5.20		
		969.11	*	16.60	2.02E-01	9.06E-02

* = 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 L1-SUB-DRS-FSGS-W05-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.998	5.01E+00	6.02E-01	
PB-212	0.560	1.78E-01	2.66E-02	
BI-214	0.348	8.37E-02	4.12E-02	
PB-214	0.719	8.84E-02	2.95E-02	
RA-226	0.993	5.35E-01	2.31E-01	
AC-228	0.605	1.83E-01	3.92E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-FSGS-W05-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 2:24:47PM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F 1	76.02	5.33407E-02	15.77		
F 5	327.90	7.18199E-03	38.56		
F 8	583.06	2.30911E-02	13.31		

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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.01E+00	4.77E-01
+	AR-41	1293.64	99.16	7.14E+02	1.94E+03	1.94E+03
+	CO-60	1173.22	100.00	1.82E-02	4.59E-02	5.40E-02
		1332.49	100.00	2.14E-02		4.59E-02
+	KR-85	513.99	0.43	9.82E+00	8.74E+00	8.74E+00
+	Y-88	898.04	93.70	3.19E-02	2.98E-02	4.28E-02
		1836.06	99.20	-2.54E-02		2.98E-02
+	NB-94	702.63	100.00	-3.27E-02	3.32E-02	3.32E-02
		871.10	100.00	-9.17E-03		3.76E-02
+	I-131	284.30	6.06	-1.47E-01	3.64E-02	4.91E-01
		364.48	81.20	1.51E-03		3.64E-02
		636.97	7.27	4.27E-02		4.66E-01
+	CS-134	604.70	97.60	6.33E-04	4.22E-02	4.22E-02
		795.84	85.40	1.68E-02		4.62E-02

Analysis Report for L1-SUB-DRS-FSGS-W05-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-137	661.65	85.12	4.23E-02	4.90E-02	4.90E-02
+	CE-144	80.12	1.36	-2.11E-01	2.39E-01	2.91E+00
		133.51	11.09	2.42E-01		2.39E-01
+	EU-152	121.78	28.40	-7.21E-02	9.16E-02	9.16E-02
		344.28	26.60	-1.09E-01		1.13E-01
		1408.00	20.74	-2.73E-02		1.63E-01
+	EU-154	123.07	40.40	-4.38E-02	6.46E-02	6.46E-02
		723.30	19.70	4.18E-02		1.85E-01
		1274.51	35.50	-5.62E-02		1.24E-01
+	EU-155	86.54	32.80	7.27E-03	1.02E-01	1.02E-01
		105.31	21.80	-9.94E-02		1.22E-01
+	BI-214	609.31	* 46.30	8.37E-02	8.23E-02	8.23E-02
		1120.29	15.10	1.93E-01		3.55E-01
		1238.11	5.94	1.67E-01		9.63E-01
		1377.67	4.11	6.40E-01		1.01E+00
		1407.98	2.48	-2.29E-01		1.36E+00
		1509.19	2.19	2.83E-01		1.43E+00
		1764.49	15.80	7.34E-02		2.37E-01
+	PB-214	77.11	10.70	4.71E-01	8.24E-02	3.97E-01
		295.21	* 19.20	9.83E-02		8.74E-02
		351.92	* 37.20	7.66E-02		8.24E-02
+	PA-228	89.95	22.00	3.87E-01	2.09E-01	3.55E-01
		93.35	35.00	1.46E-02		2.09E-01
		105.00	16.30	-8.78E-02		3.99E-01
		129.22	2.97	1.50E+00		2.19E+00
		338.32	5.30	1.98E+00		1.36E+00
		463.00	13.80	2.91E-01		5.64E-01
		911.23	16.70	8.21E-01		7.29E-01
+	AM-241	59.54	36.30	-1.01E-02	1.83E-01	1.83E-01
+	CM-243	103.76	23.00	-2.16E-03	1.16E-01	1.16E-01
		228.18	10.60	9.44E-02		2.46E-01
		277.60	14.00	5.33E-02		2.04E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

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

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

Analysis Report for L1-SUB-DRS-FSGS-W06-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-DRS-FSGS-W06-SB
Sample Description	: L1-010-104 WEST PACKAGE: L1-SUB-DRS
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:

Sample Size	: 8.908E+02 grams
Facility	: Dairyland_NPP

Sample Taken On	: 2/27/2018 9:22:00AM
Acquisition Started	: 2/28/2018 2:17:41PM

Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 3600.0 seconds
Real Time	: 3611.0 seconds

Dead Time	: 0.30 %
-----------	----------

Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV

Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:

Sample Number	: 5347
---------------	--------

PEAK ANALYSIS REPORT

Peak Analysis Performed on	: 1/15/2019 2:25:33PM
----------------------------	-----------------------

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-SUB-DRS-FSGS-W06-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	92.98	183 -	193	186.50	6.70E+01	39.25	9.05E+02	1.48
F	2	238.76	472 -	485	478.00	3.39E+02	47.95	5.08E+02	2.44
F	3	295.13	587 -	596	590.71	7.98E+01	28.33	3.06E+02	1.54
F	4	338.09	672 -	682	676.62	5.65E+01	25.12	2.44E+02	1.72
F	5	352.06	700 -	708	704.54	1.41E+02	31.21	1.91E+02	1.74
F	6	510.30	1015 -	1028	1020.97	8.54E+01	25.87	1.73E+02	2.52
F	7	582.94	1160 -	1171	1166.22	8.00E+01	22.96	1.13E+02	2.00
F	8	609.06	1212 -	1224	1218.46	9.97E+01	25.17	1.43E+02	1.86
F	9	910.78	1814 -	1829	1821.79	4.90E+01	18.32	8.01E+01	2.48
F	10	968.94	1932 -	1942	1938.10	1.67E+01	12.25	8.36E+01	1.06
F	11	1332.40	2660 -	2670	2664.95	2.19E+01	12.36	3.85E+01	1.65
F	12	1460.47	2911 -	2929	2921.05	4.65E+02	43.47	1.90E+01	2.66

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 2:25:33PM

Env. Background File : C:\Canberra\Apex\Root\ Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	92.98	6.70E+01	39.25			6.70E+01	3.93E+01
F	2	238.76	3.39E+02	47.95			3.39E+02	4.79E+01
F	3	295.13	7.98E+01	28.33			7.98E+01	2.83E+01
F	4	338.09	5.65E+01	25.12			5.65E+01	2.51E+01
F	5	352.06	1.41E+02	31.21	8.36E+01	3.72E+01	5.72E+01	4.86E+01
F	6	510.30	8.54E+01	25.87			8.54E+01	2.59E+01
F	7	582.94	8.00E+01	22.96			8.00E+01	2.30E+01
F	8	609.06	9.97E+01	25.17	4.12E+01	2.42E+01	5.85E+01	3.49E+01
F	9	910.78	4.90E+01	18.32			4.90E+01	1.83E+01
F	10	968.94	1.67E+01	12.25			1.67E+01	1.22E+01
F	11	1332.40	2.19E+01	12.36			2.19E+01	1.24E+01
F	12	1460.47	4.65E+02	43.47	5.63E+01	1.71E+01	4.09E+02	4.67E+01

Analysis Report for L1-SUB-DRS-FSGS-W06-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPPI\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.75	*	10.67	5.00E+00	6.35E-01
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	1.96E-01	2.96E-02
BI-214	0.34	609.31	*	46.30	7.56E-02	4.53E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.71	77.11		10.70		
		295.21	*	19.20	1.28E-01	4.59E-02
		351.92	*	37.20	5.55E-02	4.72E-02
AC-228	0.58	209.28		4.40		
		338.32	*	11.40	1.72E-01	7.71E-02
		794.70		4.60		
		911.60	*	27.70	1.52E-01	5.74E-02
		964.60		5.20		
		969.11	*	16.60	9.14E-02	6.73E-02

* = 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 L1-SUB-DRS-FSGS-W06-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.988	5.00E+00	6.35E-01	
PB-212	0.558	1.96E-01	2.96E-02	
BI-214	0.345	7.56E-02	4.53E-02	
PB-214	0.719	9.28E-02	3.29E-02	
AC-228	0.588	1.38E-01	3.80E-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

Analysis Report for L1-SUB-DRS-FSGS-W06-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 2:25:33PM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F 1	92.98	1.86204E-02	29.28	Tol.	PA-228
F 6	510.30	2.37301E-02	15.14		
F 7	582.94	2.22184E-02	14.35		
F 11	1332.40	6.08117E-03	28.23	Tol.	CO-60

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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.00E+00	5.45E-01
+	AR-41	1293.64	99.16	1.27E+03	3.32E+03	3.32E+03
+	CO-60	1173.22	100.00	6.06E-03	5.59E-02	5.84E-02
		1332.49	100.00	4.67E-02		5.59E-02
+	KR-85	513.99	0.43	1.27E+01	9.08E+00	9.08E+00
+	Y-88	898.04	93.70	-1.33E-02	3.33E-02	4.20E-02
		1836.06	99.20	-1.67E-02		3.33E-02
+	NB-94	702.63	100.00	-1.25E-02	3.69E-02	3.69E-02
		871.10	100.00	-7.39E-03		4.39E-02
+	I-131	284.30	6.06	-8.97E-02	4.19E-02	5.52E-01
		364.48	81.20	2.97E-03		4.19E-02
		636.97	7.27	-8.51E-02		5.35E-01
+	CS-134	604.70	97.60	-1.43E-05	4.62E-02	4.62E-02

Analysis Report for L1-SUB-DRS-FSGS-W06-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	CS-134	795.84	85.40	-3.75E-02	4.62E-02	4.63E-02
+	CS-137	661.65	85.12	4.88E-02	5.16E-02	5.16E-02
+	CE-144	80.12	1.36	1.78E+00	2.53E-01	3.11E+00
		133.51	11.09	2.45E-04		2.53E-01
+	EU-152	121.78	28.40	-1.70E-02	9.96E-02	9.96E-02
		344.28	26.60	-9.73E-02		1.24E-01
		1408.00	20.74	1.72E-01		1.94E-01
+	EU-154	123.07	40.40	-3.26E-02	6.97E-02	6.97E-02
		723.30	19.70	2.01E-01		2.05E-01
		1274.51	35.50	6.80E-02		1.32E-01
+	EU-155	86.54	32.80	2.01E-02	1.10E-01	1.10E-01
		105.31	21.80	3.46E-02		1.37E-01
+	BI-214	609.31	* 46.30	7.56E-02	8.59E-02	8.59E-02
		1120.29	15.10	2.12E-02		3.87E-01
		1238.11	5.94	4.10E-01		1.05E+00
		1377.67	4.11	9.52E-02		1.04E+00
		1407.98	2.48	1.44E+00		1.62E+00
		1509.19	2.19	-5.61E-01		1.44E+00
		1764.49	15.80	1.50E-01		2.96E-01
+	PB-214	77.11	10.70	5.75E-01	8.29E-02	4.20E-01
		295.21	* 19.20	1.28E-01		1.04E-01
		351.92	* 37.20	5.55E-02		8.29E-02
+	PA-228	89.95	22.00	-7.77E-03	2.37E-01	4.05E-01
		93.35	35.00	5.96E-02		2.37E-01
		105.00	16.30	-5.43E-02		4.60E-01
		129.22	2.97	1.40E+00		2.43E+00
		338.32	5.30	8.98E-01		1.52E+00
		463.00	13.80	6.12E-02		6.26E-01
		911.23	16.70	8.06E-01		7.66E-01
+	AM-241	59.54	36.30	-2.85E-02	2.00E-01	2.00E-01
+	CM-243	103.76	23.00	-6.05E-02	1.28E-01	1.28E-01
		228.18	10.60	-1.26E-02		2.60E-01
		277.60	14.00	-4.21E-02		2.18E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

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

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

Analysis Report for L1-SUB-DRS-FSGS-W07-SB
L1-010-104 WEST PACKAGE: L1-SUB-DRS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-DRS-FSGS-W07-SB	
Sample Description	: L1-010-104 WEST	PACKAGE: L1-SUB-DRS
Sample Type	: 500 ml Marinelli	
Unit	:	
Sample Point	:	
Sample Size	: 8.649E+02 grams	
Facility	: Dairyland_NPP	
Sample Taken On	: 2/27/2018 9:16:00AM	
Acquisition Started	: 3/1/2018 6:16:01AM	
Procedure	: 500ml Marinelli	
Operator	: Administrator	
Detector Name	: HOTLAB	
Geometry	: 500ml Marinelli	
Live Time	: 3600.0 seconds	
Real Time	: 3611.0 seconds	
Dead Time	: 0.30 %	
Peak Locate Threshold	: 3.00	
Peak Locate Range (in channels)	: 100 - 4096	
Peak Area Range (in channels)	: 100 - 4096	
Identification Energy Tolerance	: 1.000 keV	
Energy Calibration Used Done On	: 7/8/2014	
Efficiency Calibration Used Done On	: 7/8/2014	
Efficiency Calibration Description	:	
Sample Number	: 5348	

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 2:26:24PM

Peak Analysis From Channel : 100
Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-DRS-FSGS-W07-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	185.71	368 -	377	371.92	4.97E+01	29.55	5.56E+02	1.17
F	2	238.64	470 -	485	477.75	2.75E+02	44.86	7.36E+02	1.82
F	3	295.10	584 -	595	590.66	9.77E+01	32.61	3.54E+02	2.14
F	4	338.36	671 -	685	677.15	7.71E+01	27.72	3.17E+02	2.02
F	5	351.92	697 -	711	704.26	1.49E+02	32.32	3.41E+02	1.78
F	6	583.05	1162 -	1172	1166.44	8.70E+01	23.96	1.31E+02	1.72
F	7	609.26	1212 -	1223	1218.85	1.34E+02	26.94	1.08E+02	1.79
F	8	911.06	1818 -	1830	1822.37	7.22E+01	20.63	8.20E+01	2.11
M	9	964.86	1925 -	1944	1929.94	1.66E+01	11.35	4.95E+01	1.27
m	10	968.66	1925 -	1944	1937.54	3.30E+01	14.30	5.01E+01	1.28
F	11	1119.20	2234 -	2244	2238.57	2.18E+01	11.59	5.16E+01	0.91
F	12	1460.51	2911 -	2931	2921.12	5.22E+02	45.97	1.55E+01	2.63

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 2:26:24PM

Env. Background File : C:\Canberra\Apex\Root\Daityland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	185.71	4.97E+01	29.55			4.97E+01	2.95E+01
F	2	238.64	2.75E+02	44.86			2.75E+02	4.49E+01
F	3	295.10	9.77E+01	32.61			9.77E+01	3.26E+01
F	4	338.36	7.71E+01	27.72			7.71E+01	2.77E+01
F	5	351.92	1.49E+02	32.32	8.36E+01	3.72E+01	6.52E+01	4.93E+01
F	6	583.05	8.70E+01	23.96			8.70E+01	2.40E+01
F	7	609.26	1.34E+02	26.94	4.12E+01	2.42E+01	9.25E+01	3.62E+01
F	8	911.06	7.22E+01	20.63			7.22E+01	2.06E+01
M	9	964.86	1.66E+01	11.35			1.66E+01	1.13E+01
m	10	968.66	3.30E+01	14.30			3.30E+01	1.43E+01
F	11	1119.20	2.18E+01	11.59			2.18E+01	1.16E+01
F	12	1460.51	5.22E+02	45.97	5.63E+01	1.71E+01	4.66E+02	4.91E+01

Analysis Report for L1-SUB-DRS-FSGS-W07-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Daq\land_NPPI\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	5.87E+00	6.99E-01
PB-212	0.56	77.11		17.50		
		238.63	*	44.60	1.64E-01	2.81E-02
BI-214	0.34	609.31	*	46.30	1.23E-01	4.87E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.72	77.11		10.70		
		295.21	*	19.20	1.62E-01	5.45E-02
		351.92	*	37.20	6.51E-02	4.93E-02
RA-226	0.96	186.21	*	3.28	3.38E-01	2.02E-01
AC-228	0.70	209.28		4.40		
		338.32	*	11.40	2.43E-01	8.80E-02
		794.70		4.60		
		911.60	*	27.70	2.31E-01	6.69E-02
		964.60	*	5.20	2.99E-01	2.04E-01
		969.11	*	16.60	1.86E-01	8.12E-02

* = 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 L1-SUB-DRS-FSGS-W07-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.990	5.87E+00	6.99E-01	
PB-212	0.560	1.64E-01	2.81E-02	
BI-214	0.349	1.23E-01	4.87E-02	
PB-214	0.721	1.09E-01	3.66E-02	
RA-226	0.961	3.38E-01	2.02E-01	
AC-228	0.708	2.24E-01	4.35E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-FSGS-W07-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 2:26:24PM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F 6	583.05	2.41660E-02	13.77		
F 11	1119.20	6.05967E-03	26.55		

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\Daivland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	* 10.67	5.87E+00	5.54E-01	5.54E-01
+	AR-41	1293.64	99.16	1.43E+05	1.61E+06	1.61E+06
+	CO-60	1173.22	100.00	-1.86E-03	5.38E-02	5.83E-02
		1332.49	100.00	2.18E-02		5.38E-02
+	KR-85	513.99	0.43	9.40E+00	9.58E+00	9.58E+00
+	Y-88	898.04	93.70	2.94E-02	3.44E-02	5.12E-02
		1836.06	99.20	-1.02E-03		3.44E-02
+	NB-94	702.63	100.00	-1.86E-03	3.97E-02	3.97E-02
		871.10	100.00	-6.01E-02		4.24E-02
+	I-131	284.30	6.06	-4.42E-01	4.45E-02	5.88E-01
		364.48	81.20	-1.43E-02		4.45E-02
		636.97	7.27	-9.84E-02		5.90E-01
+	CS-134	604.70	97.60	5.90E-02	4.71E-02	5.11E-02
		795.84	85.40	4.15E-03		4.71E-02
+	CS-137	661.65	85.12	9.49E-02	5.49E-02	5.49E-02
+	CE-144	80.12	1.36	6.78E-01	2.65E-01	3.31E+00

Analysis Report for L1-SUB-DRS-FSGS-W07-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CE-144	133.51	11.09	-1.93E-02	2.65E-01	2.65E-01
	EU-152	121.78	28.40	-8.33E-02	1.00E-01	1.00E-01
		344.28	26.60	-1.69E-02		1.33E-01
		1408.00	20.74	9.35E-03		2.06E-01
+	EU-154	123.07	40.40	-5.58E-02	7.07E-02	7.07E-02
		723.30	19.70	1.52E-01		2.27E-01
		1274.51	35.50	1.91E-02		1.39E-01
	EU-155	86.54	32.80	-1.03E-02	1.16E-01	1.16E-01
+	BI-214	105.31	21.80	8.46E-02		1.42E-01
		609.31	* 46.30	1.23E-01	8.23E-02	8.23E-02
		1120.29	15.10	1.22E-02		3.84E-01
		1238.11	5.94	-3.81E-02		1.11E+00
		1377.67	4.11	3.69E-01		1.18E+00
		1407.98	2.48	7.82E-02		1.73E+00
		1509.19	2.19	-5.43E-01		1.70E+00
		1764.49	15.80	1.53E-01		2.85E-01
		77.11	10.70	4.44E-01	1.02E-01	4.52E-01
		295.21	* 19.20	1.62E-01		1.19E-01
+	PA-228	351.92	* 37.20	6.51E-02		1.02E-01
		89.95	22.00	6.90E-01	4.05E-01	6.94E-01
		93.35	35.00	-3.47E-01		4.05E-01
		105.00	16.30	4.53E-01		8.01E-01
		129.22	2.97	4.49E-01		4.13E+00
		338.32	5.30	1.82E+00		2.71E+00
		463.00	13.80	-1.61E-03		1.10E+00
		911.23	16.70	1.56E+00		1.53E+00
	AM-241	59.54	36.30	4.21E-02	2.12E-01	2.12E-01
	CM-243	103.76	23.00	7.34E-02	1.36E-01	1.36E-01
		228.18	10.60	4.97E-02		2.79E-01
		277.60	14.00	1.32E-01		2.28E-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

Analysis Report for L1-SUB-DRS-FSGS-W08-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-DRS-FSGS-W08-SB
Sample Description	: L1-010-104 WEST
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 9.118E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 2/27/2018 9:11:00AM
Acquisition Started	: 2/28/2018 3:19:30PM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 3600.0 seconds
Real Time	: 3610.8 seconds
Dead Time	: 0.30 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 5349

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 2:27:05PM

Peak Analysis From Channel : 100

Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-DRS-FSGS-W08-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	185.61	368 -	375	371.72	5.30E+01	30.16	4.21E+02	1.27
F	2	238.51	469 -	485	477.50	2.80E+02	44.90	7.14E+02	1.84
F	3	295.17	583 -	598	590.79	1.00E+02	31.65	4.01E+02	2.20
F	4	338.28	671 -	684	677.00	7.44E+01	26.33	2.38E+02	2.14
F	5	351.88	697 -	708	704.19	1.98E+02	33.82	2.01E+02	2.03
F	6	582.88	1160 -	1172	1166.10	7.86E+01	24.82	1.36E+02	2.56
F	7	609.18	1213 -	1225	1218.69	1.12E+02	25.17	1.23E+02	1.71
F	8	911.04	1817 -	1827	1822.32	3.89E+01	15.80	6.21E+01	1.51
F	9	969.11	1934 -	1944	1938.44	3.41E+01	15.73	6.16E+01	1.74
F	10	1460.69	2915 -	2929	2921.48	4.61E+02	43.57	2.47E+01	2.48

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 2:27:05PM

Env. Background File : C:\Canberra\Apex\Root\ Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	185.61	5.30E+01	30.16			5.30E+01	3.02E+01
F	2	238.51	2.80E+02	44.90			2.80E+02	4.49E+01
F	3	295.17	1.00E+02	31.65			1.00E+02	3.16E+01
F	4	338.28	7.44E+01	26.33			7.44E+01	2.63E+01
F	5	351.88	1.98E+02	33.82	8.36E+01	3.72E+01	1.15E+02	5.03E+01
F	6	582.88	7.86E+01	24.82			7.86E+01	2.48E+01
F	7	609.18	1.12E+02	25.17	4.12E+01	2.42E+01	7.11E+01	3.49E+01
F	8	911.04	3.89E+01	15.80			3.89E+01	1.58E+01
F	9	969.11	3.41E+01	15.73			3.41E+01	1.57E+01
F	10	1460.69	4.61E+02	43.57	5.63E+01	1.71E+01	4.04E+02	4.68E+01

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-FSGS-W08-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	4.83E+00	6.20E-01
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	1.58E-01	2.67E-02
BI-214	0.34	609.31	*	46.30	8.97E-02	4.44E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.72	77.11		10.70		
		295.21	*	19.20	1.58E-01	5.02E-02
		351.92	*	37.20	1.09E-01	4.79E-02
RA-226	0.94	186.21	*	3.28	3.42E-01	1.96E-01
AC-228	0.61	209.28		4.40		
		338.32	*	11.40	2.22E-01	7.93E-02
		794.70		4.60		
		911.60	*	27.70	1.18E-01	4.83E-02
		964.60		5.20		
		969.11	*	16.60	1.83E-01	8.47E-02

* = 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

Analysis Report for L1-SUB-DRS-FSGS-W08-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.999	4.83E+00	6.20E-01	
PB-212	0.559	1.58E-01	2.67E-02	
BI-214	0.348	8.97E-02	4.44E-02	
PB-214	0.721	1.32E-01	3.47E-02	
RA-226	0.944	3.42E-01	1.96E-01	
AC-228	0.613	1.53E-01	3.71E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-FSGS-W08-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 2:27:05PM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F 6	582.88	2.18289E-02	15.80		

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\Daq\land_NPPI\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	* 10.67	4.83E+00	5.36E-01	5.36E-01
+	AR-41	1293.64	99.16	-2.53E+03	5.11E+03	5.11E+03
+	CO-60	1173.22	100.00	1.32E-02	5.22E-02	5.68E-02
		1332.49	100.00	3.67E-02		5.22E-02
+	KR-85	513.99	0.43	1.12E+01	9.12E+00	9.12E+00
+	Y-88	898.04	93.70	-1.59E-03	3.05E-02	4.47E-02
		1836.06	99.20	-3.23E-03		3.05E-02
+	NB-94	702.63	100.00	-8.32E-03	3.65E-02	3.65E-02
		871.10	100.00	9.32E-03		4.27E-02
+	I-131	284.30	6.06	2.51E-01	3.97E-02	5.31E-01
		364.48	81.20	1.58E-02		3.97E-02
		636.97	7.27	-1.63E-02		5.21E-01
+	CS-134	604.70	97.60	-1.96E-02	4.40E-02	4.59E-02
		795.84	85.40	6.31E-03		4.40E-02
+	CS-137	661.65	85.12	5.80E-02	5.15E-02	5.15E-02
+	CE-144	80.12	1.36	1.37E-01	2.41E-01	3.01E+00
		133.51	11.09	-1.06E-01		2.41E-01

Analysis Report for L1-SUB-DRS-FSGS-W08-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	EU-152	121.78	28.40	-7.78E-02	9.34E-02	9.34E-02
		344.28	26.60	-3.18E-02		1.22E-01
		1408.00	20.74	1.08E-01		1.85E-01
+	EU-154	123.07	40.40	-4.20E-02	6.54E-02	6.54E-02
		723.30	19.70	-4.90E-02		1.84E-01
		1274.51	35.50	1.22E-01		1.47E-01
+	EU-155	86.54	32.80	-4.21E-02	1.07E-01	1.07E-01
		105.31	21.80	5.73E-02		1.31E-01
+	BI-214	609.31	* 46.30	8.97E-02	8.11E-02	8.11E-02
		1120.29	15.10	2.57E-01		3.64E-01
		1238.11	5.94	6.69E-01		1.05E+00
		1377.67	4.11	-5.76E-01		9.15E-01
		1407.98	2.48	9.00E-01		1.54E+00
		1509.19	2.19	-5.24E-01		1.47E+00
		1764.49	15.80	1.84E-01		3.04E-01
+	PB-214	77.11	10.70	1.33E-01	8.43E-02	4.06E-01
		295.21	* 19.20	1.58E-01		1.31E-01
		351.92	* 37.20	1.09E-01		8.43E-02
+	PA-228	89.95	22.00	1.59E-01	2.39E-01	4.05E-01
		93.35	35.00	-6.20E-02		2.39E-01
		105.00	16.30	2.90E-01		4.64E-01
		129.22	2.97	4.22E-01		2.34E+00
		338.32	5.30	6.31E-01		1.52E+00
		463.00	13.80	2.55E-01		6.27E-01
		911.23	16.70	4.62E-01		7.75E-01
+	AM-241	59.54	36.30	-4.11E-02	1.91E-01	1.91E-01
+	CM-243	103.76	23.00	7.22E-02	1.27E-01	1.27E-01
		228.18	10.60	-1.04E-01		2.56E-01
		277.60	14.00	-4.82E-02		2.12E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

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

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

Analysis Report for L1-SUB-DRS-FSGS-W09-SB
L1-010-104 WEST PACKAGE: L1-SUB-DRS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-DRS-FSGS-W09-SB	
Sample Description	: L1-010-104 WEST	PACKAGE: L1-SUB-DRS
Sample Type	: 500 ml Marinelli	
Unit	:	
Sample Point	:	
Sample Size	: 9.613E+02 grams	
Facility	: Dairyland_NPP	
Sample Taken On	: 2/27/2018 9:06:00AM	
Acquisition Started	: 2/28/2018 7:43:47PM	
Procedure	: 500ml Marinelli	
Operator	: Administrator	
Detector Name	: HOTLAB	
Geometry	: 500ml Marinelli	
Live Time	: 3600.0 seconds	
Real Time	: 3610.6 seconds	
Dead Time	: 0.29 %	
Peak Locate Threshold	: 3.00	
Peak Locate Range (in channels)	: 100 - 4096	
Peak Area Range (in channels)	: 100 - 4096	
Identification Energy Tolerance	: 1.000 keV	
Energy Calibration Used Done On	: 7/8/2014	
Efficiency Calibration Used Done On	: 7/8/2014	
Efficiency Calibration Description	:	
Sample Number	: 5350	

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 2:27:45PM

Peak Analysis From Channel : 100
Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-DRS-FSGS-W09-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	185.81	365 -	376	372.11	5.88E+01	29.00	7.12E+02	0.97
F	2	238.60	473 -	485	477.68	3.13E+02	46.52	5.60E+02	1.94
F	3	295.05	585 -	595	590.55	1.06E+02	30.03	2.78E+02	1.69
F	4	338.21	672 -	680	676.86	5.90E+01	23.35	1.98E+02	1.31
F	5	582.89	1159 -	1171	1166.12	8.92E+01	24.34	1.33E+02	2.03
F	6	608.98	1210 -	1227	1218.30	1.19E+02	25.92	1.41E+02	2.21
F	7	911.03	1816 -	1827	1822.29	5.43E+01	19.71	7.80E+01	2.21
F	8	1119.93	2236 -	2246	2240.04	2.54E+01	13.15	5.74E+01	1.23
F	9	1460.69	2914 -	2930	2921.49	4.80E+02	44.07	8.50E+00	2.69

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 2:27:45PM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	185.81	5.88E+01	29.00			5.88E+01	2.90E+01
F	2	238.60	3.13E+02	46.52			3.13E+02	4.65E+01
F	3	295.05	1.06E+02	30.03			1.06E+02	3.00E+01
F	4	338.21	5.90E+01	23.35			5.90E+01	2.33E+01
F	5	582.89	8.92E+01	24.34			8.92E+01	2.43E+01
F	6	608.98	1.19E+02	25.92	4.12E+01	2.42E+01	7.83E+01	3.55E+01
F	7	911.03	5.43E+01	19.71			5.43E+01	1.97E+01
F	8	1119.93	2.54E+01	13.15			2.54E+01	1.32E+01
F	9	1460.69	4.80E+02	44.07	5.63E+01	1.71E+01	4.24E+02	4.73E+01

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-FSGS-W09-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	4.80E+00	5.98E-01
PB-212	0.56	77.11		17.50		
		238.63	*	44.60	1.68E-01	2.64E-02
BI-214	0.57	609.31	*	46.30	9.37E-02	4.28E-02
		1120.29	*	15.10	1.61E-01	8.39E-02
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
RA-226	0.97	186.21	*	3.28	3.61E-01	1.79E-01

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 2.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.999	4.80E+00	5.98E-01	
PB-212	0.560	1.68E-01	2.64E-02	
BI-214	0.573	1.08E-01	3.81E-02	
RA-226	0.974	3.61E-01	1.79E-01	

Analysis Report for L1-SUB-DRS-FSGS-W09-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

-
- ? = 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 L1-SUB-DRS-FSGS-W09-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 2:27:45PM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F 3	295.05	2.95581E-02	14.11	Tol.	PB-214
F 4	338.21	1.63809E-02	19.79	Tol.	AC-228 PA-228
F 5	582.89	2.47886E-02	13.64		
F 7	911.03	1.50814E-02	18.15	Tol.	AC-228 PA-228

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\Daq\land_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	* 10.67	4.80E+00	4.77E-01	4.77E-01
+	AR-41	1293.64	99.16	-1.10E+04	2.74E+04	2.74E+04
+	CO-60	1173.22	100.00	6.65E-02	5.13E-02	5.88E-02
		1332.49	100.00	3.60E-02		5.13E-02
+	KR-85	513.99	0.43	1.04E+01	8.56E+00	8.56E+00
+	Y-88	898.04	93.70	2.22E-02	2.90E-02	4.28E-02
		1836.06	99.20	4.09E-03		2.90E-02
+	NB-94	702.63	100.00	1.10E-02	3.61E-02	3.61E-02
		871.10	100.00	-1.29E-02		3.61E-02
+	I-131	284.30	6.06	1.95E-02	3.82E-02	5.13E-01

Analysis Report for L1-SUB-DRS-FSGS-W09-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	I-131	364.48	81.20	2.74E-03	3.82E-02	3.82E-02
		636.97	7.27	-2.25E-01		5.19E-01
+	CS-134	604.70	97.60	1.21E-03	4.40E-02	4.40E-02
		795.84	85.40	4.35E-03		4.43E-02
+	CS-137	661.65	85.12	6.83E-02	5.00E-02	5.00E-02
+	CE-144	80.12	1.36	1.23E+00	2.34E-01	2.97E+00
		133.51	11.09	-4.53E-02		2.34E-01
+	EU-152	121.78	28.40	-4.82E-02	8.97E-02	8.97E-02
		344.28	26.60	-3.98E-01		1.18E-01
		1408.00	20.74	7.68E-02		1.69E-01
+	EU-154	123.07	40.40	-9.39E-03	6.33E-02	6.33E-02
		723.30	19.70	-4.21E-03		1.90E-01
		1274.51	35.50	-5.39E-02		1.30E-01
+	EU-155	86.54	32.80	-1.31E-02	1.06E-01	1.06E-01
		105.31	21.80	-1.02E-01		1.24E-01
+	BI-214	609.31	* 46.30	9.37E-02	8.39E-02	8.39E-02
		1120.29	* 15.10	1.61E-01		1.90E-01
		1238.11	5.94	1.32E+00		1.09E+00
		1377.67	4.11	9.09E-02		1.01E+00
		1407.98	2.48	6.42E-01		1.41E+00
		1509.19	2.19	-9.50E-02		1.58E+00
		1764.49	15.80	1.06E-01		2.45E-01
+	PB-214	77.11	10.70	5.57E-01	8.81E-02	4.04E-01
		295.21	19.20	9.07E-02		1.57E-01
		351.92	37.20	9.77E-02		8.81E-02
+	PA-228	89.95	22.00	8.34E-01	2.74E-01	4.69E-01
		93.35	35.00	6.09E-02		2.74E-01
		105.00	16.30	-7.51E-02		5.06E-01
		129.22	2.97	6.95E-01		2.60E+00
		338.32	5.30	1.01E+00		1.72E+00
		463.00	13.80	-1.69E-02		6.80E-01
		911.23	16.70	1.57E+00		9.17E-01
+	AM-241	59.54	36.30	5.59E-02	1.92E-01	1.92E-01
+	CM-243	103.76	23.00	6.37E-02	1.20E-01	1.20E-01
		228.18	10.60	-3.50E-03		2.47E-01
		277.60	14.00	3.10E-02		2.00E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

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

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

Analysis Report for L1-SUB-DRS-FSGS-W09-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

Analysis Report for L1-SUB-DRS-FSGS-W10-SB
L1-010-104 WEST PACKAGE: L1-SUB-DRS

GAMMA SPECTRUM ANALYSIS

Sample Identification : L1-SUB-DRS-FSGS-W10-SB
Sample Description : L1-010-104 WEST PACKAGE: L1-SUB-DRS
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 8.879E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 2/27/2018 9:02:00AM
Acquisition Started : 2/28/2018 8:53:44PM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3611.2 seconds

Dead Time : 0.31 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 100 - 4096
Peak Area Range (in channels) : 100 - 4096
Identification Energy Tolerance : 1.000 keV

Energy Calibration Used Done On : 7/8/2014
Efficiency Calibration Used Done On : 7/8/2014
Efficiency Calibration Description :

Sample Number : 5352

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 2:28:27PM
Peak Analysis From Channel : 100
Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-DRS-FSGS-W10-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.86	147 -	158	154.26	1.24E+02	48.06	1.12E+03	1.84
F	2	186.12	369 -	377	372.73	6.34E+01	32.90	4.96E+02	1.43
F	3	238.54	471 -	485	477.55	2.77E+02	42.96	6.42E+02	1.56
M	4	295.19	586 -	603	590.82	5.25E+01	21.12	1.70E+02	0.81
m	5	299.65	586 -	603	599.75	2.61E+01	16.38	1.69E+02	0.81
F	6	338.25	672 -	680	676.94	3.94E+01	21.98	2.29E+02	1.18
F	7	351.76	699 -	709	703.95	1.94E+02	34.43	2.05E+02	1.98
F	8	582.97	1158 -	1171	1166.28	7.42E+01	22.34	1.67E+02	1.46
F	9	609.32	1213 -	1225	1218.97	1.20E+02	26.03	1.15E+02	1.95
F	10	911.50	1817 -	1828	1823.23	5.13E+01	16.70	5.08E+01	1.51
F	11	969.12	1932 -	1943	1938.46	3.43E+01	16.12	6.79E+01	2.06
F	12	1460.65	2914 -	2929	2921.41	5.03E+02	45.53	2.71E+01	2.51

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 2:28:27PM

Env. Background File : C:\Canberra\Apex\Root\Daityland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	76.86	1.24E+02	48.06			1.24E+02	4.81E+01
F	2	186.12	6.34E+01	32.90			6.34E+01	3.29E+01
F	3	238.54	2.77E+02	42.96			2.77E+02	4.30E+01
M	4	295.19	5.25E+01	21.12			5.25E+01	2.11E+01
m	5	299.65	2.61E+01	16.38			2.61E+01	1.64E+01
F	6	338.25	3.94E+01	21.98			3.94E+01	2.20E+01
F	7	351.76	1.94E+02	34.43	8.36E+01	3.72E+01	1.10E+02	5.07E+01
F	8	582.97	7.42E+01	22.34			7.42E+01	2.23E+01
F	9	609.32	1.20E+02	26.03	4.12E+01	2.42E+01	7.91E+01	3.56E+01
F	10	911.50	5.13E+01	16.70			5.13E+01	1.67E+01
F	11	969.12	3.43E+01	16.12			3.43E+01	1.61E+01
F	12	1460.65	5.03E+02	45.53	5.63E+01	1.71E+01	4.47E+02	4.86E+01

Analysis Report for L1-SUB-DRS-FSGS-W10-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Daityland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	5.48E+00	6.70E-01
PB-212	0.99	77.11	*	17.50	1.98E-01	7.77E-02
		238.63	*	44.60	1.61E-01	2.63E-02
BI-214	0.35	609.31	*	46.30	1.03E-01	4.65E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.99	77.11	*	10.70	3.24E-01	1.27E-01
		295.21	*	19.20	8.46E-02	3.43E-02
		351.92	*	37.20	1.07E-01	4.96E-02
RA-226	0.99	186.21	*	3.28	4.21E-01	2.20E-01
AC-228	0.63	209.28		4.40		
		338.32	*	11.40	1.21E-01	6.76E-02
		794.70		4.60		
		911.60	*	27.70	1.60E-01	5.26E-02
		964.60		5.20		
		969.11	*	16.60	1.89E-01	8.91E-02

* = 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 L1-SUB-DRS-FSGS-W10-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.998	5.48E+00	6.70E-01	
PB-212	0.996	1.59E-01	2.50E-02	
BI-214	0.350	1.03E-01	4.65E-02	
PB-214	0.996	9.05E-02	2.76E-02	
RA-226	0.999	4.21E-01	2.20E-01	
AC-228	0.632	1.53E-01	3.76E-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

Analysis Report for L1-SUB-DRS-FSGS-W10-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 2:28:27PM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
m 5	299.65	7.25134E-03	31.38		
F 8	582.97	2.06042E-02	15.06		

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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.48E+00	5.59E-01
+	AR-41	1293.64	99.16	3.08E+04	4.98E+04	4.98E+04
+	CO-60	1173.22	100.00	1.15E-02	5.14E-02	6.06E-02
		1332.49	100.00	5.79E-02		5.14E-02
+	KR-85	513.99	0.43	1.19E+01	9.28E+00	9.28E+00
+	Y-88	898.04	93.70	3.99E-02	3.14E-02	4.72E-02
		1836.06	99.20	-1.91E-02		3.14E-02
+	NB-94	702.63	100.00	3.73E-02	3.91E-02	3.91E-02
		871.10	100.00	-6.33E-02		4.01E-02
+	I-131	284.30	6.06	-3.98E-02	4.21E-02	5.65E-01
		364.48	81.20	7.08E-03		4.21E-02
		636.97	7.27	-1.79E-01		5.59E-01
+	CS-134	604.70	97.60	-1.02E-02	4.61E-02	4.76E-02
		795.84	85.40	-1.49E-02		4.61E-02

Analysis Report for L1-SUB-DRS-FSGS-W10-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-137	661.65	85.12	5.41E-02	5.46E-02	5.46E-02
+	CE-144	80.12	1.36	-2.00E+00	2.52E-01	3.18E+00
		133.51	11.09	-4.88E-02		2.52E-01
+	EU-152	121.78	28.40	-4.10E-02	9.91E-02	9.91E-02
		344.28	26.60	-1.69E-01		1.30E-01
		1408.00	20.74	8.93E-02		2.14E-01
+	EU-154	123.07	40.40	3.78E-02	7.07E-02	7.07E-02
		723.30	19.70	1.55E-01		2.02E-01
		1274.51	35.50	1.91E-02		1.49E-01
+	EU-155	86.54	32.80	-4.51E-03	1.13E-01	1.13E-01
		105.31	21.80	1.65E-02		1.38E-01
+	BI-214	609.31	* 46.30	1.03E-01	8.21E-02	8.21E-02
		1120.29	15.10	1.28E-01		3.56E-01
		1238.11	5.94	1.19E-01		1.02E+00
		1377.67	4.11	4.82E-01		1.07E+00
		1407.98	2.48	7.47E-01		1.79E+00
		1509.19	2.19	-7.65E-01		1.45E+00
		1764.49	15.80	3.20E-01		2.86E-01
+	PB-214	77.11	* 10.70	3.24E-01	7.35E-02	3.29E-01
		295.21	* 19.20	8.46E-02		7.35E-02
		351.92	* 37.20	1.07E-01		8.57E-02
+	PA-228	89.95	22.00	6.09E-01	2.98E-01	5.12E-01
		93.35	35.00	-4.99E-02		2.98E-01
		105.00	16.30	1.41E-01		5.84E-01
		129.22	2.97	1.53E+00		2.99E+00
		338.32	5.30	9.67E-01		1.97E+00
		463.00	13.80	-4.79E-01		7.33E-01
		911.23	16.70	1.06E+00		9.66E-01
+	AM-241	59.54	36.30	2.45E-02	2.02E-01	2.02E-01
+	CM-243	103.76	23.00	5.66E-02	1.32E-01	1.32E-01
		228.18	10.60	-7.56E-03		2.59E-01
		277.60	14.00	4.55E-02		2.21E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

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

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

Analysis Report for L1-SUB-DRS-FSGS-W11-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-DRS-FSGS-W11-SB
Sample Description	: L1-010-104 WEST PACKAGE: L1-SUB-DRS
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 8.713E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 2/27/2018 8:55:00AM
Acquisition Started	: 2/28/2018 10:27:29PM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 3600.0 seconds
Real Time	: 3610.9 seconds
Dead Time	: 0.30 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 5353

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 2:29:05PM

Peak Analysis From Channel : 100

Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-DRS-FSGS-W11-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	75.93	147 -	162	152.40	2.15E+02	60.66	1.47E+03	3.67
F	2	238.61	470 -	485	477.70	2.66E+02	45.37	7.64E+02	1.90
F	3	295.16	583 -	595	590.77	8.34E+01	29.00	3.71E+02	1.63
F	4	351.95	698 -	708	704.33	1.48E+02	30.57	2.07E+02	1.82
F	5	582.78	1160 -	1173	1165.91	8.38E+01	24.30	1.41E+02	2.35
F	6	609.25	1210 -	1227	1218.83	1.35E+02	26.54	1.47E+02	1.75
F	7	661.30	1315 -	1329	1322.92	1.07E+02	25.36	1.54E+02	1.75
F	8	911.20	1817 -	1828	1822.65	5.62E+01	18.38	7.48E+01	1.62
F	9	1120.70	2237 -	2246	2241.57	1.86E+01	11.72	5.32E+01	1.10
F	10	1332.89	2662 -	2671	2665.91	1.56E+01	10.01	2.77E+01	1.19
F	11	1460.63	2913 -	2930	2921.37	4.90E+02	44.71	2.08E+01	2.64

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 2:29:05PM

Env. Background File : C:\Canberra\Apex\Root\Daityland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	75.93	2.15E+02	60.66			2.15E+02	6.07E+01
F	2	238.61	2.66E+02	45.37			2.66E+02	4.54E+01
F	3	295.16	8.34E+01	29.00			8.34E+01	2.90E+01
F	4	351.95	1.48E+02	30.57	8.36E+01	3.72E+01	6.43E+01	4.82E+01
F	5	582.78	8.38E+01	24.30			8.38E+01	2.43E+01
F	6	609.25	1.35E+02	26.54	4.12E+01	2.42E+01	9.43E+01	3.59E+01
F	7	661.30	1.07E+02	25.36	6.61E+01	2.54E+01	4.13E+01	3.59E+01
F	8	911.20	5.62E+01	18.38			5.62E+01	1.84E+01
F	9	1120.70	1.86E+01	11.72			1.86E+01	1.17E+01
F	10	1332.89	1.56E+01	10.01			1.56E+01	1.00E+01
F	11	1460.63	4.90E+02	44.71	5.63E+01	1.71E+01	4.34E+02	4.79E+01

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-FSGS-W11-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	5.43E+00	6.70E-01
CS-137	0.98	661.65	*	85.12	3.20E-02	2.79E-02
PB-212	0.56	77.11		17.50		
		238.63	*	44.60	1.58E-01	2.81E-02
BI-214	0.58	609.31	*	46.30	1.25E-01	4.80E-02
		1120.29	*	15.10	1.30E-01	8.25E-02
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.72	77.11		10.70		
		295.21	*	19.20	1.37E-01	4.81E-02
		351.92	*	37.20	6.38E-02	4.79E-02

* = 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
--------------	-----------------------	------------------------------	------------------------------	----------

Analysis Report for L1-SUB-DRS-FSGS-W11-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.998	5.43E+00	6.70E-01	
CS-137	0.981	3.20E-02	2.79E-02	
PB-212	0.560	1.58E-01	2.81E-02	
BI-214	0.580	1.26E-01	4.15E-02	
PB-214	0.721	1.00E-01	3.39E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-FSGS-W11-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 2:29:05PM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F 1	75.93	5.96811E-02	14.12		
F 5	582.78	2.32722E-02	14.50		
F 8	911.20	1.56134E-02	16.35	Tol.	AC-228 PA-228
F 10	1332.89	4.32689E-03	32.14		

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\Daityland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.43E+00	5.57E-01	5.57E-01
+	AR-41	1293.64		99.16	4.96E+04	1.02E+05	1.02E+05
+	CO-60	1173.22		100.00	4.64E-02	5.00E-02	5.73E-02
		1332.49		100.00	2.75E-02		5.00E-02
+	KR-85	513.99		0.43	7.83E+00	9.62E+00	9.62E+00
+	Y-88	898.04		93.70	-3.49E-02	3.41E-02	4.37E-02
		1836.06		99.20	-1.84E-03		3.41E-02
+	NB-94	702.63		100.00	-2.17E-02	3.86E-02	3.86E-02
		871.10		100.00	-2.80E-02		4.05E-02
+	I-131	284.30		6.06	-1.29E-01	4.22E-02	5.74E-01
		364.48		81.20	1.58E-02		4.22E-02
		636.97		7.27	6.85E-03		5.90E-01

Analysis Report for L1-SUB-DRS-FSGS-W11-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-134	604.70		97.60	-1.45E-03	5.19E-02	5.19E-02
		795.84		85.40	2.02E-02		5.45E-02
+	CS-137	661.65	*	85.12	3.20E-02	5.62E-02	5.62E-02
+	CE-144	80.12		1.36	-6.37E-01	2.62E-01	3.28E+00
		133.51		11.09	8.42E-02		2.62E-01
+	EU-152	121.78		28.40	-1.09E-01	9.70E-02	9.70E-02
		344.28		26.60	7.54E-02		1.30E-01
		1408.00		20.74	-2.76E-03		2.09E-01
+	EU-154	123.07		40.40	-5.72E-02	6.87E-02	6.87E-02
		723.30		19.70	1.56E-01		2.08E-01
		1274.51		35.50	7.91E-02		1.40E-01
+	EU-155	86.54		32.80	2.85E-02	1.17E-01	1.17E-01
		105.31		21.80	-2.08E-02		1.37E-01
+	BI-214	609.31	*	46.30	1.25E-01	9.34E-02	9.34E-02
		1120.29	*	15.10	1.30E-01		1.99E-01
		1238.11		5.94	-2.82E-01		1.07E+00
		1377.67		4.11	-2.40E-01		8.83E-01
		1407.98		2.48	-2.31E-02		1.75E+00
		1509.19		2.19	-3.49E-01		1.77E+00
		1764.49		15.80	1.24E-01		2.70E-01
+	PB-214	77.11		10.70	6.44E-01	8.78E-02	4.42E-01
		295.21	*	19.20	1.37E-01		1.24E-01
		351.92	*	37.20	6.38E-02		8.78E-02
+	PA-228	89.95		22.00	5.25E-01	3.22E-01	5.56E-01
		93.35		35.00	-9.13E-02		3.22E-01
		105.00		16.30	-1.55E-01		6.05E-01
		129.22		2.97	1.59E+00		3.17E+00
		338.32		5.30	4.78E-01		2.07E+00
		463.00		13.80	5.69E-01		8.77E-01
		911.23		16.70	1.35E+00		1.06E+00
+	AM-241	59.54		36.30	5.75E-02	2.06E-01	2.06E-01
+	CM-243	103.76		23.00	-1.68E-02	1.30E-01	1.30E-01
		228.18		10.60	-1.52E-01		2.68E-01
		277.60		14.00	-1.42E-01		2.22E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

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

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

Analysis Report for L1-SUB-DRS-FSGS-W12-SB
L1-010-104 WEST PACKAGE: L1-SUB-DRS

GAMMA SPECTRUM ANALYSIS

Sample Identification : L1-SUB-DRS-FSGS-W12-SB
Sample Description : L1-010-104 WEST PACKAGE: L1-SUB-DRS
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 7.419E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 2/27/2018 8:48:00AM
Acquisition Started : 3/1/2018 7:20:30AM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3610.8 seconds

Dead Time : 0.30 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 100 - 4096
Peak Area Range (in channels) : 100 - 4096
Identification Energy Tolerance : 1.000 keV

Energy Calibration Used Done On : 7/8/2014
Efficiency Calibration Used Done On : 7/8/2014
Efficiency Calibration Description :

Sample Number : 5354

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 2:29:46PM

Peak Analysis From Channel : 100
Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-DRS-FSGS-W12-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	75.53	147 -	159	151.60	2.33E+02	56.69	1.06E+03	3.86
F	2	238.38	471 -	481	477.23	1.75E+02	39.21	5.87E+02	1.36
F	3	295.14	582 -	595	590.73	1.14E+02	30.82	3.33E+02	1.86
F	4	338.42	673 -	681	677.27	3.71E+01	19.61	2.08E+02	0.99
F	5	351.94	695 -	712	704.30	1.99E+02	33.93	2.76E+02	2.08
F	6	583.10	1160 -	1174	1166.54	6.73E+01	21.15	1.31E+02	1.81
F	7	609.13	1212 -	1227	1218.59	1.34E+02	26.39	1.06E+02	2.15
F	8	661.62	1318 -	1330	1323.56	1.24E+02	26.27	9.95E+01	2.11
F	9	969.21	1934 -	1944	1938.65	2.80E+01	14.20	6.29E+01	1.41
F	10	1119.78	2233 -	2246	2239.75	3.94E+01	17.47	7.19E+01	2.42
F	11	1460.61	2913 -	2928	2921.33	3.56E+02	38.39	2.45E+01	2.53
F	12	1763.81	3523 -	3533	3527.68	2.73E+01	11.06	5.94E+00	2.51

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 2:29:46PM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	75.53	2.33E+02	56.69			2.33E+02	5.67E+01
F	2	238.38	1.75E+02	39.21			1.75E+02	3.92E+01
F	3	295.14	1.14E+02	30.82			1.14E+02	3.08E+01
F	4	338.42	3.71E+01	19.61			3.71E+01	1.96E+01
F	5	351.94	1.99E+02	33.93	8.36E+01	3.72E+01	1.16E+02	5.04E+01
F	6	583.10	6.73E+01	21.15			6.73E+01	2.11E+01
F	7	609.13	1.34E+02	26.39	4.12E+01	2.42E+01	9.24E+01	3.58E+01
F	8	661.62	1.24E+02	26.27	6.61E+01	2.54E+01	5.79E+01	3.65E+01
F	9	969.21	2.80E+01	14.20			2.80E+01	1.42E+01
F	10	1119.78	3.94E+01	17.47			3.94E+01	1.75E+01
F	11	1460.61	3.56E+02	38.39	5.63E+01	1.71E+01	2.99E+02	4.20E+01
F	12	1763.81	2.73E+01	11.06	1.52E+01	9.80E+00	1.21E+01	1.48E+01

Analysis Report for L1-SUB-DRS-FSGS-W12-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPPI\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	4.40E+00	6.64E-01
CS-137	1.00	661.65	*	85.12	5.27E-02	3.34E-02
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	1.21E-01	2.80E-02
BI-214	0.76	609.31	*	46.30	1.43E-01	5.62E-02
		1120.29	*	15.10	3.25E-01	1.45E-01
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49	*	15.80	1.40E-01	1.72E-01
PB-214	0.72	77.11		10.70		
		295.21	*	19.20	2.19E-01	6.04E-02
		351.92	*	37.20	1.35E-01	5.90E-02

* = 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

Analysis Report for L1-SUB-DRS-FSGS-W12-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.997	4.40E+00	6.64E-01	
CS-137	1.000	5.27E-02	3.34E-02	
PB-212	0.553	1.21E-01	2.80E-02	
BI-214	0.766	1.65E-01	5.01E-02	
PB-214	0.721	1.76E-01	4.22E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-FSGS-W12-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 2:29:46PM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F 1	75.53	6.48268E-02	12.15		
F 4	338.42	1.03000E-02	26.45	Tol.	AC-228 PA-228
F 6	583.10	1.87075E-02	15.70		
F 9	969.21	7.76670E-03	25.39	Tol.	AC-228

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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	* 10.67	4.40E+00	6.64E-01	6.64E-01
+	AR-41	1293.64	99.16	-1.99E+06	2.92E+06	2.92E+06
+	CO-60	1173.22	100.00	4.51E-02	5.83E-02	7.54E-02
		1332.49	100.00	3.71E-02		5.83E-02
+	KR-85	513.99	0.43	1.34E+01	1.05E+01	1.05E+01
+	Y-88	898.04	93.70	-1.36E-03	4.45E-02	5.46E-02
		1836.06	99.20	6.83E-03		4.45E-02
+	NB-94	702.63	100.00	2.52E-02	4.63E-02	4.63E-02
		871.10	100.00	-1.65E-02		4.96E-02
+	I-131	284.30	6.06	-8.36E-02	4.99E-02	6.40E-01
		364.48	81.20	2.89E-02		4.99E-02

Analysis Report for L1-SUB-DRS-FSGS-W12-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	I-131	636.97		7.27	2.06E-01	4.99E-02	6.97E-01
+	CS-134	604.70		97.60	-5.91E-03	5.42E-02	5.63E-02
		795.84		85.40	9.41E-03		5.42E-02
+	CS-137	661.65	*	85.12	5.27E-02	5.92E-02	5.92E-02
+	CE-144	80.12		1.36	-1.65E+00	2.94E-01	3.73E+00
		133.51		11.09	-1.95E-02		2.94E-01
+	EU-152	121.78		28.40	4.38E-02	1.15E-01	1.15E-01
		344.28		26.60	-6.61E-02		1.45E-01
		1408.00		20.74	-2.66E-01		2.24E-01
+	EU-154	123.07		40.40	4.71E-02	8.16E-02	8.16E-02
		723.30		19.70	1.77E-01		2.33E-01
		1274.51		35.50	9.21E-02		1.76E-01
+	EU-155	86.54		32.80	-1.08E-03	1.31E-01	1.31E-01
		105.31		21.80	7.86E-03		1.57E-01
+	BI-214	609.31	*	46.30	1.43E-01	1.00E-01	1.00E-01
		1120.29	*	15.10	3.25E-01		2.97E-01
		1238.11		5.94	4.17E-01		1.16E+00
		1377.67		4.11	-1.82E-01		1.15E+00
		1407.98		2.48	-2.23E+00		1.87E+00
		1509.19		2.19	3.49E-02		1.73E+00
		1764.49	*	15.80	1.40E-01		2.93E-01
+	PB-214	77.11		10.70	3.05E-01	1.17E-01	5.00E-01
		295.21	*	19.20	2.19E-01		1.41E-01
		351.92	*	37.20	1.35E-01		1.17E-01
+	PA-228	89.95		22.00	6.92E-01	4.88E-01	8.35E-01
		93.35		35.00	-1.10E-01		4.88E-01
		105.00		16.30	1.75E-02		9.25E-01
		129.22		2.97	-4.41E-01		4.82E+00
		338.32		5.30	1.29E+00		3.12E+00
		463.00		13.80	1.36E+00		1.26E+00
		911.23		16.70	4.30E-01		1.54E+00
+	AM-241	59.54		36.30	-8.90E-02	2.37E-01	2.37E-01
+	CM-243	103.76		23.00	2.62E-02	1.51E-01	1.51E-01
		228.18		10.60	-6.85E-02		3.09E-01
		277.60		14.00	-3.09E-02		2.44E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

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

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

Analysis Report for L1-SUB-DRS-FSGS-W12-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

Analysis Report for L1-SUB-DRS-FSGS-W13-SB
L1-010-104 WEST PACKAGE: L1-SUB-DRS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-DRS-FSGS-W13-SB	
Sample Description	: L1-010-104 WEST	PACKAGE: L1-SUB-DRS
Sample Type	: 500 ml Marinelli	
Unit	:	
Sample Point	:	
Sample Size	: 9.632E+02 grams	
Facility	: Dairyland_NPP	
Sample Taken On	: 2/27/2018 8:42:00AM	
Acquisition Started	: 3/1/2018 1:24:59AM	
Procedure	: 500ml Marinelli	
Operator	: Administrator	
Detector Name	: HOTLAB	
Geometry	: 500ml Marinelli	
Live Time	: 3600.0 seconds	
Real Time	: 3610.5 seconds	
Dead Time	: 0.29 %	
Peak Locate Threshold	: 3.00	
Peak Locate Range (in channels)	: 100 - 4096	
Peak Area Range (in channels)	: 100 - 4096	
Identification Energy Tolerance	: 1.000 keV	
Energy Calibration Used Done On	: 7/8/2014	
Efficiency Calibration Used Done On	: 7/8/2014	
Efficiency Calibration Description	:	
Sample Number	: 5355	

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 2:30:25PM

Peak Analysis From Channel : 100
Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-DRS-FSGS-W13-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	185.65	368 -	375	371.80	5.70E+01	26.52	5.15E+02	0.69
F	2	238.59	473 -	485	477.65	3.27E+02	46.32	5.72E+02	1.67
F	3	295.31	585 -	596	591.08	1.03E+02	30.29	3.55E+02	1.59
F	4	337.96	671 -	681	676.35	5.02E+01	25.50	2.79E+02	1.63
F	5	351.68	695 -	708	703.79	1.84E+02	35.56	2.78E+02	2.34
F	6	583.06	1160 -	1173	1166.47	8.46E+01	23.56	1.31E+02	2.06
F	7	609.55	1214 -	1226	1219.43	1.24E+02	27.88	1.47E+02	2.29
F	8	910.72	1817 -	1828	1821.68	5.09E+01	18.54	1.05E+02	1.41
F	9	1332.26	2659 -	2671	2664.65	2.52E+01	12.83	3.79E+01	1.90
F	10	1460.57	2912 -	2929	2921.25	5.07E+02	45.64	3.14E+01	2.53

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 2:30:25PM

Env. Background File : C:\Canberra\Apex\Root\Daityland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	185.65	5.70E+01	26.52			5.70E+01	2.65E+01
F	2	238.59	3.27E+02	46.32			3.27E+02	4.63E+01
F	3	295.31	1.03E+02	30.29			1.03E+02	3.03E+01
F	4	337.96	5.02E+01	25.50			5.02E+01	2.55E+01
F	5	351.68	1.84E+02	35.56	8.36E+01	3.72E+01	1.01E+02	5.15E+01
F	6	583.06	8.46E+01	23.56			8.46E+01	2.36E+01
F	7	609.55	1.24E+02	27.88	4.12E+01	2.42E+01	8.32E+01	3.69E+01
F	8	910.72	5.09E+01	18.54			5.09E+01	1.85E+01
F	9	1332.26	2.52E+01	12.83			2.52E+01	1.28E+01
F	10	1460.57	5.07E+02	45.64	5.63E+01	1.71E+01	4.50E+02	4.88E+01

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-FSGS-W13-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75 *	10.67	5.09E+00	6.20E-01
PB-212	0.56	77.11	17.50		
		238.63 *	44.60	1.75E-01	2.64E-02
BI-214	0.34	609.31 *	46.30	9.95E-02	4.45E-02
		1120.29	15.10		
		1238.11	5.94		
		1377.67	4.11		
		1407.98	2.48		
		1509.19	2.19		
		1764.49	15.80		
PB-214	0.71	77.11	10.70		
		295.21 *	19.20	1.53E-01	4.56E-02
		351.92 *	37.20	9.04E-02	4.64E-02
RA-226	0.95	186.21 *	3.28	3.49E-01	1.63E-01

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 2.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.995	5.09E+00	6.20E-01	
PB-212	0.560	1.75E-01	2.64E-02	

Analysis Report for L1-SUB-DRS-FSGS-W13-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
BI-214	0.345	9.95E-02	4.45E-02	
PB-214	0.716	1.22E-01	3.25E-02	
RA-226	0.951	3.49E-01	1.63E-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 L1-SUB-DRS-FSGS-W13-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 2:30:25PM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F 4	337.96	1.39485E-02	25.39	Tol.	AC-228 PA-228
F 6	583.06	2.34896E-02	13.93		
F 8	910.72	1.41504E-02	18.20	Tol.	AC-228 PA-228
F 9	1332.26	6.99759E-03	25.47		

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\Daivland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.09E+00	5.31E-01
+	AR-41	1293.64	99.16	-1.80E+05	2.90E+05	2.90E+05
+	CO-60	1173.22	100.00	1.23E-02	4.92E-02	5.34E-02
		1332.49	100.00	3.44E-02		4.92E-02
+	KR-85	513.99	0.43	5.49E+00	8.53E+00	8.53E+00
+	Y-88	898.04	93.70	2.77E-02	2.99E-02	4.49E-02
		1836.06	99.20	-4.12E-03		2.99E-02
+	NB-94	702.63	100.00	1.05E-03	3.48E-02	3.48E-02
		871.10	100.00	-1.60E-02		4.03E-02
+	I-131	284.30	6.06	1.42E-01	4.12E-02	5.36E-01

Analysis Report for L1-SUB-DRS-FSGS-W13-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	I-131	364.48	81.20	1.74E-02	4.12E-02	4.12E-02
		636.97	7.27	-2.96E-01		5.56E-01
+	CS-134	604.70	97.60	-4.54E-02	4.46E-02	4.57E-02
		795.84	85.40	-1.57E-02		4.46E-02
+	CS-137	661.65	85.12	4.70E-02	5.03E-02	5.03E-02
+	CE-144	80.12	1.36	1.62E+00	2.37E-01	3.05E+00
		133.51	11.09	3.37E-02		2.37E-01
+	EU-152	121.78	28.40	-3.17E-02	9.60E-02	9.60E-02
		344.28	26.60	2.33E-02		1.21E-01
		1408.00	20.74	1.25E-01		1.93E-01
+	EU-154	123.07	40.40	-2.42E-03	6.77E-02	6.77E-02
		723.30	19.70	8.48E-02		1.91E-01
		1274.51	35.50	5.95E-02		1.44E-01
+	EU-155	86.54	32.80	-3.13E-02	1.06E-01	1.06E-01
		105.31	21.80	-2.61E-02		1.30E-01
+	BI-214	609.31	* 46.30	9.95E-02	8.04E-02	8.04E-02
		1120.29	15.10	3.12E-01		3.69E-01
		1238.11	5.94	-1.42E-02		9.30E-01
		1377.67	4.11	-5.55E-01		9.66E-01
		1407.98	2.48	1.04E+00		1.62E+00
		1509.19	2.19	8.96E-01		1.36E+00
		1764.49	15.80	6.49E-02		2.81E-01
+	PB-214	77.11	10.70	2.86E-01	8.65E-02	4.11E-01
		295.21	* 19.20	1.53E-01		1.07E-01
		351.92	* 37.20	9.04E-02		8.65E-02
+	PA-228	89.95	22.00	-1.15E-01	3.27E-01	5.49E-01
		93.35	35.00	-3.85E-02		3.27E-01
		105.00	16.30	6.23E-02		6.43E-01
		129.22	2.97	9.48E-01		3.28E+00
		338.32	5.30	3.18E+00		2.14E+00
		463.00	13.80	7.52E-01		8.75E-01
		911.23	16.70	3.94E-01		1.14E+00
+	AM-241	59.54	36.30	5.48E-02	1.90E-01	1.90E-01
+	CM-243	103.76	23.00	-8.80E-02	1.24E-01	1.24E-01
		228.18	10.60	2.48E-01		2.55E-01
		277.60	14.00	-5.38E-03		2.05E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

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

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

Analysis Report for L1-SUB-DRS-FSGS-W13-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

Analysis Report for L1-SUB-DRS-FSGS-W14-SB
L1-010-104 WEST PACKAGE: L1-SUB-DRS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-DRS-FSGS-W14-SB	
Sample Description	: L1-010-104 WEST	PACKAGE: L1-SUB-DRS
Sample Type	: 500 ml Marinelli	
Unit	:	
Sample Point	:	
Sample Size	: 9.117E+02 grams	
Facility	: Dairyland_NPP	
Sample Taken On	: 2/27/2018 8:31:00AM	
Acquisition Started	: 3/1/2018 12:21:57AM	
Procedure	: 500ml Marinelli	
Operator	: Administrator	
Detector Name	: HOTLAB	
Geometry	: 500ml Marinelli	
Live Time	: 3600.0 seconds	
Real Time	: 3610.8 seconds	
Dead Time	: 0.30 %	
Peak Locate Threshold	: 3.00	
Peak Locate Range (in channels)	: 100 - 4096	
Peak Area Range (in channels)	: 100 - 4096	
Identification Energy Tolerance	: 1.000 keV	
Energy Calibration Used Done On	: 7/8/2014	
Efficiency Calibration Used Done On	: 7/8/2014	
Efficiency Calibration Description	:	
Sample Number	: 5356	

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 2:31:05PM

Peak Analysis From Channel : 100
Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-DRS-FSGS-W14-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.82	147 -	160	154.19	1.49E+02	49.99	1.31E+03	1.94
F	2	92.42	183 -	192	185.38	6.01E+01	28.24	9.03E+02	0.62
F	3	238.52	469 -	485	477.52	2.49E+02	42.15	7.70E+02	1.59
F	4	295.20	583 -	595	590.86	1.18E+02	32.54	3.81E+02	1.84
F	5	351.67	700 -	712	703.77	2.22E+02	36.20	3.00E+02	1.74
F	6	528.61	1054 -	1061	1057.58	1.78E+01	14.94	8.04E+01	1.44
F	7	582.78	1158 -	1172	1165.90	6.02E+01	22.21	1.35E+02	2.44
F	8	609.28	1211 -	1224	1218.89	1.31E+02	27.15	1.42E+02	1.73
F	9	661.46	1316 -	1330	1323.24	1.58E+02	28.40	9.47E+01	2.29
F	10	910.84	1815 -	1829	1821.92	6.39E+01	19.20	7.50E+01	1.91
F	11	1332.58	2659 -	2672	2665.29	3.98E+01	14.20	1.71E+01	2.85
F	12	1460.65	2913 -	2930	2921.41	4.40E+02	42.91	4.16E+01	2.56

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 2:31:05PM

Env. Background File : C:\Canberra\Apex\Root\ Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	76.82	1.49E+02	49.99			1.49E+02	5.00E+01
F	2	92.42	6.01E+01	28.24			6.01E+01	2.82E+01
F	3	238.52	2.49E+02	42.15			2.49E+02	4.21E+01
F	4	295.20	1.18E+02	32.54			1.18E+02	3.25E+01
F	5	351.67	2.22E+02	36.20	8.36E+01	3.72E+01	1.39E+02	5.19E+01
F	6	528.61	1.78E+01	14.94			1.78E+01	1.49E+01
F	7	582.78	6.02E+01	22.21			6.02E+01	2.22E+01
F	8	609.28	1.31E+02	27.15	4.12E+01	2.42E+01	8.95E+01	3.64E+01
F	9	661.46	1.58E+02	28.40	6.61E+01	2.54E+01	9.22E+01	3.81E+01
F	10	910.84	6.39E+01	19.20			6.39E+01	1.92E+01
F	11	1332.58	3.98E+01	14.20			3.98E+01	1.42E+01
F	12	1460.65	4.40E+02	42.91	5.63E+01	1.71E+01	3.84E+02	4.62E+01

Analysis Report for L1-SUB-DRS-FSGS-W14-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\ Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	4.59E+00	6.08E-01
CS-137	0.99	661.65	*	85.12	6.83E-02	2.85E-02
PB-212	0.99	77.11	*	17.50	2.32E-01	7.91E-02
		238.63	*	44.60	1.41E-01	2.49E-02
BI-214	0.35	609.31	*	46.30	1.13E-01	4.64E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.99	77.11	*	10.70	3.79E-01	1.29E-01
		295.21	*	19.20	1.86E-01	5.19E-02
		351.92	*	37.20	1.31E-01	4.96E-02

* = 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

Analysis Report for L1-SUB-DRS-FSGS-W14-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.998	4.59E+00	6.08E-01	
CS-137	0.994	6.83E-02	2.85E-02	
PB-212	0.995	1.40E-01	2.38E-02	
BI-214	0.350	1.13E-01	4.64E-02	
PB-214	0.992	1.57E-01	3.47E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-FSGS-W14-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 2:31:05PM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F 2	92.42	1.66852E-02	23.51	Tol.	PA-228
F 6	528.61	4.93106E-03	42.08		
F 7	582.78	1.67194E-02	18.45		
F 10	910.84	1.77426E-02	15.03	Tol.	AC-228 PA-228
F 11	1332.58	1.10661E-02	17.82	Tol.	CO-60

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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	4.59E+00	5.82E-01
+	AR-41	1293.64	99.16	-8.62E+04	1.97E+05	1.97E+05
+	CO-60	1173.22	100.00	6.45E-02	5.10E-02	6.07E-02
		1332.49	100.00	4.34E-02		5.10E-02
+	KR-85	513.99	0.43	1.05E+01	9.09E+00	9.09E+00
+	Y-88	898.04	93.70	4.48E-02	3.16E-02	4.72E-02
		1836.06	99.20	6.96E-03		3.16E-02
+	NB-94	702.63	100.00	-5.39E-03	3.80E-02	3.80E-02
		871.10	100.00	-2.09E-02		4.04E-02
+	I-131	284.30	6.06	1.39E-01	4.13E-02	5.55E-01

Analysis Report for L1-SUB-DRS-FSGS-W14-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	I-131	364.48	81.20	-2.31E-02	4.13E-02	4.13E-02
		636.97	7.27	1.35E-01		5.44E-01
+	CS-134	604.70	97.60	-5.47E-03	4.45E-02	4.85E-02
		795.84	85.40	-2.41E-02		4.45E-02
+	CS-137	661.65	* 85.12	6.83E-02	4.86E-02	4.86E-02
+	CE-144	80.12	1.36	-4.61E-01	2.54E-01	3.09E+00
		133.51	11.09	1.72E-01		2.54E-01
+	EU-152	121.78	28.40	5.72E-03	9.73E-02	9.73E-02
		344.28	26.60	-4.02E-01		1.24E-01
		1408.00	20.74	1.12E-01		2.08E-01
+	EU-154	123.07	40.40	8.49E-03	6.86E-02	6.86E-02
		723.30	19.70	1.62E-01		2.10E-01
		1274.51	35.50	1.54E-01		1.51E-01
+	EU-155	86.54	32.80	-5.58E-02	1.08E-01	1.08E-01
		105.31	21.80	3.12E-02		1.34E-01
+	BI-214	609.31	* 46.30	1.13E-01	8.48E-02	8.48E-02
		1120.29	15.10	1.86E-01		3.91E-01
		1238.11	5.94	-4.38E-01		9.87E-01
		1377.67	4.11	1.44E-01		9.80E-01
		1407.98	2.48	9.34E-01		1.74E+00
		1509.19	2.19	1.49E+00		1.79E+00
		1764.49	15.80	3.83E-01		3.24E-01
+	PB-214	77.11	* 10.70	3.79E-01	9.28E-02	3.62E-01
		295.21	* 19.20	1.86E-01		1.20E-01
		351.92	* 37.20	1.31E-01		9.28E-02
+	PA-228	89.95	22.00	-2.12E-01	3.39E-01	5.69E-01
		93.35	35.00	2.07E-01		3.39E-01
		105.00	16.30	1.95E-01		6.44E-01
		129.22	2.97	-1.28E+00		3.31E+00
		338.32	5.30	5.34E-02		2.02E+00
		463.00	13.80	-1.12E-01		8.54E-01
		911.23	16.70	5.31E-01		1.08E+00
+	AM-241	59.54	36.30	-2.09E-02	2.00E-01	2.00E-01
+	CM-243	103.76	23.00	6.42E-02	1.29E-01	1.29E-01
		228.18	10.60	-1.74E-01		2.63E-01
		277.60	14.00	6.76E-02		2.08E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

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

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

Analysis Report for L1-SUB-DRS-FSGS-W14-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

Analysis Report for L1-SUB-DRS-QSGS-W14-SB
L1-010-104 WEST PACKAGE: L1-SUB-DRS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-DRS-QSGS-W14-SB
Sample Description	: L1-010-104 WEST PACKAGE: L1-SUB-DRS
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 9.038E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 2/27/2018 8:35:00AM
Acquisition Started	: 3/1/2018 2:26:58AM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 3600.0 seconds
Real Time	: 3610.7 seconds
Dead Time	: 0.30 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 5357

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 2:31:47PM

Peak Analysis From Channel : 100
Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-DRS-QSGS-W14-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.74	147 -	161	154.02	1.36E+02	44.58	1.41E+03	1.46
F	2	238.51	457 -	485	477.50	2.31E+02	44.28	1.38E+03	1.97
F	3	295.28	584 -	597	591.01	1.17E+02	32.10	4.41E+02	1.63
F	4	351.83	698 -	711	704.08	2.53E+02	37.52	2.66E+02	1.81
F	5	583.40	1159 -	1172	1167.14	6.82E+01	20.59	1.37E+02	1.27
F	6	609.24	1211 -	1225	1218.82	1.96E+02	31.41	1.31E+02	1.95
F	7	661.62	1318 -	1330	1323.55	1.28E+02	26.21	1.16E+02	1.69
F	8	911.14	1818 -	1831	1822.53	3.93E+01	15.68	7.52E+01	1.42
F	9	968.94	1933 -	1944	1938.10	2.27E+01	16.44	1.06E+02	1.76
F	10	1119.73	2232 -	2246	2239.64	3.09E+01	14.06	9.70E+01	0.96
F	11	1460.57	2913 -	2931	2921.26	4.48E+02	43.29	4.51E+01	2.54
F	12	1764.22	3523 -	3535	3528.51	4.18E+01	13.36	3.66E+00	2.48

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 2:31:47PM

Env. Background File : C:\Canberra\Apex\Root\ Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	76.74	1.36E+02	44.58			1.36E+02	4.46E+01
F	2	238.51	2.31E+02	44.28			2.31E+02	4.43E+01
F	3	295.28	1.17E+02	32.10			1.17E+02	3.21E+01
F	4	351.83	2.53E+02	37.52	8.36E+01	3.72E+01	1.69E+02	5.28E+01
F	5	583.40	6.82E+01	20.59			6.82E+01	2.06E+01
F	6	609.24	1.96E+02	31.41	4.12E+01	2.42E+01	1.55E+02	3.97E+01
F	7	661.62	1.28E+02	26.21	6.61E+01	2.54E+01	6.23E+01	3.65E+01
F	8	911.14	3.93E+01	15.68			3.93E+01	1.57E+01
F	9	968.94	2.27E+01	16.44			2.27E+01	1.64E+01
F	10	1119.73	3.09E+01	14.06			3.09E+01	1.41E+01
F	11	1460.57	4.48E+02	43.29	5.63E+01	1.71E+01	3.92E+02	4.66E+01
F	12	1764.22	4.18E+01	13.36	1.52E+01	9.80E+00	2.66E+01	1.66E+01

Analysis Report for L1-SUB-DRS-QSGS-W14-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\ Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	4.73E+00	6.20E-01
CS-137	1.00	661.65	*	85.12	4.65E-02	2.74E-02
PB-212	0.99	77.11	*	17.50	2.14E-01	7.14E-02
		238.63	*	44.60	1.32E-01	2.62E-02
BI-214	0.77	609.31	*	46.30	1.97E-01	5.17E-02
		1120.29	*	15.10	2.09E-01	9.55E-02
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49	*	15.80	2.54E-01	1.59E-01
PB-214	0.99	77.11	*	10.70	3.50E-01	1.17E-01
		295.21	*	19.20	1.85E-01	5.16E-02
		351.92	*	37.20	1.62E-01	5.11E-02

* = 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

Analysis Report for L1-SUB-DRS-QSGS-W14-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.995	4.73E+00	6.20E-01	
CS-137	1.000	4.65E-02	2.74E-02	
PB-212	0.992	1.29E-01	2.47E-02	
BI-214	0.777	2.04E-01	4.37E-02	
PB-214	0.995	1.70E-01	3.49E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-QSGS-W14-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 2:31:47PM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F 5	583.40	1.89449E-02	15.09		
F 8	911.14	1.09179E-02	19.95	Tol.	AC-228 PA-228
F 9	968.94	6.30541E-03	36.21	Tol.	AC-228

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\Daityland_NPPLibrary\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	4.73E+00	5.99E-01
+	AR-41	1293.64	99.16	-1.49E+05	4.81E+05	4.81E+05
+	CO-60	1173.22	100.00	-3.46E-03	5.11E-02	5.64E-02
		1332.49	100.00	3.05E-02		5.11E-02
+	KR-85	513.99	0.43	1.15E+01	9.44E+00	9.44E+00
+	Y-88	898.04	93.70	2.83E-02	3.29E-02	4.58E-02
		1836.06	99.20	-5.47E-03		3.29E-02
+	NB-94	702.63	100.00	1.14E-02	3.66E-02	3.66E-02
		871.10	100.00	4.37E-04		3.70E-02
+	I-131	284.30	6.06	3.32E-01	4.25E-02	5.85E-01
		364.48	81.20	1.77E-02		4.25E-02
		636.97	7.27	2.67E-01		5.49E-01

Analysis Report for L1-SUB-DRS-QSGS-W14-SB

L1-010-104 WEST

PACKAGE: L1-SUB-DRS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-134	604.70		97.60	-9.26E-03	4.60E-02	5.34E-02
		795.84		85.40	5.85E-03		4.60E-02
+	CS-137	661.65	*	85.12	4.65E-02	5.00E-02	5.00E-02
+	CE-144	80.12		1.36	-2.60E-01	2.54E-01	3.12E+00
		133.51		11.09	1.54E-01		2.54E-01
+	EU-152	121.78		28.40	-1.30E-02	9.67E-02	9.67E-02
		344.28		26.60	9.33E-02		1.30E-01
		1408.00		20.74	-3.52E-02		2.12E-01
+	EU-154	123.07		40.40	-1.80E-02	6.77E-02	6.77E-02
		723.30		19.70	3.52E-02		2.02E-01
		1274.51		35.50	3.32E-02		1.45E-01
+	EU-155	86.54		32.80	-5.44E-02	1.08E-01	1.08E-01
		105.31		21.80	-3.43E-03		1.33E-01
+	BI-214	609.31	*	46.30	1.97E-01	8.48E-02	8.48E-02
		1120.29	*	15.10	2.09E-01		2.84E-01
		1238.11		5.94	6.35E-01		1.05E+00
		1377.67		4.11	-1.70E-01		1.14E+00
		1407.98		2.48	-2.95E-01		1.77E+00
		1509.19		2.19	6.10E-01		1.60E+00
		1764.49	*	15.80	2.54E-01		2.35E-01
+	PB-214	77.11	*	10.70	3.50E-01	9.13E-02	3.89E-01
		295.21	*	19.20	1.85E-01		1.33E-01
		351.92	*	37.20	1.62E-01		9.13E-02
+	PA-228	89.95		22.00	3.71E-01	3.53E-01	5.95E-01
		93.35		35.00	7.86E-02		3.53E-01
		105.00		16.30	1.86E-01		6.76E-01
		129.22		2.97	4.06E-01		3.54E+00
		338.32		5.30	2.37E+00		2.36E+00
		463.00		13.80	5.75E-02		9.78E-01
		911.23		16.70	1.31E+00		1.16E+00
+	AM-241	59.54		36.30	-8.58E-02	1.99E-01	1.99E-01
+	CM-243	103.76		23.00	2.45E-02	1.27E-01	1.27E-01
		228.18		10.60	-8.72E-02		2.64E-01
		277.60		14.00	4.76E-02		2.14E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

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

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

Analysis Report for L1-SUB-DRS-FJGS-W01-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-DRS-FJGS-W01-SB	
Sample Description	: L1-010-104-WEST	PACKAGE : L1-SUB-DRS
Sample Type	: 500 ml Marinelli	
Unit	:	
Sample Point	:	
Sample Size	: 8.402E+02 grams	
Facility	: Dairyland_NPP	
Sample Taken On	: 3/2/2018 10:43:00AM	
Acquisition Started	: 3/5/2018 11:05:28AM	
Procedure	: 500ml Marinelli	
Operator	: Administrator	
Detector Name	: HOTLAB	
Geometry	: 500ml Marinelli	
Live Time	: 3600.0 seconds	
Real Time	: 3610.7 seconds	
Dead Time	: 0.29 %	
Peak Locate Threshold	: 3.00	
Peak Locate Range (in channels)	: 100 - 4096	
Peak Area Range (in channels)	: 100 - 4096	
Identification Energy Tolerance	: 1.000 keV	
Energy Calibration Used Done On	: 7/8/2014	
Efficiency Calibration Used Done On	: 7/8/2014	
Efficiency Calibration Description	:	
Sample Number	: 5358	

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 2:32:39PM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-SUB-DRS-FJGS-W01-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.39	147 -	161	153.33	3.11E+02	70.38	1.68E+03	3.91
F	2	93.19	183 -	191	186.92	1.19E+02	47.18	9.21E+02	1.69
F	3	185.55	369 -	377	371.61	4.45E+01	28.96	6.74E+02	0.74
F	4	238.61	474 -	485	477.69	4.85E+02	54.28	6.16E+02	1.78
F	5	295.08	584 -	606	590.61	2.18E+02	41.00	7.11E+02	2.48
F	6	338.24	668 -	684	676.92	1.27E+02	34.22	4.33E+02	2.39
F	7	351.65	697 -	712	703.72	3.25E+02	42.65	3.92E+02	1.74
F	8	583.07	1161 -	1171	1166.48	1.11E+02	26.97	1.35E+02	2.05
F	9	609.21	1210 -	1224	1218.75	2.29E+02	34.25	1.69E+02	1.96
F	10	661.31	1316 -	1328	1322.93	1.02E+02	25.11	1.44E+02	1.62
F	11	910.91	1815 -	1827	1822.05	6.40E+01	19.73	8.47E+01	1.85
F	12	969.05	1934 -	1943	1938.32	4.23E+01	18.38	9.13E+01	1.70
F	13	1120.24	2236 -	2248	2240.67	6.43E+01	18.85	4.80E+01	2.61
F	14	1460.35	2912 -	2931	2920.82	5.67E+02	48.53	4.44E+01	2.57
F	15	1764.17	3523 -	3534	3528.41	3.01E+01	12.26	1.26E+01	2.24

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 2:32:39PM

Env. Background File : C:\Canberra\Apex\Root\ Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	76.39	3.11E+02	70.38			3.11E+02	7.04E+01
F	2	93.19	1.19E+02	47.18			1.19E+02	4.72E+01
F	3	185.55	4.45E+01	28.96			4.45E+01	2.90E+01
F	4	238.61	4.85E+02	54.28			4.85E+02	5.43E+01
F	5	295.08	2.18E+02	41.00			2.18E+02	4.10E+01
F	6	338.24	1.27E+02	34.22			1.27E+02	3.42E+01
F	7	351.65	3.25E+02	42.65	8.36E+01	3.72E+01	2.41E+02	5.66E+01
F	8	583.07	1.11E+02	26.97			1.11E+02	2.70E+01
F	9	609.21	2.29E+02	34.25	4.12E+01	2.42E+01	1.88E+02	4.19E+01
F	10	661.31	1.02E+02	25.11	6.61E+01	2.54E+01	3.62E+01	3.57E+01
F	11	910.91	6.40E+01	19.73			6.40E+01	1.97E+01
F	12	969.05	4.23E+01	18.38			4.23E+01	1.84E+01
F	13	1120.24	6.43E+01	18.85			6.43E+01	1.88E+01
F	14	1460.35	5.67E+02	48.53	5.63E+01	1.71E+01	5.11E+02	5.15E+01

Analysis Report for L1-SUB-DRS-FJGS-W01-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	15	1764.17	3.01E+01	12.26	1.52E+01	9.80E+00	1.50E+01	1.57E+01

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Daistryland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.97	1460.75	*	10.67	6.62E+00	7.62E-01
CS-137	0.98	661.65	*	85.12	2.91E-02	2.87E-02
PB-212	0.97	77.11	*	17.50	5.29E-01	1.25E-01
		238.63	*	44.60	2.97E-01	3.67E-02
BI-214	0.78	609.31	*	46.30	2.58E-01	5.93E-02
		1120.29	*	15.10	4.68E-01	1.39E-01
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49	*	15.80	1.53E-01	1.61E-01
PB-214	0.98	77.11	*	10.70	8.66E-01	2.04E-01
		295.21	*	19.20	3.70E-01	7.21E-02
		351.92	*	37.20	2.48E-01	5.94E-02
RA-226	0.93	186.21	*	3.28	3.12E-01	2.04E-01
AC-228	0.60	209.28		4.40		
		338.32	*	11.40	4.13E-01	1.13E-01
		794.70		4.60		
		911.60	*	27.70	2.11E-01	6.57E-02
		964.60		5.20		
		969.11	*	16.60	2.46E-01	1.07E-01

Analysis Report for L1-SUB-DRS-FJGS-W01-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

* = 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	0.975	6.62E+00	7.62E-01	
CS-137	0.981	2.91E-02	2.87E-02	
PB-212	0.977	3.01E-01	3.53E-02	
BI-214	0.784	2.76E-01	5.16E-02	
PB-214	0.980	3.01E-01	4.48E-02	
RA-226	0.933	3.12E-01	2.04E-01	
AC-228	0.603	2.59E-01	5.02E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-FJGS-W01-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 2:32:39PM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F 2	93.19	3.30841E-02	19.81	Tol.	PA-228
F 8	583.07	3.08884E-02	12.13		

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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	6.62E+00	6.50E-01	6.50E-01
+	AR-41	1293.64		99.16	1.13E+10	5.50E+10	5.50E+10
+	CO-60	1173.22		100.00	-2.19E-03	5.54E-02	6.75E-02
		1332.49		100.00	4.07E-02		5.54E-02
+	KR-85	513.99		0.43	2.76E+00	1.04E+01	1.04E+01
+	Y-88	898.04		93.70	8.60E-03	3.46E-02	5.40E-02
		1836.06		99.20	-3.26E-02		3.46E-02
+	NB-94	702.63		100.00	-1.70E-02	4.57E-02	4.57E-02
		871.10		100.00	-3.64E-02		4.77E-02
+	I-131	284.30		6.06	-4.07E-01	5.39E-02	7.33E-01
		364.48		81.20	-3.07E-02		5.39E-02
		636.97		7.27	7.42E-01		7.32E-01
+	CS-134	604.70		97.60	-1.50E-03	5.43E-02	6.37E-02
		795.84		85.40	-1.50E-02		5.43E-02

Analysis Report for L1-SUB-DRS-FJGS-W01-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-137	661.65	*	85.12	2.91E-02	5.62E-02	5.62E-02
+	CE-144	80.12		1.36	-4.91E-01	2.98E-01	3.85E+00
		133.51		11.09	6.80E-02		2.98E-01
+	EU-152	121.78		28.40	-1.25E-01	1.14E-01	1.14E-01
		344.28		26.60	-3.06E-02		1.60E-01
		1408.00		20.74	1.44E-01		2.43E-01
+	EU-154	123.07		40.40	-5.86E-02	8.03E-02	8.03E-02
		723.30		19.70	2.07E-01		2.61E-01
		1274.51		35.50	-1.67E-01		1.48E-01
+	EU-155	86.54		32.80	-6.02E-02	1.31E-01	1.31E-01
		105.31		21.80	3.24E-02		1.59E-01
+	BI-214	609.31	*	46.30	2.58E-01	9.75E-02	9.75E-02
		1120.29	*	15.10	4.68E-01		2.12E-01
		1238.11		5.94	1.05E+00		1.21E+00
		1377.67		4.11	-2.19E-01		1.20E+00
		1407.98		2.48	1.21E+00		2.03E+00
		1509.19		2.19	3.25E-01		2.23E+00
		1764.49	*	15.80	1.53E-01		2.80E-01
+	PB-214	77.11	*	10.70	8.66E-01	1.11E-01	4.59E-01
		295.21	*	19.20	3.70E-01		2.15E-01
		351.92	*	37.20	2.48E-01		1.11E-01
+	PA-228	89.95		22.00	-3.95E-01	1.11E+00	1.90E+00
		93.35		35.00	6.36E-01		1.11E+00
		105.00		16.30	1.18E-01		2.11E+00
		129.22		2.97	1.72E+00		1.10E+01
		338.32		5.30	6.74E+00		7.51E+00
		463.00		13.80	-7.70E-01		2.77E+00
		911.23		16.70	4.08E+00		3.49E+00
+	AM-241	59.54		36.30	3.13E-02	2.33E-01	2.33E-01
+	CM-243	103.76		23.00	-1.42E-02	1.51E-01	1.51E-01
		228.18		10.60	3.98E-02		3.01E-01
		277.60		14.00	1.80E-01		2.63E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

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

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

Analysis Report for L1-SUB-DRS-FJGS-W02-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-DRS-FJGS-W02-SB	
Sample Description	: L1-010-104-WEST	PACKAGE : L1-SUB-DRS
Sample Type	: 500 ml Marinelli	
Unit	:	
Sample Point	:	
Sample Size	: 8.870E+02 grams	
Facility	: Dairyland_NPP	
Sample Taken On	: 3/2/2018 10:50:00AM	
Acquisition Started	: 3/5/2018 12:07:48PM	
Procedure	: 500ml Marinelli	
Operator	: Administrator	
Detector Name	: HOTLAB	
Geometry	: 500ml Marinelli	
Live Time	: 3600.0 seconds	
Real Time	: 3610.7 seconds	
Dead Time	: 0.30 %	
Peak Locate Threshold	: 3.00	
Peak Locate Range (in channels)	: 100 - 4096	
Peak Area Range (in channels)	: 100 - 4096	
Identification Energy Tolerance	: 1.000 keV	
Energy Calibration Used Done On	: 7/8/2014	
Efficiency Calibration Used Done On	: 7/8/2014	
Efficiency Calibration Description	:	
Sample Number	: 5359	

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 2:33:18PM

Peak Analysis From Channel : 100

Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-DRS-FJGS-W02-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	92.83	182 -	190	186.19	7.28E+01	37.72	7.69E+02	1.27
F	2	238.43	474 -	481	477.33	2.46E+02	43.05	4.36E+02	1.47
F	3	294.89	587 -	596	590.22	7.17E+01	24.46	2.99E+02	0.99
M	4	328.46	653 -	682	657.36	4.42E+01	21.57	2.04E+02	1.62
m	5	338.38	653 -	682	677.19	5.80E+01	25.08	2.79E+02	1.63
F	6	351.60	698 -	710	703.63	1.45E+02	32.32	2.85E+02	1.90
F	7	582.91	1161 -	1172	1166.15	7.03E+01	23.91	1.67E+02	1.88
F	8	609.13	1214 -	1225	1218.59	1.38E+02	27.09	9.38E+01	1.93
F	9	910.75	1816 -	1827	1821.75	4.94E+01	19.40	8.68E+01	2.20
F	10	969.20	1934 -	1943	1938.63	2.31E+01	14.35	5.42E+01	1.87
F	11	1460.43	2913 -	2930	2920.98	4.90E+02	44.80	2.48E+01	2.65

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 2:33:18PM

Env. Background File : C:\Canberra\Apex\Root\Daairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	92.83	7.28E+01	37.72			7.28E+01	3.77E+01
F	2	238.43	2.46E+02	43.05			2.46E+02	4.30E+01
F	3	294.89	7.17E+01	24.46			7.17E+01	2.45E+01
M	4	328.46	4.42E+01	21.57			4.42E+01	2.16E+01
m	5	338.38	5.80E+01	25.08			5.80E+01	2.51E+01
F	6	351.60	1.45E+02	32.32	8.36E+01	3.72E+01	6.13E+01	4.93E+01
F	7	582.91	7.03E+01	23.91			7.03E+01	2.39E+01
F	8	609.13	1.38E+02	27.09	4.12E+01	2.42E+01	9.72E+01	3.63E+01
F	9	910.75	4.94E+01	19.40			4.94E+01	1.94E+01
F	10	969.20	2.31E+01	14.35			2.31E+01	1.43E+01
F	11	1460.43	4.90E+02	44.80	5.63E+01	1.71E+01	4.33E+02	4.80E+01

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-FJGS-W02-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.75 *	10.67	5.32E+00	6.59E-01
PB-212	0.55	77.11	17.50		
		238.63 *	44.60	1.43E-01	2.61E-02
BI-214	0.34	609.31 *	46.30	1.26E-01	4.77E-02
		1120.29	15.10		
		1238.11	5.94		
		1377.67	4.11		
		1407.98	2.48		
		1509.19	2.19		
		1764.49	15.80		
PB-214	0.70	77.11	10.70		
		295.21 *	19.20	1.16E-01	3.98E-02
		351.92 *	37.20	5.96E-02	4.81E-02
AC-228	0.58	209.28	4.40		
		338.32 *	11.40	1.78E-01	7.74E-02
		794.70	4.60		
		911.60 *	27.70	1.54E-01	6.10E-02
		964.60	5.20		
		969.11 *	16.60	1.27E-01	7.93E-02

* = 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

Analysis Report for L1-SUB-DRS-FJGS-W02-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.984	5.32E+00	6.59E-01	
PB-212	0.556	1.43E-01	2.61E-02	
BI-214	0.347	1.26E-01	4.77E-02	
PB-214	0.708	9.28E-02	3.07E-02	
AC-228	0.588	1.54E-01	4.10E-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

Analysis Report for L1-SUB-DRS-FJGS-W02-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 2:33:18PM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F 1	92.83	2.02252E-02	25.90	Tol.	PA-228
M 4	328.46	1.22825E-02	24.39		
F 7	582.91	1.95227E-02	17.01		

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\Daityland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.32E+00	5.57E-01
+	AR-41	1293.64	99.16	-2.39E+10	6.87E+10	6.87E+10
+	CO-60	1173.22	100.00	-3.73E-02	5.37E-02	5.56E-02
		1332.49	100.00	4.53E-02		5.37E-02
+	KR-85	513.99	0.43	1.66E+01	9.47E+00	9.47E+00
+	Y-88	898.04	93.70	-2.22E-02	3.38E-02	4.45E-02
		1836.06	99.20	-2.75E-02		3.38E-02
+	NB-94	702.63	100.00	1.15E-02	3.73E-02	3.73E-02
		871.10	100.00	-2.70E-02		3.98E-02
+	I-131	284.30	6.06	2.80E-01	4.77E-02	6.57E-01
		364.48	81.20	-2.10E-03		4.77E-02
		636.97	7.27	-1.06E-01		6.19E-01
+	CS-134	604.70	97.60	-3.93E-02	4.64E-02	4.92E-02

Analysis Report for L1-SUB-DRS-FJGS-W02-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	CS-134	795.84	85.40	-7.16E-03	4.64E-02	4.64E-02
+	CS-137	661.65	85.12	8.40E-02	5.81E-02	5.81E-02
+	CE-144	80.12	1.36	3.07E+00	2.59E-01	3.17E+00
		133.51	11.09	1.86E-02		2.59E-01
+	EU-152	121.78	28.40	-4.49E-02	9.90E-02	9.90E-02
		344.28	26.60	-4.36E-03		1.37E-01
		1408.00	20.74	-7.19E-02		1.67E-01
+	EU-154	123.07	40.40	-7.78E-02	6.88E-02	6.88E-02
		723.30	19.70	1.36E-01		1.89E-01
		1274.51	35.50	-5.43E-02		1.43E-01
+	EU-155	86.54	32.80	-1.18E-03	1.11E-01	1.11E-01
		105.31	21.80	3.69E-02		1.39E-01
+	BI-214	609.31	* 46.30	1.26E-01	7.82E-02	7.82E-02
		1120.29	15.10	5.03E-02		3.52E-01
		1238.11	5.94	9.30E-01		1.11E+00
		1377.67	4.11	-4.02E-01		1.08E+00
		1407.98	2.48	-6.01E-01		1.40E+00
		1509.19	2.19	3.63E-01		1.48E+00
		1764.49	15.80	1.47E-01		2.78E-01
+	PB-214	77.11	10.70	2.73E-01	9.35E-02	4.23E-01
		295.21	* 19.20	1.16E-01		1.03E-01
		351.92	* 37.20	5.96E-02		9.35E-02
+	PA-228	89.95	22.00	7.81E-01	9.78E-01	1.64E+00
		93.35	35.00	3.91E-01		9.78E-01
		105.00	16.30	4.69E-01		1.90E+00
		129.22	2.97	-1.41E-01		9.76E+00
		338.32	5.30	3.22E-01		6.74E+00
		463.00	13.80	6.29E-01		2.49E+00
		911.23	16.70	3.61E+00		3.25E+00
+	AM-241	59.54	36.30	-8.20E-02	2.03E-01	2.03E-01
+	CM-243	103.76	23.00	5.13E-02	1.32E-01	1.32E-01
		228.18	10.60	1.04E-01		2.78E-01
		277.60	14.00	6.08E-03		2.19E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

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

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

Analysis Report for L1-SUB-DRS-FJGS-W03-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-DRS-FJGS-W03-SB	
Sample Description	: L1-010-104-WEST	PACKAGE : L1-SUB-DRS
Sample Type	: 500 ml Marinelli	
Unit	:	
Sample Point	:	
Sample Size	: 8.743E+02 grams	
Facility	: Dairyland_NPP	
Sample Taken On	: 3/2/2018 10:57:00AM	
Acquisition Started	: 3/5/2018 1:09:58PM	
Procedure	: 500ml Marinelli	
Operator	: Administrator	
Detector Name	: HOTLAB	
Geometry	: 500ml Marinelli	
Live Time	: 3600.0 seconds	
Real Time	: 3610.8 seconds	
Dead Time	: 0.30 %	
Peak Locate Threshold	: 3.00	
Peak Locate Range (in channels)	: 100 - 4096	
Peak Area Range (in channels)	: 100 - 4096	
Identification Energy Tolerance	: 1.000 keV	
Energy Calibration Used Done On	: 7/8/2014	
Efficiency Calibration Used Done On	: 7/8/2014	
Efficiency Calibration Description	:	
Sample Number	: 5360	

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 2:33:57PM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-SUB-DRS-FJGS-W03-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.36	469 -	482	477.19	1.98E+02	41.03	7.26E+02	1.48
F	2	295.08	585 -	595	590.61	9.58E+01	30.28	2.97E+02	1.80
F	3	337.73	671 -	680	675.90	3.02E+01	18.54	2.31E+02	0.92
F	4	351.72	698 -	711	703.87	1.49E+02	30.95	3.15E+02	1.45
F	5	583.07	1161 -	1172	1166.49	9.39E+01	24.87	1.22E+02	2.15
F	6	609.15	1214 -	1226	1218.63	1.05E+02	25.20	1.37E+02	1.79
F	7	661.48	1318 -	1328	1323.28	1.03E+02	24.36	9.58E+01	1.72
F	8	869.80	1735 -	1746	1739.84	2.05E+01	11.64	3.86E+01	1.46
F	9	910.83	1817 -	1830	1821.90	5.32E+01	19.90	1.05E+02	2.36
F	10	1332.16	2658 -	2671	2664.45	2.77E+01	13.29	3.50E+01	2.27
F	11	1460.32	2911 -	2930	2920.74	4.80E+02	44.43	3.00E+01	2.56

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 2:33:57PM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	238.36	1.98E+02	41.03			1.98E+02	4.10E+01
F	2	295.08	9.58E+01	30.28			9.58E+01	3.03E+01
F	3	337.73	3.02E+01	18.54			3.02E+01	1.85E+01
F	4	351.72	1.49E+02	30.95	8.36E+01	3.72E+01	6.50E+01	4.84E+01
F	5	583.07	9.39E+01	24.87			9.39E+01	2.49E+01
F	6	609.15	1.05E+02	25.20	4.12E+01	2.42E+01	6.38E+01	3.49E+01
F	7	661.48	1.03E+02	24.36	6.61E+01	2.54E+01	3.71E+01	3.52E+01
F	8	869.80	2.05E+01	11.64			2.05E+01	1.16E+01
F	9	910.83	5.32E+01	19.90			5.32E+01	1.99E+01
F	10	1332.16	2.77E+01	13.29			2.77E+01	1.33E+01
F	11	1460.32	4.80E+02	44.43	5.63E+01	1.71E+01	4.24E+02	4.76E+01

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-FJGS-W03-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.97	1460.75 *	10.67	5.28E+00	6.62E-01
CS-137	0.99	661.65 *	85.12	2.87E-02	2.72E-02
PB-212	0.55	77.11	17.50		
		238.63 *	44.60	1.17E-01	2.49E-02
BI-214	0.34	609.31 *	46.30	8.40E-02	4.63E-02
		1120.29	15.10		
		1238.11	5.94		
		1377.67	4.11		
		1407.98	2.48		
		1509.19	2.19		
		1764.49	15.80		
PB-214	0.71	77.11	10.70		
		295.21 *	19.20	1.57E-01	5.01E-02
		351.92 *	37.20	6.42E-02	4.79E-02

* = 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
---------------------	------------------------------	-------------------------------------	-------------------------------------	-----------------

Analysis Report for L1-SUB-DRS-FJGS-W03-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.970	5.28E+00	6.62E-01	
CS-137	0.996	2.87E-02	2.72E-02	
PB-212	0.552	1.17E-01	2.49E-02	
BI-214	0.348	8.40E-02	4.63E-02	
PB-214	0.717	1.08E-01	3.46E-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

Analysis Report for L1-SUB-DRS-FJGS-W03-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 2:33:57PM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F 3	337.73	8.37723E-03	30.74	Tol.	AC-228 PA-228
F 5	583.07	2.60922E-02	13.24		
F 8	869.80	5.70241E-03	28.35		
F 9	910.83	1.47680E-02	18.72	Tol.	AC-228 PA-228
F 10	1332.16	7.70055E-03	23.97		

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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.28E+00	5.87E-01
+	AR-41	1293.64	99.16	9.14E+09	9.59E+10	9.59E+10
+	CO-60	1173.22	100.00	-1.05E-02	5.42E-02	6.31E-02
		1332.49	100.00	4.95E-02		5.42E-02
+	KR-85	513.99	0.43	9.87E+00	9.47E+00	9.47E+00
+	Y-88	898.04	93.70	-1.46E-02	3.11E-02	4.69E-02
		1836.06	99.20	-2.21E-02		3.11E-02
+	NB-94	702.63	100.00	-5.50E-03	3.83E-02	3.83E-02
		871.10	100.00	5.13E-03		4.05E-02

Analysis Report for L1-SUB-DRS-FJGS-W03-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	I-131	284.30	6.06	2.79E-01	5.17E-02	6.44E-01
		364.48	81.20	9.85E-03		5.17E-02
		636.97	7.27	4.91E-01		6.82E-01
+	CS-134	604.70	97.60	-3.66E-02	4.81E-02	4.81E-02
		795.84	85.40	1.54E-02		4.86E-02
+	CS-137	661.65	* 85.12	2.87E-02	4.90E-02	4.90E-02
+	CE-144	80.12	1.36	1.16E+00	2.70E-01	3.22E+00
		133.51	11.09	1.42E-01		2.70E-01
+	EU-152	121.78	28.40	-7.83E-02	1.02E-01	1.02E-01
		344.28	26.60	-1.65E-02		1.26E-01
		1408.00	20.74	1.63E-02		2.21E-01
+	EU-154	123.07	40.40	1.98E-02	7.25E-02	7.25E-02
		723.30	19.70	-7.86E-02		2.06E-01
		1274.51	35.50	4.21E-02		1.44E-01
+	EU-155	86.54	32.80	-1.12E-01	1.11E-01	1.11E-01
		105.31	21.80	-4.83E-02		1.41E-01
+	BI-214	609.31	* 46.30	8.40E-02	8.70E-02	8.70E-02
		1120.29	15.10	-1.85E-03		3.81E-01
		1238.11	5.94	-1.09E-01		9.82E-01
		1377.67	4.11	3.84E-01		1.06E+00
		1407.98	2.48	1.37E-01		1.85E+00
		1509.19	2.19	1.91E-01		1.71E+00
		1764.49	15.80	3.65E-01		3.06E-01
+	PB-214	77.11	10.70	3.83E-01	9.82E-02	4.34E-01
		295.21	* 19.20	1.57E-01		1.06E-01
		351.92	* 37.20	6.42E-02		9.82E-02
+	PA-228	89.95	22.00	2.44E+00	1.00E+00	1.71E+00
		93.35	35.00	3.09E-01		1.00E+00
		105.00	16.30	-3.58E-01		1.98E+00
		129.22	2.97	-2.07E+00		1.05E+01
		338.32	5.30	-3.18E+00		6.24E+00
		463.00	13.80	6.90E-01		2.68E+00
		911.23	16.70	1.58E+00		3.58E+00
+	AM-241	59.54	36.30	-7.95E-02	2.07E-01	2.07E-01
+	CM-243	103.76	23.00	1.53E-03	1.34E-01	1.34E-01
		228.18	10.60	1.42E-02		2.72E-01
		277.60	14.00	9.03E-02		2.21E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

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

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

Analysis Report for L1-SUB-DRS-FJGS-W03-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

Analysis Report for L1-SUB-DRS-FJGS-WO4-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-DRS-FJGS-WO4-SB	
Sample Description	: L1-010-104-WEST	PACKAGE : L1-SUB-DRS
Sample Type	: 500 ml Marinelli	
Unit	:	
Sample Point	:	
Sample Size	: 7.423E+02 grams	
Facility	: Dairyland_NPP	
Sample Taken On	: 3/2/2018 12:33:00PM	
Acquisition Started	: 3/5/2018 2:53:05PM	
Procedure	: 500ml Marinelli	
Operator	: Administrator	
Detector Name	: HOTLAB	
Geometry	: 500ml Marinelli	
Live Time	: 3600.0 seconds	
Real Time	: 3610.7 seconds	
Dead Time	: 0.29 %	
Peak Locate Threshold	: 3.00	
Peak Locate Range (in channels)	: 100 - 4096	
Peak Area Range (in channels)	: 100 - 4096	
Identification Energy Tolerance	: 1.000 keV	
Energy Calibration Used Done On	: 7/8/2014	
Efficiency Calibration Used Done On	: 7/8/2014	
Efficiency Calibration Description	:	
Sample Number	: 5361	

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 2:34:36PM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-SUB-DRS-FJGS-WO4-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.16	147 -	161	152.87	3.68E+02	71.02	1.67E+03	3.42
M	2	87.26	167 -	191	175.06	1.18E+02	43.98	1.04E+03	1.62
m	3	92.73	167 -	191	186.00	1.19E+02	44.84	1.04E+03	1.63
F	4	185.81	364 -	376	372.13	1.62E+02	47.78	9.12E+02	2.36
F	5	209.16	411 -	426	418.81	7.29E+01	37.78	1.08E+03	1.62
F	6	238.60	472 -	485	477.68	5.07E+02	57.34	7.73E+02	1.88
F	7	295.03	584 -	597	590.52	1.58E+02	37.54	5.14E+02	1.96
F	8	338.37	671 -	682	677.17	1.01E+02	33.06	3.41E+02	2.28
F	9	351.81	695 -	711	704.05	2.70E+02	40.13	4.68E+02	1.71
F	10	462.86	920 -	930	926.10	3.84E+01	17.23	1.61E+02	0.96
F	11	583.14	1161 -	1170	1166.63	1.53E+02	29.41	1.35E+02	1.62
F	12	609.23	1213 -	1226	1218.79	1.77E+02	31.48	1.64E+02	2.03
F	13	661.49	1318 -	1328	1323.30	1.30E+02	27.91	1.31E+02	1.85
F	14	727.27	1449 -	1459	1454.83	3.62E+01	17.10	9.28E+01	1.65
F	15	911.08	1816 -	1830	1822.39	9.56E+01	24.14	1.23E+02	2.13
F	16	968.80	1933 -	1943	1937.81	4.55E+01	19.43	1.02E+02	1.87
F	17	1119.81	2234 -	2245	2239.79	3.91E+01	17.45	7.20E+01	2.24
F	18	1460.47	2912 -	2930	2921.04	6.49E+02	52.15	3.20E+01	2.59
F	19	1763.98	3523 -	3535	3528.03	3.34E+01	13.40	2.33E+01	1.91

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 2:34:36PM

Env. Background File : C:\Canberra\Apex\Root\Daityland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	76.16	3.68E+02	71.02			3.68E+02	7.10E+01
M	2	87.26	1.18E+02	43.98			1.18E+02	4.40E+01
m	3	92.73	1.19E+02	44.84			1.19E+02	4.48E+01
F	4	185.81	1.62E+02	47.78			1.62E+02	4.78E+01
F	5	209.16	7.29E+01	37.78			7.29E+01	3.78E+01
F	6	238.60	5.07E+02	57.34			5.07E+02	5.73E+01
F	7	295.03	1.58E+02	37.54			1.58E+02	3.75E+01
F	8	338.37	1.01E+02	33.06			1.01E+02	3.31E+01
F	9	351.81	2.70E+02	40.13	8.36E+01	3.72E+01	1.87E+02	5.47E+01
F	10	462.86	3.84E+01	17.23			3.84E+01	1.72E+01

Analysis Report for L1-SUB-DRS-FJGS-WO4-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	11	583.14	1.53E+02	29.41			1.53E+02	2.94E+01
F	12	609.23	1.77E+02	31.48	4.12E+01	2.42E+01	1.36E+02	3.97E+01
F	13	661.49	1.30E+02	27.91	6.61E+01	2.54E+01	6.36E+01	3.77E+01
F	14	727.27	3.62E+01	17.10			3.62E+01	1.71E+01
F	15	911.08	9.56E+01	24.14			9.56E+01	2.41E+01
F	16	968.80	4.55E+01	19.43			4.55E+01	1.94E+01
F	17	1119.81	3.91E+01	17.45			3.91E+01	1.75E+01
F	18	1460.47	6.49E+02	52.15	5.63E+01	1.71E+01	5.93E+02	5.49E+01
F	19	1763.98	3.34E+01	13.40	1.52E+01	9.80E+00	1.83E+01	1.66E+01

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Daityland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.75 *	10.67	8.70E+00	9.39E-01
CS-137	0.99	661.65 *	85.12	5.78E-02	3.45E-02
BI-212	0.60	727.17 *	11.80	2.59E-01	1.23E-01
		785.42	2.00		
		1620.56	2.75		
PB-212	0.96	77.11 *	17.50	7.12E-01	1.45E-01
		238.63 *	44.60	3.52E-01	4.38E-02
BI-214	0.77	609.31 *	46.30	2.11E-01	6.27E-02
		1120.29 *	15.10	3.22E-01	1.44E-01
		1238.11	5.94		
		1377.67	4.11		
		1407.98	2.48		
		1509.19	2.19		
		1764.49 *	15.80	2.12E-01	1.93E-01
PB-214	0.97	77.11 *	10.70	1.16E+00	2.37E-01
		295.21 *	19.20	3.04E-01	7.38E-02
		351.92 *	37.20	2.17E-01	6.46E-02
RA-226	0.97	186.21 *	3.28	1.29E+00	3.86E-01
AC-228	0.78	209.28 *	4.40	4.66E-01	2.43E-01
		338.32 *	11.40	3.68E-01	1.23E-01

Analysis Report for L1-SUB-DRS-FJGS-WO4-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
AC-228	0.78	794.70	4.60		
		911.60 *	27.70	3.57E-01	9.15E-02
		964.60	5.20		
		969.11 *	16.60	2.99E-01	1.29E-01

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 2.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.987	8.70E+00	9.39E-01	
CS-137	0.996	5.78E-02	3.45E-02	
BI-212	0.604	2.59E-01	1.23E-01	
PB-212	0.960	3.69E-01	4.20E-02	
BI-214	0.774	2.27E-01	5.51E-02	
PB-214	0.975	2.67E-01	4.77E-02	
RA-226	0.975	1.29E+00	3.86E-01	
AC-228	0.780	3.54E-01	6.16E-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

Analysis Report for L1-SUB-DRS-FJGS-WO4-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 2:34:36PM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
M 2	87.26	3.27350E-02	18.66	Tol.	EU-155
m 3	92.73	3.30422E-02	18.85	Tol.	PA-228
F 10	462.86	1.06665E-02	22.44	Tol.	PA-228
F 11	583.14	4.25829E-02	9.59		

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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	8.70E+00	6.92E-01
+	AR-41	1293.64	99.16	-5.17E+10	1.33E+11	1.33E+11
+	CO-60	1173.22	100.00	6.23E-02	6.15E-02	8.28E-02
		1332.49	100.00	-3.81E-03		6.15E-02
+	KR-85	513.99	0.43	1.66E+01	1.26E+01	1.26E+01
+	Y-88	898.04	93.70	-1.60E-04	4.38E-02	6.13E-02
		1836.06	99.20	2.60E-03		4.38E-02

Analysis Report for L1-SUB-DRS-FJGS-WO4-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	NB-94	702.63	100.00	7.22E-03	4.85E-02	4.85E-02
		871.10	100.00	-4.26E-02		5.31E-02
+	I-131	284.30	6.06	-7.00E-01	6.55E-02	8.72E-01
		364.48	81.20	-2.30E-02		6.55E-02
		636.97	7.27	5.36E-02		8.89E-01
+	CS-134	604.70	97.60	-1.81E-02	6.61E-02	6.61E-02
		795.84	85.40	-3.79E-02		6.66E-02
+	CS-137	661.65	* 85.12	5.78E-02	6.11E-02	6.11E-02
+	CE-144	80.12	1.36	-4.11E-01	3.48E-01	4.41E+00
		133.51	11.09	-8.73E-03		3.48E-01
+	EU-152	121.78	28.40	-7.22E-02	1.32E-01	1.32E-01
		344.28	26.60	-3.82E-02		1.80E-01
		1408.00	20.74	8.80E-02		2.70E-01
+	EU-154	123.07	40.40	-3.23E-02	9.39E-02	9.39E-02
		723.30	19.70	1.44E-01		2.72E-01
		1274.51	35.50	1.22E-01		2.06E-01
+	EU-155	86.54	32.80	-1.53E-02	1.52E-01	1.52E-01
		105.31	21.80	-1.32E-02		1.79E-01
+	BI-214	609.31	* 46.30	2.11E-01	1.08E-01	1.08E-01
		1120.29	* 15.10	3.22E-01		2.79E-01
		1238.11	5.94	-2.31E-01		1.36E+00
		1377.67	4.11	7.15E-01		1.38E+00
		1407.98	2.48	7.35E-01		2.26E+00
		1509.19	2.19	3.97E-01		2.22E+00
		1764.49	* 15.80	2.12E-01		3.51E-01
+	PB-214	77.11	* 10.70	1.16E+00	1.34E-01	5.21E-01
		295.21	* 19.20	3.04E-01		1.74E-01
		351.92	* 37.20	2.17E-01		1.34E-01
+	PA-228	89.95	22.00	3.49E+00	1.38E+00	2.36E+00
		93.35	35.00	2.79E-01		1.38E+00
		105.00	16.30	-4.09E-01		2.53E+00
		129.22	2.97	7.01E+00		1.37E+01
		338.32	5.30	5.34E+00		9.15E+00
		463.00	13.80	-3.16E+00		3.47E+00
		911.23	16.70	6.61E+00		4.83E+00
+	AM-241	59.54	36.30	1.92E-01	2.71E-01	2.71E-01
+	CM-243	103.76	23.00	-3.00E-02	1.71E-01	1.71E-01
		228.18	10.60	-1.80E-02		3.58E-01
		277.60	14.00	-1.16E-01		3.02E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

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

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

Analysis Report for L1-SUB-DRS-FJGS-WO4-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

Analysis Report for L1-SUB-DRS-FJGS-W05-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-DRS-FJGS-W05-SB	
Sample Description	: L1-010-104-WEST	PACKAGE : L1-SUB-DRS
Sample Type	: 500 ml Marinelli	
Unit	:	
Sample Point	:	
Sample Size	: 8.420E+02 grams	
Facility	: Dairyland_NPP	
Sample Taken On	: 3/2/2018 12:43:00PM	
Acquisition Started	: 3/5/2018 3:55:17PM	
Procedure	: 500ml Marinelli	
Operator	: Administrator	
Detector Name	: HOTLAB	
Geometry	: 500ml Marinelli	
Live Time	: 3600.0 seconds	
Real Time	: 3610.8 seconds	
Dead Time	: 0.30 %	
Peak Locate Threshold	: 3.00	
Peak Locate Range (in channels)	: 100 - 4096	
Peak Area Range (in channels)	: 100 - 4096	
Identification Energy Tolerance	: 1.000 keV	
Energy Calibration Used Done On	: 7/8/2014	
Efficiency Calibration Used Done On	: 7/8/2014	
Efficiency Calibration Description	:	
Sample Number	: 5362	

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 2:35:16PM

Peak Analysis From Channel : 100

Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-DRS-FJGS-W05-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	87.12	170 -	181	174.79	8.31E+01	39.57	9.77E+02	1.46
F	2	238.45	469 -	485	477.38	3.03E+02	46.15	6.93E+02	2.03
M	3	295.09	587 -	605	590.63	8.13E+01	27.91	2.69E+02	1.53
m	4	299.99	587 -	605	600.43	3.31E+01	22.06	3.26E+02	1.54
F	5	338.06	672 -	681	676.55	7.22E+01	26.29	2.09E+02	1.80
F	6	351.72	699 -	708	703.87	1.66E+02	31.83	1.79E+02	1.76
F	7	582.97	1160 -	1172	1166.28	9.22E+01	24.28	1.43E+02	1.76
F	8	609.13	1209 -	1225	1218.60	1.13E+02	27.04	1.60E+02	2.46
F	9	661.24	1317 -	1332	1322.80	1.03E+02	24.87	1.37E+02	2.09
F	10	911.10	1816 -	1828	1822.44	6.49E+01	20.22	9.37E+01	1.79
F	11	1120.26	2236 -	2247	2240.71	2.17E+01	14.00	5.80E+01	1.90
F	12	1460.46	2911 -	2930	2921.03	5.15E+02	46.12	3.00E+01	2.71

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 2:35:16PM

Env. Background File : C:\Canberra\Apex\Root\Daityland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	87.12	8.31E+01	39.57			8.31E+01	3.96E+01
F	2	238.45	3.03E+02	46.15			3.03E+02	4.62E+01
M	3	295.09	8.13E+01	27.91			8.13E+01	2.79E+01
m	4	299.99	3.31E+01	22.06			3.31E+01	2.21E+01
F	5	338.06	7.22E+01	26.29			7.22E+01	2.63E+01
F	6	351.72	1.66E+02	31.83	8.36E+01	3.72E+01	8.21E+01	4.90E+01
F	7	582.97	9.22E+01	24.28			9.22E+01	2.43E+01
F	8	609.13	1.13E+02	27.04	4.12E+01	2.42E+01	7.23E+01	3.63E+01
F	9	661.24	1.03E+02	24.87	6.61E+01	2.54E+01	3.73E+01	3.55E+01
F	10	911.10	6.49E+01	20.22			6.49E+01	2.02E+01
F	11	1120.26	2.17E+01	14.00			2.17E+01	1.40E+01
F	12	1460.46	5.15E+02	46.12	5.63E+01	1.71E+01	4.59E+02	4.92E+01

Analysis Report for L1-SUB-DRS-FJGS-W05-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Daivland_NPPLibrary\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.75	*	10.67	5.94E+00	7.17E-01
CS-137	0.97	661.65	*	85.12	2.99E-02	2.85E-02
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	1.86E-01	2.98E-02
BI-214	0.58	609.31	*	46.30	9.88E-02	4.99E-02
		1120.29	*	15.10	1.58E-01	1.02E-01
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.71	77.11		10.70		
		295.21	*	19.20	1.38E-01	4.79E-02
		351.92	*	37.20	8.42E-02	5.04E-02

* = 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

Analysis Report for L1-SUB-DRS-FJGS-W05-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.987	5.94E+00	7.17E-01	
CS-137	0.974	2.99E-02	2.85E-02	
PB-212	0.557	1.86E-01	2.98E-02	
BI-214	0.582	1.10E-01	4.48E-02	
PB-214	0.717	1.12E-01	3.47E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-FJGS-W05-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 2:35:16PM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F 1	87.12	2.30748E-02	23.82	Tol.	EU-155
m 4	299.99	9.20322E-03	33.29		
F 5	338.06	2.00549E-02	18.21	Tol.	AC-228 PA-228
F 7	582.97	2.56192E-02	13.16		
F 10	911.10	1.80198E-02	15.58	Tol.	AC-228 PA-228

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\Daityland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	* 10.67	5.94E+00	6.10E-01	6.10E-01
+	AR-41	1293.64	99.16	9.15E+10	1.68E+11	1.68E+11
+	CO-60	1173.22	100.00	2.26E-03	5.21E-02	6.78E-02

Analysis Report for L1-SUB-DRS-FJGS-W05-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	CO-60	1332.49	100.00	3.02E-02	5.21E-02	5.21E-02
+	KR-85	513.99	0.43	1.41E+01	1.05E+01	1.05E+01
+	Y-88	898.04	93.70	2.91E-02	3.24E-02	5.31E-02
		1836.06	99.20	-2.25E-02		3.24E-02
+	NB-94	702.63	100.00	5.17E-03	4.12E-02	4.12E-02
		871.10	100.00	3.66E-02		4.63E-02
+	I-131	284.30	6.06	-7.82E-03	5.13E-02	6.99E-01
		364.48	81.20	-2.71E-02		5.13E-02
		636.97	7.27	1.25E-01		7.31E-01
+	CS-134	604.70	97.60	-8.26E-04	5.14E-02	5.14E-02
		795.84	85.40	3.39E-02		5.25E-02
+	CS-137	661.65	* 85.12	2.99E-02	5.71E-02	5.71E-02
+	CE-144	80.12	1.36	2.97E+00	2.68E-01	3.37E+00
		133.51	11.09	-2.09E-01		2.68E-01
+	EU-152	121.78	28.40	-2.00E-02	1.04E-01	1.04E-01
		344.28	26.60	-1.37E-01		1.31E-01
		1408.00	20.74	8.34E-02		2.19E-01
+	EU-154	123.07	40.40	2.67E-02	7.39E-02	7.39E-02
		723.30	19.70	2.16E-02		2.11E-01
		1274.51	35.50	-1.59E-01		1.45E-01
+	EU-155	86.54	32.80	-7.58E-02	1.17E-01	1.17E-01
		105.31	21.80	-2.28E-02		1.44E-01
+	BI-214	609.31	* 46.30	9.88E-02	9.78E-02	9.78E-02
		1120.29	* 15.10	1.58E-01		2.24E-01
		1238.11	5.94	-3.09E-01		1.10E+00
		1377.67	4.11	-6.76E-01		1.12E+00
		1407.98	2.48	6.97E-01		1.83E+00
		1509.19	2.19	2.86E-01		1.80E+00
		1764.49	15.80	2.11E-01		3.17E-01
+	PB-214	77.11	10.70	7.48E-01	8.76E-02	4.64E-01
		295.21	* 19.20	1.38E-01		9.62E-02
		351.92	* 37.20	8.42E-02		8.76E-02
+	PA-228	89.95	22.00	7.32E-01	1.08E+00	1.82E+00
		93.35	35.00	-1.41E-01		1.08E+00
		105.00	16.30	-1.20E+00		2.09E+00
		129.22	2.97	4.94E+00		1.09E+01
		338.32	5.30	6.37E+00		7.02E+00
		463.00	13.80	7.03E-01		2.91E+00
		911.23	16.70	-8.84E-01		3.61E+00
+	AM-241	59.54	36.30	-1.37E-01	2.16E-01	2.16E-01
+	CM-243	103.76	23.00	-5.94E-02	1.37E-01	1.37E-01
		228.18	10.60	-1.18E-01		2.75E-01
		277.60	14.00	-2.82E-01		2.30E-01

Analysis Report for L1-SUB-DRS-FJGS-W05-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

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

Analysis Report for L1-SUB-DRS-FJGS-WO6-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-DRS-FJGS-WO6-SB	
Sample Description	: L1-010-104-WEST	PACKAGE : L1-SUB-DRS
Sample Type	: 500 ml Marinelli	
Unit	:	
Sample Point	:	
Sample Size	: 8.805E+02 grams	
Facility	: Dairyland_NPP	
Sample Taken On	: 3/2/2018 1:09:00PM	
Acquisition Started	: 3/5/2018 5:01:35PM	
Procedure	: 500ml Marinelli	
Operator	: Administrator	
Detector Name	: HOTLAB	
Geometry	: 500ml Marinelli	
Live Time	: 3600.0 seconds	
Real Time	: 3610.2 seconds	
Dead Time	: 0.28 %	
Peak Locate Threshold	: 3.00	
Peak Locate Range (in channels)	: 100 - 4096	
Peak Area Range (in channels)	: 100 - 4096	
Identification Energy Tolerance	: 1.000 keV	
Energy Calibration Used Done On	: 7/8/2014	
Efficiency Calibration Used Done On	: 7/8/2014	
Efficiency Calibration Description	:	
Sample Number	: 5363	

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 2:35:52PM

Peak Analysis From Channel : 100

Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-DRS-FJGS-WO6-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.81	147 -	161	154.17	2.16E+02	57.62	1.30E+03	2.78
F	2	238.49	472 -	485	477.45	2.72E+02	44.81	6.73E+02	1.70
F	3	295.25	586 -	596	590.94	1.02E+02	29.13	3.37E+02	1.33
F	4	337.92	672 -	680	676.27	5.45E+01	22.97	2.13E+02	1.20
F	5	351.71	699 -	709	703.85	1.58E+02	33.26	2.80E+02	1.67
F	6	510.30	1012 -	1030	1020.96	9.90E+01	28.59	2.15E+02	3.56
F	7	582.95	1159 -	1172	1166.25	9.09E+01	24.55	1.54E+02	1.88
F	8	609.04	1213 -	1223	1218.42	1.39E+02	27.23	9.85E+01	1.79
F	9	911.07	1815 -	1829	1822.38	5.97E+01	20.46	9.87E+01	2.25
F	10	1120.09	2235 -	2245	2240.37	2.33E+01	12.82	4.48E+01	1.45
F	11	1331.70	2657 -	2668	2663.55	2.22E+01	11.77	3.00E+01	1.75
F	12	1460.44	2914 -	2930	2920.99	4.92E+02	45.20	3.29E+01	2.53

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 2:35:52PM

Env. Background File : C:\Canberra\Apex\Root\Daairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	76.81	2.16E+02	57.62			2.16E+02	5.76E+01
F	2	238.49	2.72E+02	44.81			2.72E+02	4.48E+01
F	3	295.25	1.02E+02	29.13			1.02E+02	2.91E+01
F	4	337.92	5.45E+01	22.97			5.45E+01	2.30E+01
F	5	351.71	1.58E+02	33.26	8.36E+01	3.72E+01	7.39E+01	4.99E+01
F	6	510.30	9.90E+01	28.59			9.90E+01	2.86E+01
F	7	582.95	9.09E+01	24.55			9.09E+01	2.46E+01
F	8	609.04	1.39E+02	27.23	4.12E+01	2.42E+01	9.73E+01	3.64E+01
F	9	911.07	5.97E+01	20.46			5.97E+01	2.05E+01
F	10	1120.09	2.33E+01	12.82			2.33E+01	1.28E+01
F	11	1331.70	2.22E+01	11.77			2.22E+01	1.18E+01
F	12	1460.44	4.92E+02	45.20	5.63E+01	1.71E+01	4.36E+02	4.83E+01

Analysis Report for L1-SUB-DRS-FJGS-WO6-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Daityland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.75	*	10.67	5.39E+00	6.69E-01
PB-212	0.99	77.11	*	17.50	3.47E-01	9.54E-02
		238.63	*	44.60	1.59E-01	2.75E-02
BI-214	0.57	609.31	*	46.30	1.27E-01	4.82E-02
		1120.29	*	15.10	1.62E-01	8.93E-02
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.99	77.11	*	10.70	5.68E-01	1.56E-01
		295.21	*	19.20	1.66E-01	4.80E-02
		351.92	*	37.20	7.25E-02	4.91E-02

* = 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

Analysis Report for L1-SUB-DRS-FJGS-WO6-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.984	5.39E+00	6.69E-01	
PB-212	0.994	1.68E-01	2.65E-02	
BI-214	0.578	1.35E-01	4.24E-02	
PB-214	0.994	1.28E-01	3.36E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-DRS-FJGS-WO6-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 2:35:52PM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F 4	337.92	1.51307E-02	21.09	Tol.	AC-228 PA-228
F 6	510.30	2.75019E-02	14.44		
F 7	582.95	2.52598E-02	13.50		
F 9	911.07	1.65735E-02	17.14	Tol.	AC-228 PA-228
F 11	1331.70	6.15329E-03	26.57	Tol.	CO-60

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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	* 10.67	5.39E+00	5.76E-01	5.76E-01
+	AR-41	1293.64	99.16	3.85E+10	2.05E+11	2.05E+11
+	CO-60	1173.22	100.00	5.51E-03	5.41E-02	6.07E-02
		1332.49	100.00	6.05E-02		5.41E-02
+	KR-85	513.99	0.43	-2.05E+00	9.69E+00	9.69E+00
+	Y-88	898.04	93.70	3.84E-02	3.20E-02	4.79E-02
		1836.06	99.20	-1.24E-02		3.20E-02
+	NB-94	702.63	100.00	-3.38E-02	3.89E-02	3.89E-02
		871.10	100.00	-1.69E-02		4.12E-02

Analysis Report for L1-SUB-DRS-FJGS-WO6-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	I-131	284.30	6.06	2.35E-02	4.86E-02	6.82E-01
		364.48	81.20	-3.96E-02		4.86E-02
		636.97	7.27	4.45E-01		6.81E-01
+	CS-134	604.70	97.60	8.86E-02	4.73E-02	4.95E-02
		795.84	85.40	1.76E-02		4.73E-02
+	CS-137	661.65	85.12	5.28E-02	5.37E-02	5.37E-02
+	CE-144	80.12	1.36	-6.54E-01	2.72E-01	3.26E+00
		133.51	11.09	4.17E-02		2.72E-01
+	EU-152	121.78	28.40	-2.23E-02	1.03E-01	1.03E-01
		344.28	26.60	-1.30E-01		1.31E-01
		1408.00	20.74	-4.77E-02		2.22E-01
+	EU-154	123.07	40.40	-7.63E-03	7.27E-02	7.27E-02
		723.30	19.70	-1.99E-02		1.98E-01
		1274.51	35.50	-7.80E-03		1.42E-01
+	EU-155	86.54	32.80	-1.14E-02	1.13E-01	1.13E-01
		105.31	21.80	-8.51E-02		1.33E-01
+	BI-214	609.31	* 46.30	1.27E-01	7.86E-02	7.86E-02
		1120.29	* 15.10	1.62E-01		1.88E-01
		1238.11	5.94	1.20E+00		1.16E+00
		1377.67	4.11	2.31E-01		1.01E+00
		1407.98	2.48	-3.98E-01		1.85E+00
		1509.19	2.19	7.50E-01		1.64E+00
		1764.49	15.80	2.36E-01		3.15E-01
+	PB-214	77.11	* 10.70	5.68E-01	9.20E-02	3.82E-01
		295.21	* 19.20	1.66E-01		1.12E-01
		351.92	* 37.20	7.25E-02		9.20E-02
+	PA-228	89.95	22.00	1.52E+00	1.05E+00	1.81E+00
		93.35	35.00	-6.36E-01		1.05E+00
		105.00	16.30	-6.57E-01		1.99E+00
		129.22	2.97	5.50E+00		1.10E+01
		338.32	5.30	4.66E+00		6.90E+00
		463.00	13.80	-5.99E-01		2.76E+00
		911.23	16.70	6.17E+00		3.78E+00
+	AM-241	59.54	36.30	2.35E-02	2.02E-01	2.02E-01
+	CM-243	103.76	23.00	2.39E-03	1.28E-01	1.28E-01
		228.18	10.60	1.08E-01		2.80E-01
		277.60	14.00	1.02E-01		2.23E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

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

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

Analysis Report for L1-SUB-DRS-FJGS-WO6-SB

L1-010-104-WEST

PACKAGE : L1-SUB-DRS

Analysis Report for L1-SUB-DRS-FSGS-W05-SB SPLIT

02/27/18 - 0927

GAMMA SPECTRUM ANALYSIS

Sample Identification : L1-SUB-DRS-FSGS-W05-SB SPLIT
Sample Description : 02/27/18 - 0927
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 9.496E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 2/27/2018 9:27:00AM
Acquisition Started : 10/16/2018 3:15:50PM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3610.7 seconds

Dead Time : 0.30 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 100 - 4096
Peak Area Range (in channels) : 100 - 4096
Identification Energy Tolerance : 1.000 keV

Energy Calibration Used Done On : 7/8/2014
Efficiency Calibration Used Done On : 7/8/2014
Efficiency Calibration Description :

Sample Number : 5072

Reviewed
Scott J. Hall

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/18/2018 8:51:59AM

Peak Analysis From Channel : 100
Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-DRS-FSGS-W05-SB SPLIT

02/27/18 - 0927

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	186.20	365 -	376	372.90	5.75E+01	29.63	6.40E+02	1.13
F	2	238.81	472 -	485	478.09	2.96E+02	47.88	5.75E+02	2.51
F	3	295.08	586 -	595	590.62	8.03E+01	29.85	3.17E+02	1.64
F	4	352.00	697 -	708	704.44	1.55E+02	33.09	2.37E+02	2.21
F	5	463.37	922 -	931	927.13	2.15E+01	13.38	1.03E+02	0.89
F	6	583.42	1161 -	1173	1167.18	7.36E+01	22.13	1.04E+02	2.16
F	7	609.55	1212 -	1228	1219.43	1.30E+02	27.03	1.14E+02	2.65
F	8	662.01	1318 -	1332	1324.33	1.01E+02	25.56	1.24E+02	2.73
F	9	846.77	1687 -	1697	1693.80	2.12E+01	12.76	5.22E+01	1.41
F	10	911.00	1815 -	1829	1822.24	7.02E+01	20.51	8.25E+01	2.22
F	11	1119.76	2236 -	2247	2239.69	2.05E+01	6.13	6.00E+01	0.66
F	12	1461.13	2913 -	2930	2922.37	5.05E+02	45.39	1.76E+01	2.85

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 10/18/2018 8:51:59AM

Env. Background File : C:\Canberra\Apex\Root\ Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	186.20	5.75E+01	29.63			5.75E+01	2.96E+01
F	2	238.81	2.96E+02	47.88			2.96E+02	4.79E+01
F	3	295.08	8.03E+01	29.85			8.03E+01	2.99E+01
F	4	352.00	1.55E+02	33.09	8.36E+01	3.72E+01	7.11E+01	4.98E+01
F	5	463.37	2.15E+01	13.38			2.15E+01	1.34E+01
F	6	583.42	7.36E+01	22.13			7.36E+01	2.21E+01
F	7	609.55	1.30E+02	27.03	4.12E+01	2.42E+01	8.93E+01	3.63E+01
F	8	662.01	1.01E+02	25.56	6.61E+01	2.54E+01	3.48E+01	3.60E+01
F	9	846.77	2.12E+01	12.76			2.12E+01	1.28E+01
F	10	911.00	7.02E+01	20.51			7.02E+01	2.05E+01
F	11	1119.76	2.05E+01	6.13			2.05E+01	6.13E+00
F	12	1461.13	5.05E+02	45.39	5.63E+01	1.71E+01	4.49E+02	4.85E+01

Analysis Report for L1-SUB-DRS-FSGS-W05-SB SPLIT

02/27/18 - 0927

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.97	1460.75	*	10.67	5.15E+00	6.26E-01
CS-137	0.98	661.65	*	85.12	2.51E-02	2.61E-02
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	1.61E-01	2.73E-02
BI-214	0.57	609.31	*	46.30	1.08E-01	4.45E-02
		1120.29	*	15.10	1.32E-01	3.99E-02
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.72	77.11		10.70		
		295.21	*	19.20	1.21E-01	4.54E-02
		351.92	*	37.20	6.47E-02	4.54E-02
RA-226	1.00	186.21	*	3.28	3.57E-01	1.85E-01

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 2.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for L1-SUB-DRS-FSGS-W05-SB SPLIT
02/27/18 - 0927

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.978	5.15E+00	6.26E-01	
CS-137	0.980	2.51E-02 ✓	2.61E-02	
PB-212	0.556	1.61E-01	2.73E-02	
BI-214	0.573	1.22E-01	2.97E-02	
PB-214	0.720	9.29E-02	3.21E-02	
RA-226	1.000	3.57E-01	1.85E-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 L1-SUB-DRS-FSGS-W05-SB SPLIT
02/27/18 - 0927

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/18/2018 8:51:59AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F 5	463.37	5.96221E-03	31.16	Tol.	SB-125 PA-228
F 6	583.42	2.04390E-02	15.04		
F 9	846.77	5.89133E-03	30.09		
F 10	911.00	1.94957E-02	14.61	Tol.	AC-228 PA-228

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\ Dairy\and_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.15E+00	5.06E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	-1.45E-02	4.91E-02 ✓	5.34E-02
		1332.49	100.00	3.07E-02		4.91E-02
+	KR-85	513.99	0.43	1.35E+01	8.90E+00	8.90E+00
+	Y-88	898.04	93.70	1.75E-01	1.58E-01	1.87E-01
		1836.06	99.20	-3.07E-02		1.58E-01
+	NB-94	702.63	100.00	-4.18E-03	3.49E-02	3.49E-02
		871.10	100.00	-3.97E-02		3.54E-02

Analysis Report for L1-SUB-DRS-FSGS-W05-SB SPLIT

02/27/18 - 0927

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	I-131	284.30	6.06	9.27E+07	1.44E+07	2.07E+08
		364.48	81.20	-1.24E+07		1.44E+07
		636.97	7.27	-5.21E+07		1.91E+08
+	CS-134	604.70	97.60	-2.47E-03	5.23E-02	5.23E-02
		795.84	85.40	1.31E-02		5.59E-02
+	CS-137	661.65	* 85.12	2.51E-02	4.99E-02 ✓	4.99E-02
+	CE-144	80.12	1.36	2.45E+00	4.00E-01	5.17E+00
		133.51	11.09	3.46E-02		4.00E-01
+	EU-152	121.78	28.40	-6.10E-02	9.18E-02 ✓	9.18E-02
		244.69	7.49	-3.07E-01		4.29E-01
		964.00	14.44	3.67E-01		3.62E-01
		1408.00	20.74	1.61E-01		1.83E-01
+	EU-154	123.07	40.40	-3.59E-02	6.61E-02 ✓	6.61E-02
		247.94	6.60	-5.56E-01		4.45E-01
		723.30	19.70	-1.49E-01		1.85E-01
		873.20	11.50	8.15E-02		3.33E-01
		1004.76	17.90	-1.10E-01		2.60E-01
		1274.51	35.50	-3.59E-02		1.36E-01
+	EU-155	86.54	32.80	-5.24E-02	1.13E-01	1.13E-01
		105.31	21.80	-9.94E-02		1.37E-01
+	BI-214	609.31	* 46.30	1.08E-01	7.98E-02	7.98E-02
		1120.29	* 15.10	1.32E-01		2.02E-01
		1238.11	5.94	6.17E-01		1.02E+00
		1377.67	4.11	-1.25E-01		1.04E+00
		1407.98	2.48	1.30E+00		1.48E+00
		1509.19	2.19	1.80E-03		1.47E+00
		1764.49	15.80	2.25E-01		2.74E-01
+	PB-214	77.11	10.70	7.13E-01	8.32E-02	4.06E-01
		295.21	* 19.20	1.21E-01		9.83E-02
		351.92	* 37.20	6.47E-02		8.32E-02
+	@ PA-228	89.95	22.00	1.00E+26	1.00E+26	1.00E+26
	@	93.35	35.00	1.00E+26		1.00E+26
	@	105.00	16.30	1.00E+26		1.00E+26
	@	129.22	2.97	1.00E+26		1.00E+26
	@	338.32	5.30	1.00E+26		1.00E+26
	@	463.00	13.80	1.00E+26		1.00E+26
	@	911.23	16.70	1.00E+26		1.00E+26
+	AM-241	59.54	36.30	4.18E-02	1.99E-01	1.99E-01
+	CM-243	103.76	23.00	-2.70E-02	1.22E-01	1.22E-01
		228.18	10.60	-1.15E-01		2.37E-01
		277.60	14.00	-5.21E-02		2.07E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

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

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

Analysis Report for L1-SUB-DRS-FSGS-W05-SB SPLIT
02/27/18 - 0927

Analysis Report for L1-SUB-DRS-FJGS-W03-SB SPLIT

03/02/18 - 1057

GAMMA SPECTRUM ANALYSIS

Sample Identification : L1-SUB-DRS-FJGS-W03-SB SPLIT
Sample Description : 03/02/18 - 1057
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 8.518E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 3/2/2018 10:57:00AM
Acquisition Started : 10/16/2018 9:35:44AM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 1800.0 seconds
Real Time : 1805.1 seconds

Dead Time : 0.28 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 100 - 4096
Peak Area Range (in channels) : 100 - 4096
Identification Energy Tolerance : 1.000 keV

Energy Calibration Used Done On : 7/8/2014
Efficiency Calibration Used Done On : 7/8/2014
Efficiency Calibration Description :

Sample Number : 5066

Reviewed
Scott J. All

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/18/2018 8:48:01AM

Peak Analysis From Channel : 100
Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-DRS-FJGS-W03-SB SPLIT

03/02/18 - 1057

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.38	473 -	484	477.24	1.17E+02	29.14	2.21E+02	1.97
F	2	582.70	1160 -	1172	1165.75	4.36E+01	15.69	4.60E+01	1.72
F	3	609.35	1215 -	1225	1219.03	5.10E+01	17.10	4.03E+01	2.07
F	4	662.07	1318 -	1330	1324.46	5.43E+01	18.39	5.85E+01	2.36
F	5	1460.98	2913 -	2932	2922.08	2.04E+02	29.11	1.90E+01	2.64

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 10/18/2018 8:48:01AM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	238.38	1.17E+02	29.14			1.17E+02	2.91E+01
F	2	582.70	4.36E+01	15.69			4.36E+01	1.57E+01
F	3	609.35	5.10E+01	17.10	2.06E+01	1.21E+01	3.04E+01	2.10E+01
F	4	662.07	5.43E+01	18.39	3.31E+01	1.27E+01	2.12E+01	2.23E+01
F	5	1460.98	2.04E+02	29.11	2.82E+01	8.57E+00	1.76E+02	3.03E+01

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Analysis Report for L1-SUB-DRS-FJGS-W03-SB SPLIT
03/02/18 - 1057

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75 *	10.67	4.51E+00	8.16E-01
CS-137	0.97	661.65 *	85.12	3.41E-02	3.60E-02
PB-212	0.55	77.11	17.50		
		238.63 *	44.60	1.41E-01	3.60E-02
BI-214	0.35	609.31 *	46.30	8.22E-02	5.69E-02
		1120.29	15.10		
		1238.11	5.94		
		1377.67	4.11		
		1407.98	2.48		
		1509.19	2.19		
		1764.49	15.80		

* = 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	0.991	4.51E+00	8.16E-01	
CS-137	0.972	3.41E-02	3.60E-02	
PB-212	0.553	1.41E-01	3.60E-02	
BI-214	0.350	8.22E-02	5.69E-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

Analysis Report for L1-SUB-DRS-FJGS-W03-SB SPLIT

03/02/18 - 1057

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/18/2018 8:48:01AM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F 2	582.70	2.42295E-02	17.99		Tl-208

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\Daistryland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	4.51E+00	8.17E-01
+	@ AR-41	1293.64		99.16	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	9.89E-02	6.98E-02 ✓	9.42E-02
		1332.49	100.00	-1.44E-02		6.98E-02
+	KR-85	513.99	0.43	7.90E+00	1.47E+01	1.47E+01
+	Y-88	898.04	93.70	1.16E-01	2.20E-01	2.92E-01
		1836.06	99.20	-4.76E-02		2.20E-01
+	NB-94	702.63	100.00	-8.33E-03	4.98E-02	4.98E-02
		871.10	100.00	-2.66E-02		6.66E-02
+	I-131	284.30	6.06	8.42E+06	1.81E+07	2.41E+08
		364.48	81.20	1.23E+06		1.81E+07
		636.97	7.27	2.55E+07		2.49E+08
+	CS-134	604.70	97.60	-1.04E-01	8.66E-02	8.66E-02
		795.84	85.40	-4.42E-03		8.72E-02
+	CS-137	661.65	*	85.12	3.41E-02	6.93E-02 ✓
+	CE-144	80.12	1.36	5.48E+00	6.26E-01	8.03E+00
		133.51	11.09	7.27E-02		6.26E-01

Analysis Report for L1-SUB-DRS-FJGS-W03-SB SPLIT

03/02/18 - 1057

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	EU-152	121.78	28.40	1.56E-02	1.47E-01 ✓	1.47E-01
		244.69	7.49	-3.95E-01		6.61E-01
		964.00	14.44	8.47E-02		4.83E-01
		1408.00	20.74	1.98E-02		3.16E-01
+	EU-154	123.07	40.40	-4.34E-02	1.04E-01 ✓	1.04E-01
		247.94	6.60	-7.69E-01		7.26E-01
		723.30	19.70	2.44E-01		3.21E-01
		873.20	11.50	-1.05E-01		6.10E-01
		1004.76	17.90	1.49E-01		4.04E-01
		1274.51	35.50	1.10E-01		2.14E-01
+	EU-155	86.54	32.80	-8.51E-02	1.77E-01	1.77E-01
		105.31	21.80	-6.50E-02		2.08E-01
+	BI-214	609.31 *	46.30	8.22E-02	9.92E-02	9.92E-02
		1120.29	15.10	-1.15E-01		5.16E-01
		1238.11	5.94	6.87E-01		1.43E+00
		1377.67	4.11	5.92E-01		1.31E+00
		1407.98	2.48	1.60E-01		2.56E+00
		1509.19	2.19	5.51E-01		2.23E+00
		1764.49	15.80	4.45E-01		4.97E-01
+	PB-214	77.11	10.70	2.09E-01	1.40E-01	6.23E-01
		295.21	19.20	4.79E-02		2.54E-01
		351.92	37.20	1.23E-01		1.40E-01
+	@ PA-228	89.95	22.00	1.00E+26	1.00E+26	1.00E+26
	@	93.35	35.00	1.00E+26		1.00E+26
	@	105.00	16.30	1.00E+26		1.00E+26
	@	129.22	2.97	1.00E+26		1.00E+26
	@	338.32	5.30	1.00E+26		1.00E+26
	@	463.00	13.80	1.00E+26		1.00E+26
	@	911.23	16.70	1.00E+26		1.00E+26
+	AM-241	59.54	36.30	1.24E-01	3.13E-01	3.13E-01
+	CM-243	103.76	23.00	6.37E-02	1.87E-01	1.87E-01
		228.18	10.60	6.63E-02		3.91E-01
		277.60	14.00	-1.48E-01		3.07E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

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

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

ATTACHMENT 8

GEL LABORATORIES ANALYTICAL REPORTS

COPY

gel.com

April 17, 2018

Mr. Jason Q. Spaide
LaCrosseSolutions
S4601 State Hwy 35
Genoa, Wisconsin 54632

Re: LACBWR Site Restoration Project
Work Order: 446394

Dear Mr. Spaide:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on March 22, 2018. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4453.

Sincerely,

Edith M. Kent

Edith Kent
Project Manager

Purchase Order: 672583
Enclosures



GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis Report for

ENRG070 LaCrosseSolutions, LLC (672583)

Client SDG: 446394 GEL Work Order: 446394

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- ** Analyte is a surrogate compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- UI Gamma Spectroscopy—Uncertain identification

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

The designation ND, if present, appears in the result column when the analyte concentration is not detected above the limit as defined in the 'U' qualifier above.

This data report has been prepared and reviewed in accordance with GEL Laboratories LLC standard operating procedures. Please direct any questions to your Project Manager, Edith Kent.

Reviewed by

Edith M. Kent

Certificate of Analysis

Report Date: April 17, 2018

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L1-SUB-LES-FSGS-001-SB	Project: ENRG07001
Sample ID: 446394001	Client ID: ENRG070
Matrix: Soil	
Collect Date: 02-FEB-18 13:45	
Receive Date: 22-MAR-18	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.0364	+/-0.0927	0.159	0.400	pCi/g			KSD1	04/02/18	1804	1749761	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	JX01	03/22/18	1330	1749454

The following Analytical Methods were performed:

Method	Description	Analyst Comments			
EPA 905.0 Modified/DOE RP501 Rev. 1 Modified					
Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			93	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES .C

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: April 17, 2018

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L1-SUB-LES-FSGS-012-SB
Sample ID: 446394002
Matrix: Soil
Collect Date: 02-FEB-18 14:45
Receive Date: 22-MAR-18
Collector: Client

Project: ENRG07001
Client ID: ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.115	+/-0.110	0.183	0.400	pCi/g			KSD1	04/02/18	1804	1749761	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	JXO1	03/22/18	1330	1749454

The following Analytical Methods were performed:

Method	Description	Analyst Comments
	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			97.7	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: April 17, 2018

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L1-SUB-DRS-FSGS-W12-SB	Project: ENRG07001
Sample ID: 446394003	Client ID: ENRG070
Matrix: Soil	
Collect Date: 27-FEB-18 08:48	
Receive Date: 22-MAR-18	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
3FPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	-0.0222	+/-0.0755	0.134	0.400	pCi/g			KSD1	04/02/18	1805	1749761	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	JX01	03/22/18	1330	1749454

The following Analytical Methods were performed:

Method	Description	Analyst Comments
	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			102	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: April 17, 2018

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L1-SUB-DRS-FSGS-W14-SB
Sample ID: 446394004
Matrix: Soil
Collect Date: 27-FEB-18 08:31
Receive Date: 22-MAR-18
Collector: Client

Project: ENRG07001
Client ID: ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.103	+/-0.0922	0.153	0.400	pCi/g			KSD1	04/02/18	1805	1749761	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	JXO1	03/22/18	1330	1749454

The following Analytical Methods were performed:

Method	Description	Analyst Comments
	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			95.3	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration

Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: April 17, 2018

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L2-SUB-103-AJGS-002-SB	Project: ENRG07001
Sample ID: 446394005	Client ID: ENRG070
Matrix: Soil	
Collect Date: 23-FEB-18 14:03	
Receive Date: 22-MAR-18	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"													
Americium-241	U	-0.0132	+/-0.0259	0.0722	0.400	pCi/g			HAKB	03/27/18	0906	1749552	1
Americium-243	U	0.00638	+/-0.0667	0.139	0.400	pCi/g							
Curium-243/244	U	0.00	+/-0.0161	0.0239	0.400	pCi/g							
Alphaspec Np, Solid "Dry Weight Corrected"													
Neptunium-237	U	-0.000991	+/-0.00238	0.00548	0.010	pCi/g			HAKB	03/27/18	1346	1749553	2
Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"													
Plutonium-238	U	0.0149	+/-0.0293	0.0406	0.400	pCi/g			HAKB	03/27/18	0906	1749554	3
Plutonium-239/240	U	0.0193	+/-0.0341	0.0517	0.400	pCi/g							
Liquid Scint Pu241, Solid "Dry Weight Corrected"													
Plutonium-241	U	-0.703	+/-2.45	4.19	5.00	pCi/g			HAKB	03/28/18	1012	1749555	4
Rad Gamma Spec Analysis													
Gamma Ni59, Solid "Dry Weight Corrected"													
Nickel-59	U	-0.244	+/-1.24	2.43	5.00	pCi/g			TXJ1	04/05/18	1346	1751598	5
Gamma, Cs137, Co60, Nb94, Eu152, Eu154, Eu155 "Dry Weight Corrected"													
Cesium-137	UI	0.00	+/-0.0497	0.0593	1.00	pCi/g			MXR1	03/27/18	0857	1749466	6
Cobalt-60	U	-0.00529	+/-0.0311	0.067		pCi/g							
Europium-152	U	-0.0117	+/-0.0719	0.125		pCi/g							
Europium-154	U	0.0772	+/-0.105	0.263		pCi/g							
Europium-155	U	-0.0189	+/-0.0641	0.128		pCi/g							
Niobium-94	U	-0.0208	+/-0.0256	0.0432		pCi/g							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.00765	+/-0.0638	0.112	0.400	pCi/g			KSD1	04/02/18	1805	1749761	7
Rad Liquid Scintillation Analysis													
LSC, Tritium Distillation, Solid "As Received"													
Tritium	U	-0.61	+/-3.32	5.89	10.0	pCi/g			MXH8	03/30/18	1228	1750348	8
Liquid Scint C14, Solid "As Received"													
Carbon-14	U	0.0595	+/-2.30	3.95	5.00	pCi/g			BXM4	03/29/18	2124	1750468	9
Liquid Scint Tc99, Solid "As Received"													
Technetium-99	U	-0.162	+/-0.818	1.42	2.00	pCi/g			CXS7	04/15/18	0915	1753302	10
Liquid Scint Fe55, Solid "Dry Weight Corrected"													
Iron-55	U	6.70	+/-4.91	7.15	10.0	pCi/g			TXJ1	04/12/18	0954	1751579	11
Liquid Scint Ni63, Solid "Dry Weight Corrected"													

Certificate of Analysis

Report Date: April 17, 2018

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L2-SUB-103-AJGS-002-SB
Sample ID: 446394005

Project: ENRG07001
Client ID: ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Liquid Scintillation Analysis													
Liquid Scint Ni63, Solid "Dry Weight Corrected"													
Nickel-63	U	-1.38	+/-1.70	3.08	5.00	pCi/g			TXJI	04/07/18	0535	1751578	12

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	JX01	03/22/18	1330	1749454

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	ASTM C 1475-00 Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Pu-11-RC Modified	
5	DOE RESL Ni-1	
6	DOE HASL 300, 4.5.2.3/Ga-01-R	
7	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	
8	EPA 906.0 Modified	
9	EPA EERF C-01 Modified	
0	DOE EML HASL-300, Tc-02-RC Modified	
1	DOE RESL Fe-1, Modified	
2	DOE RESL Ni-1, Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			65.8	(15%-125%)
Curium-243/244 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			23.9	(15%-125%)
Americium-243 Tracer	Alphaspec Np, Solid "Dry Weight Corrected"			99	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"			69.2	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Solid "Dry Weight Corrected"			69.2	(15%-125%)
Nickel Carrier	Gamma Ni59, Solid "Dry Weight Corrected"			101	(25%-125%)
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			102	(25%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Solid "As Received"			89.7	(15%-125%)
Iron-59 Tracer	Liquid Scint Fe55, Solid "Dry Weight Corrected"			73	(15%-125%)
Nickel Carrier	Liquid Scint Ni63, Solid "Dry Weight Corrected"			78.5	(25%-125%)

Notes:

Certificate of Analysis

Report Date: April 17, 2018

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L2-SUB-103-AJGS-002-SB
Sample ID: 446394005

Project: ENRG07001
Client ID: ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
-----------	-----------	--------	-------------	-----	----	-------	----	----	---------	------	------	-------	--------

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: April 17, 2018

Page 1 of 1

Contact: LaCrosseSolutions
S4601 State Hwy 35
Genoa, Wisconsin
Mr. Jason Q. Spaide

Workorder: 446394

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	1749552										
QC1203994922	446394005	DUP									
Americium-241	U	-0.0132	U	-0.00351	pCi/g	N/A		N/AHAKB		03/27/18	09:00
	Uncertainty	+/-0.0259		+/-0.0242							
Americium-243	U	0.00638	U	0.0305	pCi/g	N/A		N/A			
	Uncertainty	+/-0.0667		+/-0.0396							
Curium-243/244	U	0.00	U	-0.0104	pCi/g	N/A		N/A			
	Uncertainty	+/-0.0161		+/-0.0348							
QC1203994923	LCS										
Americium-241	1.93			1.92	pCi/g		99.7	(75%-125%)		03/27/18	09:00
	Uncertainty			+/-0.210							
Americium-243			U	0.0107	pCi/g			(75%-125%)			
	Uncertainty			+/-0.021							
Curium-243/244	2.41			2.18	pCi/g		90.6	(75%-125%)			
	Uncertainty			+/-0.222							
QC1203994921	MB										
Americium-241			U	-0.00837	pCi/g					03/27/18	09:00
	Uncertainty			+/-0.0286							
Americium-243			U	-0.00824	pCi/g						
	Uncertainty			+/-0.0156							
Curium-243/244			U	0.0056	pCi/g						
	Uncertainty			+/-0.021							
Batch	1749553										
QC1203994925	446394005	DUP									
Neptunium-237	U	-0.000991	U	-0.00103	pCi/g	N/A		N/AHAKB		03/27/18	13:40
	Uncertainty	+/-0.00238		+/-0.00201							
QC1203994926	LCS										
Neptunium-237	1.48			1.67	pCi/g		113	(75%-125%)		03/27/18	13:40
	Uncertainty			+/-0.0554							
QC1203994924	MB										
Neptunium-237			U	0.00128	pCi/g					03/27/18	13:40
	Uncertainty			+/-0.00307							

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 446394

Page 2 of 2

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	1749554										
QC1203994928	446394005	DUP									
Plutonium-238	U	0.0149	U	0.0153	pCi/g	N/A			N/A HAKB	03/27/18	09:00
	Uncertainty	+/-0.0293		+/-0.0271							
Plutonium-239/240	U	0.0193	U	-0.00484	pCi/g	N/A			N/A		
	Uncertainty	+/-0.0341		+/-0.0146							
QC1203994929	LCS										
Plutonium-238			U	0.0177	pCi/g					03/27/18	09:00
	Uncertainty			+/-0.0314							
Plutonium-239/240	1.94			1.95	pCi/g		101	(75%-125%)			
	Uncertainty			+/-0.242							
QC1203994927	MB										
Plutonium-238			U	-0.00134	pCi/g					03/27/18	09:00
	Uncertainty			+/-0.031							
Plutonium-239/240			U	0.000335	pCi/g						
	Uncertainty			+/-0.0248							
Batch	1749555										
QC1203994931	446394005	DUP									
Plutonium-241	U	-0.703	U	0.613	pCi/g	N/A			N/A HAKB	03/28/18	14:00
	Uncertainty	+/-2.45		+/-2.21							
QC1203994932	LCS										
Plutonium-241	69.5			73.9	pCi/g		106	(75%-125%)		03/28/18	16:00
	Uncertainty			+/-3.53							
QC1203994930	MB										
Plutonium-241			U	0.201	pCi/g					03/28/18	12:00
	Uncertainty			+/-2.47							
Rad Gamma Spec											
Batch	1749466										
QC1203994728	446394005	DUP									
Cesium-137	UI	0.00	U	0.000751	pCi/g	N/A			N/A MXR1	03/28/18	08:00
	Uncertainty	+/-0.0497		+/-0.0237							
Cobalt-60	U	-0.00529	U	0.000415	pCi/g	N/A			N/A		
	Uncertainty	+/-0.0311		+/-0.0206							
Europium-152	U	-0.0117	U	-0.00698	pCi/g	N/A			N/A		
	Uncertainty	+/-0.0719		+/-0.0584							

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 446394

Page 3 of 3

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	1749466										
Europium-154	U	0.0772	U	0.0134	pCi/g	N/A			N/A MXR1	03/28/18	08:08
	Uncertainty	+/-0.105		+/-0.0852							
Europium-155	U	-0.0189	U	0.0436	pCi/g	N/A			N/A		
	Uncertainty	+/-0.0641		+/-0.057							
Niobium-94	U	-0.0208	U	-0.00613	pCi/g	N/A			N/A		
	Uncertainty	+/-0.0256		+/-0.0242							
QC1203994729 LCS											
Americium-241	488			570	pCi/g		117	(75%-125%)		03/28/18	09:09
	Uncertainty			+/-14.9							
Cesium-137	173			169	pCi/g		97.4	(75%-125%)			
	Uncertainty			+/-3.33							
Cobalt-60	132			130	pCi/g		98.2	(75%-125%)			
	Uncertainty			+/-3.47							
Europium-152			U	1.53	pCi/g						
	Uncertainty			+/-1.41							
Europium-154			U	-0.542	pCi/g						
	Uncertainty			+/-1.02							
Europium-155			U	0.586	pCi/g						
	Uncertainty			+/-1.36							
Niobium-94			U	-0.00958	pCi/g						
	Uncertainty			+/-0.436							
QC1203994727 MB											
Cesium-137			U	-0.00512	pCi/g					03/27/18	08:00
	Uncertainty			+/-0.0117							
Cobalt-60			U	-0.00268	pCi/g						
	Uncertainty			+/-0.020							
Europium-152			U	-0.0119	pCi/g						
	Uncertainty			+/-0.035							
Europium-154			U	-0.00315	pCi/g						
	Uncertainty			+/-0.0481							
Europium-155			U	-0.0146	pCi/g						
	Uncertainty			+/-0.0396							

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 446394

Page 4 of 4

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	1749466										
Niobium-94			U	0.00616	pCi/g				MXR1	03/27/18	08:00
	Uncertainty			+/-0.0189							
Rad Gas Flow											
Batch	1751598										
QC1203999565	446394005	DUP									
Nickel-59			U	-0.244	pCi/g	N/A			N/A	TXJ1	04/05/18 14:00
	Uncertainty			+/-1.24							
QC1203999566	LCS										
Nickel-59				80.5	pCi/g		85.5	(75%-125%)			04/05/18 14:00
	Uncertainty			+/-6.36							
QC1203999564	MB										
Nickel-59			U	-0.0478	pCi/g						04/05/18 13:00
	Uncertainty			+/-0.562							
Rad Liquid Scintillation											
Batch	1750348										
QC1203996820	446394005	DUP									
Tritium			U	-0.61	pCi/g	N/A			N/AMXH8	03/30/18	14:10
	Uncertainty			+/-3.32							
QC1203996822	LCS										
Tritium				48.4	pCi/g		83.5	(75%-125%)			03/31/18 07:50
	Uncertainty			+/-9.46							
QC1203996819	MB										
Tritium			U	0.765	pCi/g						03/30/18 13:20
	Uncertainty			+/-3.14							

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 446394

Page 5 of

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Liquid Scintillation											
Batch	1750348										
QC1203996821	446394005	MS									
Tritium	126	U	-0.61	109	pCi/g		86.4	(75%-125%)	MXH8	03/30/18	15:0
	Uncertainty		+/-3.32	+/-11.3							
Batch	1750468										
QC1203997027	446394005	DUP									
Carbon-14		U	0.0595	-0.396	pCi/g	N/A			N/A	BXM4	03/29/18 22:0
	Uncertainty		+/-2.30	+/-2.24							
QC1203997029	LCS										
Carbon-14	135			122	pCi/g		90.3	(75%-125%)		03/29/18	23:4
	Uncertainty			+/-4.52							
QC1203997026	MB										
Carbon-14		U	-0.109		pCi/g					03/29/18	22:0
	Uncertainty		+/-2.24								
QC1203997028	446394005	MS									
Carbon-14	272	U	0.0595	257	pCi/g		94.4	(75%-125%)		03/29/18	23:1
	Uncertainty		+/-2.30	+/-9.15							
Batch	1751578										
QC1203999522	446394005	DUP									
Nickel-63		U	-1.38	-0.199	pCi/g	N/A			N/A	TXJ1	04/07/18 06:0
	Uncertainty		+/-1.70	+/-1.92							
QC1203999523	LCS										
Nickel-63	85.3			88.7	pCi/g		104	(75%-125%)		04/07/18	06:2
	Uncertainty			+/-4.13							
QC1203999521	MB										
Nickel-63		U	-0.145		pCi/g					04/07/18	05:5
	Uncertainty		+/-1.64								
Batch	1751579										
QC1203999525	446394005	DUP									
Iron-55		U	6.70	-0.191	pCi/g	N/A			N/A	TXJ1	04/10/18 00:2
	Uncertainty		+/-4.91	+/-2.21							
QC1203999526	LCS										
Iron-55	116			90.1	pCi/g		77.9	(75%-125%)		04/10/18	01:2
	Uncertainty			+/-4.16							

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 446394

Page 6 of 6

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Liquid Scintillation											
Batch	1751579										
QC1203999524	MB										
Iron-55			U	-0.888	pCi/g				TXJ1	04/09/18	23:
	Uncertainty			+/-2.03							
Batch	1753302										
QC1204003340	446394005	DUP									
Technetium-99			U	-0.162	pCi/g	N/A			N/A	CXS7	04/15/18 10:
	Uncertainty			+/-0.818							
QC1204003341	LCS										
Technetium-99		31.7		24.6	pCi/g		77.7	(75%-125%)			04/15/18 10:
	Uncertainty			+/-1.26							
QC1204003339	MB										
Technetium-99			U	-0.265	pCi/g						04/15/18 09:
	Uncertainty			+/-0.678							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- ** Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded
- J Value is estimated
- K Analyte present. Reported value may be biased high. Actual value is expected to be lower.
- L Analyte present. Reported value may be biased low. Actual value is expected to be higher.
- M M if above MDC and less than LLD
- M REMP Result > MDC/CL and < RDL
- N/A RPD or %Recovery limits do not apply.
- NI See case narrative
- ND Analyte concentration is not detected above the detection limit
- NJ Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Q One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
- R Sample results are rejected
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- UI Gamma Spectroscopy--Uncertain identification

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 446394

Page 7 of 7

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UJ	Gamma Spectroscopy--Uncertain identification										
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.										
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier										
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.										
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.										
h	Preparation or preservation holding time was exceeded										

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

**Radiochemistry
Technical Case Narrative
LaCrosseSolutions, LLC (ENRG)
SDG #: 446394**

Product: Alphaspec Isotopic Am241 Am243, Cm243/244, Solid
Analytical Method: DOE EML HASL-300, Am-05-RC Modified
Analytical Procedure: GL-RAD-A-011 REV# 26
Analytical Batch: 1749552

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 22
Preparation Batch: 1749454

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
446394005	L2-SUB-103-AJGS-002-SB
1203994921	Method Blank (MB)
1203994922	446394005(L2-SUB-103-AJGS-002-SB) Sample Duplicate (DUP)
1203994923	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Manual Integration

Manual integration of alpha spectroscopy spectra 1203994923 (LCS) was performed to fully separate counts in Regions of Interest which would have been biased.

Product: Alphaspec Np, Solid
Analytical Method: ASTM C 1475-00 Modified
Analytical Procedure: GL-RAD-A-032 REV# 21
Analytical Batch: 1749553

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 22
Preparation Batch: 1749454

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
446394005	L2-SUB-103-AJGS-002-SB
1203994924	Method Blank (MB)
1203994925	446394005(L2-SUB-103-AJGS-002-SB) Sample Duplicate (DUP)
1203994926	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Alphaspec Pu238, 239/240, Solid
Analytical Method: DOE EML HASL-300, Pu-11-RC Modified
Analytical Procedure: GL-RAD-A-011 REV# 26
Analytical Batch: 1749554

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 22
Preparation Batch: 1749454

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
446394005	L2-SUB-103-AJGS-002-SB
1203994927	Method Blank (MB)
1203994928	446394005(L2-SUB-103-AJGS-002-SB) Sample Duplicate (DUP)
1203994929	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Dry Weight
Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 22
Preparation Batch: 1749454

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
446394001	L1-SUB-LES-FSGS-001-SB
446394002	L1-SUB-LES-FSGS-012-SB
446394003	L1-SUB-DRS-FSGS-W12-SB
446394004	L1-SUB-DRS-FSGS-W14-SB
446394005	L2-SUB-103-AJGS-002-SB

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Gamma, Cs137, Co60, Nb94, Eu152, Eu154, Eu155

Analytical Method: DOE HASL 300, 4.5.2.3/Ga-01-R

Analytical Procedure: GL-RAD-A-013 REV# 27

Analytical Batch: 1749466

Preparation Method: Dry Soil Prep

Preparation Procedure: GL-RAD-A-021 REV# 22

Preparation Batch: 1749454

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
446394005	L2-SUB-103-AJGS-002-SB
1203994727	Method Blank (MB)
1203994728	446394005(L2-SUB-103-AJGS-002-SB) Sample Duplicate (DUP)
1203994729	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Qualifier Information

Qualifier	Reason	Analyte	Sample	Client Sample
UI	Results are considered a false positive due to no valid peak.	Cesium-137	446394005	L2-SUB-103-AJGS-002-SB

Product: Gamma Ni59, Solid

Analytical Method: DOE RESL Ni-1

Analytical Procedure: GL-RAD-A-022 REV# 18

Analytical Batch: 1751598

Preparation Method: Dry Soil Prep

Preparation Procedure: GL-RAD-A-021 REV# 22

Preparation Batch: 1749454

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
446394005	L2-SUB-103-AJGS-002-SB
1203999564	Method Blank (MB)
1203999565	446394005(L2-SUB-103-AJGS-002-SB) Sample Duplicate (DUP)
1203999566	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC, Sr90, Solid

Analytical Method: EPA 905.0 Modified/DOE RP501 Rev. 1 Modified

Analytical Procedure: GL-RAD-A-004 REV# 19

Analytical Batch: 1749761

Preparation Method: Dry Soil Prep

Preparation Procedure: GL-RAD-A-021 REV# 22

Preparation Batch: 1749454

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
446394001	L1-SUB-LES-FSGS-001-SB
446394002	L1-SUB-LES-FSGS-012-SB
446394003	L1-SUB-DRS-FSGS-W12-SB
446394004	L1-SUB-DRS-FSGS-W14-SB
446394005	L2-SUB-103-AJGS-002-SB
1203995444	Method Blank (MB)
1203995445	446394005(L2-SUB-103-AJGS-002-SB) Sample Duplicate (DUP)
1203995446	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Liquid Scint Pu241, Solid

Analytical Method: DOE EML HASL-300, Pu-11-RC Modified

Analytical Procedure: GL-RAD-A-035 REV# 19

Analytical Batch: 1749555

Preparation Method: Dry Soil Prep

Preparation Procedure: GL-RAD-A-021 REV# 22

Preparation Batch: 1749454

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
446394005	L2-SUB-103-AJGS-002-SB
1203994930	Method Blank (MB)
1203994931	446394005(L2-SUB-103-AJGS-002-SB) Sample Duplicate (DUP)
1203994932	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: LSC, Tritium Distillation, Solid

Analytical Method: EPA 906.0 Modified

Analytical Procedure: GL-RAD-A-002 REV# 22

Analytical Batch: 1750348

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
446394005	L2-SUB-103-AJGS-002-SB
1203996819	Method Blank (MB)
1203996820	446394005(L2-SUB-103-AJGS-002-SB) Sample Duplicate (DUP)
1203996821	446394005(L2-SUB-103-AJGS-002-SB) Matrix Spike (MS)
1203996822	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information**Recounts**

Sample 1203996822 (LCS) was recounted due to low recovery. The recount is reported.

Miscellaneous Information**Additional Comments**

The matrix spike, 1203996821 (L2-SUB-103-AJGS-002-SBMS), aliquot was reduced to conserve sample volume.

Product: Liquid Scint C14, Solid

Analytical Method: EPA EERF C-01 Modified

Analytical Procedure: GL-RAD-A-003 REV# 16

Analytical Batch: 1750468

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
446394005	L2-SUB-103-AJGS-002-SB
1203997026	Method Blank (MB)
1203997027	446394005(L2-SUB-103-AJGS-002-SB) Sample Duplicate (DUP)
1203997028	446394005(L2-SUB-103-AJGS-002-SB) Matrix Spike (MS)
1203997029	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information**Additional Comments**

The matrix spike, 1203997028 (L2-SUB-103-AJGS-002-SBMS), aliquot was reduced to conserve sample volume.

Product: Liquid Scint Ni63, Solid

Analytical Method: DOE RESL Ni-1, Modified

Analytical Procedure: GL-RAD-A-022 REV# 18

Analytical Batch: 1751578

Preparation Method: Dry Soil Prep

Preparation Procedure: GL-RAD-A-021 REV# 22

Preparation Batch: 1749454

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
446394005	L2-SUB-103-AJGS-002-SB
1203999521	Method Blank (MB)
1203999522	446394005(L2-SUB-103-AJGS-002-SB) Sample Duplicate (DUP)
1203999523	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Liquid Scint Fe55, Solid

Analytical Method: DOE RESL Fe-I, Modified

Analytical Procedure: GL-RAD-A-040 REV# 13

Analytical Batch: 1751579

Preparation Method: Dry Soil Prep

Preparation Procedure: GL-RAD-A-021 REV# 22

Preparation Batch: 1749454

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
446394005	L2-SUB-103-AJGS-002-SB
1203999524	Method Blank (MB)
1203999525	446394005(L2-SUB-103-AJGS-002-SB) Sample Duplicate (DUP)
1203999526	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts

Sample 446394005 (L2-SUB-103-AJGS-002-SB) was recounted to verify sample results. Recount is reported.

Product: Liquid Scint Tc99, Solid

Analytical Method: DOE EML HASL-300, Tc-02-RC Modified

Analytical Procedure: GL-RAD-A-059 REV# 5

Analytical Batch: 1753302

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
446394005	L2-SUB-103-AJGS-002-SB
1204003339	Method Blank (MB)
1204003340	446394005(L2-SUB-103-AJGS-002-SB) Sample Duplicate (DUP)
1204003341	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

Project # LACBWR Site
Quote #:
COC Number (1):
PO Number: 672583



Laboratories LLC

Chemistry | Radiochemistry | Radiobiassay | Specialty Analytics

Chain of Custody and Analytical Request

446394

GEL Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: La Crosse Solutions

Phone # 608 689 4259

Sample Analysis Requested (5) (Fill in the number of containers for each test)

Project/Site Name: LACBWR - Genoa WI

Fax #

Address: 54601 State Road 35

Collected By: Scott Zoller
Send Results To: SG Zoller@energysolutions.com

Sample ID	*Date Collected (mm-dd-yy)	*Time Collected (Military) (hhmm)	QC Code (1)	Field Filtered (2)	Sample Matrix (4)	Radiactive Please supply isotopic info:	(7) Known or possible hazards	Total number of containers	Sr-90	Ni-59, Co-60, Nb-94	Cs-137, Eu-152, Eu-154	Eu-155, Pu-241	H3, C14, Fe-55	Ni-63, Tc-99	Np-237, Pu-238	Pu-239, Pu-240	Am-241, Am-243	Cm-243, Cm-244	← Preservative Type (6)	Comments Note: extra sample is required for sample specific QC
*For composites - indicate start and stop date/time																				
L1-SUB-LES-PSGS-001-SB	02-02-18	1345	N	N	SO	N	N	1	1											
L1-SUB-LES-PSGS-012-SB	02-02-18	1445	N	N	SO	N	N	1	1											
L1-SUB-DRS-FSGS-W12-SB	02-27-18	0848	N	N	SO	N	N	1	1											
L1-SUB-DRS-FSGS-W14-SB	02-27-18	0831	N	N	SO	N	N	1	1											
L2-SUB-103-ATGS-002-SB	02-23-18	1403	N	N	SO	N	N	1	1	1	1	1	1	1	1	1	1	1	1	MDC <0.01 pCi Np-237
																				All samples are to be returned please.

Chain of Custody Signatures

TAT Requested: Normal: ☒ Rush: ☐ Specify: ☐ (Subject to Surcharge)

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time	Fax Results: [] Yes [X] No
1 <u>Jay Shmidt</u>	03-19-18	1255	1 <u>A. Almen</u>	3/22/18	8:50	Select Deliverable: [] C of A [] QC Summary [] level 1 [X] Level 2 [] Level 3 [] Level 4
2			2			Additional Remarks: <u>None</u>
3			3			For Lab Receiving Use Only: Custody Seal Intact? [] Yes [] No Cooler Temp: <input type="text"/> °C

> For sample shipping and delivery details, see Sample Receipt & Review form (SRR.)

Sample Collection Time Zone: [] Eastern [] Pacific [X] Central [] Mountain [] Other:

- Chain of Custody Number = Client Determined
- QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite
- Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered.
- Matrix Codes: DW=Drinking Water, GW=Groundwater, SW=Surface Water, WW=Waste Water, W=Water, ML=Misc Liquid, SO=Soil, SD=Sediment, SL=Sludge, SS=Solid Waste, O=Oil, F=Filter, P=Wipe, U=Urine, F=Fecal, N=Nasal
- Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. 8260B - 3, 6010B/7470A - 1).
- Preservative Type: HA = Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = Hexane, ST = Sodium Thiosulfate. If no preservative is added = leave field blank

7) Are there any known or possible hazards associated with these samples?

Characteristic Hazards

FL = Flammable/Ignitable
CO = Corrosive
RE = Reactive

Listed Waste

LW = Listed Waste
(F, K, P and U-listed wastes.)
Waste code(s):

Other

OT = Other / Unknown
(i.e.: High/low pH, asbestos, beryllium, irritants, other misc. health hazards, etc.)
Description:

TSCA Regulated

PCB = Polychlorinated

biphenyls

RCRA Metals

As = Arsenic Hg = Mercury
Ba = Barium Se = Selenium
Cd = Cadmium Ag = Silver
Cr = Chromium MR = Miscellaneous
Pb = Lead RCRA metals

Please provide any additional details below regarding handling and/or disposal concerns. (i.e.: Origin of sample(s), type of site collected from, odd matrices, etc.)

SAMPLE RECEIPT & REVIEW FORM

Client: <u>ENRG</u>			SDG/AR/COC/Work Order:			
Received By: <u>AA</u>			Date Received: <u>3/22/18</u>			
Carrier and Tracking Number			Circle Applicable: FedEx Express <input type="checkbox"/> <u>FedEx Ground</u> <input checked="" type="checkbox"/> UPS <input type="checkbox"/> Field Services <input type="checkbox"/> Courier <input type="checkbox"/> Other <input type="checkbox"/>			
			<u>7717 7777 3246</u>			
Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.			
Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	Hazard Class Shipped: UN#:			
COC/Samples marked or classified as radioactive?		<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3			
Is package, COC, and/or Samples marked HAZ?		<input checked="" type="checkbox"/>	If yes, select Hazards below, and contact the GEL Safety Group. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:			
Sample Receipt Criteria			Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>				Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>				
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		<input checked="" type="checkbox"/>			Preservation Method: Wet Ice Ice Packs Dry ice <u>None</u> Other: *all temperatures are recorded in Celsius TEMP: <u>19°</u>
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>				Temperature Device Serial #: <u>IR2-17</u> Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>				Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?		<input checked="" type="checkbox"/>			Sample ID's and Containers Affected: If Preservation added, Lot#: _____ If Yes, Are Encores or Soil Kits present? Yes ___ No ___ (If yes, take to VOA Freezer) Do VOA vials contain acid preservation? Yes ___ No ___ N/A (If unknown, select No) VOA vials free of headspace? Yes ___ No ___ N/A Sample ID's and containers affected:
7	Do any samples require Volatile Analysis?			<input checked="" type="checkbox"/>		
8	Samples received within holding time?	<input checked="" type="checkbox"/>				ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>				Sample ID's and containers affected:
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>				Sample ID's affected:
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>				Sample ID's affected:
12	Are sample containers identifiable as GEL provided?			<input checked="" type="checkbox"/>		
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>				
Comments (Use Continuation Form if needed):						

PM (or PMA) review: Initials

EM

Date

3/22/18

Page

1 of 1

GL-CHL-SR-001 Rev 5

List of current GEL Certifications as of 17 April 2018

State	Certification
Alaska	17-018
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
Delaware	SC00012
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho Chemistry	SC00012
Idaho Radiochemistry	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana NELAP	03046 (AI33904)
Louisiana SDWA	LA180011
Maryland	270
Massachusetts	M-SC012
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122018-1
New Hampshire NELAP	205415
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	9904
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-18-13
Utah NELAP	SC000122018-26
Vermont	VT87156
Virginia NELAP	460202
Washington	C780
West Virginia	997404