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November 9, 2016

PG&E Letter HBL-16-008

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, D.C. 20555-0001

Docket No. 50-133, License No. DPR-7  
Humboldt Bay Power Plant, Unit 3  
Request for Partial Release of Humboldt Bay Power Plant Unit 3 Property from the  
Part 50 Site

Dear Commissioners and Staff:

Pacific Gas and Electric Company (PG&E) requests NRC approval to release a portion of the Humboldt Bay Power Plant (HBPP) Unit 3 site in accordance with the HBPP Unit 3 License Termination Plan (LTP). Specifically, PG&E intends to release approximately 30.4 acres, known as the Fisherman's Channel, from the HBPP Unit 3 site to allow for the transfer of this property to the Humboldt Bay Harbor District.

Enclosure 1 contains an assessment that demonstrates that the area can be released for unrestricted use in accordance with LTP criteria. Enclosure 2 contains the Final Status Survey Report for the area to be released.

Enclosure 1, Figure 1, depicts the current HBPP Unit 3 site property boundary. The land area proposed for release consists of the land and waterway within the site boundary across from King Salmon Avenue (Enclosure 1, Figure 2) and is referred to hereafter as the "Release Area."

HBPP Unit 3 LTP, Section 1.2, describes PG&E's intent to perform this partial site release as part of a phased approach to release the entire site for unrestricted use. In accordance with LTP, Section 1.2, PG&E has verified that the "Release Area" meets acceptance levels through final status surveys. PG&E also assessed the subject "Release Area" to ensure that this proposed action will have no adverse impact on the ability of the site in the aggregate to meet 10 CFR Part 20, Subpart E, criteria for unrestricted release.

There are no new or revised regulatory commitments (as defined in NEI 99-04) made in this letter.

NMSS01



If you have any questions regarding this submittal, please contact Mr. William Barley at (707) 444-0856.

Sincerely,

A handwritten signature in black ink, appearing to read 'Loren D. Sharp'.

Loren D. Sharp  
*Senior Director Humboldt Bay Nuclear*

Enclosures

cc: HBPP Humboldt Distribution  
cc/enc: John B. Hickman, NRC Project Manager  
Kriss M. Kennedy, NRC Region IV Administrator  
Gonzalo Perez, California Department of Public Health

**Humboldt Bay Power Plant Unit 3 “Release Area” Assessment**

## **Humboldt Bay Power Plant (HBPP) Unit 3 "Release Area" Assessment**

### **Background:**

Humboldt Bay Power Plant (HBPP) Unit 3 commenced commercial operations in 1963 and last operated in July 1976. Unit 3 consisted of a General Electric natural circulation, boiling water reactor, an associated turbine-generator, and the necessary support and auxiliary systems. During its operational period, Unit 3 experienced a variety of operating events (e.g., fuel failures, leaks, spills, and repairs) that have affected decontamination and decommissioning processes. Radiological contamination of the site is found within systems, on components, on structure interiors, and in soil located inside and adjacent to the Unit 3 Restricted Area (RA).

The Atomic Energy Commission (AEC) granted Unit 3 a construction permit on October 17, 1960. The AEC issued Operating License DPR-7 in August 1962, and Unit 3 began commercial operation in August 1963. On May 17, 1976, the NRC issued an order that required satisfactory completion of a seismic design upgrade program and resolution of specified geologic and seismic concerns prior to return to power following the 1976 refueling outage. On July 2, 1976, Pacific Gas and Electric Company (PG&E) shut down Unit 3 for refueling. In December 1980, it became apparent that the cost of completing the required backfits would make it uneconomical to restart the unit. PG&E ultimately concluded that the seismic and other modifications required (i.e., in response to the Three Mile Island accident in 1979) were in fact not economical and in June 1983 announced its intention to decommission the unit.

The HBPP Unit 3 reactor was permanently defueled in 1984 and on July 30, 1984, PG&E submitted a license amendment request (LAR) to possess fuel for up to 30 years, but no longer operate, and to decommission HBPP Unit 3 using the SAFSTOR method. On July 16, 1985, the NRC issued License Amendment (LA) 19 to place Unit 3 in a possess-but-not-operate status, and on July 19, 1988, the NRC issued LA 23 approving the Decommissioning Plan and authorizing the decommissioning of Unit 3. PG&E submitted the HBPP Unit 3 Post-Shutdown Decommissioning Activities Report (PSDAR) to the NRC pursuant to 10 CFR 50.82(a)(4)(i) on February 27, 1998. The PSDAR and the Defueled Safety Analysis Report (DSAR) superseded the original Decommissioning Plan and provided the information required by 10 CFR 50.82(a)(4). By December 2008, all spent fuel had been removed from the HBPP Unit 3 spent fuel pool and transferred to the 10 CFR Part 72-licensed Humboldt Bay Independent Spent Fuel Storage Installation (HB ISFSI).

In May 2013, PG&E submitted the HBPP Unit 3 License Termination Plan (LTP) in LAR 13-01. In response to the NRC's Requests for Additional Information (RAIs), PG&E submitted Revision 1 to the HBPP Unit 3 LTP on August 13, 2014. The NRC approved the HBPP Unit 3 LTP on May 4, 2016.



**Purpose:**

The purpose of this assessment is to ensure that the requested partial site release will have no adverse impact on the ability of the site, in aggregate, to meet 10 CFR Part 20, Subpart E, criteria for unrestricted release. The Final Status Survey (FSS) Report for the "Release Area" is contained in Enclosure 2.

**Site History Related to the "Release Area":**

This area of the plant site is nonindustrialized. The 30.4-acre area includes coastal marsh, intertidal areas, and a navigable channel used for recreational boating. The "Release Area," according to the HBPP Historical Site Assessment (2011 Update), was potentially impacted by dry and wet deposition from Unit 3 stack releases. As discussed on page 8 of the FSS Report and Section 2.3 of the LTP, PG&E performed characterization surveys in the area in 1998, and more recently, in 2013. The results of the characterization surveys indicated Cs-137 levels at a small fraction of the derived concentration guideline levels. The FSS of the "Release Area" supports the characterization data. In addition, the FSS of the "Release Area" supports the rejection of the null hypothesis (i.e., the "Release Area" meets the HBPP Unit 3 release criteria) and that the "as low as reasonably achievable" (ALARA) criterion as specified in the LTP was achieved.

**Impact of the Release of the Area:**

**Statement of Dismantling Activities**

No dismantlement activities are required, or were performed, in the "Release Area." Since the subject area is impacted, an FSS was performed.

**Potential for Cross-Contamination from Subsequent Activities**

The "Release Area" is bounded on the east by King Salmon Avenue and off-site locations on the north, west and south.

Since the commencement of decommissioning, restrictive controls have been placed on the release of material from radiological controlled areas, which further decreases the probability that the "Release Area" will be impacted from decommissioning activities. These controls include contamination containment, dust control measures, storm water runoff control measures, building demolition controls, and additional evaluations and surveys of material leaving the site. These radiation protection program requirements for decommissioning activities, as well as the additional protections afforded from FSS isolation and control measures of adjacent site areas, provide strong assurance that the potential for cross-contamination of the "Release Area" is de minimis.

### **Impact of Releasing the Specific Area on Part 50 Licensing Basis**

The licensing basis for HBPP Unit 3 includes the maintenance of certain programs to fulfill regulatory requirements and functional responsibilities. Throughout decommissioning, these programs are modified as necessary and terminated when the applicable concern is no longer relevant. These program changes are implemented using the change processes specified for each type of program. The methodology for releasing land requires a review and assessment of the impact on licensing programs for the site lands remaining within the domain of the Part 50 License. The impact of releasing the "Release Area" on each of the HBPP Unit 3 licensing programs is described below. With this submittal, PG&E is requesting NRC review and concurrence of the changes described herein.

### **Technical Specifications**

The Design Features and Administrative Controls, as described in the HBPP Unit 3 Technical Specifications, are not impacted by the release of the "Release Area."

### **Defueled Safety Analysis Report (DSAR)**

A change will be made to the HBPP Unit 3 DSAR, Figure 2-1, to identify the new site boundary reflecting the reduced site area resulting from the release of the "Release Area."

### **Environmental Report for HBPP Decommissioning**

LTP Chapter 8 contains the Supplement to the Environmental Report for HBPP Decommissioning, dated July 1984. Neither the Environmental Report nor the Supplement is impacted by the release of the "Release Area."

### **Humboldt Bay Site Emergency Plan**

This Plan will not be affected by the release of the "Release Area."

### **Humboldt Bay Quality Assurance Plan**

This Plan will not be affected by the release of the "Release Area."

### **Offsite Dose Calculation Manual (ODCM)**

This Manual will not be affected by the release of the "Release Area."

### **Environmental Monitoring Program**

This Program will not be affected by release of the "Release Area."

### **Ground Water Monitoring Program**

The Ground Water Monitoring Program will not be affected by release of the "Release Area." There are no active ground water monitoring wells in the "Release Area." The "Release Area" comprises Humboldt Bay area and tidal-influenced marsh land. Since the area is a considerable distance from areas of potential ground water contamination, there is no need to place ground water wells in the "Release Area." Therefore, there is no need to perform a capture zone analysis and there is no need to add a ground water contribution in the "Release Area."

### **Fire Protection Program**

This Program will not be affected by the release of the "Release Area."

### **Training Program**

This Program will not be affected by the release of the "Release Area."

### **Post-Shutdown Decommissioning Activities Report (PSDAR)**

This Report will not be affected by the release of the "Release Area."

### **License Termination Plan (LTP)**

Changes will be made to the HBPP Unit 3 LTP in Sections 2.1.8.11 and 8.1.2; Figures 1-2, 2-2, 6-2, and 8-1; and Table 2-3, to reflect the new site boundary and reduced site acreage resulting from the release of the "Release Area."

### **Additional Areas to be Addressed to Support the Release of the Area**

PG&E will continue to maintain authority over all activities conducted within the HB ISFSI 10 CFR Part 72 license until such time as the spent fuel is removed from the site and the NRC terminates the 10 CFR Part 72 license.

PG&E will maintain the following records through license termination: (1) a map of the site identifying the facility and site as defined in the original license; (2) a record of the "Release Area" released under this action; and (3) documentation of the radiological conditions of the lands released under this action.

### **Site Release Criteria**

The site radiological release criteria for the HBPP Unit 3 site correspond to the 10 CFR 20.1402 criteria for unrestricted use. The residual radioactivity, including that from ground water sources that is distinguishable from background, must not cause the total effective dose equivalent (TEDE) to an average member of the critical group to exceed 25 mrem/yr. The residual radioactivity must also be reduced to levels that are ALARA.

### **Final Status Survey:**

HBPP Unit 3 LTP, Section 5, describes the FSS Plan that encompasses the radiological assessment of all affected structures, systems, and land areas for the purpose of quantifying the concentrations of any residual activity that exists following all decontamination activities. An FSS was performed in the "Release Area." The FSS Report determined that the site release criteria was met and is included in Enclosure 2.

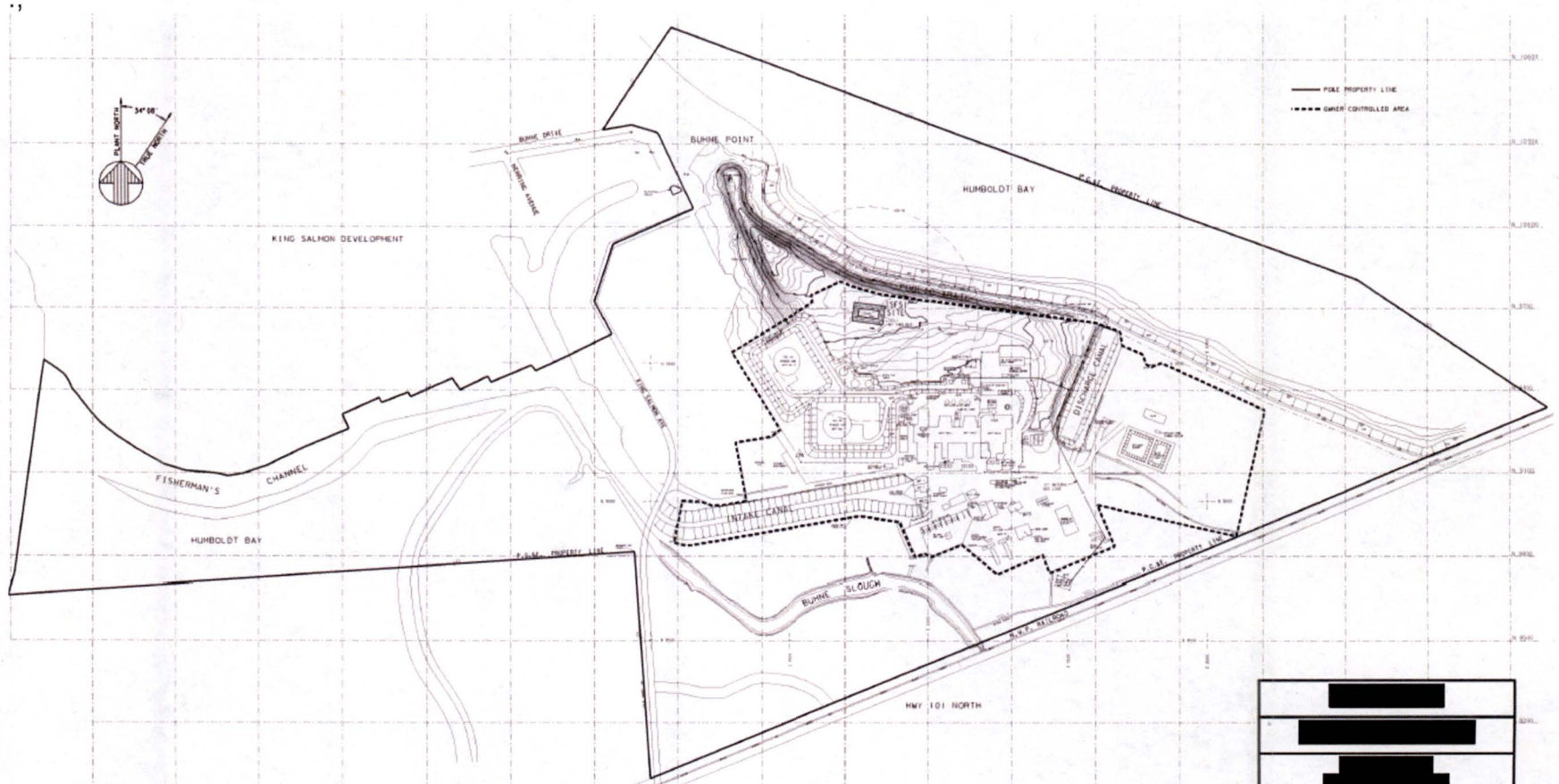
### **Conclusion:**

The release of the "Release Area" is part of PG&E's overall effort to terminate License DPR-7 and to achieve unrestricted release of the entire site, with the exception of the 10 CFR Part 72 portion, in accordance with the criteria in Subpart E of 10 CFR Part 20. This action is also consistent with the phased approach described in Section 1.2 of the HBPP Unit 3 LTP.

In addition, 10 CFR 50.82(a)(11) establishes the following criteria to be used by the NRC for terminating the license of a power reactor facility: (1) dismantlement has been performed in accordance with the approved LTP; and (2) the final radiation survey and associated documentation demonstrate that the facility and site have met the criteria for decommissioning in 10 CFR Part 20, Subpart E. Although no dismantling activities were required for the "Release Area," the FSS supports the release of the "Release Area" by demonstrating that this portion of the site land can be released from the HBPP Unit 3 site.

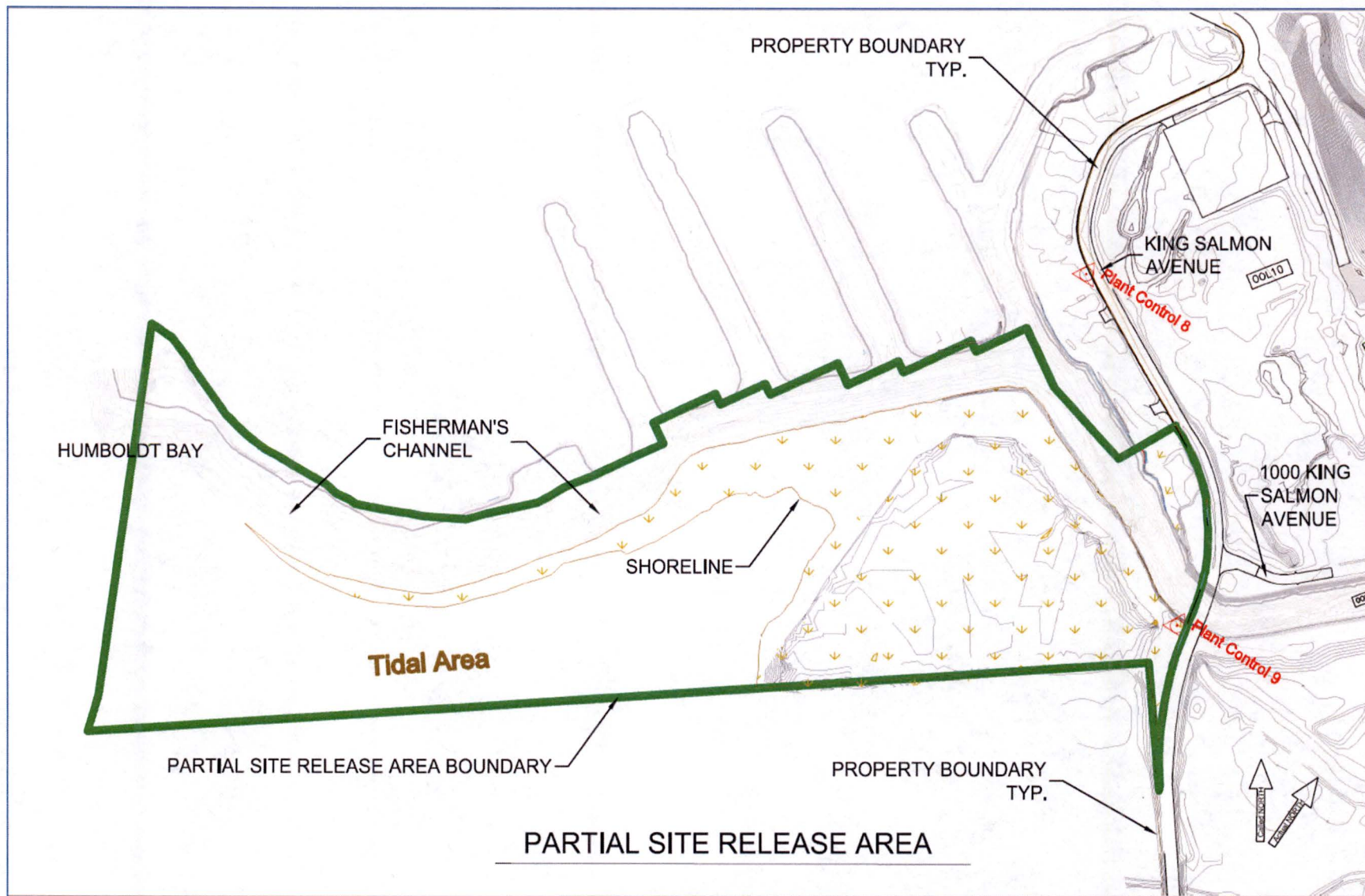
The FSS Report, along with future reports, provides documentation that decommissioning activities have been performed in accordance with the LTP, and each FSS confirms that the residual radioactivity in each associated survey unit meets the criteria established in the HBPP Unit 3 LTP. Thus, this action supports the overall license termination process in accordance with NRC regulations.

Figure I  
HBPP Property Boundary





**Figure 2**  
**Partial Site Release Boundary**



**Humboldt Bay Power Plant Unit 3 "Release Area" Final Status Survey Report**





Pacific Gas and  
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**HUMBOLDT BAY POWER PLANT  
FINAL STATUS SURVEY REPORTS  
HBPP-FSS-OOL10-11 & HBPP-FSS-OOL10-12**

**Final Status Survey Report for Survey Units:  
HBPP-FSSP-OOL10-11 and HBPP-FSSP-OOL10-12**



Prepared by: Dale Randall, CHP / Dale Randall / Dale Randall Date: 11-2-16  
FSS Engineering Supervisor (print/sign)

Reviewed by: Marshall Blake / Marshall Blake Date: 11-2-16  
FSS Engineering (print/sign)

Approved by: William Barley, CHP / William Barley Date: 11-2-16  
Site Closure Manager (print/sign)



## **Attachments**

Attachment 1	Survey Plan HBPP-FSSP-OOL10-11-00
Attachment 2	HTD Assessment data
Attachment 3	Laboratory Data for HBPP-FSSP-OOL10-11 & HBPP-FSSP-OOL10-12
Attachment 4	Data Assessment HBPP-FSSP-OOL10-11
Attachment 5	ALARA Statement
Attachment 6	Quality Verification Assessment Report
Attachment 7	Survey Plan HBPP-FSSP-OOL10-12-00
Attachment 8	Data Assessment HBPP-FSSP-OOL10-12

## Executive Summary

In accordance with the provisions of the Humboldt Bay License Termination Plan, Rev. 1 (LTP), Survey Units HBPP-FSSP-OOL10-11 and HBPP-FSSP-OOL10-12 were Final Status Surveyed (FSS) for phased release from the site's 10CFR50 license. This report was prepared to document that the designated survey units satisfy the radiological release criteria.

Survey Area OOL10 is designated in the LTP as a Class 3 land area with a low likelihood of radiological contaminants in excess of the derived concentration guideline levels (DCGLs). The total surface area is approximately 235,191 m<sup>2</sup>. The two survey units within Survey Area OOL10 under consideration for this report consist of site land areas to the southwest of King Salmon Avenue. It is made up of two survey units, HBPP-FSSP-OOL10-11 (76,520 m<sup>2</sup>) and HBPP-FSSP-OOL10-12 (46,364 m<sup>2</sup>). Survey Unit HBPP-FSSP-OOL10-11 (or "OOL10-11") can be described as the water covered portion of the area that includes Fisherman's Channel, a navigable waterway, and tidal mud flats to the east. Survey Unit HBPP-FSSP-OOL10-12 (or "OOL10-12") is the non-tidally influenced land area which includes coastal marshland. The survey units are both designated as Class 3 land areas.

The surveys performed included a total of twenty (20) sediment samples and twenty (20) soil samples. Each of the sample locations was selected based on an approved randomized methodology and the locations were confirmed by a high precision global positioning system (GPS). The sampling included four (4) split-samples and two (2) sample recounts that were taken for quality assurance purposes. The land area (Survey Unit OOL10-12) was also partially walkover scanned with a gamma sensitive instrument probe. Information for Survey Unit OOL10-11 is summarized in Executive Summary Table A. Survey Unit OOL10-12 information is summarized in Executive Summary Table B.

Some minor Quality Assurance (QA) related discrepancies were discovered both by audit and by the failure of one of the six QA sample comparisons performed. These issues were entered into the site's corrective action program, investigated, and evaluated. They are not considered to significantly impact the overall confidence in the results or conclusions of the FSS.

The walkover scan survey results found no elevated locations. The sample analysis results indicated that the only positively detected plant-derived isotope was Cs-137. Cs-137, which also is found in the environment as a result of atmospheric weapons testing fallout, was positively detected in some samples at up to a small fraction of the DCGL.

The maximum hypothetical dose (from all sources, including groundwater) to a future resident farmer was determined to be less than 1.78 mrem/yr. The report concludes that both survey units have met their FSS data quality objectives and meet the regulatory release criteria of less than or equal to 25 mrem/yr Total Effective Dose Equivalent (TEDE) to the average member of the critical group plus As Low As Reasonably Achievable (ALARA).

**Executive Summary Table A**

<b>Feature</b>	<b>Design Criteria</b>	<b>Comment</b>
<b>Synopsis of FSS of HBPP-FSSP-OOL10-11</b>		
Survey Unit Land Area	76,520 m <sup>2</sup>	Based on AutoCAD
Classification	Class 3	Based on the HBPP LTP, Rev. 1.
Final Status Survey Plan No.	HBPP-FSSP-OOL10-11-00	HBPP Procedure RCP FSS-2
Grid Spacing	66.5 m	Based on triangular grid
DCGL <sub>op</sub> <sup>1</sup>	7.58 pCi/g Cs-137	Administratively set to achieve 24 mrem/yr TEDE
Scan Survey Area Coverage	A variance was taken from this requirement. <sup>2</sup>	The LTP requires 1-10% of area coverage for Class 3 survey units
Number of Measurements	15 required	20 Taken on a fixed grid with random start point
Min. Value	5.63E-03	pCi/g Cs-137
Max. Value	1.42E-01	pCi/g Cs-137
Mean	7.66E-02	pCi/g Cs-137
Median	7.92E-02	pCi/g Cs-137
Std. Dev.	3.43E-02	pCi/g Cs-137
No. of Bias Measurements	None	N/A

(1) DCGL<sub>op</sub> is the Operational DCGL; adjusted to conservatively account for potential dose from Hard-to-Detect radionuclides.

(2) The typical approach consisting of walk-over scan surveys using a 2"x2" NaI(Tl) scintillation detector could not be performed due to routine tidal flooding of the inlet.

**Executive Summary Table B**

<b>Feature</b>	<b>Design Criteria</b>	<b>Comment</b>
<b>Synopsis of FSS of HBPP-FSSP-OOL10-12</b>		
Survey Unit Land Area	46,364 m <sup>2</sup>	Based on AutoCAD
Classification	Class 3	Based on the HBPP LTP, Rev. 1.
Final Status Survey Plan No.	HBPP-FSSP-OOL10-12-00	HBPP Procedure RCP FSS-2
Grid Spacing	N/A	Sample points were randomly selected.
DCGL <sub>op</sub> <sup>1</sup>	7.58 pCi/g Cs-137	Administratively set to achieve 24 mrem/yr TEDE
Scan Survey Area Coverage	Approximately 10%	The LTP requires 1- 10% of area coverage for Class 3 survey units
Number of Measurements	15 required	20 Randomly selected sample locations were selected
Min. Value	-1.04E-02	pCi/g Cs-137
Max. Value	1.19E+00	pCi/g Cs-137
Mean	2.37E-01	pCi/g Cs-137
Median	1.68E-01	pCi/g Cs-137
Std. Dev.	2.63E-01	pCi/g Cs-137
No. of Bias Measurements	None	N/A

### **Phase 1 Release Area Description**

The Phase 1 Area for release consists of all site land areas to the south (site west) of King Salmon Avenue. The Phase 1 Area includes two survey units, HBPP-FSSP-OOL10-11 and HBPP-FSSP-OOL10-12. This area of the plant site is non-industrialized. The area includes coastal marsh, intertidal areas and a navigable channel used for recreational boating. Figure 1 is an aerial photograph of the area. Figure 2 is a map of the Phase 1 Release area.

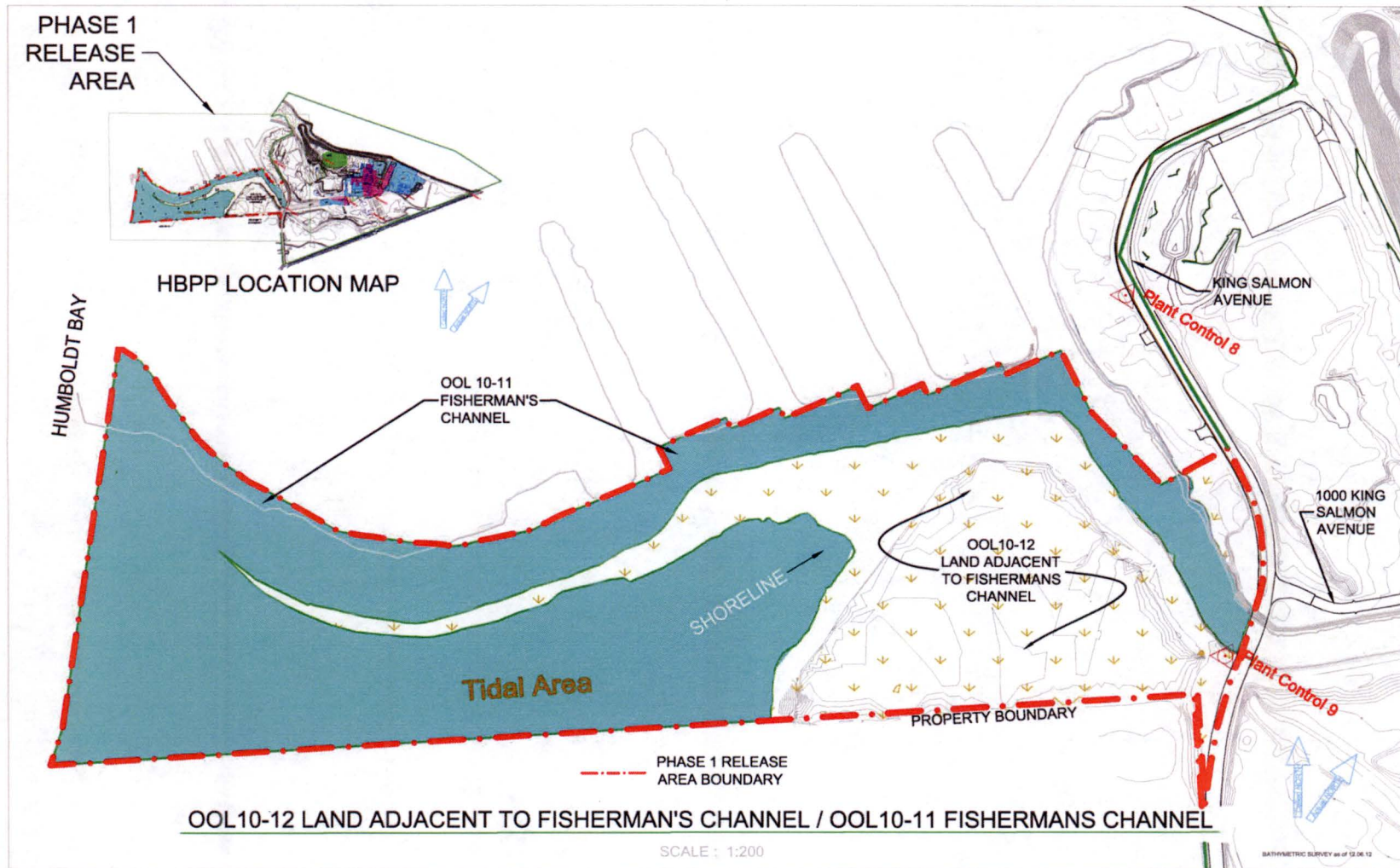


Figure 1. Aerial Photograph of Survey Area HBPP-FSS-OOL10





Figure 2. Map of the Phase I Release Area & Associated FSS Survey Units



## **Survey Unit Designation**

In accordance with Humboldt Bay Power Plant (HBPP) Procedure RCP FSS-1, Survey Units HBPP-FSSP-OOL10-11 and HBPP-FSSP-OOL10-12 are designated as Class 3 Survey Units per the HBPP LTP (Ref. 1) and was confirmed by subsequent reviews.

## **Survey Unit Design Information HBPP-FSSP-OOL10-11 & HBPP-FSSP-OOL10-12**

### **Data Quality Objectives (DQOs)**

FSS design and planning used the Data Quality Objective (DQO) process as described by the LTP, Procedure RCP FSS-2, "*Preparation of Final Status Survey Plan*," (Ref. 2) and the "*Multi-Agency Radiation Survey and Site Investigation Manual*" (MARSSIM) (Ref.3). A summary of the main features of the DQO process are provided herein.

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) assumes residual activity in the survey unit exceeds the release criteria. Rejection of the null hypothesis indicates residual activity within the survey unit does not exceed the release criteria. The primary objective of the FSS plan was to demonstrate that the level of residual radioactivity in Survey Units OOL10-11 & OOL10-12 did not exceed the release criteria specified in the LTP and that the potential dose from residual radioactivity is ALARA.

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

The total dose under the LTP criteria is 25 mrem/yr Total Effective Dose Equivalent (TEDE) from all of the potentially present plant derived nuclides. The presence of all radionuclides listed (gamma-emitters, HTD beta-emitters, and TRUs) in the soil (sediment) were evaluated under FSS Survey Plans HBPP-FSSP-OOL10-11-00 (Attachment 1) and HBPP-FSSP-OOL10-12-00 (Attachment 7).

### **DQOs re Nuclide Selection and DCGLs**

The soil DCGLs determined in the LTP are presented in Table 1, *Soil DCGLs and Analysis Lower Limits of Detection*.

**Table 1 – Soil DCGLs and Analysis Lower Limits of Detection (LLDs)**

Radionuclide <sup>(1)</sup>	Soil DCGL (pCi/g) <sup>(2)</sup>	LLD (pCi/g) <sup>(3)</sup>
<b>H-3</b>	6.8E+02	6.8E+01
<b>C-14</b>	6.3E+00	6.3E-01
Mn-54	1.9E+03	1.9E+02
<b>Fe-55<sup>(4)</sup></b>	1.0E+04	1.0E+03
Co-60	3.8E+00	3.8E-01
<b>Ni-63</b>	7.2E+02	7.2E+01
<b>Sr-90</b>	1.5E+00	1.5E-01
Nb-94	7.1E+00	7.1E-01
<b>Tc-99</b>	1.2E+01	1.2E+00
Cs-137	7.9E+00	7.58E-01
Eu-152	1.0E+01	1.0E+00
Eu-154	9.4E+00	9.4E-01
Np-237	1.1E+00	1.1E-01
<b>Pu-238</b>	2.9E+01	2.9E+00
<b>Pu-239/240<sup>(6)</sup></b>	2.6E+01	2.6E+00
<b>Am-241<sup>(5)</sup></b>	2.5E+01	2.5E+00
<b>Pu-241</b>	8.6E+02	8.6E+01
<b>Cm-243/244</b>	2.9E+01	2.9E+00
<b>Cm-245/246</b>	1.7E+01	1.7E+00

(1) Bold text indicates radionuclides that are considered Hard to Detect (HTD)

(2) The Soil DCGL(s) are specified by the LTP in Chapter 6 and are equivalent to twenty-five (25) mrem/yr TEDE.

(3) The desired LLD is 10% of the Soil DCGL within an acceptable range of up to 50% of the DCGL.

(4) Generic Screening Value of NUREG 1757, Vol. 2

(5) Americium-241 can be analyzed by gamma and alpha spectroscopy and is considered to be Easy to Detect (ETD). The preferred result is the alpha spectroscopy's when both analyses are performed.

(6) For radiochemical analyses whose results cannot discern between two isotopes, i.e. Pu-239/240, Cm-243/244 and Cm-245/246, the lower of the two DCGLs was selected from the LTP.



## Nuclide Selection

Another important facet of the DQO process is to identify the radionuclides of concern and determine the concentration and variability. Based on a review of the samples collected to characterize the environs associated with Survey Area OOL10, Cs-137 was the only plant-related radionuclide identified consistently in the characterization samples analyzed. Sample results for all other easy-to-detect (ETD) and hard-to-detect nuclides (HTD) were less than the minimum detectable concentration (<MDC) for laboratory analyses of soil samples. This characterization data for Survey Area OOL10 soils was used to formulate the design for Survey Units OOL10-11 and OOL10-12. Additional detail on the development of the survey design is provided in Attachment 1, *Survey Plan HBPP-FSSP-OOL10-11-00* and Attachment 7, *Survey Plan for HBPP-FSSP-OOL10-12-00*.

Based on historical use of the area (Class 3 designation) and review of the existing pre-FSS characterization data, all samples were not analyzed for HTD nuclides. However, any potential dose from HTD nuclides was bounded by directly adding the dose contribution of a representative sample collected from the Reactor Drain Tank (RDT) vault of the Liquid Radioactive Waste Building. This sample had an activity of 22 pCi/g and was collected from an area of concentration for all potential plant-related nuclides, including hard-to-detect and transuranic nuclides.

The results of this representative sample were used to bound the dose contribution from HTD nuclides. As shown in Attachment 2, Resultant Dose from Hard-to-Detect Nuclides, the highest potential dose contributed from HTD nuclides is less than 1 mrem/yr. Note that Sr-90 and H-3 were excluded from this bounding estimate, since samples from each survey unit were analyzed on-site for these specific HTD nuclides.

A reduction of 1 mrem/yr to the default Cs-137 DCGL (7.93 pCi/g) was required, since the default DCGL is based on an annual dose of 25 mrem/yr (i.e., from both HTD & ETD nuclides). This information and analysis formed the basis for reducing the Cs-137 DCGL by 1 mrem/yr to conservatively account for any potential dose contribution from HTD nuclides.

The limit for the total annual dose for all potential plant-related nuclides is 25 mrem/yr. As previously shown, the only nuclide expected to be present is Cs-137. A reduction of 1 mrem/yr to the default Cs-137 DCGL (7.93 pCi/g) was required, since the default DCGL is based on an annual dose of 25 mrem/yr for all nuclides.

The reduced DCGL for Cs-137, or "Operational DCGL" ( $DCGL_{OP}$ ) can be related to the default DCGL (provided in the LTP) using the following principle relationship:

$$D_{OP} = D_{LTP} \times \frac{DCGL_{OP}}{DCGL_{LTP}}$$

where:  $D_{OP} = 24$  mrem/yr

$D_{LTP} = 25$  mrem/yr

$DCGL_{LTP} = 7.93$  pCi/g

This results in a DCGL<sub>OP</sub> of 7.58 pCi/g for Cs-137; scaled to a TEDE of 24 mrem/yr to account for any HTD nuclides that might be present.

In addition to scaling the DCGL for Cs-137, the HBPP Site Closure Laboratory also analyzed all samples from each Sr-90 and H-3 and sent two (2) samples to an independent laboratory for analysis of HTD nuclides. This methodology and analysis described above was used to account for any potential dose contribution from HTD nuclides present in Survey Units OOL10-11 & OOL10-12.

It was also identified during the development of the survey plans that because the expected timing of the Phase 1 release occurs prior to the LTP assumed date 2019, Fe-55 screens into the nuclide suite as a potential nuclide of concern. At present a site specific DCGL for Fe-55 does not exist; however, since Fe-55 has not been detected and would not be expected to be present in detectable concentrations in Class 3 plant areas, the Generic Screening value of NUREG 1757 Vol. 2 (Ref. 4) was applied as the DCGL for Fe-55 (i.e., 1.0 E+04 pCi/g).

As part of the DQOs applied to laboratory processes, analysis results were reported as actual calculated results. Results reported as less than the Minimum Detectable Concentration (MDC) were not used for FSS. Sample report summaries included unique sample identification, analytical method, radionuclide, result, uncertainty to two (2) standard deviations, data qualifiers, units, and the required and observed MDC.

## **Survey Unit Description HBPP-FSSP-OOL10-11**

Survey Unit HBPP-FSSP-OOL10-11 (Fisherman's Channel) is approximately 76,520 square meters of surface area. The unit is completely covered by seawater at high tide, requiring a boat and sample dredge to collect sediment samples for final status survey. The survey unit's boundary abuts both Survey Area HBPP-FSSP-OOL10-12 and off-site locations, including residences associated with the King Salmon community. See Figure 2 for detail on survey unit location and adjacent areas.

### **HSA Events**

Within the Historical Site Assessment (HSA), there is no mention of plant related activities occurring within the boundaries of this Survey Unit.

### **Scoping Surveys**

Scoping Surveys were not performed in this area based on its assessment as a non-industrialized area.

### **Characterization**

Based on a review of the general plant characterization data of the HBPP environs, Cs-137 was the only plant-related radionuclide that was identified consistently in the characterization samples analyzed. Seventy one (71) samples from previous characterization data were used to provide the characterization data for survey area OOL10. The following data was sufficient to support the planning of Survey Unit HBPP-FSSP-OOL10-11.

- Cs-137 (51 detects)
- Cs-137 was present in 72 % of the characterization samples.
- Other HBPP ETD
- There were no other easy to detect nuclides identified greater than Minimum Detectable Activity (>MDA).
- There were no hard to detect nuclides identified in the four samples analyzed.

A more recent (2013) continuing characterization effort collected and analyzed six (6) randomly located sediment samples which were analyzed by gamma spectroscopy. One (1) sample tested positive for Cs-137, at 0.15 pCi/g. No other plant related isotopes were detected. As a conservative measure the characterization data for OOL10 soils were used to formulate the survey design.

### **Remedial Action Surveys and Activities**

No remedial Actions or surveys are known to have been performed in this Survey Unit.

### **Survey approach/methods**

The usual survey approach for Class 3 land areas would ordinarily consist of soil collection of statistically random locations and walk-over scanning of biasedly selected areas with a 2" x 2" NaI(Tl) scintillation detector. This approach could not be directly applied as the entire survey unit is normally submerged at high tide. So, the survey approach for the submerged sediment media of Fisherman's Channel was modified to accommodate field conditions.

A boat (See Figure 3) and a specially designed Ekman sample dredge were used to obtain the samples. It was also anticipated that not all sample point locations would be accessible, however all locations were accessed. No means was readily available to perform a gamma scan of submerged sediment media. As a consequence, four compensatory variances from the FSS program were applied:

- The investigation level was reduced to 25% (from the required 50%) of the DCGL.
- Samples were collected on a triangular grid with a random start point.
- The samples were collected with an Ekman sampling dredge designed for collecting sediment.
- Twenty (20) samples were collected; an increase from the statistically determined minimum number of fifteen (15).

**Figure 3 - FSS Survey Crew loads into boat at Fisherman's Channel.**



### **Number samples and measurements**

The DQO process determined that Cs-137 is the radionuclide of concern in the Survey Unit. Other radionuclides that were positively identified in concentrations greater than the screening criteria during the performance of this FSS would be evaluated to ensure adequate survey design.

The Sign Test (Ref.12) 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 minimum number of soil (sediment) samples for FSS was determined in accordance with Procedure RCP FSS-7, "*Determination of the Number and Location of FSS Samples*" (Ref.5). The Lower Bound of the Gray Region (LBGR) was set in accordance with Procedure RCP FSS-7 to achieve a relative shift ( $\Delta/\sigma$ ) in the range between 1 and 3. The resulting relative shift was 7.22 pCi/g Cs-137.

A Prospective Power Curve was generated using MARSSIM Power 2000 (Ref. 6). MARSSIM Power 2000 is a software package developed under the sponsorship of the United States Department of Energy Environmental Measurement Laboratory.

The grid pattern and locations of the soil samples were determined using Visual Sample Plan (VSP) in accordance with Procedure RCP FSS-18, "*Computer Determination of Number and Locations of FSS Samples*" (Ref. 7). Visual Sample Plan was created by Pacific Northwest National Laboratory (PNNL) for the United States Department of Energy (Ref. 8). A systematic triangular grid pattern with a random starting point was selected for sample design, which is appropriate and conservative for a Class 3 area.

Sample locations were identified using AutoCAD, a commercially available plotting software package with coordinates consistent with the California State Plane System. These coordinates were integrated with a GPS to locate sample locations in the field. Sample measurement locations for the design are listed with the GPS coordinates in Table 2.

**Table 2 - Sample Measurement Locations with Associated GPS Coordinates  
(Survey Unit HBPP-FSSP-OOL10-11)**

Designation	Northing	Easting
OOL10-11-001-F	5946542.65	2159425.53
OOL10-11-002-F	5946651.69	2159236.68
OOL10-11-003-F	5946760.72	2159047.82
OOL10-11-004-F	5946869.75	2158858.97
OOL10-11-005-F	5946978.79	2159047.82
OOL10-11-006-F	5946869.75	2159236.68
OOL10-11-007-F	5947196.85	2159047.82
OOL10-11-008-F	5947196.85	2159425.53
OOL10-11-009-F	5947307.58	2159235.52
OOL10-11-010-F	5947414.92	2159425.53
OOL10-11-011-F	5947303.86	2159622.98
OOL10-11-012-F	5947414.92	2159803.23
OOL10-11-013-F	5947523.96	2159614.38
OOL10-11-014-F	5947632.99	2159425.53
OOL10-11-015-F	5947523.96	2159992.09
OOL10-11-016-F	5947632.99	2159803.23
OOL10-11-017-F	5947742.02	2159614.38
OOL10-11-018-F	5947960.09	2160369.79
OOL10-11-019-F	5948178.16	2160369.79
OOL10-11-020-F	5948505.26	2160180.94

NOTE: See Posting Plot in Attachment 4 for corresponding map of these sample locations.

Procedure RCP FSS-2 specifies that 5% of the samples are required to be selected for HTD analysis. Two (2) soil (sediment) samples or 5% of the number of samples that would be used for non-parametric statistical testing were randomly selected for HTD radionuclide analyses using the Microsoft Excel "RAND" function. Each of the selected samples was sent off-site for a full suite analysis of the HTD radionuclides specified in Table 1.

The LTP requires a minimum of 5% of the samples taken for non-parametric statistical testing be selected for split sample analyses with the off-site laboratory. The implementation of quality control measures as referenced by Procedure RCP FSS-11, "*Split Sample Assessment for Final Status Survey*," (Ref 9) included the collection of one (1) soil sample for "split sample" analysis by the off-site laboratory. These locations were selected randomly using the Microsoft Excel "RAND" function. Additionally, Procedure HBAP C-202, "*Final Status Survey Quality Assurance Project Plan*" (Ref. 10) requires the 5% of the samples taken for non-parametric statistical testing be selected for QC Replicate analyses.

Table 5-4 of the LTP specifies scanning coverage of “Judgmental” 1-10% for Class 3 areas. A variance from this requirement was taken as noted.

For this Class 3 survey unit, the “Investigation Level” for soil (sediment) sample measurement results is more conservative than that specified in LTP, Table 5-5. Table 3 provides a synopsis of the survey design.

**Table 3 – Synopsis of the Survey Design**

Feature	Design Criteria	Basis
Survey Unit Land Area	76,520 m <sup>2</sup>	Based on AutoCAD
Number of Measurements	15 required (15 Randomly selected) 20 Taken on a fixed grid with random start point	Type 1 and Type 2 errors were 0.05, sigma was 0.18 pCi/g, the LBGR was set at 7.22 pCi/g to achieve a Relative Shift in the range of 1 and 3 ( $\Delta/\sigma=2.0$ )
Grid Spacing	66.5 m	Based on triangular grid
Operational DCGL	7.58 pCi/g Cs-137	Administratively set to achieve 24 mrem/yr TEDE <sup>(1)</sup>
Soil (sediment) Investigation Level	1.90 pCi/g Cs-137	25% of the Operational DCGL exceeds the LTP criteria for a Class 3 survey unit
Scan Survey Area Coverage	Scan surveys not applicable; survey unit is a waterway	The LTP requires 1- 10% of area coverage for Class 3 survey units
Scan Investigation Level	N/A – Unit is a waterway	Detectable above background, Per the LTP for Class 3 Survey Units

(1) The allowable dose from easy-to-detect nuclides in this survey unit is limited to 24 mrem/yr TEDE as the bounding dose from hard-to-detect nuclides is 1 mrem/yr.



## Survey Results HBPP-FSSP-OOL10-11

### Sample measurements results

All field survey activities were performed on April 28 and April 29, 2014.

The on-site laboratory analyzed the twenty (20) samples collected for non-parametric statistical testing, the associated field splits and one (1) QC replicate sample using gamma spectroscopy. Gamma spectroscopy analysis was performed to the required MDCs. No plant derived isotopes were positively detected.

Cs-137 was not identified in any of the twenty (20) samples collected for non-parametric statistical testing. A summary of the twenty (20) samples collected for non-parametric statistical testing results is provided in Table 4.

**Table 4 - Summary of Gamma Spectroscopy Results for Sediment Samples  
Comprising the Statistical Sample Population**

Sample Number	Cs-137 pCi/g	Percentage of DCGL
OOL10-11-001-F	4.94E-02	6.52E-01
OOL10-11-002-F	8.63E-02	1.14E+00
OOL10-11-003-F	3.17E-02	4.18E-01
OOL10-11-004-F	9.44E-02	1.25E+00
OOL10-11-005-F	9.30E-02	1.23E+00
OOL10-11-006-F	1.42E-01	1.87E+00
OOL10-11-007-F	6.44E-02	8.50E-01
OOL10-11-008-F	6.79E-02	8.96E-01
OOL10-11-009-F	1.03E-01	1.36E+00
OOL10-11-010-F	2.70E-02	3.56E-01
OOL10-11-011-F	1.33E-01	1.75E+00
OOL10-11-012-F	9.40E-02	1.24E+00
OOL10-11-013-F	8.48E-02	1.12E+00
OOL10-11-014-F	1.06E-01	1.40E+00
OOL10-11-015-F	7.35E-02	9.70E-01
OOL10-11-016-F	6.24E-02	8.23E-01
OOL10-11-017-F	4.45E-02	5.87E-01
OOL10-11-018-F	7.04E-02	9.29E-01
OOL10-11-019-F	9.92E-02	1.31E+00
OOL10-11-020-F	5.63E-03	7.43E-02

The off-site laboratory employed for the radiological analyses of samples was General Engineering Laboratories, LLC. The off-site laboratory processed two (2) samples for HTD analyses as required by the sample plan. The requested analyses included alpha spectroscopy, gas proportional counting, and liquid scintillation depending on the radionuclide and the measurement method. All analyses performed met the required minimum MDC. Neither of these results tested positive for Cs-137 or other plant derived nuclides. All laboratory sample results are Included as Attachment 3.

#### **Fixed-point radiation measurements**

Sediment samples were used as fixed point measurements.

#### **Scan data**

Scanning was not performed as it was not a feature of the design of this FSS, as noted previously.

### **Survey Unit Data Assessment HBPP-FSSP-OOL10-11**

#### **Statistical Evaluations**

The DQO sample design and data were reviewed in accordance with Procedure RCP FSS-14, "*Data Quality Assessment*" (Ref. 11) for completeness and consistency. The sampling design had adequate power as indicated by the Retrospective Power Curve. The Sign Test was performed (by inspection) on the data and compared to the original assumptions of the DQOs. The evaluation of the Sign Test results demonstrates that the survey unit passes the unrestricted release criteria, thus, the null hypothesis is rejected.

Documentation was complete and legible. Surveys and sample collection were consistent with the DQOs and were sufficient to ensure that the survey unit was properly designated as Class 3.

The preliminary data review consisted of calculating basic statistical quantities (e.g., mean, median, standard deviation). The mean and median values are well below the Operational DCGL. 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 basic statistical quantities for the statistical sample population are provided below in Table 5.



**Table 5 - Basic Statistical Quantities**

<b>Statistic</b>	<b>Cs-137 (pCi/g)</b>	<b>Fraction of the DCGL</b>
DCGL <sub>op</sub> <sup>(1)</sup> :	7.58E+00	1.00E+00
Minimum Value:	5.63E-03	7.43E-04
Maximum Value:	1.42E-01	1.87E-02
Mean:	7.66E-02	1.01E-02
Median:	7.92E-02	1.04E-02
Standard Deviation:	3.43E-02	4.52E-03

<sup>1</sup> DCGL<sub>op</sub> is the "operational DCGL" that is adjusted to conservatively account for potential dose from Hard-to-Detect radionuclides.

The range of the data is approximately 4 standard deviations, not a particularly large variation. The difference between the mean and median was about 0.074 of the standard deviation which indicates very limited skewness in the data. The data was represented graphically through posting plots, a frequency plot, and a quantile plot. The frequency plot indicates a very slight skewness as confirmed by the calculated skew of -0.14.

### **Graphical Evaluations**

All data, assessments, and graphical representations are provided in Attachment 3 and Attachment 4.

## **Survey Unit Investigations and Results HBPP-FSSP-OOL10-11**

No investigations were performed for Survey Unit HBPP-FSS-OOL10-11.

## **ALARA Statement HBPP-FSSP-OOL10-11**

A Generic Technically Based Document has been prepared to demonstrate that it is not ALARA to remediate soil to levels below the DCGL. It is provided in Attachment 5.

## **Changes in Initial Survey Unit Assumptions HBPP-FSSP-OOL10-11**

None of the initial assumptions were changed as a result of information gained in the performance of the FSS survey or in reviewing its results.

## **Quality Assurance and Corrective Actions HBPP-FSSP-OOL10-11**

### **Corrective actions**

While performing the data quality assessment it was determined that the QC recount of Sample HBPP-FSSP-OOL10-11-020 and its recount did not achieve an acceptable level of agreement. The comparison was based on K-40 alone since this was the only isotope detected in the matrix. The issue was investigated by pulling the archived sample matrix and repeating the recount exercise. Upon reviewing these results it was determined that one count appeared to be an outlier as the initial and second repeat results were in good agreement.

The issue was input into site's corrective action tracking system as SAPN No. 1390520. It was concluded that the disagreement detected did not affect the validity or reliability of the balance of the sample results based on the fact that the two other split sample comparisons of this unit were in good agreement and that the nuclide being compared was not a plant derived nuclide. K-40 is ubiquitous in the environment and measurements may be influenced by the detectability of K-40 sources outside the detector shield.

### **Quality Verification**

Quality Verification (QV) Assessment # 140830025 defined its scope as follows: "This assessment will verify adequacy of the Survey Plan for the FSS of the Fisherman's Channel. This particular survey introduces a number of variables that are atypical of a FSS of soils areas. This assessment will verify that these variables are appropriately addressed in the survey plans.

The QV concluded that while FSS plan number HBPP-FSSP-OOL10-11-00 (Attachment 1) adequately addresses the unique challenges present by the FSS of the Fisherman's Channel but it also commented that, "When the survey plan was compared against the procedure for the preparation of FSS survey plans a number of minor discrepancies were identified. Many of the discrepancies were a result of using an uncontrolled copy of the form. Other inconsistencies were noted in the plan. For example at one place in the survey plan, the area was referred to as the "Intake Canal" rather than the "Fisherman's Channel". The identified discrepancies did not affect the performance of an experienced technician. The Data quality is not compromised. These discrepancies could however affect the quality of records."

The results of this assessment were reviewed with the responsible engineer and appropriate actions are being formulated. The discrepancies identified are addressed in Notification 1388478. QV Assessment # 140830025 is included as Attachment 6.

### **Survey Unit Description HBPP-FSSP-OOL10-12**

Survey OOL10-12 is a part of Survey Area OOL10 which consists of the surface area of the remainder of the HBPP land area. The survey unit is made up of coastal marshland that is devoid of plant related structures. It is bordered by Survey Unit OOL10-11 over most of its boundary, in addition to off-site locations to plant south and King Salmon Avenue to plant east. It is approximately 46,364 square meters of surface area.

### **HSA Events**

There is no mention of plant related activities occurring within the boundaries of this Survey Unit.

### **Scoping Surveys**

Scoping Surveys were not performed in this area.

## **Characterization**

Based on a review of the general plant characterization data of the HBPP environs, Cs-137 was the only plant-related radionuclide that was identified consistently in the characterization samples analyzed. Seventy one (71) samples from previous characterization data were used to provide the characterization data for survey area OOL10. The data was sufficient to support the planning of Survey Unit HBPP-FSSP-OOL10-12.

- Cs-137 (51 detects)
- Cs-137 was present in 72 % of the characterization samples.
- Other HBPP ETD
- There were no other easy to detect nuclides identified >MDA.
- There were no hard to detect nuclides identified in the four (4) samples analyzed.

## **Remedial Action Surveys and Activities**

No remedial Actions or surveys are known to have been performed in this Survey Unit.

## **Survey Unit Design Information HBPP-FSSP-OOL10-12**

### **Data Quality Objectives (DQOs)**

FSS design and planning used the Data Quality Objective (DQO) process as described by the LTP, Procedure RCP FSS-2, "*Preparation of Final Status Survey Plan*," and the "*Multi-Agency Radiation Survey and Site Investigation Manual*" (MARSSIM). A summary of the main features of the DQO process are provided herein.

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.

The primary objective of the FSS plan was to demonstrate that the level of residual radioactivity in Survey Unit HBPP-FSSP-OOL10-12 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).

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

The total dose under the LTP criteria is 25 mrem/yr Total Effective Dose Equivalent (TEDE) from all of the potentially present plant derived nuclides.

The presence of all radionuclides listed (gamma-emitters, HTD beta-emitters, and TRUs) in the soil (sediment) were evaluated under survey plan HBPP-FSSP-OOL10-12-00 (Attachment 7).

#### **DQOs re Nuclide Selection and DCGLs**

As was the case for Survey Unit HBPP-FSSP-OOL10-11 within Survey Unit HBPP-FSSP-OOL10-12 no HTD nuclides were expected to be present, the contribution from HTD nuclides (except for H-3 and Sr-90, were measured on-site for each sample) were bounded by directly adding the dose contribution of a sample contaminated to approximately 3 times the DCGL (~22 pCi/g) for Cs-137. The resultant dose from these HTD nuclides is less than 1 mrem/yr, as shown in Attachment 2.

Also, it was identified that because the expected timing of the Phase 1 release, occurs prior to the current license termination scheduled date 2019, Fe-55 screens into the nuclide suite as a potential nuclide of concern. At present a site specific DCGL for Fe-55 does not exist; however, since Fe-55 has not been detected and would not be expected to be present in detectable concentrations in Class 3 plant areas, the Generic Screening value of NUREG 1757 Vol. 2 (Ref 4.) was applied as the DCGL. Table 1 presents the Soil DCGLs per the HBPP LTP. Cs-137, the only nuclide expected to be present was scaled to a TEDE of 24 mrem/yr to account for any HTD nuclides that might be present.

Another important facet of the DQO process is to identify the radionuclides of concern and determine the concentration and variability.

As part of the DQOs applied to laboratory processes, analysis results were reported as actual calculated results. Results reported as less than the Minimum Detectable Concentration (MDC) were not used for FSS. Sample report summaries included unique sample identification, analytical method, radionuclide, result, uncertainty to two (2) standard deviations, laboratory data qualifiers, units, and the required and observed MDC.

#### **Survey approach/methods**

The survey approach was typical for Class 3 land area survey units and utilized the Sign Test from statistically random locations. Cs-137 was the principal nuclide of concern. Walk-over scanning of biasedly selected areas with a 2" x 2" NaI(Tl) scintillation detector was also a feature of the survey unit design (See Figure 4). Some quality assurance measures incorporated to the FSS plan included repeat and split sample comparisons in addition to pre-and post-source checks of scanning instruments.

**Figure 4 - Walkover scan being performed on the opposite shoreline of Fisherman's Channel**



### **Number samples and measurements**

The DQO process determined that Cs-137 is the radionuclide of concern in Survey Unit. Other radionuclides that were positively identified in concentrations greater than the screening criteria during the performance of this FSS would be evaluated to ensure adequate survey design.

The Sign Test (Ref.12) 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 minimum number of soil (sediment) samples for FSS was determined in accordance with Procedure RCP FSS-7, "*Determination of the Number and Location of FSS Samples*". The Lower Bound of the Gray Region (LBGR) was set in accordance with Procedure RCP FSS-7 to achieve a relative shift ( $\Delta/\sigma$ ) in the range between 1 and 3. The resulting relative shift was 7.22 pCi/g Cs-137.

A Prospective Power Curve was generated using MARSSIM Power 2000. MARSSIM Power 2000 is a software package developed under the sponsorship of the United States Department of Energy Environmental Measurement Laboratory.

The grid pattern and locations of the soil samples were determined using Visual Sample Plan (VSP) in accordance with Procedure RCP FSS-18, "*Computer Determination of Number and Locations of FSS Samples*." Visual Sample Plan was created by Pacific Northwest National Laboratory (PNNL) for the United States Department of Energy. A systematic triangular grid pattern with a random starting point was selected for sample design, which is appropriate and conservative for a Class 3 area.

Sample locations were identified using AutoCAD, a commercially available plotting software package with coordinates consistent with the California State Plane System. These coordinates were integrated with a GPS to locate sample locations in the field. Sample measurement locations for the design are listed with the GPS coordinates in Table 6.

**Table 6 - Sample Measurement Locations with Associated GPS Coordinates  
HBPP-FSSP-OOL10-12**

Designation	Northing	Easting
OOL10-12-001-F	5947081.59	2159247.24
OOL10-12-002-F	5947279.91	2159362.50
OOL10-12-003-F	5947896.89	2159566.82
OOL10-12-004-F	5947867.51	2159692.56
OOL10-12-005-F	5947779.37	2159944.03
OOL10-12-006-F	5948021.76	2159671.60
OOL10-12-007-F	5947749.99	2160069.77
OOL10-12-008-F	5947933.62	2159985.94
OOL10-12-009-F	5948043.79	2159881.16
OOL10-12-010-F	5948220.07	2159786.86
OOL10-12-011-F	5947904.24	2160237.42
OOL10-12-012-F	5948014.41	2160132.64
OOL10-12-013-F	5948198.04	2160048.81
OOL10-12-014-F	5948102.55	2160258.37
OOL10-12-015-F	5948168.66	2160174.55
OOL10-12-016-F	5948374.32	2159954.51
OOL10-12-017-F	5948278.83	2160164.07
OOL10-12-018-F	5948433.08	2160331.72
OOL10-12-019-F	5948455.11	2160352.68
OOL10-12-020-F	5948521.22	2160268.85

Procedure RCP FSS-2 specifies that 5% of the samples are required to be selected for HTD analysis. Two (2) soil (sediment) samples or 5% of the number of samples that would be used for non-parametric statistical testing were randomly selected for HTD radionuclide analysis using the Microsoft Excel "RAND" function. Each of the selected samples was sent off-site for a full suite analysis of the HTD radionuclides specified in Table 1.



The LTP requires a minimum of 5% of the samples taken for non-parametric statistical testing be selected for split sample analyses with the off-site laboratory. The implementation of quality control measures as referenced by Procedure RCP FSS-11, "*Split Sample Assessment for Final Status Survey*," included the collection of one (1) soil sample for "split sample" analysis by the off-site laboratory. These locations were selected randomly using the Microsoft Excel "RAND" function. Additionally, Procedure HBAP C-202, "*Final Status Survey Quality Assurance Project Plan*", requires the 5% of the samples taken for non-parametric statistical testing be selected for QC Replicate analyses.

Table 5-4 of the LTP specifies scanning coverage of "Judgmental" 1-10% for Class 3 areas. This requirement was conservatively met by performing scan surveys covering approximately ten percent (10%) of the units surface area.

For this Class 3 survey unit, the "Investigation Level" for soil (sediment) sample measurement results is more conservative than that specified in LTP, Table 5-5. Table 7 provides a synopsis of the survey design.

**Table 7 – Synopsis of the Survey Design HBPP-FSSP-OOL10-12**

Feature	Design Criteria	Basis
Survey Unit Land Area	46,364 m <sup>2</sup>	Based on AutoCAD
Number of Measurements	15 required (20 Randomly selected were taken)	Type 1 and Type 2 errors were 0.05, sigma was 0.18 pCi/g, the LBGR was set at 7.22 pCi/g to achieve a Relative Shift in the range of 1 and 3 ( $\Delta/\sigma=2.0$ )
Grid Spacing	N/A	Sample points were randomly selected
Operational DCGL	7.58 pCi/g Cs-137	Administratively set to achieve 24 mrem/yr TEDE <sup>(1)</sup>
Soil Investigation Level	3.79 pCi/g Cs-137	50% of the Operational DCGL meets the LTP criteria for a Class 3 survey unit
Scan Survey Area Coverage	Approximately 10%.	The LTP requires 1- 10% of area coverage for Class 3 survey units
Scan Investigation Level	Detectable above background	Detectable above background, Per the LTP for Class 3 Survey Units

(1) The allowable dose from easy-to-detect nuclides in this survey unit is limited to 24 mrem/yr TEDE as the bounding dose from hard-to-detect nuclides is 1 mrem/yr.

## Survey Results HBPP-FSSP-OOL10-12

### Sample measurements results

All field survey activities were performed on April 30, 2014.

The on-site laboratory analyzed the twenty (20) samples collected for non-parametric statistical testing, the associated field splits and one (1) QC replicate sample using gamma spectroscopy. Gamma spectroscopy analysis was performed to the required MDCs. Cs-137 was the only plant derived isotope that was positively detected.

Cs-137 was identified in nine (9) of the twenty (20) samples collected for non-parametric statistical testing. A summary of the twenty (20) sample results collected for non-parametric statistical testing results is provided in Table 8.

**Table 8 - Summary of Gamma Spectroscopy Results for Surface Soil Samples  
Comprising the Statistical Sample Population HBPP-FSSP-OOL10-12**

Sample Number	Cs-137 pCi/g	Percentage of DCGL
OOL10-12-001-F	<b>3.18E-01</b>	4.20E+00
OOL10-12-002-F	1.62E-01	2.14E+00
OOL10-12-003-F	<b>1.74E-01</b>	2.30E+00
OOL10-12-004-F	<b>3.25E-01</b>	4.29E+00
OOL10-12-005-F	4.57E-02	6.03E-01
OOL10-12-006-F	-1.04E-02	-1.37E-01
OOL10-12-007-F	1.24E-01	1.64E+00
OOL10-12-008-F	<b>2.73E-01</b>	3.60E+00
OOL10-12-009-F	5.74E-02	7.57E-01
OOL10-12-010-F	1.19E-02	1.57E-01
OOL10-12-011-F	1.56E-01	2.06E+00
OOL10-12-012-F	<b>3.94E-01</b>	5.20E+00
OOL10-12-013-F	<b>1.19E+00</b>	1.57E+01
OOL10-12-014-F	<b>2.79E-01</b>	3.68E+00
OOL10-12-015-F	<b>5.17E-01</b>	6.82E+00
OOL10-12-016-F	<b>2.53E-01</b>	3.34E+00
OOL10-12-017-F	1.95E-01	2.57E+00
OOL10-12-018-F	1.47E-01	1.94E+00
OOL10-12-019-F	7.23E-02	9.54E-01
OOL10-12-020-F	5.31E-02	7.01E-01

NOTE: Bold text indicates results that were greater than laboratory MDC.

The off-site laboratory employed for the radiological analyses of samples was General Engineering Laboratories, LLC. The off-site laboratory processed two (2) samples for HTD analyses as required by the sample plan. The requested analyses included alpha spectroscopy, gas proportional counting, and liquid scintillation depending on the radionuclide and the measurement method. All analyses performed met the required minimum MDC.



Neither of these results tested positive for Cs-137 or other plant derived nuclides. All laboratory sample results are included as Attachment 3.

### Fixed-point radiation measurements

Soil samples were used as fixed point measurements.

### Scan data

Scanning was performed on greater than 10% of the area, exceeding the coverage minimum called for in the LTP. A portion of the area scanned included a small amount extended into Survey Unit HBPP-FSSP-OOL10-11 since it became accessible at low tide. The background ranged from approximately 3-4.7 kcpm which compares well with the anticipated range of 3.2 to 5.4 kcpm predicted in the plan. No indications above background were encountered. Field notes related to scanning are included as part of Attachment 3.

## Survey Unit Data Assessment HBPP-FSSP-OOL10-12

### Statistical Evaluations

The DQO sample design and data were reviewed in accordance with Procedure RCP FSS-14, "*Data Quality Assessment*," for completeness and consistency. The sampling design had adequate power as indicated by the Retrospective Power Curve. The Sign Test was performed (by inspection) on the data and compared to the original assumptions of the DQOs. The evaluation of the Sign Test results demonstrates that the survey unit passes the unrestricted release criteria, thus, the null hypothesis is rejected.

Documentation was complete and legible. Surveys and sample collection were consistent with the DQOs and were sufficient to ensure that the survey unit was properly designated as Class 3.

The preliminary data review consisted of calculating basic statistical quantities (e.g., mean, median, standard deviation). The mean and median values are well below the Operational DCGL. 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 basic statistical quantities for the statistical sample population are provided below in Table 9.

**Table 9 - Basic Statistical Quantities HBPP-FSSP-OOL10-12**

Statistic	Cs-137 (pCi/g)	Fraction of the DCGL
DCGL <sub>op</sub> <sup>(1)</sup> :	7.58E+00	1.00E+00
Minimum Value:	-1.04E-02	-1.37E-03
Maximum Value:	1.19E+00	1.57E-01
Mean:	2.37E-01	3.13E-02
Median:	1.68E-01	2.22E-02
Standard Deviation:	2.63E-01	3.46E-02

<sup>1</sup> DCGL<sub>op</sub> is the "operational" DCGL that is adjusted to conservatively account for potential dose from Hard-to-Detect radionuclides.

The range of the data is approximately 4.57 standard deviations, not a particularly large variation. The difference between the mean and median was about -0.26 of the standard deviation which indicates some skewness in the data. The data was represented graphically through posting plots, a frequency plot, and a quantile plot. The frequency plot indicates a positive skewness as confirmed by the calculated skew of 2.71.

### **Graphical Evaluations**

All data, assessments, and graphical representations are provided in Attachment 3 and Attachment 8.

## **Survey Unit Investigations and Results HBPP-FSSP-OOL10-12**

No investigations were performed for Survey Unit HBPP-FSSP-OOL10-12.

## **ALARA Statement HBPP-FSSP-OOL10-12**

A Generic Technically Based Document has been prepared to demonstrate that it is not ALARA to remediate soil to levels below the DCGL. It is provided as Attachment 5.

## **Changes in Initial Survey Unit Assumptions HBPP-FSSP-OOL10-12**

None of the initial assumptions were changed as a result of information gained in the performance of the FSS survey or in reviewing its results.

## **Quality Assurance and Corrective Actions HBPP-FSSP-OOL10-12**

Each of the QA related sample comparisons compared favorably against the comparison criteria of Procedure RCP FSS-11, *Split Sample Assessment for Final Status Survey*. Survey Instruments were verified to be properly calibrated and passed their required pre-survey and post-survey source checks. No anomalies or corrective actions were noted.

## **Conclusion**

Survey Units HBPP-FSSP-OOL10-11 and HBPP-FSSP-OOL10-12 meet the final DQOs of their respective FSS. The ALARA criterion for soils as specified in the LTP was achieved (Attachment 5). Elevated Measurement Comparison and remediation were not required for either survey unit.

### **Survey Unit HBPP-FSSP-OOL10-11**

The sample data passed the Sign Test. The null hypothesis was rejected. Graphical representation of data indicates very limited positive skewness. The Retrospective Power Curve generated shows adequate power was achieved. The survey unit was properly designated as Class 3.

The hypothetical dose contribution from sediment is 0.25 mrem/yr TEDE based on the average concentration of the samples used for non-parametric statistical sampling.

The average hypothetical total dose from residual radioactivity in this survey unit, including that from HTDs in the sediment, will not exceed 1.25 mrem/yr Total Effective Dose Equivalent (TEDE).

### **Survey Unit HBPP-FSSP-OOL10-12**

The sample data passed the Sign Test. The null hypothesis was rejected. Graphical representation of data indicates very limited positive skewness. The Retrospective Power Curve generated shows adequate power was achieved. The survey unit was properly designated as Class 3.

The hypothetical dose contribution from sediment is 0.78 mrem/yr TEDE based on the average concentration of the samples used for non-parametric statistical sampling.

The average hypothetical total dose from residual radioactivity in this survey unit, including that from HTDs in the sediment, will not exceed 1.78 mrem/yr Total Effective Dose Equivalent (TEDE).

### **References**

- 1.0 Humboldt Bay Power Plant License Termination Plan, Rev. 1 Submitted, August, 2014.
- 2.0 HBPP Procedure RCP FSS-2, "*Preparation of Final Status Survey Plan*", Rev. 0D, September 11, 2013.
- 3.0 NUREG 1575 *Multi Agency Radiation Site Survey and Investigation Manual*, (MARSSIM), USNRC Rev. 1 August, 2000.
- 4.0 NUREG 1757, Vol. 2 Consolidated Decommissioning Guidance "*Characterization, Survey, and Determination of Radiological Criteria*", Rev. 1. USNRC, September, 2006.
- 5.0 HBPP Procedure RCP FSS-7, "*Determination of the Number and Location of FSS Samples*" Rev. 0C, September 11, 2013.
- 6.0 MARSSIM Power 2000 software, V. 1.0.0 Environmental Measurements Laboratory, US Department of Energy, December 2000.
- 7.0 HBPP Procedure RCP FSS-18, "*Computer Determination of Number and Locations of FSS Samples*", Rev. 0C, September 11, 2013.
- 8.0 VSP Development Team (2014). *Visual Sample Plan: A Tool for Design and Analysis of Environmental Sampling*. Version 6.2d. Pacific Northwest National Laboratory. Richland, WA. <http://vsp.pnnl.gov>.
- 9.0 HBPP Procedure RCP FSS-11, "*Split Sample Assessment for Final Status Survey*" Rev. 0C, September 11, 2013.
- 10.0 HBPP Procedure HBAP C-202, "*Final Status Survey Quality Assurance Project Plan*" Rev. 3, June 5, 2014.
- 11.0 HBPP Procedure RCP FSS-14, "*Data Quality Assessment*" Rev. 0C, September 11, 2013.
- 12.0 HBPP Procedure RCP FSS-15, "*Statistical Test*" Rev. 0C, September 11, 2013.

## **Attachment 1**

### **Survey Plan HBPP-FSSP-OOL10-11-00**

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<b>GENERAL SECTION</b>	
Survey Area No: OOL10	Survey Unit No: 11
Survey Unit Name: Fisherman's Channel	
Final Status Survey Number: HBPP-FSSP-OOL10-11-00	
<b>PREPARATION FOR FINAL STATUS SURVEY ACTIVITIES</b>	
<p>Check marks in the boxes below signify affirmative responses and completion of the action.</p> <p>1.1 Files have been established for survey unit FSS records. Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/></p> <p>1.2 ALARA review has been completed for the survey unit. Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/></p> <p>1.3 The survey unit has been turned over for final status survey. Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/></p> <p>1.4 An initial walkdown has been performed <input checked="" type="checkbox"/></p> <p>1.5 Activities conducted within area since turnover has been reviewed. <input checked="" type="checkbox"/></p> <p>Based on reviewed information, subsequent walkdown: <input checked="" type="checkbox"/> not warranted <input type="checkbox"/> warranted</p> <p>If warranted, subsequent walkdown has been performed and documented</p> <p align="center">OR</p> <p>The basis has been provided to and accepted for not performing a subsequent walkdown. <input type="checkbox"/></p> <p>1.6 A final classification has been performed. <input checked="" type="checkbox"/></p> <p align="center">Classification: CLASS 1 <input type="checkbox"/> CLASS 2 <input type="checkbox"/> CLASS 3 <input checked="" type="checkbox"/></p>	
<b>DATA QUALITY OBJECTIVES (DQO)</b>	
<p>For each survey unit area, an adequate final status survey must be designed to demonstrate compliance with the release criteria per the License termination Plan. That is the Objective of this Plan.</p>	

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**1.0 State the problem:**

Survey Area OOL-10 consists of the surface area of the remainder of the HBPP land area. Survey Unit OOL-10-11 (Fisherman's Channel) is completely covered by seawater at high tide and will require a boat and sample dredge to acquire sediment samples for final status survey. It is anticipated that some areas may be inaccessible due to safety and/or access concerns.

The balance of the survey unit's boundary abuts OOL10 and off-site locations. It is approximately 76,520 square meters of surface area.

The problem as defined by this survey plan is to demonstrate that the years of plant operation did not result in an accumulation of plant-related radioactivity that exceeds the release criteria. PG&E intends to submit a request to the USNRC for an early phase release for this and adjacent Survey Unit OOL10-12 in accordance with 10CFR20 subpart E. The planned early release causes Fe-55 to screen in as a potential nuclide of concern. At present a site specific DCGL for Fe-55 does not exist.

There is, at present, no readily available means to perform a gamma scan of submerged sediment media. As a consequence, four compensatory variances from the FSS program will be applied:

- The investigation level is reduced to 25% (from the required 50%) of the DCGL.
- Samples will be collected on a triangular grid with a random start point.
- The samples are collected with an Ekman sampling dredge designed for collecting sediment.
- 20 samples will be collected; an increase from the statistically determined minimum number of 15.

The planning team for this effort consists of the Site Closure Manager, FSS Engineers, FSS Foreman and FSS Technicians. The FSS Engineers will make primary decisions with the concurrence of the Site Closure Manager.

**2.0 Identify the decision:**

Does residual plant-related radioactivity, if present in the survey unit, exceed the release criteria?

Alternative actions may include no action, investigation, resurvey, remediation and reclassification.



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**3.0. Identify the inputs to the decision:**

<i>Sample media:</i>		Sediment			
<i>Types of measurements:</i>		Sediment samples			
<i>Radionuclides-of-concern:</i>		Cs-137			
<i>Applicable DCGL:</i>		The DCGLs applied under this survey plan correspond to the soil (sediment) dose as determined in the LTP. For Fe-55, the screening level DCGLs of NUREG 1757 Vol. 2 were applied for interim use until a site specific DCGL is determined.			
Nuclide	DCGL (pCi/g)	Nuclide	DCGL (pCi/g)	Nuclide	DCGL (pCi/g)
H-3	6.8E+02	I-129	4.8E+00	Pu-241	8.6E+02
C-14	6.3E+00	Cs-137	7.9E+00	Am-241	2.5E+01
Ni-59	1.9E+03	Eu-152	1.0E+01	Cm-243	2.9E+01
Co-60	3.8E+00	Eu-154	9.4E+00	Cm-244	4.8E+01
Ni-63	7.2E+02	Np-237	1.1E+00	Cm-245	1.7E+01
Sr-90	1.5E+00	Pu-238	2.9E+01	Cm-246	2.5E+01
Nb-94	7.1E+00	Pu-239	2.6E+01	Fe-55	1.0E+04
Tc-99	1.2E+01	Pu-240	2.6E+01		

Based on a review of the general plant characterization data of the HBPP environs, Cs-137 was the only plant-related radionuclide that was identified consistently in the characterization samples analyzed. Seventy one (71) samples from previous characterization data were used to provide the characterization data for survey area OOL10. The data is sufficient to support the planning of Survey Unit OOL10-11.

- Cs-137 (51 detects)      Cs-137 is present in 72 % of the characterization samples.
- Other HBPP ETD      There were no other easy to detect nuclides identified >MDA.
- HBPP HTD      There were no hard to detect nuclides identified in the four samples analyzed.

A more recent (2013) continuing characterization effort collected and analyzed six randomly located sediment samples which were analyzed by gamma spectroscopy. One sample tested positive for Cs-137 at 0.15 pCi/g. No other plant related isotopes were detected. As a conservative measure the characterization data for OOL10 soils were used to formulate the survey design.

The presence of all radionuclides listed in this plan (gamma-emitters, HTD beta-emitters, and TRUs) in the soil (sediment) will be evaluated under this survey plan. Although no HTD nuclides are expected to be present, the contribution from HTD nuclides (except for H-3 and Sr-90, which will be measured on-site for each sample) will be bounded by directly adding the dose contribution of a sample contaminated to approximately 3 times the DCGL (~22 pCi/g) for Cs-137. The resultant dose from these HTD

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nuclides is less than 1 mrem/y.

A consequence of the planned early site release for this area is that the earlier date (Prior to 2019) for site release causes Fe-55 to screen in as a potential nuclide of concern. The sample will be counted for Fe-55 based on the screening level DCGLs of NUREG 1757 Vol 2. The sample will be retained, per the requirements of the FSS program, in case it is later determined that a re-analysis for Fe-55 is necessary.

The HBPP Site Closure Laboratory will analyze each soil sample for all listed gamma-emitting nuclides, Sr-90 and Tritium. In addition, 2 FSS soil samples will be sent to an independent laboratory for analyses of gamma-emitters and HTD radionuclides.

***Survey Design /Release Criteria***

<i>Classification:</i>	Class 3
<i>Average Cs-137 concentration:</i>	0.38 pCi/g
<i>Standard deviation Cs- 137 (<math>\sigma</math>):</i>	0.18 pCi/g
<i>Surrogate DCGL:</i>	N/A (a surrogate DCGL will not be used)
<i>LBGR:</i>	Initial = $0.5 \times \text{DCGL} = 3.79 \text{ pCi/g Cs-137}$
<i>Adjusted LBGR( set <math>\Delta/\sigma = 2.0</math>)</i>	= $7.22 \text{ pCi/g Cs-137}$
<i>Number of Samples:</i>	Calculated = 15
<i>Survey Unit Area:</i>	$76,520 \text{ m}^2$
<i>Grid Area (A/N):</i>	N/A Class 3
<i>DCGL<sub>emc</sub> Cs-137:</i>	N/A Class 3
<i>Investigation Level for soil samples:</i>	> 25% DCGL for Cs-137 = $1.98 \text{ pCi/g Cs-137}$
<i>Gamma scanning Coverage:</i>	N/A
<i>Investigation Level for SPA-3 Scans:</i>	N/A
<i>Radionuclides for analysis:</i>	All listed nuclides with the focus on Cs-137

The HBPP onsite laboratory will analyze each sediment sample for all listed gamma-emitting nuclides.

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***Survey Design /Release Criteria***

*Radionuclides for analysis:*

All listed nuclides with the focus on Cs-137

*MDCs for gamma analysis of soil samples:*

<u>Nuclide</u>	<u>10% to %50 of the DCGL (pCi/g)</u>		
Co-60	3.8E-01	to	1.9E+00
Nb-94	7.1E-01	to	3.55E+00
I-129	4.8E-01	to	2.4E+00
Cs-137*	7.58E-01	to	3.79E+00
Eu-152	1.0E+00	to	5.0E+00
Eu-154	9.40E-01	to	4.70E+00
Np-237	1.1E-01	to	5.5E-01

The desired MDCs in the laboratory analyses of soil samples will be the 10% DCGL values. If it is impractical to achieve those, the 50% DCGL values must be achieved in the laboratory analyses of the sediment samples.

\* The DCGL for Cs-137, the only nuclide expected to be present, has been reduced to 24 mrem/y to account for any HTDs that may be present.

*MDC's for HTD nuclide:*

<u>Nuclide</u>	<u>10%</u>	to	<u>50% of the DCGL (pCi/g)</u>
H-3	6.8E+01		3.4E+02
C-14	6.3E-01		3.15E+00
Fe-55	1.0E+03		5.0E+03
Ni-59	1.9E+02		9.5E+02
Ni-63	7.2E+01		3.6E+02
Sr-90	1.5E-01		7.5E-01
Tc-99	1.2E+00		6.0E+00

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Pu-238	2.9E+00	1.45E+01
Pu-239/240	2.6E+00	1.3E+01
Pu-241	8.6E+01	4.3E+02
Am-241	2.5E+00	1.25E+01
Cm-243	2.9E+00	1.45E+01
Cm-244	4.8E+00	2.4E+01
Cm-245	1.7E+00	8.5E+00
Cm-246	2.5E+00	1.25E+01

The MDC values for difficult to detect nuclides will be conveyed to the outside laboratory via the sample Chain-Of-Custody form which will accompany the sediment samples.

**4.0 Define the boundaries of the survey:**

- Boundaries of Survey Areas are as shown on the attached map. This area is bordered by the Survey Area off-site locations or OOL10 on all sides.
- The survey will be performed at high tide and under safe marine weather conditions (as defined by instrumentation and/or equipment limitations and human factors). Surveys will be performed during daylight hours.

**5.0 Develop a decision rule:**

Upon review of the FSS data collected under this survey plan:

- (a) If all the sample data show that the sediment concentrations of plant related nuclides are below the DCGLs and the sum of fractions of nuclides are below unity, then reject the null hypothesis (i.e., Survey Unit OOL10-11 meets the release criteria).
- (b) If the investigation levels are exceeded, then perform an investigation survey.
- (c) If the average concentration of any listed nuclide exceeds its respective DCGL or the average sum of fractions for any listed nuclide exceeds one, then accept the null hypothesis (i.e., Survey Unit OOL10-11 fails to meet the release criteria).

Note: Alternate actions beyond investigations include remediation, reclassification and resurvey.

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**6.0 Specify tolerable limits on decision errors:**

<i>Null hypothesis:</i>	Residual plant-related radioactivity in Survey Unit OOL10-11 exceeds the release criteria.
<i>Probability of type I error:</i>	0.05
<i>Probability of type II error:</i>	0.05
<i>LBGR:</i>	Adjusted to 7.22 pCi/g Cs-137

**7.0 Optimize Design:**

<i>Number and Location of Samples:</i>	Twenty (20) sediment samples will be collected at locations based on a triangular grid with a random startpoint.
--	--

**GENERAL INSTRUCTIONS**

1. Measurement locations will be identified using GPS. Any locations that are not suitable for sediment sampling will be relocated to the nearest suitable location and documented on the survey map.
2. Chain of Custody form will be used for all sediment samples.
3. All sediment samples will be received and prepared as directed by the FSS Engineer.
4. The job hazards associated with the Survey described in this package will be addressed in the pre-job brief.
5. All personnel participating in this survey shall be trained in the operation of the - instrumentation.

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**SPECIFIC INSTRUCTIONS**

1. All designated measurement locations will be identified by GPS. If a designated sample location is obstructed for any reason, the FSS Engineer or the Lead FSS Technician will select an alternate location within Three meters of the original location. A detailed description of the alternate location will be recorded on the survey form, the survey unit map will be annotated appropriately, and the alternate location will be identified with GPS. GPS coordinates are provided in Table 1 (below).

**Table 1 Sample Locations**

Sample	Easting*	Northing*
Intake Canal		
OOL10-11-001-F	5946542.65	2159425.53
OOL10-11-002-F	5946651.69	2159236.68
OOL10-11-003-F	5946760.72	2159047.82
OOL10-11-004-F	5946869.75	2158858.97
OOL10-11-005-F	5946978.79	2159047.82
OOL10-11-006-F	5946869.75	2159236.68
OOL10-11-007-F	5947196.85	2159047.82
OOL10-11-008-F	5947196.85	2159425.53
OOL10-11-009-F	5947307.58	2159235.52
OOL10-11-010-F	5947414.92	2159425.53
OOL10-11-011-F	5947303.86	2159622.98
OOL10-11-012-F	5947414.92	2159803.23
OOL10-11-013-F	5947523.96	2159614.38
OOL10-11-014-F	5947632.99	2159425.53
OOL10-11-015-F	5947523.96	2159992.09
OOL10-11-016-F	5947632.99	2159803.23
OOL10-11-017-F	5947742.02	2159614.38
OOL10-11-018-F	5947960.09	2160369.79
OOL10-11-019-F	5948178.16	2160369.79
OOL10-11-020-F	5948505.26	2160180.94
*CA Zone 1 NAD83/NAVD88		

2. Sample Requirements:

- Collect twenty (20) 1-liter sediment samples in accordance with the instructions of this plan. Two (2) of the 20 sediment samples will be analyzed as QC split samples and one (1) will be a sample recount to fulfill the QC requirement. The QC split samples will also be analyzed for Hard-to-Detect nuclides.



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- Sediment samples will be collected as follows:
  - At the sample location, using a clean drop-dredge implement, deploy the dredge until approximately one liter of sediment material is obtained placing the soil in a sample container. If necessary sample may be decanted to remove excess water.
  - Record the number of dredge drops that were required.
  - Label the plastic bag with the sample location identifier.
  - Transfer the bag of soils to the sample preparation area.
  - Clean/decontaminate the dredging tool after each sample is taken.

**3. Soil Sample Designation:**

Statistical sediment samples:	OOL10-11-001-F through OOL10-11-020-F corresponding to sample locations 001 through 020.
QC split samples:	OOL10-11-003-F-S and OOL10-11-016-F-S are to be designated as QC split samples. These samples will be sent to the off-site laboratory.
Recount samples:	OOL10-11-020-F-RC is to be counted twice on site. The results will be compared as directed by the FSS Engineer.

**4. Sample Analysis:**

- Gamma analysis will be performed on all sediment samples. If any of the gamma analyses show that an investigation level has been exceeded an investigation survey will be conducted at that sample location as directed in specific instruction # 5.
- HBPP will analyze OOL10-11-001-F through OOL10-11-020-F for gamma-emitting nuclides, H-3 and Sr-90.
- HBPP will analyze OOL10-11-020-F as a sample recount. The recounted sample will possess the naming convention OOL10-11-020-F-RC.
- HBPP will analyze OOL10-11-003-F-S and OOL10-11-016-F-S for gamma-emitting nuclides prior to being sent to the off-site laboratory. These samples will be analyzed for gamma emitting nuclides and HTD at the off-site laboratory.
- On-site gamma analysis of the samples shall achieve the MDC values stated in the DQO

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section of this plan. The MDC's for off-site analysis will be communicated to the laboratory using an attachment to the Chain-of-Custody form or previous direction that meets specified MDC's of this final status survey plan.

5. If the results of any sample analysis exceed an investigation level, perform a first level investigation as follows:

- Using the GPS establish the investigation sample points at 3m distance in the four compass directions around any confirmed elevated measurement location.
  - Obtain a sediment sample at the identified locations. Designate the sample as "OOL10-11 -xxx-F-I" where "xxx" continues sequentially from the last number assigned to an investigative sample.
- Sediment samples will be collected as follows:
  - At the sample location, using a clean drop-dredge implement, deploy the dredge until approximately one liter of sediment material is obtained placing the soil in a sample container. If necessary sample may be decanted to remove excess water.
  - Record the number of dredge drops that were required.
  - Label the plastic bag with the sample location identifier.
  - Transfer the bag of soils to the sample preparation area.
  - Clean/decontaminate the dredging tool after each sample is taken.

Prepared by: *Dal Runkall*  
 FSS Engineer

Date: 4-16-14

Reviewed by: *Matthew C. Gind*  
 FSS Engineer

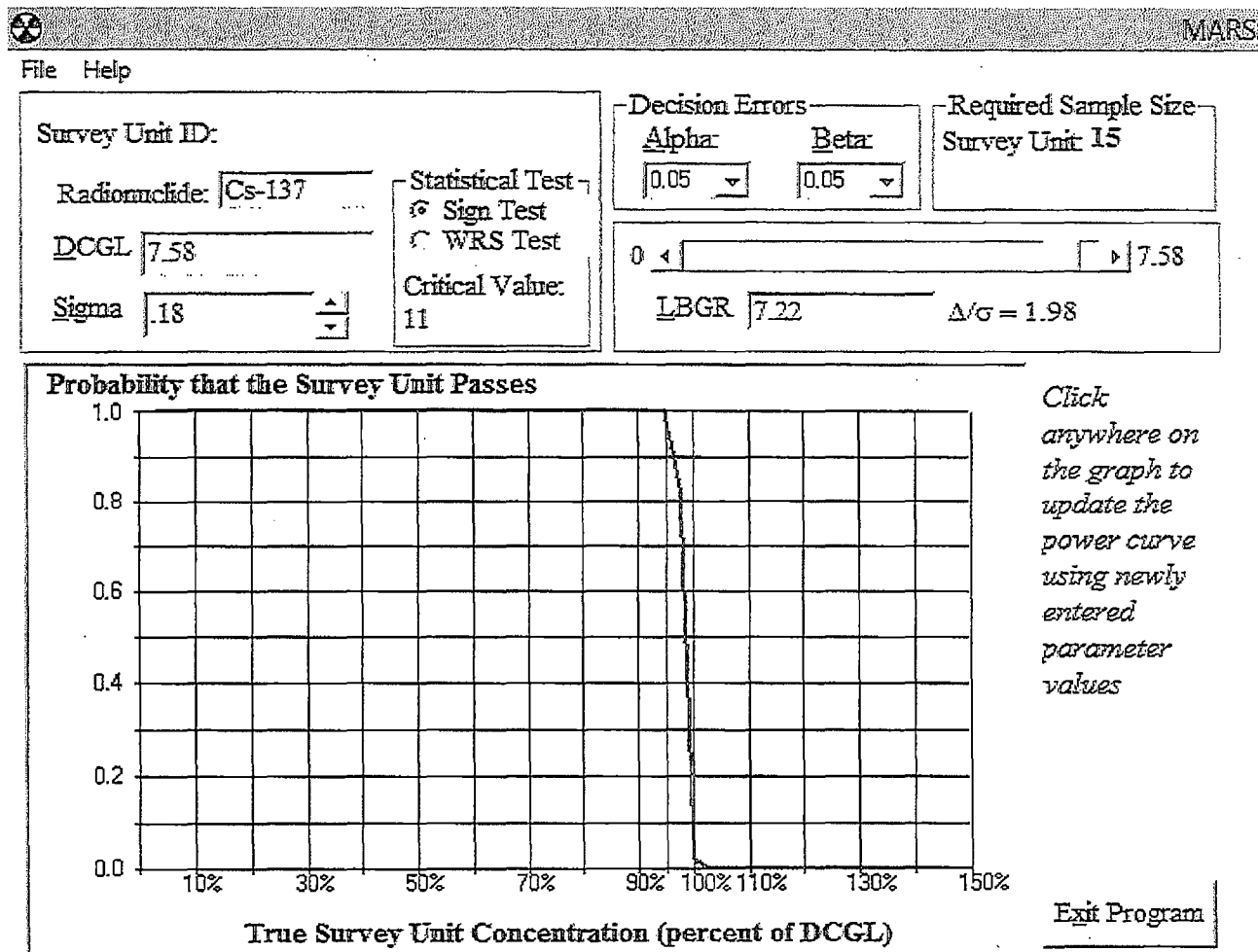
Date: 4/16/14

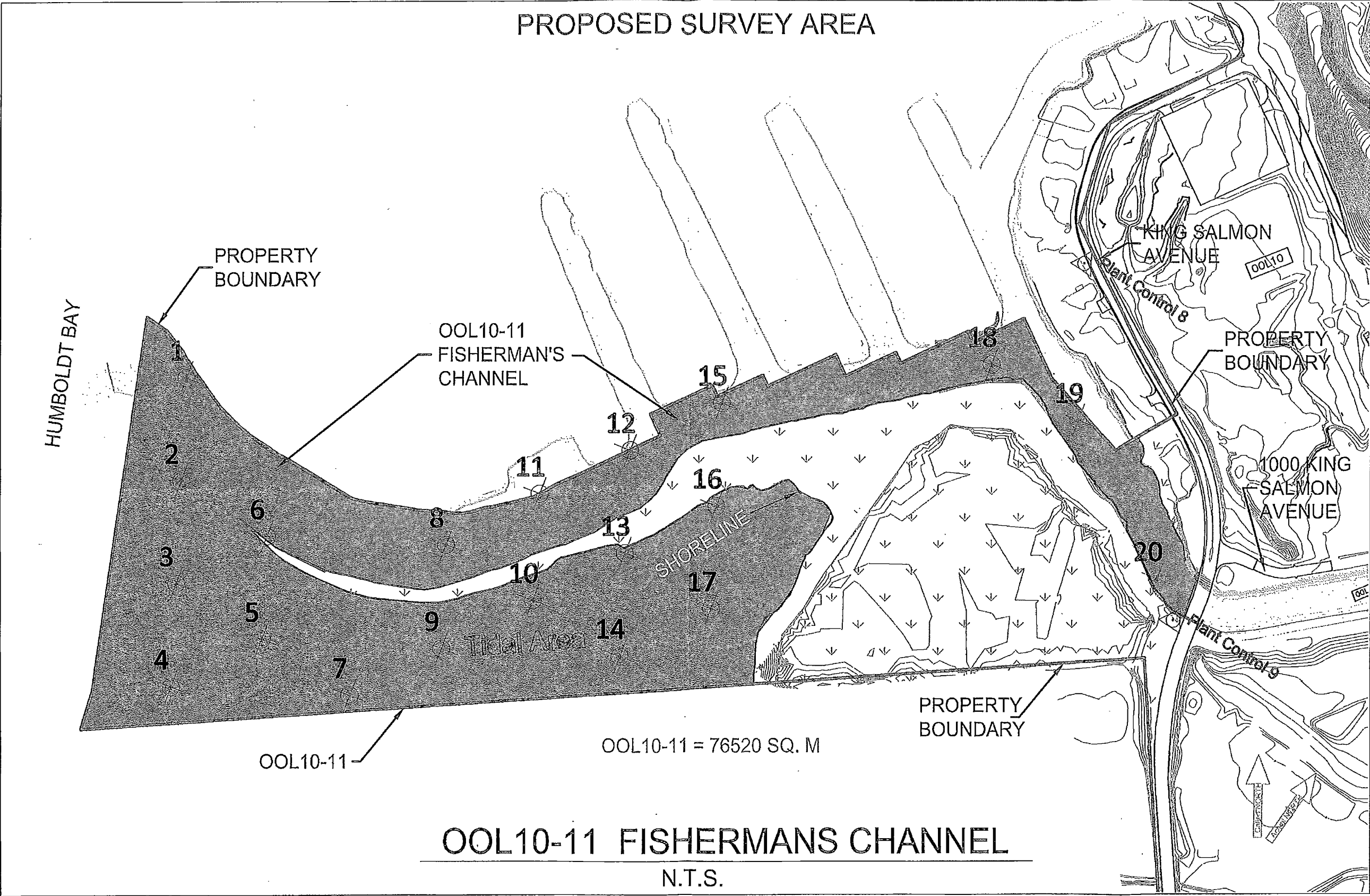
Approved by: *W. A. Barley*  
 Final Status Survey Supervisor

Date: 4/17/14

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# OOL10-11 Prospective Power Curve





**Attachment 2**

**Hard-to-Detect (HTD)**  
**Assessment Data**

## Attachment 2: Resultant Dose from Hard-to-Detect Nuclides

Composite Soils - RDT Vault of the Liquid Radwaste Building					
Nuclide	Building Surface DCGL (dpm/100 cm <sup>2</sup> )	Soil  DCGL (pCi/g)	Results  (pCi/g)	Results/DCGL  Unity Fraction	Results/DCGL (positive only)  Unity Fraction
Am-241	3.00E+03	2.50E+01	-3.38E-02	-1.4E-03	0.0E+00
C-14	7.00E+06	6.30E+00	-1.65E-01	-2.6E-02	0.0E+00
Cm-243	4.30E+03	2.90E+01	7.53E-02	2.6E-03	2.6E-03
Cm-244	5.50E+03	4.80E+01	7.53E-02	1.6E-03	1.6E-03
Cm-245	2.20E+03	1.70E+01	8.40E-02	4.9E-03	4.9E-03
Cm-246	2.70E+03	2.50E+01	8.40E-02	3.4E-03	3.4E-03
Co-60	1.30E+04	3.80E+00		0.0E+00	0.0E+00
Cs-137	4.60E+04	7.90E+00		0.0E+00	0.0E+00
Eu-152	2.70E+04	1.00E+01		0.0E+00	0.0E+00
Eu-154	2.50E+04	9.40E+00		0.0E+00	0.0E+00
H-3	1.80E+08	6.80E+02		0.0E+00	0.0E+00
I-129	4.90E+04	4.80E+00		0.0E+00	0.0E+00
Nb-94	1.90E+04	7.10E+00		0.0E+00	0.0E+00
Ni-59	6.30E+07	1.90E+03		0.0E+00	0.0E+00
Ni-63	2.40E+07	7.20E+02	6.81E-01	9.5E-04	9.5E-04
Np-237	2.40E+03	1.10E+00		0.0E+00	0.0E+00
Pu-238	3.40E+03	2.90E+01		0.0E+00	0.0E+00
Pu-239	3.10E+03	2.60E+01	2.81E-01	1.1E-02	1.1E-02
Pu-240	3.10E+03	2.60E+01	2.81E-01	1.1E-02	1.1E-02
Pu-241	1.40E+05	8.60E+02	7.60E-01	8.8E-04	8.8E-04
Sr-90	9.70E+04	1.50E+00		0.0E+00	0.0E+00
Tc-99	9.60E+06	1.20E+01	-5.2E-01	-4.3E-02	0.0E+00
			total	-3.5E-02	3.6E-02
			Total (mrem/y)	-8.8E-01	9.0E-01

NOTE: Tritium (H-3) & Strontium-90 (Sr-90) excluded. Both isotopes were measured at on-site lab for each sample.





a member of **The GEL Group** INC



PO Box 30712 Charleston, SC 29417  
2040 Savage Road Charleston, SC 29407  
P 843.556.8171 F 843.766.1178

April 11, 2014

[www.gel.com](http://www.gel.com)

Ms. Dee Anderson  
Pacific Gas and Electric, Humboldt Bay Power Plant  
1000 King Salmon Avenue  
Eureka, California 95503

Re: Final Status Survey  
Work Order: 345495

Dear Ms. Anderson:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on March 29, 2014. 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. 4504.

Sincerely,

A handwritten signature in black ink, appearing to read "Erin L. Trent".

Erin Trent  
Project Manager

Purchase Order: 3500953353, Line item #4  
Enclosures



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# Case Narrative

**Case Narrative  
for  
Pacific Gas and Electric Company  
SDG: 345495**

**April 11, 2014**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary**

**Sample Receipt** The sample arrived at GEL Laboratories LLC, Charleston, South Carolina on March 29, 2014 for analysis. The sample was delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

**Sample Identification** The laboratory received the following sample:

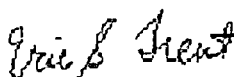
<u>Laboratory ID</u>	<u>Client ID</u>
345495001	2014-2127a RDT Vault Soil Composite

**Case Narrative**

Sample analyses were conducted using methodology as outlined in GEL Laboratories, LLC (GEL) Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

**Data Package**

The enclosed data package contains the following sections: General Narrative, Chain of Custody and Supporting Documentation, and data from the following fractions: Radiochemistry.



Erin Trent  
Project Manager

# **Chain of Custody and Supporting Documentation**





**Subject:** FSS MDAs

**From:** "Anderson, Dee" <D1A6@pge.com>

**Date:** Tue, 2 Oct 2012 15:19:52 +0000

**To:** Erin Trent <Erin.Trent@gel.com>

**CC:** "Oliver, Cynthia" <CCO1@pge.com>, "Alderman, Wayne" <WLAB@pge.com>

Good Morning Erin,

Attached please find a list of required MDAs to be used for FSS analysis of soils. GEL receives FSS samples for the hard to detect nuclides. The MDCs remain the same as previously with the exception that H-3 is now being analyzed onsite.

Thank you for your great work!

D.

Dee Anderson  
Count Room Supervisor  
Humboldt Bay Power Plant  
1000 King Salmon  
Eureka, CA 95503  
Ph. 707-444-0746

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FSS GEL MDAs.xls	<b>Content-Description:</b> FSS GEL MDAs.xls <b>Content-Type:</b> application/vnd.ms-excel <b>Content-Encoding:</b> base64
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## Characterization MDCs for GEL for FSS Samples

Gamma Analysis:		10% to 50% of the DCGL			
Co-60	3.82E-01	to	1.91E+00	pCi/g	
Nb-94	7.13E-01	to	3.57E+00	pCi/g	
I-129	4.83E-01	to	2.42E+00	pCi/g	
Cs-137	7.93E-01	to	3.97E+00	pCi/g	
Eu-152	1.01E+00	to	5.05E+00	pCi/g	
Eu-154	9.40E-01	to	4.70E+00	pCi/g	
Np-237	1.11E-01	to	5.55E-01	pCi/g	

Hard to Detect Nuclides:		10% to 50% of the DCGL			
H-3	6.86E+01	to	3.43E+02	pCi/g	
C-14	6.30E-01	to	3.15E+00	pCi/g	
Ni-59	1.97E+02	to	9.85E+02	pCi/g	
Ni-63	7.24E+01	to	3.62E+02	pCi/g	
Sr-90	1.51E-01	to	7.55E-01	pCi/g	
Tc-99	1.24E+00	to	6.20E+00	pCi/g	
Pu-238	2.97E+00	to	1.49E+01	pCi/g	
Pu-239/240	2.67E+00	to	1.34E+01	pCi/g	
Pu-241	8.61E+01	to	4.31E+02	pCi/g	
Am-241	2.58E+00	to	1.29E+01	pCi/g	
Cm-243	2.90E+00	to	1.46E+01	pCi/g	
Cm-244	4.81E+00	to	2.41E+01	pCi/g	
Cm-245	1.78E+00	to	8.90E+00	pCi/g	
Cm-246	2.58E+00	to	1.29E+01	pCi/g	

**GEL**

Laboratories LLC

**SAMPLE RECEIPT & REVIEW FORM**

Client: <u>PCGE/HBPP</u>		SDG/AR/COC/Work Order: <u>345495</u>	
Received By: <u>MK</u>		Date Received: <u>3-29-14</u>	
Suspected Hazard Information	Yes <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/>	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.	
COC/Samples marked as radioactive?	Yes <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>CPND</u>	
Classified Radioactive II or III by RSO?	Yes <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/>	If Yes, Were swipes taken of sample containers < action levels?	
COC/Samples marked containing PCBs?	Yes <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/>		
Package, COC, and/or Samples marked as beryllium or asbestos containing?	Yes <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/>	If Yes, samples are to be segregated as Safety Controlled Samples, and opened by the GEL Safety Group.	
Shipped as a DOT Hazardous?	Yes <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/>	Hazard Class Shipped: UN#:	
Samples identified as Foreign Soil?	Yes <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/>		

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Preservation Method: Ice bags Blue ice Dry ice <u>None</u> Other (describe) *all temperatures are recorded in Celsius <u>18°C</u>
2a Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Temperature Device Serial #: <u>130532776</u> Secondary Temperature Device Serial # (If Applicable):
3 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4 Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
5 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sample ID's, containers affected and observed pH: If Preservation added, Lot#:
6 VOA vials free of headspace (defined as < 6mm bubble)?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sample ID's and containers affected:
7 Are Encore containers present?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	(If yes, immediately deliver to Volatiles laboratory)
8 Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ID's and tests affected:
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sample ID's and containers affected:
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sample ID's affected:
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sample ID's affected:
12 Are sample containers identifiable as GEL provided?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
14 Carrier and tracking number.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Circle Applicable: <u>FedEx Air</u> FedEx Ground UPS Field Services Courier Other <u>8046 1600 7133</u>

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials EST Date 3/31/14 Page 1 of 1

**Subject:** just a reminder - in case you need it for the package.

**From:** "Oliver, Cynthia" <CCO1@pge.com>

**Date:** Fri, 28 Mar 2014 21:16:55 +0000

**To:** "Erin Trent (Erin.Trent@gel.com)" <Erin.Trent@gel.com>

The soil sample we sent today has the wrong charge line on the COC – it should be line 4 for FSS

Thanks,  
Cyndi

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# Laboratory Certifications

## List of current GEL Certifications as of 11 April 2014

State	Certification
Alaska	UST-110
Arkansas	88-0651
CLIA	42D0904046
California NELAP	01151CA
Colorado	SC00012
Connecticut	PH-0169
Delaware	SC000122013-10
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-12-00283, P330-12-00284
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC000122013-10
Idaho Chemistry	SC00012
Idaho Radiochemistry	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky	90129
Louisiana NELAP	03046 (AI33904)
Louisiana SDWA	LA130005
Maryland	270
Massachusetts	M-SC012
Michigan	9976
Mississippi	SC000122013-10
Nebraska	NE-OS-26-13
Nevada	SC000122014-1
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
Oklahoma	9904
Pennsylvania NELAP	68-00485
Plant Material Permit	PDEP-12-00260
South Carolina Chemistry	10120001
South Carolina GVL	23611001
South Carolina Radiochemi	10120002
Tennessee	TN 02934
Texas NELAP	T104704235-14-9
Utah NELAP	SC000122013-11
Vermont	VT87156
Virginia NELAP	460202
Washington	C780-12
Wisconsin	999887790

**GEL Laboratories LLC***problem solved*

P.O. Box 30712-Charleston, S.C. 29417-2040 Savage Road-29407  
(843)556-8171-Fax(843)766-1178

**Invoice for Analytical Services**

**Accounts Payable—PG&E**  
**Pacific Gas and Electric Company**  
**P.O. Box 7760**  
**San Francisco, California 94120**

**PO: 3500953353, Line item #4**

**Invoice #:** 285072  
**Invoice Date:** 11-APR-14  
**Terms:** Net 30  
**Client:** Pacific Gas and Electric Company  
**Description (Order):** Final Status Survey  
**Workorder/SDG:** 345495  
**Project:** PCGE00606  
**Project Manager:** Erin Trent

GELID:345495001	Matrix:SOIL	ClientID: 2014-2127a RDT Vault	Collected: 26-MAR-14	Received: 29-MAR-14	
Test	Description	Methods	Turn Days		Charge
GSCGAMMS	GammaSpec, Gamma, Solid (Standard List)	DOE HASL 300, 4 5 2 3/Ga-01-R	14 (Receive)		
LSC99TCS	Liquid Scint Tc99, Solid 1 24 pCi/g RDL	DOE EML HASL-300, Tc-02-RC Mo	14 (Receive)		
GSC59NIS	Gamma Ni59, Solid 197 pCi/g RDL	DOE RESL Ni-1	14 (Receive)		
LSC_14CS	Liquid Scint C14, Solid, 0 63 pCi/g RDL	EPA EERF C-01 Modified	14 (Receive)		
LSC63NIS	Liquid Scint Ni63, Solid 72 4 pCi/g RDL	DOE RESL Ni-1, Modified	14 (Receive)		
ASPAMCMS	Alphaspec Am241, Cm, Solid 1 78 pCi/g RDL	DOE EML HASL-300, Am-05-RC Mo	14 (Receive)		
ASP_PUS	Alphaspec Pu, Solid 2 67 pCi/g RDL	DOE EML HASL-300, Pu-11-RC Mo	14 (Receive)		
LSC41PUS	Liquid Scint Pu241, Solid 86 1 pCi/g RDL	DOE EML HASL-300, Pu-11-RC Mo	14 (Receive)		
GFC90SRS	GFPC, Sr90, soil 0 151 pCi/g RDL	EPA 905 0 Modified	14 (Receive)		
GSC_29IS	Gamma I129, Solid	DOE EML HASL-300,I-01 Modified	14 (Receive)		
Sample Total:					

Miscellaneous Charge	Description	Charge
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**Invoice Total:**



# Radiological Analysis

**Radiochemistry Case Narrative  
Pacific Gas and Electric Company (PCGE)  
SDG 345495**

**Method/Analysis Information**

**Product:** Alphaspec Am241, Cm, Solid 1.78 pCi/g RDL  
**Analytical Method:** DOE EML HASL-300, Am-05-RC Modified  
**Prep Method:** Dry Soil Prep  
**Analytical Batch Number:** 1377656  
**Prep Batch Number:** 1376446

<b>Sample ID</b>	<b>Client ID</b>
345495001	2014-2127a RDT Vault Soil Composite
1203062540	Method Blank (MB)
1203062541	345495001(2014-2127a RDT Vault Soil Composite) Sample Duplicate (DUP)
1203062542	Laboratory Control Sample (LCS)

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

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-011 REV# 24.

**Calibration Information:****Calibration Information**

All initial and continuing calibration requirements have been met.

**Standards Information**

Standard solutions for these analysis are NIST traceable or verified with a NIST traceable standard and used before the expiration dates.

**Sample Geometry**

All counting sources were prepared in the same geometry as the calibration standards.

**Quality Control (QC) Information:****Blank Information**

The blank volume is representative of the sample volume in this batch.

**Designated QC**

The following sample was used for QC: 345495001 (2014-2127a RDT Vault Soil Composite).

**QC Information**

All of the QC samples met the required acceptance limits.

**Technical Information:**

**Holding Time**

All sample procedures for this sample set were performed within the required holding time.

**Sample Re-prep/Re-analysis**

The batch was reprepared due to spectral interference. The re-analysis is reported.

**Recounts**

None of the samples in this batch were recounted.

**Miscellaneous Information:**

**Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A data exception report (DER) was not generated for this SDG.

**Manual Integration**

No manual integrations were performed on data in this batch.

**Sample-Specific MDA/MDC**

The MDA/MDC reported on the certificate of analysis is a sample-specific MDA/MDC.

**Additional Comments**

Additional comments were not required for this sample set.

**Qualifier Information**

Manual qualifiers were not required.

**Method/Analysis Information**

<b>Product:</b>	<b>Alphaspec Pu, Solid 2.67 pCi/g RDL</b>
<b>Analytical Method:</b>	<b>DOE EML HASL-300, Pu-11-RC Modified</b>
<b>Prep Method:</b>	<b>Dry Soil Prep</b>
<b>Analytical Batch Number:</b>	<b>1377658</b>
<b>Prep Batch Number:</b>	<b>1376446</b>

<b>Sample ID</b>	<b>Client ID</b>
345495001	2014-2127a RDT Vault Soil Composite
1203062543	Method Blank (MB)
1203062544	345495001(2014-2127a RDT Vault Soil Composite) Sample Duplicate (DUP)
1203062545	Laboratory Control Sample (LCS)

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

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-011 REV# 24.

**Calibration Information:**

**Calibration Information**

All initial and continuing calibration requirements have been met.

**Standards Information**

Standard solutions for these analysis are NIST traceable or verified with a NIST traceable standard and used before the expiration dates.

**Sample Geometry**

All counting sources were prepared in the same geometry as the calibration standards.

**Quality Control (QC) Information:**

**Blank Information**

The blank volume is representative of the sample volume in this batch.

**Designated QC**

The following sample was used for QC: 345495001 (2014-2127a RDT Vault Soil Composite).

**QC Information**

All of the QC samples met the required acceptance limits.

**Technical Information:**

**Holding Time**

All sample procedures for this sample set were performed within the required holding time.

**Sample Re-prep/Re-analysis**

Sample 345495001 (2014-2127a RDT Vault Soil Composite) was reprepared due to low carrier/tracer yield. The re-analysis is being reported.

**Recounts**

None of the samples in this batch were recounted.

**Miscellaneous Information:**

**Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A data exception report (DER) was not generated for this SDG.

**Manual Integration**

No manual integrations were performed on data in this batch.

**Sample-Specific MDA/MDC**

The MDA/MDC reported on the certificate of analysis is a sample-specific MDA/MDC.

**Additional Comments**

Additional comments were not required for this sample set.

**Qualifier Information**

Manual qualifiers were not required.

**Method/Analysis Information**

**Product:** Gamma I129, Solid  
**Analytical Method:** DOE EML HASL-300,I-01 Modified  
**Analytical Batch Number:** 1376494

Sample ID	Client ID
345495001	2014-2127a RDT Vault Soil Composite
1203059635	Method Blank (MB)
1203059636	345495001(2014-2127a RDT Vault Soil Composite) Sample Duplicate (DUP)
1203059637	345495001(2014-2127a RDT Vault Soil Composite) Matrix Spike (MS)
1203059638	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-006 REV# 21.

**Calibration Information:**

**Calibration Information**

All initial and continuing calibration requirements have been met.

**Standards Information**

Standard solutions for these analysis are NIST traceable or verified with a NIST traceable standard and used before the expiration dates.

**Sample Geometry**

All counting sources were prepared in the same geometry as the calibration standards.

**Quality Control (QC) Information:**

**Blank Information**

The blank volume is representative of the sample volume in this batch.

**Designated QC**

The following sample was used for QC: 345495001 (2014-2127a RDT Vault Soil Composite).

**QC Information**

All of the QC samples met the required acceptance limits.

**Technical Information:****Holding Time**

All sample procedures for this sample set were performed within the required holding time.

**Sample Re-prep/Re-analysis**

None of the samples in this sample set required reprep or reanalysis.

**Recounts**

None of the samples in this batch were recounted.

**Miscellaneous Information:****Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A data exception report (DER) was not generated for this SDG.

**Sample-Specific MDA/MDC**

The MDA/MDC reported on the certificate of analysis is a sample-specific MDA/MDC.

**Additional Comments**

Additional comments were not required for this sample set.

**Qualifier Information**

Manual qualifiers were not required.

**Method/Analysis Information**

<b>Product:</b>	<b>Gammasec, Gamma, Solid (Standard List)</b>
Analytical Method:	DOE HASL 300, 4.5.2.3/Ga-01-R
Prep Method:	Dry Soil Prep
Analytical Batch Number:	1376566
Prep Batch Number:	1376446

<b>Sample ID</b>	<b>Client ID</b>
345495001	2014-2127a RDT Vault Soil Composite
1203059875	Method Blank (MB)
1203059876	345495001(2014-2127a RDT Vault Soil Composite) Sample Duplicate (DUP)
1203059877	Laboratory Control Sample (LCS)

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

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with

GL-RAD-A-013 REV# 25.

**Calibration Information**

All initial and continuing calibration requirements have been met.

**Standards Information**

Standard solutions for these analysis are NIST traceable or verified with a NIST traceable standard and used before the expiration dates.

**Sample Geometry**

All counting sources were prepared in the same geometry as the calibration standards.

**Quality Control (QC) Information:**

**Blank Information**

The blank volume is representative of the sample volume in this batch.

**Designated QC**

The following sample was used for QC: 345495001 (2014-2127a RDT Vault Soil Composite).

**QC Information**

All of the QC samples meet the required acceptance limits with the following exceptions: The sample and the duplicate, 1203059876 (2014-2127a RDT Vault Soil Composite) and 345495001 (2014-2127a RDT Vault Soil Composite), did not meet the Ac-228/Ra-228 relative percent difference requirement (0-20%); however, they do meet the relative error ratio requirement (0-3) with value of 1.18.

**Technical Information:**

**Holding Time**

All sample procedures for this sample set were performed within the required holding time.

**Sample Re-prep/Re-analysis**

None of the samples in this sample set required reprep or reanalysis.

**Recounts**

None of the samples in this batch were recounted.

**Miscellaneous Information:**

**Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A data exception report (DER) was not generated for this SDG.

**Sample-Specific MDA/MDC**

The MDA/MDC reported on the certificate of analysis is a sample-specific MDA/MDC.

**Additional Comments**

Additional comments were not required for this sample set.

**Qualifier Information**

Qualifier	Reason	Analyte	Sample	Client Sample
-----------	--------	---------	--------	---------------



## Attachment 2: HTD Assessment Data

UI	Data rejected due to high counting uncertainty.	Lead-210	1203059876	2014-2127a RDT Vault Soil Composite(3454
UI	Data rejected due to low abundance.	Bismuth-212	345495001	2014-2127a RDT Vault Soil Composite
UI	Data rejected due to no valid peak.	Thorium-234	1203059876	2014-2127a RDT Vault Soil Composite(3454
		Uranium-238	1203059876	2014-2127a RDT Vault Soil Composite(3454

### Method/Analysis Information

**Product:** Gamma Ni59, Solid 197 pCi/g RDL  
**Analytical Method:** DOE RESL Ni-1  
**Prep Method:** Dry Soil Prep  
**Analytical Batch Number:** 1376823  
**Prep Batch Number:** 1376446

Sample ID	Client ID
345495001	2014-2127a RDT Vault Soil Composite
1203060558	Method Blank (MB)
1203060559	345495001(2014-2127a RDT Vault Soil Composite) Sample Duplicate (DUP)
1203060560	Laboratory Control Sample (LCS)

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

### **SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-022 REV# 16.

### Calibration Information:

#### **Calibration Information**

All initial and continuing calibration requirements have been met.

#### **Standards Information**

Standard solutions for these analysis are NIST traceable or verified with a NIST traceable standard and used before the expiration dates.

#### **Sample Geometry**

All counting sources were prepared in the same geometry as the calibration standards.

**Quality Control (QC) Information:**

**Blank Information**

The blank volume is representative of the sample volume in this batch.

**Designated QC**

The following sample was used for QC: 345495001 (2014-2127a RDT Vault Soil Composite).

**QC Information**

All of the QC samples met the required acceptance limits.

**Technical Information:**

**Holding Time**

All sample procedures for this sample set were performed within the required holding time.

**Sample Re-prep/Re-analysis**

None of the samples in this sample set required reprep or reanalysis.

**Chemical Recoveries**

All chemical recoveries meet the required acceptance limits for this sample set.

**Recounts**

None of the samples in this batch were recounted.

**Miscellaneous Information:**

**Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A data exception report (DER) was not generated for this SDG.

**Sample-Specific MDA/MDC**

The MDA/MDC reported on the certificate of analysis is a sample-specific MDA/MDC.

**Additional Comments**

Additional comments were not required for this sample set.

**Qualifier Information**

Manual qualifiers were not required.

**Method/Analysis Information**

<b>Product:</b>	<b>GFPC, Sr90, soil 0.151 pCi/g RDL</b>
<b>Analytical Method:</b>	<b>EPA 905.0 Modified</b>
<b>Prep Method:</b>	<b>Dry Soil Prep</b>
<b>Analytical Batch Number:</b>	<b>1376626</b>
<b>Prep Batch Number:</b>	<b>1376446</b>

Sample ID	Client ID
345495001	2014-2127a RDT Vault Soil Composite
1203060080	Method Blank (MB)
1203060081	345495001(2014-2127a RDT Vault Soil Composite) Sample Duplicate (DUP)
1203060082	Laboratory Control Sample (LCS)

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

#### **SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-004 REV# 17.

#### **Calibration Information:**

##### **Calibration Information**

All initial and continuing calibration requirements have been met.

##### **Standards Information**

Standard solutions for these analysis are NIST traceable or verified with a NIST traceable standard and used before the expiration dates.

##### **Sample Geometry**

All counting sources were prepared in the same geometry as the calibration standards.

#### **Quality Control (QC) Information:**

##### **Blank Information**

The blank volume is representative of the sample volume in this batch.

##### **Designated QC**

The following sample was used for QC: 345495001 (2014-2127a RDT Vault Soil Composite).

##### **QC Information**

All of the QC samples meet the required acceptance limits with the following exceptions: The sample and the duplicate, 1203060081 (2014-2127a RDT Vault Soil Composite) and 345495001 (2014-2127a RDT Vault Soil Composite), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with value of 2.82.

#### **Technical Information:**

##### **Holding Time**

All sample procedures for this sample set were performed within the required holding time.

##### **Sample Re-prep/Re-analysis**

None of the samples in this sample set required reprep or reanalysis.

##### **Chemical Recoveries**

All chemical recoveries meet the required acceptance limits for this sample set.

##### **Recounts**

Samples 1203060081 (2014-2127a RDT Vault Soil Composite) and 345495001 (2014-2127a RDT Vault Soil Composite) were recounted due to high relative percent difference/relative error ratio. The recounts are reported.

**Miscellaneous Information:****Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A data exception report (DER) was not generated for this SDG.

**Sample-Specific MDA/MDC**

The MDA/MDC reported on the certificate of analysis is a sample-specific MDA/MDC.

**Additional Comments**

Samples 1203060081 (2014-2127a RDT Vault Soil Composite) and 345495001 (2014-2127a RDT Vault Soil Composite) were verified by recounting at least five days from the separation date.

**Qualifier Information**

Manual qualifiers were not required.

**Method/Analysis Information**

<b>Product:</b>	<b>Liquid Scint Pu241, Solid 86.1 pCi/g RDL</b>
Analytical Method:	DOE EML HASL-300, Pu-11-RC Modified
Prep Method:	Dry Soil Prep
Analytical Batch Number:	1377659
Prep Batch Number:	1376446

<b>Sample ID</b>	<b>Client ID</b>
345495001	2014-2127a RDT Vault Soil Composite
1203062546	Method Blank (MB)
1203062547	345495001(2014-2127a RDT Vault Soil Composite) Sample Duplicate (DUP)
1203062548	Laboratory Control Sample (LCS)

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

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-035 REV# 16.

**Calibration Information:****Calibration Information**

All initial and continuing calibration requirements have been met.

**Standards Information**

## Attachment 2: HTD Assessment Data

Standard solutions for these analysis are NIST traceable or verified with a NIST traceable standard and used before the expiration dates.

### **Sample Geometry**

All counting sources were prepared in the same geometry as the calibration standards.

### **Quality Control (QC) Information:**

#### **Blank Information**

The blank volume is representative of the sample volume in this batch.

#### **Designated QC**

The following sample was used for QC: 345495001 (2014-2127a RDT Vault Soil Composite).

#### **QC Information**

All of the QC samples met the required acceptance limits.

### **Technical Information:**

#### **Holding Time**

All sample procedures for this sample set were performed within the required holding time.

#### **Sample Re-prep/Re-analysis**

Samples were reprepared due to low carrier/tracer yield. The re-analysis is being reported.

#### **Recounts**

None of the samples in this batch were recounted.

### **Miscellaneous Information:**

#### **Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A data exception report (DER) was not generated for this SDG.

#### **Manual Integration**

No manual integrations were performed on data in this batch.

#### **Sample-Specific MDA/MDC**

The MDA/MDC reported on the certificate of analysis is a sample-specific MDA/MDC.

#### **Additional Comments**

Additional comments were not required for this sample set.

### **Qualifier Information**

Manual qualifiers were not required.

### **Method/Analysis Information**

<b>Product:</b>	<b>Liquid Scint Ni63, Solid 72.4 pCi/g RDL</b>
<b>Analytical Method:</b>	<b>DOE RESL Ni-1, Modified</b>

Prep Method: Dry Soil Prep  
 Analytical Batch Number: 1376798  
 Prep Batch Number: 1376446

Sample ID	Client ID
345495001	2014-2127a RDT Vault Soil Composite
1203060483	Method Blank (MB)
1203060484	345495001(2014-2127a RDT Vault Soil Composite) Sample Duplicate (DUP)
1203060485	Laboratory Control Sample (LCS)

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

#### **SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-022 REV# 16.

#### **Calibration Information:**

##### **Calibration Information**

All initial and continuing calibration requirements have been met.

##### **Standards Information**

Standard solutions for these analysis are NIST traceable or verified with a NIST traceable standard and used before the expiration dates.

##### **Sample Geometry**

All counting sources were prepared in the same geometry as the calibration standards.

#### **Quality Control (QC) Information:**

##### **Blank Information**

The blank volume is representative of the sample volume in this batch.

##### **Designated QC**

The following sample was used for QC: 345495001 (2014-2127a RDT Vault Soil Composite).

##### **QC Information**

All of the QC samples met the required acceptance limits.

#### **Technical Information:**

##### **Holding Time**

All sample procedures for this sample set were performed within the required holding time.

##### **Sample Re-prep/Re-analysis**

None of the samples in this sample set required reprep or reanalysis.

##### **Recounts**

Sample 1203060483 (MB) was recounted due to the quench number being outside the calibration range. The recount is reported.

**Miscellaneous Information:**

**Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A data exception report (DER) was not generated for this SDG.

**Sample-Specific MDA/MDC**

The MDA/MDC reported on the certificate of analysis is a sample-specific MDA/MDC.

**Additional Comments**

Additional comments were not required for this sample set.

**Qualifier Information**

Manual qualifiers were not required.

**Method/Analysis Information**

**Product:** Liquid Scint Tc99, Solid 1.24 pCi/g RDL  
**Analytical Method:** DOE EML HASL-300, Tc-02-RC Modified  
**Analytical Batch Number:** 1376803

Sample ID	Client ID
345495001	2014-2127a RDT Vault Soil Composite
1203060501	Method Blank (MB)
1203060502	345495001(2014-2127a RDT Vault Soil Composite) Sample Duplicate (DUP)
1203060503	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-059 REV# 2.

**Calibration Information:**

**Calibration Information**

All initial and continuing calibration requirements have been met.

**Standards Information**

Standard solutions for these analysis are NIST traceable or verified with a NIST traceable standard and used before the expiration dates.

**Sample Geometry**

All counting sources were prepared in the same geometry as the calibration standards.

**Quality Control (QC) Information:**

**Blank Information**

The blank volume is representative of the sample volume in this batch.

**Designated QC**

The following sample was used for QC: 345495001 (2014-2127a RDT Vault Soil Composite).

**QC Information**

All of the QC samples met the required acceptance limits.

**Technical Information:**

**Holding Time**

All sample procedures for this sample set were performed within the required holding time.

**Sample Re-prep/Re-analysis**

None of the samples in this sample set required reprep or reanalysis.

**Recounts**

None of the samples in this batch were recounted.

**Miscellaneous Information:**

**Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A data exception report (DER) was not generated for this SDG.

**Sample-Specific MDA/MDC**

The MDA/MDC reported on the certificate of analysis is a sample-specific MDA/MDC.

**Additional Comments**

Additional comments were not required for this sample set.

**Qualifier Information**

Manual qualifiers were not required.

**Method/Analysis Information**

**Product:** Liquid Scint C14, Solid, 0.63 pCi/g RDL

**Analytical Method:** EPA EERF C-01 Modified

**Analytical Batch Number:** 1376820

<b>Sample ID</b>	<b>Client ID</b>
345495001	2014-2127a RDT Vault Soil Composite
1203060549	Method Blank (MB)
1203060550	345495001(2014-2127a RDT Vault Soil Composite) Sample Duplicate (DUP)
1203060551	345495001(2014-2127a RDT Vault Soil Composite) Matrix Spike (MS)



1203060552 Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-003 REV# 15.

**Calibration Information:**

**Calibration Information**

All initial and continuing calibration requirements have been met.

**Standards Information**

Standard solutions for these analysis are NIST traceable or verified with a NIST traceable standard and used before the expiration dates.

**Sample Geometry**

All counting sources were prepared in the same geometry as the calibration standards.

**Quality Control (QC) Information:**

**Blank Information**

The blank volume is representative of the sample volume in this batch.

**Designated QC**

The following sample was used for QC: 345495001 (2014-2127a RDT Vault Soil Composite).

**QC Information**

All of the QC samples met the required acceptance limits.

**Technical Information:**

**Holding Time**

All sample procedures for this sample set were performed within the required holding time.

**Sample Re-prep/Re-analysis**

None of the samples in this sample set required reprep or reanalysis.

**Recounts**

None of the samples in this batch were recounted.

**Miscellaneous Information:**

**Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A data exception report (DER) was not generated for this SDG.

**Sample-Specific MDA/MDC**

The MDA/MDC reported on the certificate of analysis is a sample-specific MDA/MDC.

**Additional Comments**

Additional comments were not required for this sample set.

**Qualifier Information**

Manual qualifiers were not required.

**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.

**GEL LABORATORIES LLC**

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

**Qualifier Definition Report  
for**

PCGE006 Pacific Gas and Electric Company

Client SDG: 345495 GEL Work Order: 345495

**The Qualifiers in this report are defined as follows:**

M Result is <LLD and >MDC

U Result is <LLD and <MDC

UI Uncertain identification for gamma spectroscopy

**Review/Validation**

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

**Signature:** 

**Name:** Kate Gellatly

**Date:** 14 APR 2014

**Title:** Analyst I

# Sample Data Summary

**GEL LABORATORIES LLC****Certificate of Analysis** 2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

GEL Sample ID: 345495001

Client: Pacific Gas and Electric Company

Client Sample ID: 2014-2127a RDT Vault Soil Composite

Collect Date: March 26, 2014

Client Matrix: Soil

Receive Date: March 29, 2014

Amount of Sample Received:

Report Date: April 14, 2014

Isotope	Run Date	Qualifier	Activity	2 Sigma Uncertainty	MDC	LLD	2 Sigma TPU	Units
C-14	04/03/14	U	-1.65E-01	2.78E-01	4.71E-01	6.30E-01	2.78E-01	pCi/g
Ni-63	04/03/14	U	6.81E-01	1.49E+01	2.50E+01	7.24E+01	1.49E+01	pCi/g
Sr-90	04/08/14		4.92E-01	1.01E-01	7.89E-02	1.51E-01	1.36E-01	pCi/g
Tc-99	04/08/14	U	-5.21E-01	5.88E-01	1.01E+00	1.24E+00	5.88E-01	pCi/g
Pu-241	04/08/14	U	7.60E-01	3.32E+01	5.57E+01	8.61E+01	3.32E+01	pCi/g
Alpha Spec								
Pu-238	04/05/14	U	-8.44E-03	7.28E-02	1.69E-01	2.97E+00	7.29E-02	pCi/g
Pu-239/240	04/05/14	U	2.81E-03	1.29E-01	2.84E-01	2.67E+00	1.29E-01	pCi/g
Am-241	04/05/14	U	-3.38E-02	1.14E-01	2.97E-01	2.58E+00	1.14E-01	pCi/g
Cm-243/244	04/05/14	U	7.53E-02	2.56E-01	4.82E-01	2.90E+00	2.56E-01	pCi/g
Cm-245/246	04/05/14	U	8.40E-02	1.44E-01	1.26E-01	1.78E+00	1.44E-01	pCi/g
Gamma Spec								
Be-7	04/01/14	U	-1.04E-01	3.59E-01	6.16E-01		3.62E-01	pCi/g
Na-22	04/01/14	U	2.14E-02	1.64E-02	3.09E-02		1.91E-02	pCi/g
K-40	04/01/14		9.07E+00	5.97E-01	1.90E-01		1.01E+00	pCi/g
Cr-51	04/01/14	U	-4.87E-02	2.81E-01	4.98E-01		2.82E-01	pCi/g
Mn-54	04/01/14	U	-6.62E-03	1.40E-02	2.35E-02		1.43E-02	pCi/g
Fe-59	04/01/14	U	-1.21E-02	3.07E-02	5.05E-02		3.12E-02	pCi/g
Co-56	04/01/14	U	2.23E-02	1.38E-02	2.70E-02		1.73E-02	pCi/g
Co-57	04/01/14	U	-2.48E-03	1.91E-02	3.34E-02		1.91E-02	pCi/g
Co-58	04/01/14	U	8.39E-04	1.32E-02	2.32E-02		1.32E-02	pCi/g
Co-60	04/01/14	M	1.02E-01	2.04E-02	2.14E-02	3.82E-01	2.20E-02	pCi/g
Ni-59	04/03/14	U	-7.28E+01	5.89E+01	8.50E+01	1.97E+02	6.78E+01	pCi/g
Zn-65	04/01/14	U	2.11E-06	3.58E-02	5.28E-02		3.58E-02	pCi/g
Y-88	04/01/14	U	1.48E-02	9.64E-03	2.24E-02		1.18E-02	pCi/g
Zr-95	04/01/14	U	1.04E-02	2.64E-02	4.76E-02		2.68E-02	pCi/g
Nb-94	04/01/14	U	1.34E-02	1.12E-02	2.22E-02	7.13E-01	1.28E-02	pCi/g
Nb-95	04/01/14	U	2.80E-03	1.57E-02	2.44E-02		1.57E-02	pCi/g
Ru-106	04/01/14	U	-1.27E-01	2.35E-01	3.89E-01		2.42E-01	pCi/g
Ag-110m	04/01/14	U	-1.23E-02	1.85E-02	3.04E-02		1.94E-02	pCi/g
Sn-113	04/01/14	U	1.49E-02	4.63E-02	8.16E-02		4.68E-02	pCi/g
Sb-124	04/01/14	U	-3.64E-03	2.58E-02	4.33E-02		2.59E-02	pCi/g
Sb-125	04/01/14	U	1.79E-02	1.08E-01	1.88E-01		1.08E-01	pCi/g
I-129	04/04/14	U	-1.11E-02	2.30E-01	3.43E-01	5.00E-01	2.30E-01	pCi/g
Cs-134	04/01/14	U	1.98E-02	1.62E-02	3.08E-02		1.86E-02	pCi/g

**Notes:** 1. LLDs are a-priori values.

2. MDCs are calculated a-posteriori values.

3. Gamma spectroscopy analysis results are calculated from a measurement using only one gamma energy line.

4. Air sample volumes are received in units of ft3. GEL converts the units and reports them as m3.

**Qualifiers:** U Target isotope was analyzed for but not detected above the MDC and LLD.

UI Uncertain identification for gamma spectroscopy.

X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.

M Reported result is less than the LLD and greater than the MDC.

**GEL LABORATORIES LLC****Certificate of Analysis** 2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

GEL Sample ID: 345495001

Client: Pacific Gas and Electric Company

Client Sample ID: 2014-2127a RDT Vault Soil Composite

Collect Date: March 26, 2014

Client Matrix: Soil

Receive Date: March 29, 2014

Amount of Sample Received:

Report Date: April 14, 2014

Isotope	Run Date	Qualifier	Activity	2 Sigma Uncertainty	MDC	LLD	2 Sigma TPU	Units
Cs-136	04/01/14	U	-1.22E-02	2.46E-02	4.03E-02		2.53E-02	pCi/g
Cs-137	04/01/14		2.39E+01	2.35E-01	4.17E-02	7.93E-01	1.92E+00	pCi/g
Ba-133	04/01/14	U	-2.61E-02	4.83E-02	7.36E-02		4.97E-02	pCi/g
Ba-140	04/01/14	U	-1.52E-02	2.01E-02	2.92E-02		2.13E-02	pCi/g
Ce-139	04/01/14	U	5.94E-03	2.32E-02	4.02E-02		2.34E-02	pCi/g
Ce-141	04/01/14	U	-2.13E-02	4.03E-02	6.91E-02		4.15E-02	pCi/g
Ce-144	04/01/14	U	-2.33E-02	1.51E-01	2.62E-01		1.51E-01	pCi/g
Nd-147	04/01/14	U	-2.00E-01	2.89E-01	4.84E-01		3.03E-01	pCi/g
Pm-144	04/01/14	U	-2.83E-03	1.47E-02	2.10E-02		1.48E-02	pCi/g
Pm-146	04/01/14	U	-7.10E-02	5.47E-02	9.24E-02		6.38E-02	pCi/g
Eu-152	04/01/14	U	6.63E-02	9.98E-02	1.73E-01	1.01E+00	1.04E-01	pCi/g
Eu-154	04/01/14	U	5.96E-02	4.65E-02	8.77E-02	9.40E-01	5.40E-02	pCi/g
Eu-155	04/01/14	U	5.16E-02	7.62E-02	1.37E-01		7.98E-02	pCi/g
Ir-192	04/01/14	U	6.64E-03	3.06E-02	5.47E-02		3.08E-02	pCi/g
Hg-203	04/01/14	U	2.62E-02	2.99E-02	5.45E-02		3.22E-02	pCi/g
Tl-208	04/01/14		1.28E-01	4.77E-02	4.58E-02		4.89E-02	pCi/g
Pb-210	04/01/14	U	-9.12E-01	2.37E+00	4.15E+00		2.41E+00	pCi/g
Pb-212	04/01/14		4.83E-01	8.36E-02	9.06E-02		9.43E-02	pCi/g
Pb-214	04/01/14		4.54E-01	1.58E-01	1.27E-01		1.63E-01	pCi/g
Bi-212	04/01/14	UI	4.45E-01	3.18E-01	4.45E-01		4.21E-01	pCi/g
Bi-214	04/01/14		3.51E-01	1.04E-01	8.79E-02		1.07E-01	pCi/g
Ra-228	04/01/14		5.54E-01	1.21E-01	8.65E-02		1.45E-01	pCi/g
Ac-228	04/01/14		5.54E-01	1.21E-01	8.65E-02		1.45E-01	pCi/g
Th-234	04/01/14	U	1.31E+00	1.32E+00	1.48E+00		1.36E+00	pCi/g
U-235	04/01/14	U	-4.84E-03	1.60E-01	2.73E-01		1.60E-01	pCi/g
U-238	04/01/14	U	1.31E+00	1.32E+00	1.48E+00		1.36E+00	pCi/g
Np-237	04/01/14	U	1.09E-02	6.18E-02	1.10E-01	1.11E-01	6.20E-02	pCi/g
Np-239	04/01/14	U	-4.05E-01	3.03E-01	5.17E-01		3.56E-01	pCi/g
Am-241	04/01/14	U	1.33E-02	1.10E-01	1.79E-01		1.10E-01	pCi/g

**Notes:** 1. LLDs are a-priori values.

2. MDCs are calculated a-posteriori values.

3. Gamma spectroscopy analysis results are calculated from a measurement using only one gamma energy line.

4. Air sample volumes are received in units of ft3. GEL converts the units and reports them as m3.

**Qualifiers:** U Target isotope was analyzed for but not detected above the MDC and LLD.

UI Uncertain identification for gamma spectroscopy.

X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.

M Reported result is less than the LLD and greater than the MDC.

# Quality Control Data

**GEL LABORATORIES LLC**

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

**QC Summary**

**Client :** Pacific Gas and Electric, Humboldt Bay Power Plant  
1000 King Salmon Avenue

**Report Date:** April 14, 2014  
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Eureka, California

**Contact:** Ms. Dee Anderson

**Workorder:** 345495

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<hr/>											
Rad Alpha Spec											
Batch 1377656											
<hr/>											
QC1203062541 345495001 DUP											
Americium-241	U	-0.0338	U	0.0175	pCi/g	0			N/A	MXS2	04/05/1411:46
	Uncert:	+/-0.114		+/-0.113							
	TPU:	+/-0.114		+/-0.113							
Curium-243/244	U	0.0753	U	0.00865	pCi/g	0			N/A		
	Uncert:	+/-0.256		+/-0.0905							
	TPU:	+/-0.256		+/-0.0905							
Curium-245/246	U	0.084	U	0.0272	pCi/g	0			N/A		
	Uncert:	+/-0.144		+/-0.102							
	TPU:	+/-0.144		+/-0.102							
QC1203062542 LCS											
Americium-241	6.72			7.39	pCi/g		110	(75%-125%)	MXS2		04/05/1411:46
	Uncert:			+/-1.01							
	TPU:			+/-1.39							
Curium-243/244	13.6			13.4	pCi/g		98.4	(75%-125%)			
	Uncert:			+/-1.35							
	TPU:			+/-2.20							
Curium-245/246			M	0.236	pCi/g						
	Uncert:			+/-0.214							
	TPU:			+/-0.216							
QC1203062540 MB											
Americium-241			U	0.0616	pCi/g				MXS2		04/05/1411:46
	Uncert:			+/-0.121							
	TPU:			+/-0.121							
Curium-243/244			U	-0.0331	pCi/g						
	Uncert:			+/-0.0768							
	TPU:			+/-0.0769							
Curium-245/246			U	0.0401	pCi/g						
	Uncert:			+/-0.113							
	TPU:			+/-0.113							
<hr/>											
Batch 1377658											
<hr/>											
QC1203062544 345495001 DUP											
Plutonium-238	U	-0.00844	U	0.0591	pCi/g	0			N/A	MXS2	04/05/1411:47
	Uncert:	+/-0.0728		+/-0.134							
	TPU:	+/-0.0729		+/-0.134							
Plutonium-239/240	U	0.00281	U	0.0171	pCi/g	0			N/A		
	Uncert:	+/-0.129		+/-0.0948							
	TPU:	+/-0.129		+/-0.0949							
QC1203062545 LCS											
Plutonium-238			U	0.0259	pCi/g			(75%-125%)	MXS2		04/05/1411:47
	Uncert:			+/-0.167							
	TPU:			+/-0.168							



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**QC Summary**

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Alpha Spec</b>											
Batch	1377658										
Plutonium-239/240	9.38			7.58	pCi/g		80.9	(75%-125%)			
	Uncert:			+/-1.17							
	TPU:			+/-1.63							
QC1203062543 MB											
Plutonium-238			U	-0.054	pCi/g				MXS2	04/05/1411:47	
	Uncert:			+/-0.0871							
	TPU:			+/-0.0873							
Plutonium-239/240			U	-0.045	pCi/g						
	Uncert:			+/-0.0853							
	TPU:			+/-0.0855							
Batch	1377659										
QC1203062547 345495001 DUP											
Plutonium-241		U	0.760	U	2.19	pCi/g	0		N/A MXS2	04/08/1408:23	
	Uncert:		+/-33.2		+/-27.1						
	TPU:		+/-33.2		+/-27.1						
QC1203062548 LCS											
Plutonium-241	409			346	pCi/g		84.6	(75%-125%)	MXS2	04/08/1408:39	
	Uncert:			+/-41.3							
	TPU:			+/-83.6							
QC1203062546 MB											
Plutonium-241			U	-8.64	pCi/g				MXS2	04/08/1408:07	
	Uncert:			+/-32.5							
	TPU:			+/-32.5							
<b>Rad Gamma Spec</b>											
Batch	1376494										
QC1203059636 345495001 DUP											
Iodine-129		U	-0.0111	U	-0.049	pCi/g	0		N/A MJH1	04/04/1413:54	
	Uncert:		+/-0.230		+/-0.244						
	TPU:		+/-0.230		+/-0.245						
QC1203059638 LCS											
Iodine-129	9.44			8.61	pCi/g		91.2	(75%-125%)	MJH1	04/04/1413:55	
	Uncert:			+/-1.67							
	TPU:			+/-1.88							
QC1203059635 MB											
Iodine-129			U	-0.00409	pCi/g				MJH1	04/04/1413:54	
	Uncert:			+/-0.158							
	TPU:			+/-0.158							
QC1203059637 345495001 MS											
Iodine-129	9.44	U	-0.0111	9.94	pCi/g		105	(75%-125%)	MJH1	04/04/1413:55	
	Uncert:		+/-0.230	+/-1.30							
	TPU:		+/-0.230	+/-1.64							
Batch	1376566										
QC1203059876 345495001 DUP											
Actinium-228			0.554	0.431	pCi/g	25.1*		(0%-20%)	MXR1	04/01/1413:35	
	Uncert:		+/-0.121	+/-0.137							

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**QC Summary**

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	1376566										
Americium-241	TPU:	+/-0.145		+/-0.146							
	U	0.0133	U	0.0444	pCi/g	0			N/A		
	Uncert:	+/-0.110		+/-0.038							
Antimony-124	TPU:	+/-0.110		+/-0.0383							
	U	-0.00364	U	0.00871	pCi/g	0			N/A		
	Uncert:	+/-0.0258		+/-0.0276							
Antimony-125	TPU:	+/-0.0259		+/-0.0279							
	U	0.0179	U	-0.0315	pCi/g	0			N/A		
	Uncert:	+/-0.108		+/-0.103							
Barium-133	TPU:	+/-0.108		+/-0.104							
	U	-0.0261	U	0.0213	pCi/g	0			N/A		
	Uncert:	+/-0.0483		+/-0.0436							
Barium-140	TPU:	+/-0.0497		+/-0.0447							
	U	-0.0152	U	-0.0201	pCi/g	0			N/A		
	Uncert:	+/-0.0201		+/-0.0221							
Beryllium-7	TPU:	+/-0.0213		+/-0.0239							
	U	-0.104	U	0.0692	pCi/g	0			N/A		
	Uncert:	+/-0.359		+/-0.344							
Bismuth-212	TPU:	+/-0.362		+/-0.345							
	UI	0.00		0.500	pCi/g	11.5		(0% - 100%)			
	Uncert:	+/-0.318		+/-0.274							
Bismuth-214	TPU:	+/-0.421		+/-0.278							
		0.351		0.419	pCi/g	17.6		(0%-20%)			
	Uncert:	+/-0.104		+/-0.104							
Cerium-139	TPU:	+/-0.107		+/-0.109							
	U	0.00594	U	0.00877	pCi/g	0			N/A		
	Uncert:	+/-0.0232		+/-0.0191							
Cerium-141	TPU:	+/-0.0234		+/-0.0196							
	U	-0.0213	U	0.00945	pCi/g	0			N/A		
	Uncert:	+/-0.0403		+/-0.0331							
Cerium-144	TPU:	+/-0.0415		+/-0.0334							
	U	-0.0233	U	0.144	pCi/g	0			N/A		
	Uncert:	+/-0.151		+/-0.121							
Cesium-134	TPU:	+/-0.151		+/-0.138							
	U	0.0198	U	7.74E-05	pCi/g	0			N/A		
	Uncert:	+/-0.0162		+/-0.0178							
Cesium-136	TPU:	+/-0.0186		+/-0.0178							
	U	-0.0122	U	0.0197	pCi/g	0			N/A		
	Uncert:	+/-0.0246		+/-0.0276							
Cesium-137	TPU:	+/-0.0253		+/-0.0291							
		23.9		24.6	pCi/g	2.77		(0%-20%)			
	Uncert:	+/-0.235		+/-0.219							
Chromium-51	TPU:	+/-1.92		+/-1.95							
	U	-0.0487	U	0.134	pCi/g	0			N/A		
	Uncert:	+/-0.281		+/-0.260							
	TPU:	+/-0.282		+/-0.268							

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch 1376566											
Cobalt-56	U	0.0223	U	-0.00238	pCi/g	0			N/A		
	Uncert:	+/-0.0138		+/-0.0153							
	TPU:	+/-0.0173		+/-0.0153							
Cobalt-57	U	-0.00248	U	0.00299	pCi/g	0			N/A		
	Uncert:	+/-0.0191		+/-0.0151							
	TPU:	+/-0.0191		+/-0.0152							
Cobalt-58	U	0.000839	U	-0.000717	pCi/g	0			N/A		
	Uncert:	+/-0.0132		+/-0.0151							
	TPU:	+/-0.0132		+/-0.0151							
Cobalt-60	M	0.102	M	0.110	pCi/g	7.63		(0% - 100%)			
	Uncert:	+/-0.0204		+/-0.0284							
	TPU:	+/-0.022		+/-0.0297							
Europium-152	U	0.0663	U	-0.0469	pCi/g	0			N/A		
	Uncert:	+/-0.0998		+/-0.0854							
	TPU:	+/-0.104		+/-0.0881							
Europium-154	U	0.0596	U	-0.0293	pCi/g	0			N/A		
	Uncert:	+/-0.0465		+/-0.0516							
	TPU:	+/-0.054		+/-0.0533							
Europium-155	U	0.0516	U	0.0821	pCi/g	0			N/A		
	Uncert:	+/-0.0762		+/-0.106							
	TPU:	+/-0.0798		+/-0.106							
Iridium-192	U	0.00664	U	-0.012	pCi/g	0			N/A		
	Uncert:	+/-0.0306		+/-0.0276							
	TPU:	+/-0.0308		+/-0.0281							
Iron-59	U	-0.0121	U	-0.0159	pCi/g	0			N/A		
	Uncert:	+/-0.0307		+/-0.0335							
	TPU:	+/-0.0312		+/-0.0343							
Lead-210	U	-0.912	UI	0.00	pCi/g	0			N/A		
	Uncert:	+/-2.37		+/-0.690							
	TPU:	+/-2.41		+/-0.693							
Lead-212		0.483		0.499	pCi/g	3.24		(0%-20%)			
	Uncert:	+/-0.0836		+/-0.0697							
	TPU:	+/-0.0943		+/-0.086							
Lead-214		0.454		0.429	pCi/g	5.67		(0% - 100%)			
	Uncert:	+/-0.158		+/-0.110							
	TPU:	+/-0.163		+/-0.117							
Manganese-54	U	-0.00662	U	-0.00453	pCi/g	0			N/A		
	Uncert:	+/-0.014		+/-0.0157							
	TPU:	+/-0.0143		+/-0.0158							
Mercury-203	U	0.0262	U	-0.00873	pCi/g	0			N/A		
	Uncert:	+/-0.0299		+/-0.0264							
	TPU:	+/-0.0322		+/-0.0267							
Neodymium-147	U	-0.20	U	-0.406	pCi/g	0			N/A		
	Uncert:	+/-0.289		+/-0.277							
	TPU:	+/-0.303		+/-0.334							
Neptunium-237	U	0.0109	U	0.00105	pCi/g	0			N/A		

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**QC Summary**

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	1376566										
Neptunium-239		Uncert: +/-0.0618 TPU: +/-0.062 U -0.405	U	+/-0.0545 +/-0.0545 0.286	pCi/g	0			N/A		
Niobium-94		Uncert: +/-0.303 TPU: +/-0.356 U 0.0134	U	+/-0.312 +/-0.339 0.00923	pCi/g	0			N/A		
Niobium-95		Uncert: +/-0.0112 TPU: +/-0.0128 U 0.0028	U	+/-0.0142 +/-0.0149 0.00172	pCi/g	0			N/A		
Potassium-40		Uncert: +/-0.0157 TPU: +/-0.0157 9.07		+/-0.0184 +/-0.0184 8.99	pCi/g	.886		(0%-20%)			
Promethium-144		Uncert: +/-0.597 TPU: +/-1.01 U -0.00283	U	+/-0.569 +/-0.967 0.00408	pCi/g	0			N/A		
Promethium-146		Uncert: +/-0.0147 TPU: +/-0.0148 U -0.071	U	+/-0.0148 +/-0.0149 -0.0187	pCi/g	0			N/A		
Radium-228		Uncert: +/-0.0547 TPU: +/-0.0638 0.554		+/-0.0527 +/-0.0534 0.431	pCi/g	25.1*		(0%-20%)			
Ruthenium-106		Uncert: +/-0.121 TPU: +/-0.145 U -0.127	U	+/-0.137 +/-0.146 0.170	pCi/g	0			N/A		
Silver-110m		Uncert: +/-0.235 TPU: +/-0.242 U -0.0123	U	+/-0.214 +/-0.228 -0.0159	pCi/g	0			N/A		
Sodium-22		Uncert: +/-0.0185 TPU: +/-0.0194 U 0.0214	U	+/-0.0217 +/-0.0229 -0.0103	pCi/g	0			N/A		
Thallium-208		Uncert: +/-0.0164 TPU: +/-0.0191 0.128		+/-0.0181 +/-0.0187 0.142	pCi/g	9.86		(0% - 100%)			
Thorium-234		Uncert: +/-0.0477 TPU: +/-0.0489 U 1.31	UI	+/-0.0384 +/-0.0401 0.00	pCi/g	0			N/A		
Tin-113		Uncert: +/-1.32 TPU: +/-1.36 U 0.0149	U	+/-0.541 +/-0.601 -0.0197	pCi/g	0			N/A		
Uranium-235		Uncert: +/-0.0463 TPU: +/-0.0468 U -0.00484	U	+/-0.0424 +/-0.0433 0.0244	pCi/g	0			N/A		
Uranium-238		Uncert: +/-0.160 TPU: +/-0.160 U 1.31	UI	+/-0.151 +/-0.151 0.00	pCi/g	0			N/A		
		Uncert: +/-1.32		+/-0.541							

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	1376566										
Yttrium-88		TPU: +/-1.36		+/-0.601							
		U 0.0148	U	0.00421	pCi/g	0			N/A		
		Uncert: +/-0.00964		+/-0.0119							
Zinc-65		TPU: +/-0.0118		+/-0.012							
		U 2.11E-06	U	-0.0505	pCi/g	0			N/A		
		Uncert: +/-0.0358		+/-0.0471							
Zirconium-95		TPU: +/-0.0358		+/-0.0528							
		U 0.0104	U	0.00101	pCi/g	0			N/A		
		Uncert: +/-0.0264		+/-0.0268							
		TPU: +/-0.0268		+/-0.0268							
QC1203059877 LCS											
Actinium-228			U	-2.27	pCi/g				MXR1	04/01/14	10:36
		Uncert: +/-2.20		+/-2.45							
Americium-241	491			585	pCi/g		119	(75%-125%)			
		Uncert: +/-8.80		+/-53.3							
Antimony-124			U	0.146	pCi/g						
		Uncert: +/-0.430		+/-0.435							
Antimony-125			U	1.26	pCi/g						
		Uncert: +/-1.14		+/-1.28							
Barium-133			U	0.345	pCi/g						
		Uncert: +/-0.458		+/-0.485							
Barium-140			U	0.0731	pCi/g						
		Uncert: +/-0.226		+/-0.229							
Beryllium-7			U	1.42	pCi/g						
		Uncert: +/-3.53		+/-3.59							
Bismuth-212			U	-3.61	pCi/g						
		Uncert: +/-6.39		+/-6.61							
Bismuth-214			U	-0.386	pCi/g						
		Uncert: +/-0.750		+/-0.770							
Cerium-139				1.10	pCi/g						
		Uncert: +/-0.312		+/-0.390							
Cerium-141			U	0.151	pCi/g						
		Uncert: +/-0.356		+/-0.362							
Cerium-144			U	-0.489	pCi/g						
		Uncert: +/-1.72									

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**QC Summary**

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Parmname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec									
Batch 1376566									
Cesium-134	TPU:		+/-1.73						
		U	-0.0159	pCi/g					
	Uncert:		+/-0.523						
Cesium-136	TPU:		+/-0.523						
		U	-0.559	pCi/g					
	Uncert:		+/-0.731						
Cesium-137	TPU:		+/-0.780						
	190		183	pCi/g		96.4	(75%-125%)		
	Uncert:		+/-1.80						
Chromium-51	TPU:		+/-14.5						
		U	-0.182	pCi/g					
	Uncert:		+/-2.67						
Cobalt-56	TPU:		+/-2.67						
		U	0.000425	pCi/g					
	Uncert:		+/-0.504						
Cobalt-57	TPU:		+/-0.504						
			10.4	pCi/g					
	Uncert:		+/-0.451						
Cobalt-58	TPU:		+/-1.13						
		U	0.0082	pCi/g					
	Uncert:		+/-0.467						
Cobalt-60	TPU:		+/-0.467						
	223		209	pCi/g		93.8	(75%-125%)		
	Uncert:		+/-2.20						
Europium-152	TPU:		+/-16.6						
		U	-0.36	pCi/g					
	Uncert:		+/-1.03						
Europium-154	TPU:		+/-1.04						
		U	-0.337	pCi/g					
	Uncert:		+/-0.835						
Europium-155	TPU:		+/-0.850						
		U	-0.0639	pCi/g					
	Uncert:		+/-0.875						
Iridium-192	TPU:		+/-0.876						
		U	0.141	pCi/g					
	Uncert:		+/-0.318						
Iron-59	TPU:		+/-0.324						
		U	-0.514	pCi/g					
	Uncert:		+/-1.09						
Lead-210	TPU:		+/-1.12						
			6220	pCi/g					
	Uncert:		+/-198						
Lead-212	TPU:		+/-621						
		U	-0.306	pCi/g					
	Uncert:		+/-0.514						
	TPU:		+/-0.533						

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Parmname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec Batch 1376566									
Lead-214		U	-0.575	pCi/g					
	Uncert:		+/-0.790						
	TPU:		+/-0.833						
Manganese-54		U	-0.104	pCi/g					
	Uncert:		+/-0.486						
	TPU:		+/-0.489						
Mercury-203		U	0.118	pCi/g					
	Uncert:		+/-0.307						
	TPU:		+/-0.311						
Neodymium-147		U	-0.922	pCi/g					
	Uncert:		+/-2.54						
	TPU:		+/-2.57						
Neptunium-237			0.294	pCi/g					
	Uncert:		+/-0.669						
	TPU:		+/-0.682						
Neptunium-239		U	0.947	pCi/g					
	Uncert:		+/-3.83						
	TPU:		+/-3.86						
Niobium-94		U	-0.0382	pCi/g					
	Uncert:		+/-0.372						
	TPU:		+/-0.373						
Niobium-95		U	-0.0572	pCi/g					
	Uncert:		+/-0.421						
	TPU:		+/-0.421						
Potassium-40		U	-2.17	pCi/g					
	Uncert:		+/-1.97						
	TPU:		+/-2.21						
Promethium-144		U	-0.123	pCi/g					
	Uncert:		+/-0.368						
	TPU:		+/-0.372						
Promethium-146		U	0.318	pCi/g					
	Uncert:		+/-0.572						
	TPU:		+/-0.590						
Radium-228		U	-2.27	pCi/g					
	Uncert:		+/-2.20						
	TPU:		+/-2.45						
Ruthenium-106		U	-1.99	pCi/g					
	Uncert:		+/-3.51						
	TPU:		+/-3.63						
Silver-110m		U	-0.555	pCi/g					
	Uncert:		+/-0.775						
	TPU:		+/-0.818						
Sodium-22		U	-0.0855	pCi/g					
	Uncert:		+/-0.292						
	TPU:		+/-0.294						
Thallium-208		U	0.0914	pCi/g					

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**QC Summary**

Workorder: 345495

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Parmname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec Batch 1376566									
	Uncert:		+/-0.388						
	TPU:		+/-0.390						
Thorium-234		U	-42	pCi/g					
	Uncert:		+/-18.6						
	TPU:		+/-28.3						
Tin-113		U	0.360	pCi/g					
	Uncert:		+/-0.571						
	TPU:		+/-0.571						
Uranium-235		U	0.530	pCi/g					
	Uncert:		+/-1.55						
	TPU:		+/-1.57						
Uranium-238		U	-42	pCi/g					
	Uncert:		+/-18.6						
	TPU:		+/-28.3						
Yttrium-88			0.614	pCi/g					
	Uncert:		+/-0.394						
	TPU:		+/-0.484						
Zinc-65			31.3	pCi/g					
	Uncert:		+/-2.00						
	TPU:		+/-5.62						
Zirconium-95		U	0.335	pCi/g					
	Uncert:		+/-0.767						
	TPU:		+/-0.783						
QC1203059875 MB									
Actinium-228		U	0.104	pCi/g				MXR1	04/01/1410:35
	Uncert:		+/-0.104						
	TPU:		+/-0.115						
Americium-241		U	-0.121	pCi/g					
	Uncert:		+/-0.0327						
	TPU:		+/-0.065						
Antimony-124		U	-0.0102	pCi/g					
	Uncert:		+/-0.0445						
	TPU:		+/-0.0448						
Antimony-125		U	-0.00206	pCi/g					
	Uncert:		+/-0.052						
	TPU:		+/-0.052						
Barium-133		U	-0.00627	pCi/g					
	Uncert:		+/-0.0235						
	TPU:		+/-0.0237						
Barium-140		U	-0.00528	pCi/g					
	Uncert:		+/-0.0229						
	TPU:		+/-0.0231						
Beryllium-7		U	0.0705	pCi/g					
	Uncert:		+/-0.173						
	TPU:		+/-0.176						
Bismuth-212		U	0.256	pCi/g					



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**QC Summary**

Workorder: 345495

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Parmname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec Batch 1376566										
			Uncert:							
			TPU:							
Bismuth-214		U	0.067	pCi/g						
			Uncert:							
			TPU:							
Cerium-139		U	0.00236	pCi/g						
			Uncert:							
			TPU:							
Cerium-141		U	0.00337	pCi/g						
			Uncert:							
			TPU:							
Cerium-144		U	-0.064	pCi/g						
			Uncert:							
			TPU:							
Cesium-134		U	-0.00831	pCi/g						
			Uncert:							
			TPU:							
Cesium-136		U	-0.00236	pCi/g						
			Uncert:							
			TPU:							
Cesium-137		U	0.00323	pCi/g						
			Uncert:							
			TPU:							
Chromium-51		U	0.0505	pCi/g						
			Uncert:							
			TPU:							
Cobalt-56		U	0.000131	pCi/g						
			Uncert:							
			TPU:							
Cobalt-57		U	-0.00615	pCi/g						
			Uncert:							
			TPU:							
Cobalt-58		U	-0.000878	pCi/g						
			Uncert:							
			TPU:							
Cobalt-60		U	0.0105	pCi/g						
			Uncert:							
			TPU:							
Europium-152		U	0.00388	pCi/g						
			Uncert:							
			TPU:							
Europium-154		U	-0.0229	pCi/g						
			Uncert:							
			TPU:							
Europium-155		U	0.00814	pCi/g						
			Uncert:							
			TPU:							

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**QC Summary**

Workorder: 345495

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Parmname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec										
Batch	1376566									
Iridium-192		U	+/-0.0437 0.0182	pCi/g						
	Uncert:		+/-0.0274							
	TPU:		+/-0.0286							
Iron-59		U	0.000581	pCi/g						
	Uncert:		+/-0.0384							
	TPU:		+/-0.0384							
Lead-210		U	0.00173	pCi/g						
	Uncert:		+/-0.496							
	TPU:		+/-0.496							
Lead-212		U	0.0182	pCi/g						
	Uncert:		+/-0.0407							
	TPU:		+/-0.0416							
Lead-214		U	0.00541	pCi/g						
	Uncert:		+/-0.0471							
	TPU:		+/-0.0472							
Manganese-54		U	-0.00198	pCi/g						
	Uncert:		+/-0.0204							
	TPU:		+/-0.0205							
Mercury-203		U	-0.00656	pCi/g						
	Uncert:		+/-0.0185							
	TPU:		+/-0.0188							
Neodymium-147		U	-0.0111	pCi/g						
	Uncert:		+/-0.127							
	TPU:		+/-0.127							
Neptunium-237		U	0.0311	pCi/g						
	Uncert:		+/-0.0564							
	TPU:		+/-0.0582							
Neptunium-239		U	-0.13	pCi/g						
	Uncert:		+/-0.176							
	TPU:		+/-0.186							
Niobium-94		U	0.0109	pCi/g						
	Uncert:		+/-0.0238							
	TPU:		+/-0.0243							
Niobium-95		U	0.0117	pCi/g						
	Uncert:		+/-0.0205							
	TPU:		+/-0.0212							
Potassium-40		U	0.0563	pCi/g						
	Uncert:		+/-0.323							
	TPU:		+/-0.323							
Promethium-144		U	0.0152	pCi/g						
	Uncert:		+/-0.0245							
	TPU:		+/-0.0255							
Promethium-146		U	0.00773	pCi/g						
	Uncert:		+/-0.0242							
	TPU:		+/-0.0245							

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**QC Summary**

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Paramname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Analst	Date	Time
Rad Gamma Spec											
Batch	1376566										
Radium-228			U	0.104	pCi/g						
	Uncert:			+/-0.104							
	TPU:			+/-0.115							
Ruthenium-106			U	-0.00129	pCi/g						
	Uncert:			+/-0.188							
	TPU:			+/-0.188							
Silver-110m			U	0.0234	pCi/g						
	Uncert:			+/-0.0344							
	TPU:			+/-0.0361							
Sodium-22			U	-0.0088	pCi/g						
	Uncert:			+/-0.024							
	TPU:			+/-0.0243							
Thallium-208			U	0.0251	pCi/g						
	Uncert:			+/-0.0325							
	TPU:			+/-0.0326							
Thorium-234			U	-0.0809	pCi/g						
	Uncert:			+/-0.350							
	TPU:			+/-0.352							
Tin-113			U	-0.0128	pCi/g						
	Uncert:			+/-0.0232							
	TPU:			+/-0.0239							
Uranium-235			U	-0.0839	pCi/g						
	Uncert:			+/-0.105							
	TPU:			+/-0.112							
Uranium-238			U	-0.0809	pCi/g						
	Uncert:			+/-0.350							
	TPU:			+/-0.352							
Yttrium-88			U	-0.000317	pCi/g						
	Uncert:			+/-0.0227							
	TPU:			+/-0.0227							
Zinc-65			U	0.00875	pCi/g						
	Uncert:			+/-0.0448							
	TPU:			+/-0.045							
Zirconium-95			U	0.0193	pCi/g						
	Uncert:			+/-0.035							
	TPU:			+/-0.0361							
Batch	1376823										
QC1203060559	345495001	DUP									
Nickel-59			U	-72.8	U	13.3	pCi/g	0	N/A TYJ1	04/03/1409:53	
			Uncert:	+/-58.9		+/-14.6					
			TPU:	+/-67.8		+/-15.8					
QC1203060560	LCS										
Nickel-59	1670			1420	pCi/g	85.3	(75%-125%) TYJ1	04/03/1409:59			
			Uncert:	+/-202							
			TPU:	+/-246							
QC1203060558	MB										

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**QC Summary**

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gamma Spec</b>											
Batch	1376823										
Nickel-59			U	1.49	pCi/g				TYJ1	04/03/14	09:33
		Uncert:		+/-27.0							
		TPU:		+/-27.0							
<b>Rad Gas Flow</b>											
Batch	1376626										
QC1203060081	345495001	DUP									
Strontium-90			0.492	0.850	pCi/g	53.4*		(0%-20%)	KSD1	04/08/14	12:01
		Uncert:	+/-0.101	+/-0.135							
		TPU:	+/-0.136	+/-0.209							
QC1203060082	LCS										
Strontium-90		3.76		4.37	pCi/g		116	(75%-125%)	KSD1	04/07/14	12:10
		Uncert:		+/-0.249							
		TPU:		+/-0.819							
QC1203060080	MB										
Strontium-90			U	-0.0173	pCi/g				KSD1	04/07/14	12:10
		Uncert:		+/-0.0357							
		TPU:		+/-0.0357							
<b>Rad Liquid Scintillation</b>											
Batch	1376798										
QC1203060484	345495001	DUP									
Nickel-63			U	0.681	U	3.04	pCi/g	0	N/A TYJ1	04/03/14	17:47
		Uncert:		+/-14.9		+/-11.3					
		TPU:		+/-14.9		+/-11.4					
QC1203060485	LCS										
Nickel-63		586		621	pCi/g		106	(75%-125%)	TYJ1	04/03/14	18:03
		Uncert:		+/-28.9							
		TPU:		+/-119							
QC1203060483	MB										
Nickel-63			U	0.610	pCi/g				TYJ1	04/04/14	19:34
		Uncert:		+/-12.1							
		TPU:		+/-12.1							
Batch	1376803										
QC1203060502	345495001	DUP									
Technetium-99			U	-0.521	U	-0.279	pCi/g	0	N/AMYM1	04/08/14	09:16
		Uncert:		+/-0.588		+/-0.531					
		TPU:		+/-0.588		+/-0.531					
QC1203060503	LCS										
Technetium-99		37.8		36.1	pCi/g		95.5	(75%-125%)	MYM1	04/08/14	10:20
		Uncert:		+/-1.06							
		TPU:		+/-4.29							
QC1203060501	MB										
Technetium-99			U	-0.331	pCi/g				MYM1	04/08/14	08:13
		Uncert:		+/-0.521							
		TPU:		+/-0.521							
Batch	1376820										

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**QC Summary**

Workorder: 345495

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Liquid Scintillation</b>											
Batch	1376820										
QC1203060550	345495001	DUP									
Carbon-14		U	-0.165	U	-0.169	pCi/g	0		N/A	BYS1	04/03/1404:50
		Uncert:	+/-0.278		+/-0.277						
		TPU:	+/-0.278		+/-0.277						
QC1203060552	LCS										
Carbon-14		36.4			33.4	pCi/g	91.8	(75%-125%)	BYS1	04/03/1408:04	
		Uncert:			+/-0.802						
		TPU:			+/-2.56						
QC1203060549	MB										
Carbon-14				U	-0.0404	pCi/g			BYS1	04/03/1402:49	
		Uncert:			+/-0.279						
		TPU:			+/-0.279						
QC1203060551	345495001	MS									
Carbon-14		36.5	U	-0.165	35.3	pCi/g	96.5	(75%-125%)	BYS1	04/03/1406:51	
		Uncert:		+/-0.278	+/-0.841						
		TPU:		+/-0.278	+/-2.70						

**Notes:**

TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- M Result is <LLD and >MDC
- U Result is <LLD and <MDC
- UI Uncertain identification for gamma spectroscopy
- X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details
- X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.

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

\*\* Indicates analyte is a surrogate/tracer compound.

^ 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.

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.

**Attachment 3**

**Laboratory Data for**  
**HBPP-FSSP-OOL10-11 & HBPP-FSSP-OOL10-12**



4/30/2014 3:56:49PM

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Analysis Report for FSS-2014-0264  
FSSP-OOL10-11-001-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0264  
 Sample Description : FSSP-OOL10-11-001-F  
 Sample Type : 1L Soil  
  
 Sample Size : 1.604E+03 grams  
 Facility : Default  
  
 Sample Taken On : 4/28/2014 8:00:00AM  
 Acquisition Started : 4/30/2014 3:46:24PM  
  
 Procedure : 1L Soil HD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli HD  
 Live Time : 600.0 seconds  
 Real Time : 600.0 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli HD

Sample Number : 1596

*Rm Brunel* 5-1-14

*M. J. Deane* 5-7-14

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 4/30/2014 3:56:31PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0264

FSSP-OOL10-11-001-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.54	471 -	483	477.05	9.69E+01	22.47	1.31E+02	1.56
F	2	609.61	1215 -	1224	1219.21	3.17E+01	12.42	2.22E+01	0.76
F	3	1460.74	2914 -	2928	2921.30	1.23E+02	22.47	7.50E+00	2.23

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81 *	10.67	5.87E+00	1.11E+00
Pb-212	0.89	238.63 *	44.60	2.55E-01	6.11E-02
		300.09	3.41		
Bi-214	0.47	609.31 *	46.30	1.68E-01	6.66E-02
		1120.29	15.10		
		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 = 0.40  
Errors quoted at 2.000sigma



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Analysis Report for FSS-2014-0264  
FSSP-OOL10-11-001-F

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## INTERFERENCE CORRECTED REPORT

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<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	0.999	5.87E+00	1.11E+00	
Pb-212	0.894	2.55E-01	6.11E-02	
Bi-214	0.477	1.68E-01	6.66E-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

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Analysis Report for FSS-2014-0264  
FSSP-OOL10-11-001-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 4/30/2014 3:56:31PM  
Peak Locate From Channel : 100  
Peak Locate To Channel : 4096

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

All peaks were identified.

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

## NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	5.87E+00	6.42E-01	6.42E-01
	Co-60	1173.22	100.00	-1.24E-02	9.20E-02	9.78E-02
		1332.49	100.00	4.70E-02		9.20E-02
	Nb-94	702.63	100.00	-7.94E-03	7.19E-02	7.19E-02
		871.10	100.00	-2.24E-02		7.26E-02
	Ag-108m	79.20	7.10	-8.63E-01	5.73E-02	1.30E+00
		433.93	89.90	-1.40E-02		5.73E-02
		614.37	90.40	-1.83E-02		1.08E-01
		722.95	90.50	-1.55E-02		7.53E-02
	Cs-134	569.31	15.43	1.55E-01	6.54E-02	3.70E-01
		604.70	97.60	-3.99E-02		9.48E-02
		795.84	85.40	-5.41E-03		6.54E-02
	Cs-137	661.65	85.12	4.94E-02	8.45E-02	8.45E-02
	Eu-152	121.78	28.40	5.95E-03	1.66E-01	1.86E-01
		244.69	7.49	3.73E-02		7.16E-01
		344.27	26.50	-2.69E-01		1.66E-01
		778.89	12.74	2.72E-01		6.04E-01
		867.32	4.16	-5.34E-01		1.78E+00
		964.01	14.40	3.41E-01		7.48E-01

4/30/2014 3:56:49PM

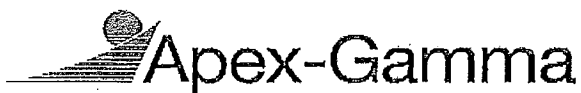
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Analysis Report for FSS-2014-0264

FSSP-OOL10-11-001-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	1085.78	10.00	8.69E-02	1.66E-01	8.02E-01
	1112.02	13.30	5.90E-02		6.15E-01
	1407.95	20.70	-1.61E-01		3.36E-01
Eu-154	123.07	40.50	-9.78E-02	1.26E-01	1.26E-01
	247.94	6.60	-6.54E-01		6.74E-01
	723.30	19.70	-7.15E-02		3.46E-01
	873.19	11.50	-2.95E-01		6.49E-01
	996.32	10.30	8.56E-02		6.79E-01
	1004.76	17.90	1.02E-01		4.20E-01
	1274.45	35.50	-2.26E-01		2.23E-01
Eu-155	105.31	20.70	-1.63E-01	2.56E-01	2.56E-01
Pb-206	803.10	100.00	4.20E-03	6.23E-02	6.23E-02
Ac-228	338.32	11.40	4.25E-01	4.08E-01	5.47E-01
	911.07	27.70	4.04E-01		4.08E-01
	969.11	16.60	4.23E-01		6.25E-01
Th-234	63.29	3.80	2.63E+00	1.28E+00	3.79E+00
	92.59	5.41	8.28E-01		1.28E+00
U-235	143.76	10.50	-7.47E-02	1.00E-01	4.51E-01
	163.35	4.70	4.92E-01		9.48E-01
	185.72	54.00	2.96E-02		1.00E-01
	205.31	4.70	6.31E-01		1.06E+00
Np-237	311.98	38.60	-7.21E-03	1.10E-01	1.10E-01
Am-241	59.54	35.90	-2.99E-01	4.25E-01	4.25E-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



4/30/2014 4:11:50PM

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Analysis Report for FSS-2014-0265  
FSSP-OOL10-11-002-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0265  
 Sample Description : FSSP-OOL10-11-002-F  
 Sample Type : 1L Soil  
  
 Sample Size : 1.049E+03 grams  
 Facility : Default  
  
 Sample Taken On : 4/28/2014 8:10:00AM  
 Acquisition Started : 4/30/2014 4:01:25PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1597

*Ron Arnold* 5-1-14

*M. Williams* 5-7-14

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 4/30/2014 4:11:32PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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4/30/2014 4:11:50PM

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Analysis Report for FSS-2014-0265

FSSP-OOL10-11-002-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.41	470 -	482	476.78	9.47E+01	22.99	1.46E+02	1.23
F	2	295.26	585 -	594	590.48	4.11E+01	14.73	4.33E+01	1.12
F	3	1460.81	2915 -	2929	2921.45	1.80E+02	26.93	3.25E+00	2.20

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.81	*	10.67	1.23E+01	1.96E+00
Pb-212	0.88	238.63	*	44.60	3.50E-01	8.74E-02
		300.09		3.41		

\* = 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 = 0.40  
Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0265

FSSP-OOL10-11-002-F

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**INTERFERENCE CORRECTED REPORT**

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<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	1.000	1.23E+01	1.96E+00	
Pb-212	0.888	3.50E-01	8.74E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 2,000sigma

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Analysis Report for FSS-2014-0265

FSSP-OOL10-11-002-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 4/30/2014 4:11:32PM  
 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	295.26	6.84689E-02	17.92	Tol.	Pb-214

MA 5-7-14

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.23E+01	6.50E-01	6.50E-01
	Co-60	1173.22	100.00	-1.18E-01	1.13E-01	1.43E-01
		1332.49	100.00	3.46E-02		1.13E-01
	Nb-94	702.63	100.00	-1.97E-02	8.66E-02	8.66E-02
		871.10	100.00	-4.46E-02		1.01E-01
	Ag-108m	79.20	7.10	1.48E+00	9.98E-02	1.76E+00
		433.93	89.90	7.06E-02		9.98E-02
		614.37	90.40	1.91E-01		1.62E-01
		722.95	90.50	9.52E-02		1.26E-01
	Cs-134	569.31	15.43	1.01E-01	1.21E-01	5.89E-01
		604.70	97.60	1.34E-01		1.46E-01
		795.84	85.40	5.84E-02		1.21E-01
	Cs-137	661.65	85.12	8.63E-02	1.32E-01	1.32E-01
	Eu-152	121.78	28.40	-8.04E-02	2.26E-01	2.36E-01
		244.69	7.49	1.31E-01		1.13E+00
		344.27	26.50	-4.55E-01		2.26E-01
		778.89	12.74	-8.01E-02		8.31E-01
		867.32	4.16	3.01E-01		2.95E+00

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Analysis Report for FSS-2014-0265

FSSP-OOL10-11-002-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	1.20E+00	2.26E-01	1.20E+00
	1085.78	10.00	-9.57E-02		1.25E+00
	1112.02	13.30	-1.32E+00		8.81E-01
	1407.95	20.70	-8.55E-03		5.14E-01
Eu-154	123.07	40.50	-1.17E-02	1.69E-01	1.69E-01
	247.94	6.60	-1.14E+00		9.96E-01
	723.30	19.70	4.38E-01		5.80E-01
	873.19	11.50	-2.86E-01		8.31E-01
	996.32	10.30	-4.45E-01		1.00E+00
	1004.76	17.90	4.52E-01		7.18E-01
	1274.45	35.50	-2.56E-01		3.34E-01
Eu-155	105.31	20.70	-6.34E-02	3.25E-01	3.25E-01
Pb-206	803.10	100.00	1.71E-02	1.06E-01	1.06E-01
Ac-228	338.32	11.40	5.73E-01	5.78E-01	7.33E-01
	911.07	27.70	5.61E-01		5.78E-01
	969.11	16.60	8.71E-01		1.04E+00
Th-234	63.29	3.80	3.03E+00	1.87E+00	4.30E+00
	92.59	5.41	1.45E+00		1.87E+00
U-235	143.76	10.50	3.45E-01	1.35E-01	6.55E-01
	163.35	4.70	5.50E-01		1.51E+00
	185.72	54.00	4.63E-02		1.35E-01
	205.31	4.70	-1.25E+00		1.38E+00
Np-237	311.98	38.60	-1.13E-01	1.64E-01	1.64E-01
Am-241	59.54	35.90	6.87E-02	4.93E-01	4.93E-01

+ = Nuclide identified during the nuclide identification

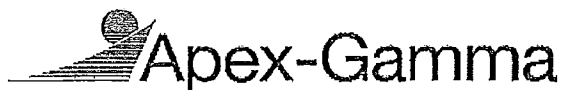
\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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





5/1/2014 12:01:51PM

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Analysis Report for FSS-2014-0266  
FSSP-OOL10-11-003-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0266  
 Sample Description : FSSP-OOL10-11-003-F  
 Sample Type : 1L Soil  
  
 Sample Size : 1.148E+03 grams  
 Facility : Default  
  
 Sample Taken On : 4/28/2014 8:20:00AM  
 Acquisition Started : 4/30/2014 4:16:26PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1608

*For Summit 5-1-14*

*M. Adumma 5-7-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/1/2014 12:01:33PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0266

FSSP-OOL10-11-003-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.54	472 -	482	477.04	1.25E+02	26.52	1.75E+02	1.19
F	2	351.92	698 -	710	703.79	7.71E+01	19.91	8.60E+01	1.38
F	3	609.45	1214 -	1225	1218.88	6.24E+01	16.77	2.54E+01	1.41
F	4	1460.89	2915 -	2928	2921.60	1.91E+02	27.64	3.68E+00	2.02

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81 *	10.67	1.19E+01	1.84E+00
Pb-212	0.89	238.63 *	44.60	4.22E-01	9.29E-02
		300.09	3.41		
Bi-214	0.48	609.31 *	46.30	4.32E-01	1.19E-01
		1120.29	15.10		
		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 = 0.40  
Errors quoted at 2.000sigma

5/1/2014 12:01:51PM

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Analysis Report for FSS-2014-0266

FSSP-OOL10-11-003-F

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## INTERFERENCE CORRECTED REPORT

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<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	0.999	1.19E+01	1.84E+00	
Pb-212	0.894	4.22E-01	9.29E-02	
Bi-214	0.485	4.32E-01	1.19E-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

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5/1/2014 12:01:51PM

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Analysis Report for FSS-2014-0266

FSSP-OOL10-11-003-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/1/2014 12:01:33PM  
 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 2	351.92	1.28488E-01	12.92	Tol.	Pb-214

K/A 5-1-14

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.19E+01	6.39E-01	6.39E-01
	Co-60	1173.22	100.00	-1.21E-01	1.03E-01	1.28E-01
		1332.49	100.00	1.08E-02		1.03E-01
	Nb-94	702.63	100.00	-4.15E-03	9.71E-02	9.71E-02
		871.10	100.00	-2.08E-02		1.02E-01
	Ag-108m	79.20	7.10	1.73E-01	6.59E-02	1.72E+00
		433.93	89.90	-3.14E-02		6.59E-02
		614.37	90.40	-1.87E-02		1.61E-01
		722.95	90.50	-5.53E-03		1.22E-01
	Cs-134	569.31	15.43	1.18E-01	8.86E-02	5.46E-01
		604.70	97.60	-4.77E-02		1.52E-01
		795.84	85.40	-3.75E-02		8.86E-02
	Cs-137	661.65	85.12	3.17E-02	1.15E-01	1.15E-01
	Eu-152	121.78	28.40	-5.21E-02	2.23E-01	2.23E-01
		244.69	7.49	-8.93E-02		1.03E+00
		344.27	26.50	-1.84E-01		2.64E-01
		778.89	12.74	1.01E-01		8.03E-01
		867.32	4.16	4.41E-01		2.59E+00

5/1/2014 12:01:51PM

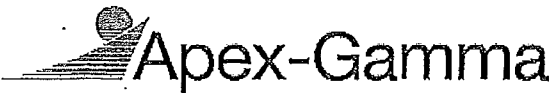
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Analysis Report for FSS-2014-0266

FSSP-OOL10-11-003-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	2.18E-01	2.23E-01	9.37E-01
	1085.78	10.00	-5.17E-01		1.17E+00
	1112.02	13.30	-2.70E-01		8.76E-01
	1407.95	20.70	2.34E-02		4.96E-01
Eu-154	123.07	40.50	-7.13E-02	1.58E-01	1.58E-01
	247.94	6.60	-1.73E+00		9.51E-01
	723.30	19.70	-2.54E-02		5.61E-01
	873.19	11.50	5.48E-02		9.07E-01
	996.32	10.30	4.34E-01		1.08E+00
	1004.76	17.90	-1.02E-01		6.13E-01
	1274.45	35.50	-2.96E-02		3.68E-01
Eu-155	105.31	20.70	-1.67E-01	3.01E-01	3.01E-01
Pb-206	803.10	100.00	-5.96E-02	7.88E-02	7.88E-02
Ac-228	338.32	11.40	5.10E-01	5.56E-01	7.34E-01
	911.07	27.70	3.87E-01		5.56E-01
	969.11	16.60	6.66E-01		8.74E-01
Th-234	63.29	3.80	-3.03E-01	1.58E+00	3.88E+00
	92.59	5.41	-4.65E-01		1.58E+00
U-235	143.76	10.50	-3.27E-01	1.31E-01	6.14E-01
	163.35	4.70	5.44E-01		1.35E+00
	185.72	54.00	2.86E-02		1.31E-01
	205.31	4.70	-7.86E-01		1.40E+00
Np-237	311.98	38.60	7.97E-03	1.64E-01	1.64E-01
Am-241	59.54	35.90	-1.30E-02	4.77E-01	4.77E-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



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Analysis Report for FSS-2014-0267  
FSSP-OOL10-11-004-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0267  
 Sample Description : FSSP-OOL10-11-004-F  
 Sample Type : 1L Soil  
  
 Sample Size : 1.284E+03 grams  
 Facility : Default  
  
 Sample Taken On : 4/28/2014 8:40:00AM  
 Acquisition Started : 4/29/2014 1:03:41PM  
  
 Procedure : 1L Soil HD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli HD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli HD

Sample Number : 1585

*Run Performed 4-29-14*

*M. Alderman 4-29-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 4/29/2014 1:13:48PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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4/29/2014 1:14:06PM

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Analysis Report for FSS-2014-0267

FSSP-QOL10-11-004-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.99	148 -	159	153.97	1.11E+02	24.98	2.27E+02	1.64
F	2	238.54	471 -	483	477.05	1.07E+02	24.65	1.95E+02	1.05
F	3	351.86	697 -	710	703.68	1.07E+02	21.13	4.22E+01	1.73
F	4	583.09	1160 -	1172	1166.18	5.50E+01	15.95	3.00E+01	1.63
F	5	609.47	1214 -	1226	1218.93	6.82E+01	17.11	1.90E+01	1.75
F	6	1460.98	2916 -	2929	2921.79	1.77E+02	26.87	4.10E+00	2.07

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-xRay	0.54	77.11	*	100.00	2.18E-01	5.15E-02
		87.20		36.00		
K-40	0.99	1460.81	*	10.67	1.05E+01	1.69E+00
Tl-208	0.69	277.35		6.80		
		583.14	*	84.20	1.93E-01	5.72E-02
		860.37		12.46		
Pb-212	0.89	238.63	*	44.60	3.54E-01	8.37E-02
		300.09		3.41		
Bi-214	0.48	609.31	*	46.30	4.52E-01	1.16E-01
		1120.29		15.10		
		1764.49		15.80		

4/29/2014 1:14:06PM

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Analysis Report for FSS-2014-0267  
FSSP-OOL10-11-004-F

\* = 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 = 0.40  
Errors quoted at 2.000sigma

## INTERFERENCE CORRECTED REPORT

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
Bi-xRay	0.541	2.18E-01	5.15E-02	
K-40	0.995	1.05E+01	1.69E+00	
Tl-208	0.696	1.93E-01	5.72E-02	
Pb-212	0.894	3.54E-01	8.37E-02	
Bi-214	0.483	4.52E-01	1.16E-01	

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

Errors quoted at 2.000sigma



4/29/2014 1:14:06PM

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Analysis Report for FSS-2014-0267  
FSSP-OOL10-11-004-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 4/29/2014 1:13:48PM  
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	351.86	1.77778E-01	9.90	Tol.	Pb-214

MA 4-29-14

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.05E+01	6.50E-01	6.50E-01
	Co-60	1173.22	100.00	-9.68E-02	8.31E-02	1.22E-01
		1332.49	100.00	-7.15E-02		8.31E-02
	Nb-94	702.63	100.00	-3.79E-02	8.65E-02	8.65E-02
		871.10	100.00	-3.73E-02		8.83E-02
	Ag-108m	79.20	7.10	-6.77E-01	7.38E-02	2.08E+00
		433.93	89.90	3.33E-04		7.38E-02
		614.37	90.40	-7.23E-04		1.57E-01
		722.95	90.50	1.54E-02		1.18E-01
	Cs-134	569.31	15.43	2.34E-01	1.06E-01	6.45E-01
		604.70	97.60	-7.33E-02		1.41E-01
		795.84	85.40	5.18E-02		1.06E-01
	Cs-137	661.65	85.12	9.44E-02	1.27E-01	1.27E-01
	Eu-152	121.78	28.40	-4.36E-02	2.25E-01	2.58E-01
		244.69	7.49	-9.59E-01		1.10E+00
		344.27	26.50	-3.26E-01		2.25E-01
		778.89	12.74	9.62E-02		7.54E-01
		867.32	4.16	-9.19E-01		2.28E+00

4/29/2014 1:14:06PM

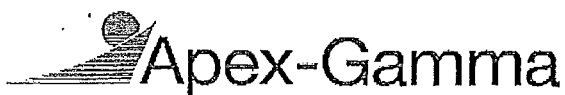
Page 5 of 5

Analysis Report for FSS-2014-0267

FSSP-OOL10-11-004-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	9.30E-01	2.25E-01	9.22E-01
	1085.78	10.00	-8.16E-01		9.04E-01
	1112.02	13.30	-2.72E-01		8.37E-01
	1407.95	20.70	-1.21E-01		4.72E-01
Eu-154	123.07	40.50	-1.40E-01	1.78E-01	1.78E-01
	247.94	6.60	-1.31E+00		1.08E+00
	723.30	19.70	7.07E-02		5.44E-01
	873.19	11.50	4.93E-01		8.49E-01
	996.32	10.30	-1.46E-01		1.13E+00
	1004.76	17.90	3.09E-01		6.13E-01
	1274.45	35.50	1.72E-01		3.60E-01
	105.31	20.70	1.38E-01		3.68E-01
Eu-155	105.31	20.70	1.38E-01	3.68E-01	3.68E-01
Pb-206	803.10	100.00	2.54E-03	8.24E-02	8.24E-02
Ac-228	338.32	11.40	0.00E+00	5.82E-01	6.30E-01
	911.07	27.70	5.80E-01		5.82E-01
	969.11	16.60	3.50E-01		8.56E-01
Th-234	63.29	3.80	2.00E+00	1.77E+00	5.33E+00
	92.59	5.41	-8.90E-01		1.77E+00
U-235	143.76	10.50	9.73E-02	1.38E-01	6.88E-01
	163.35	4.70	-3.65E-01		1.38E+00
	185.72	54.00	9.25E-02		1.38E-01
	205.31	4.70	6.54E-01		1.61E+00
Np-237	311.98	38.60	-5.92E-02	1.55E-01	1.55E-01
Am-241	59.54	35.90	-5.41E-01	6.38E-01	6.38E-01

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



4/29/2014 1:29:08PM

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Analysis Report for FSS-2014-0268  
FSSP-OOL10-11-005-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0268  
 Sample Description : FSSP-OOL10-11-005-F  
 Sample Type : 1L Soil  
  
 Sample Size : 1.211E+03 grams  
 Facility : Default  
  
 Sample Taken On : 4/28/2014 8:50:00AM  
 Acquisition Started : 4/29/2014 1:18:43PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1586

*Ran Amundson*

4-29-14

*W. Anderson*

4-29-14

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 4/29/2014 1:28:50PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0268

FSSP-OOL10-11-005-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	77.00	148 -	159	153.98	7.34E+01	22.50	2.32E+02	0.93
F	2	238.57	471 -	483	477.09	1.19E+02	25.73	1.98E+02	1.22
F	3	351.81	697 -	710	703.58	8.25E+01	20.03	7.50E+01	1.21
F	4	609.28	1212 -	1224	1218.55	6.13E+01	16.87	3.23E+01	1.44
F	5	1460.87	2915 -	2928	2921.56	1.87E+02	27.52	7.40E+00	1.95

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2,000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-xRay	0.54	77.11	*	100.00	1.19E-01	3.75E-02
		87.20		36.00		
K-40	0.99	1460.81	*	10.67	1.11E+01	1.74E+00
Pb-212	0.89	238.63	*	44.60	3.81E-01	8.53E-02
		300.09		3.41		
Bi-214	0.48	609.31	*	46.30	4.03E-01	1.13E-01
		1120.29		15.10		
		1764.49		15.80		

4/29/2014 1:29:08PM

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Analysis Report for FSS-2014-0268

FSSP-OOL10-11-005-F

\* = 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 = 0.40

Errors quoted at 2.000sigma

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## INTERFERENCE CORRECTED REPORT

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<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
Bi-xRay	0.547	1.19E-01	3.75E-02	
K-40	0.999	1.11E+01	1.74E+00	
Pb-212	0.895	3.81E-01	8.53E-02	
Bi-214	0.486	4.03E-01	1.13E-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

4/29/2014 1:29:08PM

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Analysis Report for FSS-2014-0268  
FSSP-OOL10-11-005-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 4/29/2014 1:28:50PM  
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	351.81	1.37506E-01	12.14	Tol.	Pb-214
NA 4-29-14					

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.11E+01	7.95E-01	7.95E-01
	Co-60	1173.22	100.00	8.98E-03	1.21E-01	1.51E-01
		1332.49	100.00	2.93E-03		1.21E-01
	Nb-94	702.63	100.00	-1.54E-02	8.51E-02	9.51E-02
		871.10	100.00	-7.81E-02		8.51E-02
	Ag-108m	79.20	7.10	-2.47E-01	8.28E-02	1.67E+00
		433.93	89.90	-5.64E-02		8.28E-02
		614.37	90.40	-7.53E-02		1.59E-01
		722.95	90.50	5.43E-02		1.16E-01
	Cs-134	569.31	15.43	2.63E-01	1.33E-01	5.99E-01
		604.70	97.60	1.20E-02		1.40E-01
		795.84	85.40	4.01E-02		1.33E-01
	Cs-137	661.65	85.12	9.30E-02	1.26E-01	1.26E-01
	Eu-152	121.78	28.40	-1.60E-02	2.33E-01	2.33E-01
		244.69	7.49	-8.57E-01		1.02E+00
		344.27	26.50	-4.93E-01		2.35E-01
		778.89	12.74	3.75E-02		7.62E-01
		867.32	4.16	-5.90E-01		2.26E+00

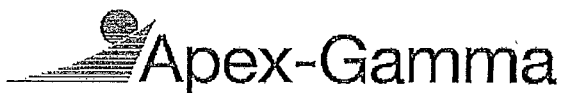
4/29/2014 1:29:08PM

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Analysis Report for FSS-2014-0268  
FSSP-OOL10-11-005-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	1.16E+00	2.33E-01	1.11E+00
	1085.78	10.00	4.89E-01		1.16E+00
	1112.02	13.30	-1.63E+00		7.14E-01
	1407.95	20.70	2.67E-01		4.93E-01
Eu-154	123.07	40.50	-9.26E-02	1.62E-01	1.62E-01
	247.94	6.60	-2.62E+00		8.95E-01
	723.30	19.70	2.49E-01		5.32E-01
	873.19	11.50	3.39E-01		8.60E-01
	996.32	10.30	1.48E-01		8.40E-01
	1004.76	17.90	6.10E-02		5.20E-01
	1274.45	35.50	6.58E-02		2.89E-01
	105.31	20.70	7.74E-02		3.23E-01
Eu-155	105.31	20.70	7.74E-02	3.23E-01	3.23E-01
Pb-206	803.10	100.00	-1.26E-01	9.40E-02	9.40E-02
Ac-228	338.32	11.40	5.41E-01	4.83E-01	6.73E-01
	911.07	27.70	1.45E-01		4.83E-01
	969.11	16.60	7.22E-01		9.54E-01
Th-234	63.29	3.80	1.45E+00	1.63E+00	4.04E+00
	92.59	5.41	7.40E-01		1.63E+00
U-235	143.76	10.50	-1.57E-01	1.34E-01	5.85E-01
	163.35	4.70	-7.14E-01		1.34E+00
	185.72	54.00	1.28E-01		1.34E-01
	205.31	4.70	6.72E-01		1.43E+00
Np-237	311.98	38.60	-6.67E-02	1.47E-01	1.47E-01
Am-241	59.54	35.90	-4.76E-01	4.63E-01	4.63E-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



4/29/2014 1:44:10PM

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Analysis Report for FSS-2014-0269  
FSSP-OOL10-11-006-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0269  
 Sample Description : FSSP-OOL10-11-006-F  
 Sample Type : 1L Soil  
  
 Sample Size : 1.161E+03 grams  
 Facility : Default  
  
 Sample Taken On : 4/28/2014 9:20:00AM  
 Acquisition Started : 4/29/2014 1:33:44PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1587

*Ron D. Smith* 4-29-14

*Michael D. Smith* 4-29-14

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 4/29/2014 1:43:51PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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4/29/2014 1:44:10PM

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Analysis Report for FSS-2014-0269

FSSP-OOL10-11-006-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.51	472 -	480	476.99	1.11E+02	24.99	1.19E+02	1.15
F	2	351.85	700 -	708	703.67	8.11E+01	18.88	2.40E+01	1.54
F	3	609.43	1214 -	1225	1218.86	4.79E+01	15.20	2.59E+01	1.45
F	4	1460.96	2914 -	2928	2921.74	1.57E+02	25.14	7.68E+00	2.21

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81 *	10.67	9.67E+00	1.64E+00
Pb-212	0.89	238.63 *	44.60	3.71E-01	8.62E-02
		300.09	3.41		
Bi-214	0.48	609.31 *	46.30	3.28E-01	1.06E-01
		1120.29	15.10		
		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 = 0.40

Errors quoted at 2.000sigma

4/29/2014 1:44:10PM

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Analysis Report for FSS-2014-0269  
FSSP-OOL10-11-006-F

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*INTERFERENCE CORRECTED REPORT*

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<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	0.997	9.67E+00	1.64E+00	
Pb-212	0.893	3.71E-01	8.62E-02	
Bi-214	0.485	3.28E-01	1.06E-01	

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

Errors quoted at 2.000sigma

4/29/2014 1:44:10PM

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Analysis Report for FSS-2014-0269

FSSP-OOL10-11-006-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 4/29/2014 1:43:51PM  
 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	351.85	1.35236E-01	11.64	Tol.	Pb-214

NA 4-29-14

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	9.67E+00	8.49E-01	8.49E-01
	Co-60	1173.22	100.00	2.31E-02	8.62E-02	1.43E-01
		1332.49	100.00	1.63E-02		8.62E-02
	Nb-94	702.63	100.00	7.77E-02	9.61E-02	9.76E-02
		871.10	100.00	3.92E-03		9.61E-02
	Ag-108m	79.20	7.10	-4.48E-01	7.38E-02	1.53E+00
		433.93	89.90	-5.25E-02		7.38E-02
		614.37	90.40	-1.75E-02		1.51E-01
		722.95	90.50	6.17E-02		1.17E-01
	Cs-134	569.31	15.43	2.15E-01	1.09E-01	5.80E-01
		604.70	97.60	-2.06E-02		1.29E-01
		795.84	85.40	6.28E-02		1.09E-01
	Cs-137	661.65	85.12	1.42E-01	1.34E-01	1.34E-01
	Eu-152	121.78	28.40	-7.20E-02	2.22E-01	2.24E-01
		244.69	7.49	-1.29E+00		9.93E-01
		344.27	26.50	-4.35E-01		2.22E-01
		778.89	12.74	-1.88E-01		6.34E-01
		867.32	4.16	-6.48E-01		2.46E+00

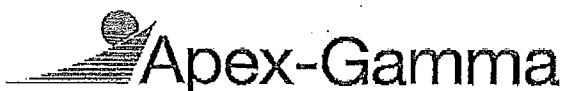
4/29/2014 1:44:10PM

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Analysis Report for FSS-2014-0269  
FSSP-OOL10-11-006-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	0.00E+00	2.22E-01	8.41E-01
	1085.78	10.00	-2.35E-01		9.35E-01
	1112.02	13.30	-4.65E-01		9.50E-01
	1407.95	20.70	-3.86E-02		4.36E-01
Eu-154	123.07	40.50	-3.16E-02	1.60E-01	1.60E-01
	247.94	6.60	-1.92E+00		9.20E-01
	723.30	19.70	2.84E-01		5.39E-01
	873.19	11.50	-6.95E-02		8.77E-01
	996.32	10.30	2.68E-01		8.76E-01
	1004.76	17.90	-2.25E-01		5.43E-01
	1274.45	35.50	1.92E-01		4.07E-01
Eu-155	105.31	20.70	2.05E-01	3.13E-01	3.13E-01
Pb-206	803.10	100.00	-6.00E-03	8.75E-02	8.75E-02
Ac-228	338.32	11.40	4.78E-01	5.55E-01	7.11E-01
	911.07	27.70	4.16E-01		5.55E-01
	969.11	16.60	4.94E-01		7.59E-01
Th-234	63.29	3.80	-3.90E-01	1.57E+00	3.69E+00
	92.59	5.41	1.69E-01		1.57E+00
U-235	143.76	10.50	1.78E-01	1.25E-01	6.16E-01
	163.35	4.70	-4.59E-01		1.25E+00
	185.72	54.00	6.57E-02		1.25E-01
	205.31	4.70	9.87E-01		1.40E+00
Np-237	311.98	38.60	7.29E-03	1.57E-01	1.57E-01
Am-241	59.54	35.90	-1.78E-01	4.78E-01	4.78E-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



4/30/2014 4:41:52PM

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Analysis Report for FSS-2014-0270  
FSSP-OOL10-11-007-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0270  
 Sample Description : FSSP-OOL10-11-007-F  
 Sample Type : 1L Soil

Sample Size : 1.209E+03 grams  
 Facility : Default

Sample Taken On : 4/28/2014 9:00:00AM  
 Acquisition Started : 4/30/2014 4:31:28PM

Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds

Dead Time : 0.01 %

Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1599

*R. D. Smith* 5-1-14

*M. J. Smith* 5-7-14

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 4/30/2014 4:41:34PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0270

FSSP-OOL10-11-007-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.54	471 -	482	477.03	1.28E+02	26.46	1.76E+02	1.50
F	2	295.12	586 -	595	590.20	4.35E+01	15.19	4.36E+01	1.24
F	3	351.82	698 -	709	703.61	8.97E+01	20.36	5.45E+01	1.41
F	4	609.40	1213 -	1225	1218.79	7.48E+01	18.36	3.32E+01	1.55
F	5	1460.81	2914 -	2929	2921.46	1.88E+02	27.74	1.17E+01	1.88

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.81	*	10.67	1.11E+01	1.75E+00
Pb-212	0.89	238.63	*	44.60	4.11E-01	8.82E-02
		300.09		3.41		
Bi-214	0.48	609.31	*	46.30	4.92E-01	1.24E-01
		1120.29		15.10		
		1764.49		15.80		
Pb-214	0.79	241.98		7.49		
		295.21	*	19.20	3.80E-01	1.34E-01
		351.92	*	37.20	4.66E-01	1.08E-01

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Analysis Report for FSS-2014-0270

FSSP-OOL10-11-007-F

\* = 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 = 0.40  
 Errors quoted at 2.000sigma

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## INTERFERENCE CORRECTED REPORT

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<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	1.000	1.11E+01	1.75E+00	
Pb-212	0.894	4.11E-01	8.82E-02	
Bi-214	0.486	4.92E-01	1.24E-01	
Pb-214	0.790	4.32E-01	8.44E-02	

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

Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0270

FSSP-OOL10-11-007-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 4/30/2014 4:41:34PM  
 Peak Locate From Channel : 100  
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

## NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	*	10.67	1.11E+01	9.73E-01	9.73E-01
	Co-60	1173.22		100.00	3.13E-02	1.07E-01	1.44E-01
		1332.49		100.00	-3.08E-02		1.07E-01
	Nb-94	702.63		100.00	-2.64E-03	7.46E-02	8.91E-02
		871.10		100.00	-4.24E-02		7.46E-02
	Ag-108m	79.20		7.10	2.31E-01	7.41E-02	1.57E+00
		433.93		89.90	2.06E-02		7.41E-02
		614.37		90.40	5.09E-03		1.68E-01
		722.95		90.50	9.13E-02		1.19E-01
	Cs-134	569.31		15.43	2.80E-01	1.26E-01	5.86E-01
		604.70		97.60	-1.71E-02		1.47E-01
		795.84		85.40	6.27E-02		1.26E-01
	Cs-137	661.65		85.12	6.44E-02	1.10E-01	1.10E-01
	Eu-152	121.78		28.40	2.77E-03	2.14E-01	2.17E-01
		244.69		7.49	5.71E-01		9.58E-01
		344.27		26.50	-4.61E-01		2.14E-01
		778.89		12.74	-2.68E-01		6.26E-01
		867.32		4.16	-9.97E-01		1.98E+00
		964.01		14.40	4.95E-01		9.88E-01



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Analysis Report for FSS-2014-0270  
FSSP-OOL10-11-007-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	1085.78	10.00	-1.07E+00	2.14E-01	9.96E-01
	1112.02	13.30	-1.21E+00		8.10E-01
	1407.95	20.70	2.05E-01		5.38E-01
Eu-154	123.07	40.50	-3.91E-02	1.52E-01	1.52E-01
	247.94	6.60	-8.90E-01		9.59E-01
	723.30	19.70	4.20E-01		5.47E-01
	873.19	11.50	-2.80E-01		6.50E-01
	996.32	10.30	4.24E-01		1.00E+00
	1004.76	17.90	-1.96E-01		5.37E-01
	1274.45	35.50	5.58E-02		3.58E-01
Eu-155	105.31	20.70	-1.62E-01	3.12E-01	3.12E-01
Pb-206	803.10	100.00	-2.55E-02	1.01E-01	1.01E-01
Ac-228	338.32	11.40	6.64E-01	5.54E-01	6.74E-01
	911.07	27.70	7.38E-01		5.54E-01
	969.11	16.60	9.42E-01		8.81E-01
Th-234	63.29	3.80	-1.03E+00	1.67E+00	3.85E+00
	92.59	5.41	-3.73E-01		1.67E+00
U-235	143.76	10.50	-9.29E-02	1.36E-01	6.17E-01
	163.35	4.70	4.58E-01		1.38E+00
	185.72	54.00	2.11E-02		1.36E-01
	205.31	4.70	-5.65E-01		1.43E+00
Np-237	311.98	38.60	-3.83E-02	1.60E-01	1.60E-01
Am-241	59.54	35.90	-8.87E-02	4.62E-01	4.62E-01

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



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Analysis Report for FSS-2014-0271  
FSSP-OOL10-11-008-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0271  
 Sample Description : FSSP-OOL10-11-008-F  
 Sample Type : 1L Soil  
  
 Sample Size : 1.143E+03 grams  
 Facility : Default  
  
 Sample Taken On : 4/28/2014 9:45:00AM  
 Acquisition Started : 4/29/2014 1:48:46PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1588

*Ron A. Smith* 4-29-14

*M. Alderson* 4-29-14

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 4/29/2014 1:58:53PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0271

FSSP-OOL10-11-008-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.48	473 -	482	476.91	7.49E+01	21.59	1.38E+02	1.22
F	2	295.26	585 -	595	590.48	3.98E+01	15.97	7.84E+01	1.19
F	3	1460.87	2914 -	2928	2921.56	1.76E+02	26.61	3.75E+00	2.23

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81 *	10.67	1.10E+01	1.77E+00
Pb-212	0.89	238.63 *	44.60	2.54E-01	7.48E-02
		300.09	3.41		

\* = 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 = 0.40

Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0271

FSSP-OOL10-11-008-F

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**INTERFERENCE CORRECTED REPORT**

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<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	0.999	1.10E+01	1.77E+00	
Pb-212	0.892	2.54E-01	7.48E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0271  
FSSP-OOL10-11-008-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 4/29/2014 1:58:53PM  
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	295.26	6.63513E-02	20.06	Tol.	Pb-214

NA 4-29-14

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.10E+01	6.50E-01	6.50E-01
	Co-60	1173.22	100.00	-6.92E-03	1.08E-01	1.34E-01
		1332.49	100.00	6.21E-02		1.08E-01
	Nb-94	702.63	100.00	4.54E-02	8.75E-02	9.43E-02
		871.10	100.00	-3.26E-02		8.75E-02
	Ag-108m	79.20	7.10	4.92E-01	7.14E-02	1.67E+00
		433.93	89.90	-7.00E-02		7.14E-02
		614.37	90.40	1.61E-01		1.40E-01
		722.95	90.50	4.58E-02		9.87E-02
	Cs-134	569.31	15.43	3.09E-01	1.29E-01	7.16E-01
		604.70	97.60	1.41E-01		1.36E-01
		795.84	85.40	8.73E-02		1.29E-01
	Cs-137	661.65	85.12	6.79E-02	1.21E-01	1.21E-01
	Eu-152	121.78	28.40	1.41E-01	2.28E-01	2.28E-01
		244.69	7.49	-1.16E-01		1.02E+00
		344.27	26.50	-1.37E-01		2.38E-01
		778.89	12.74	-5.01E-02		7.31E-01
		867.32	4.16	-1.89E+00		2.28E+00

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Analysis Report for FSS-2014-0271  
FSSP-OOL10-11-008-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	4.36E-01	2.28E-01	1.05E+00
	1085.78	10.00	-6.51E-01		1.15E+00
	1112.02	13.30	-7.35E-01		7.83E-01
	1407.95	20.70	3.45E-01		5.69E-01
Eu-154	123.07	40.50	-7.67E-02	1.56E-01	1.56E-01
	247.94	6.60	-1.05E+00		9.76E-01
	723.30	19.70	2.10E-01		4.54E-01
	873.19	11.50	2.28E-01		7.86E-01
	996.32	10.30	1.18E-02		1.09E+00
	1004.76	17.90	-5.73E-02		6.45E-01
	1274.45	35.50	-7.70E-02		3.60E-01
Eu-155	105.31	20.70	-7.05E-02	3.13E-01	3.13E-01
Pb-206	803.10	100.00	1.70E-02	1.02E-01	1.02E-01
Ac-228	338.32	11.40	9.74E-02	4.93E-01	6.35E-01
	911.07	27.70	3.12E-01		4.93E-01
	969.11	16.60	1.00E+00		9.83E-01
Th-234	63.29	3.80	3.41E+00	1.60E+00	3.96E+00
	92.59	5.41	8.31E-01		1.60E+00
U-235	143.76	10.50	2.21E-01	1.28E-01	5.96E-01
	163.35	4.70	7.37E-02		1.34E+00
	185.72	54.00	7.66E-02		1.28E-01
	205.31	4.70	-2.52E-01		1.36E+00
Np-237	311.98	38.60	-4.17E-02	1.58E-01	1.58E-01
Am-241	59.54	35.90	-1.17E-01	4.74E-01	4.74E-01

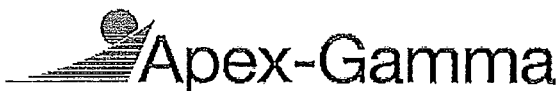
+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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



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Analysis Report for FSS-2014-0272  
FSSP-OOL10-11-009-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0272  
 Sample Description : FSSP-OOL10-11-009-F  
 Sample Type : 1L Soil  
  
 Sample Size : 1.195E+03 grams  
 Facility : Default  
  
 Sample Taken On : 4/29/2014 9:50:00AM  
 Acquisition Started : 4/30/2014 4:46:29PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1600

*Rev. Amend 5-1-14*

*W. J. Deanna 5-7-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 4/30/2014 4:56:35PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0272

FSSP-OOL10-11-009-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.45	470 -	483	476.86	1.30E+02	25.48	1.62E+02	1.61
F	2	295.06	586 -	596	590.07	4.03E+01	15.94	7.95E+01	1.15
F	3	351.69	699 -	708	703.34	7.84E+01	19.82	5.84E+01	1.30
F	4	609.38	1215 -	1223	1218.76	3.44E+01	13.08	2.06E+01	1.32
F	5	1461.03	2914 -	2929	2921.88	1.94E+02	27.90	3.87E+00	2.16

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81	*	10.67	1.16E+01	1.79E+00
Pb-212	0.89	238.63	*	44.60	4.23E-01	8.63E-02
		300.09		3.41		
Bi-214	0.48	609.31	*	46.30	2.29E-01	8.81E-02
		1120.29		15.10		
		1764.49		15.80		
Pb-214	0.78	241.98		7.49		
		295.21	*	19.20	3.56E-01	1.42E-01
		351.92	*	37.20	4.12E-01	1.06E-01



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Analysis Report for FSS-2014-0272

FSSP-OOL10-11-009-F

\* = 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 = 0.40  
 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	0.993	1.16E+01	1.79E+00	
Pb-212	0.890	4.23E-01	8.63E-02	
Bi-214	0.486	2.29E-01	8.81E-02	
Pb-214	0.786	3.92E-01	8.51E-02	

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

Errors quoted at 2.000sigma

4/30/2014 4:56:53PM

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Analysis Report for FSS-2014-0272

FSSP-OOL10-11-009-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 4/30/2014 4:56:35PM  
 Peak Locate From Channel : 100  
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

## NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.16E+01	6.33E-01
	Co-60	1173.22	100.00	5.92E-02	9.90E-02
		1332.49	100.00	1.65E-02	9.90E-02
	Nb-94	702.63	100.00	1.27E-02	9.34E-02
		871.10	100.00	-3.12E-03	9.34E-02
	Ag-108m	79.20	7.10	3.96E-01	7.50E-02
		433.93	89.90	-2.58E-02	7.50E-02
		614.37	90.40	-3.04E-02	1.35E-01
		722.95	90.50	4.13E-03	1.11E-01
	Cs-134	569.31	15.43	1.44E-01	9.64E-02
		604.70	97.60	-1.23E-01	1.20E-01
		795.84	85.40	-1.07E-02	9.64E-02
	Cs-137	661.65	85.12	1.03E-01	1.22E-01
	Eu-152	121.78	28.40	1.44E-01	2.15E-01
		244.69	7.49	-4.55E-01	1.04E+00
		344.27	26.50	-2.44E-01	2.43E-01
		778.89	12.74	-3.88E-01	5.39E-01
		867.32	4.16	1.85E-01	2.39E+00
		964.01	14.40	2.20E-01	8.87E-01

4/30/2014 4:56:53PM

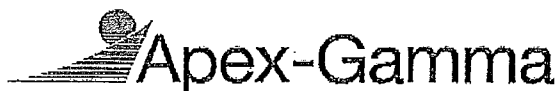
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Analysis Report for FSS-2014-0272

FSSP-OOL10-11-009-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams) <sup>+</sup>	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	1085.78	10.00	-3.99E-01	2.15E-01	1.04E+00
	1112.02	13.30	-1.76E+00		8.19E-01
	1407.95	20.70	2.39E-01		5.23E-01
Eu-154	123.07	40.50	-5.99E-02	1.51E-01	1.51E-01
	247.94	6.60	-8.05E-01		9.64E-01
	723.30	19.70	1.90E-02		5.09E-01
	873.19	11.50	2.86E-03		8.34E-01
	996.32	10.30	1.90E-01		1.02E+00
	1004.76	17.90	3.07E-01		6.17E-01
	1274.45	35.50	5.65E-02		3.62E-01
Eu-155	105.31	20.70	-9.78E-02	3.14E-01	3.14E-01
Pb-206	803.10	100.00	-6.31E-02	8.05E-02	8.05E-02
Ac-228	338.32	11.40	7.33E-01	5.40E-01	7.53E-01
	911.07	27.70	2.94E-01		5.40E-01
	969.11	16.60	7.88E-01		7.96E-01
Th-234	63.29	3.80	2.36E-01	1.53E+00	3.76E+00
	92.59	5.41	-3.07E-01		1.53E+00
U-235	143.76	10.50	5.00E-02	1.27E-01	5.86E-01
	163.35	4.70	2.10E+00		1.36E+00
	185.72	54.00	9.43E-02		1.27E-01
	205.31	4.70	7.87E-01		1.40E+00
Np-237	311.98	38.60	9.71E-02	1.72E-01	1.72E-01
Am-241	59.54	35.90	1.16E-01	4.53E-01	4.53E-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



5/1/2014 4:08:25PM

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Analysis Report for FSS-2014-0273  
FSSP-OOL10-11-010-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0273  
 Sample Description : FSSP-OOL10-11-010-F  
 Sample Type : 1L Soil  
  
 Sample Size : 1.352E+03 grams  
 Facility : Default  
  
 Sample Taken On : 4/29/2014 9:25:00AM  
 Acquisition Started : 5/1/2014 3:57:59PM  
  
 Procedure : 1L Soil HD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli HD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli HD

Sample Number : 1612

*in Annex 5-1-14*

*M. Alderman 5-7-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/1/2014 4:08:06PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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5/1/2014 4:08:25PM

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Analysis Report for FSS-2014-0273

FSSP-OOL10-11-010-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.54	472 -	483	477.04	1.28E+02	25.66	1.47E+02	1.35
F	2	351.97	699 -	709	703.89	7.49E+01	18.00	2.80E+01	1.77
F	3	583.17	1162 -	1171	1166.33	4.88E+01	15.42	2.75E+01	1.47
F	4	609.36	1213 -	1222	1218.71	7.37E+01	18.44	3.00E+01	1.53
F	5	1460.87	2915 -	2929	2921.56	1.71E+02	26.36	7.50E+00	2.08

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81	*	10.67	9.63E+00	1.58E+00
Tl-208	0.69	277.35		6.80		
		583.14	*	84.20	1.63E-01	5.23E-02
		860.37		12.46		
Pb-212	0.89	238.63	*	44.60	4.01E-01	8.36E-02
		300.09		3.41		
Bi-214	0.48	609.31	*	46.30	4.64E-01	1.19E-01
		1120.29		15.10		
		1764.49		15.80		

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Analysis Report for FSS-2014-0273

FSSP-OOL10-11-010-F

\* = 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 = 0.40  
 Errors quoted at 2.000sigma

## INTERFERENCE CORRECTED REPORT

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	0.999	9.63E+00	1.58E+00	
Tl-208	0.696	1.63E-01	5.23E-02	
Pb-212	0.893	4.01E-01	8.36E-02	
Bi-214	0.485	4.64E-01	1.19E-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

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Analysis Report for FSS-2014-0273  
FSSP-OOL10-11-010-F

### UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/1/2014 4:08:06PM  
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 2	351.97	1.24868E-01	12.01	Tol.	Pb-214

*mt 5-7-14*

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	9.63E+00	7.65E-01	7.65E-01
	Co-60	1173.22	100.00	2.10E-02	9.33E-02	1.42E-01
		1332.49	100.00	-1.15E-01		9.33E-02
	Nb-94	702.63	100.00	-1.67E-02	7.91E-02	8.37E-02
		871.10	100.00	-1.08E-01		7.91E-02
	Ag-108m	79.20	7.10	-4.23E-01	7.69E-02	1.89E+00
		433.93	89.90	-4.81E-02		7.69E-02
		614.37	90.40	-2.68E-01		1.60E-01
		722.95	90.50	-3.39E-03		9.30E-02
	Cs-134	569.31	15.43	1.88E-01	1.03E-01	4.81E-01
		604.70	97.60	-4.76E-02		1.39E-01
		795.84	85.40	2.45E-02		1.03E-01
	Cs-137	661.65	85.12	2.70E-02	1.09E-01	1.09E-01
	Eu-152	121.78	28.40	-1.15E-01	2.36E-01	2.37E-01
		244.69	7.49	-2.86E-02		1.03E+00
		344.27	26.50	-1.71E-01		2.36E-01
		778.89	12.74	-7.57E-02		5.48E-01
		867.32	4.16	3.30E-02		2.22E+00

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Analysis Report for FSS-2014-0273

FSSP-OOL10-11-010-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	4.98E-01	2.36E-01	8.88E-01
	1085.78	10.00	-4.33E-01		1.09E+00
	1112.02	13.30	-7.25E-01		5.45E-01
	1407.95	20.70	1.01E-01		4.48E-01
Eu-154	123.07	40.50	1.49E-02	1.70E-01	1.70E-01
	247.94	6.60	-1.01E-01		1.04E+00
	723.30	19.70	-1.56E-02		4.27E-01
	873.19	11.50	-2.57E-02		7.70E-01
	996.32	10.30	2.40E-01		8.86E-01
	1004.76	17.90	3.06E-02		5.42E-01
	1274.45	35.50	-7.23E-02		3.33E-01
Eu-155	105.31	20.70	-8.78E-02	3.38E-01	3.38E-01
Pb-206	803.10	100.00	-6.37E-02	7.61E-02	7.61E-02
Ac-228	338.32	11.40	4.22E-01	5.89E-01	6.62E-01
	911.07	27.70	7.59E-01		5.89E-01
	969.11	16.60	5.57E-01		8.13E-01
Th-234	63.29	3.80	-3.76E-01	1.82E+00	4.53E+00
	92.59	5.41	1.04E+00		1.82E+00
U-235	143.76	10.50	4.03E-02	1.43E-01	6.21E-01
	163.35	4.70	-6.54E-01		1.34E+00
	185.72	54.00	4.31E-02		1.43E-01
	205.31	4.70	8.14E-02		1.44E+00
Np-237	311.98	38.60	-6.60E-03	1.56E-01	1.56E-01
Am-241	59.54	35.90	-2.77E-02	5.80E-01	5.80E-01

+ = Nuclide identified during the nuclide identification

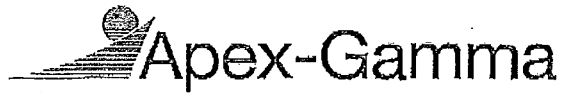
\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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





4/29/2014 2:14:14PM

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Analysis Report for FSS-2014-0274  
FSSP-OOL10-11-011-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0274  
 Sample Description : FSSP-OOL10-11-011-F  
 Sample Type : 1L Soil  
  
 Sample Size : 1.131E+03 grams  
 Facility : Default  
  
 Sample Taken On : 4/28/2014 9:25:00AM  
 Acquisition Started : 4/29/2014 2:03:48PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1589

*By Daniel 4-29-14*

*Miss Gorman 4-29-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 4/29/2014 2:13:55PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0274

FSSP-OOL10-11-011-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.63	471 -	483	477.22	1.13E+02	24.36	1.56E+02	1.50
F	2	351.81	697 -	708	703.58	7.58E+01	18.64	4.33E+01	1.71
F	3	583.01	1161 -	1171	1166.01	5.84E+01	16.24	1.94E+01	1.56
F	4	609.36	1212 -	1223	1218.71	6.54E+01	16.80	1.76E+01	1.83
F	5	1460.96	2915 -	2929	2921.74	2.06E+02	29.07	1.50E+01	1.97

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81 *	10.67	1.30E+01	1.97E+00
Tl-208	0.69	277.35	6.80		
		583.14 *	84.20	2.18E-01	6.18E-02
		860.37	12.46		
Pb-212	0.89	238.63 *	44.60	3.87E-01	8.65E-02
		300.09	3.41		
Bi-214	0.48	609.31 *	46.30	4.59E-01	1.21E-01
		1120.29	15.10		
		1764.49	15.80		

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Analysis Report for FSS-2014-0274

FSSP-OOL10-11-011-F

\* = 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 = 0.40  
 Errors quoted at 2.000sigma

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## INTERFERENCE CORRECTED REPORT

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<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	0.997	1.30E+01	1.97E+00	
Tl-208	0.693	2.18E-01	6.18E-02	
Pb-212	0.895	3.87E-01	8.65E-02	
Bi-214	0.486	4.59E-01	1.21E-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

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Analysis Report for FSS-2014-0274  
FSSP-OOL10-11-011-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 4/29/2014 2:13:55PM  
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	351.81	1.26351E-01	12.30	Tol.	Pb-214

NA 4-29-14

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.30E+01	1.14E+00	1.14E+00
	Co-60	1173.22	100.00	5.37E-02	1.22E-01	1.44E-01
		1332.49	100.00	4.30E-02		1.22E-01
	Nb-94	702.63	100.00	3.20E-02	9.35E-02	9.35E-02
		871.10	100.00	9.95E-03		9.86E-02
	Ag-108m	79.20	7.10	4.28E-01	8.46E-02	1.70E+00
		433.93	89.90	-1.43E-02		8.46E-02
		614.37	90.40	-1.86E-01		1.64E-01
		722.95	90.50	2.28E-02		1.10E-01
	Cs-134	569.31	15.43	3.30E-01	1.48E-01	5.95E-01
		604.70	97.60	-5.64E-02		1.48E-01
		795.84	85.40	4.42E-02		1.48E-01
	Cs-137	661.65	85.12	1.33E-01	1.42E-01	1.42E-01
	Eu-152	121.78	28.40	-1.09E-02	2.40E-01	2.43E-01
		244.69	7.49	-1.84E-01		1.09E+00
		344.27	26.50	-4.14E-01		2.40E-01
		778.89	12.74	-3.19E-01		6.51E-01
		867.32	4.16	-2.82E+00		2.18E+00

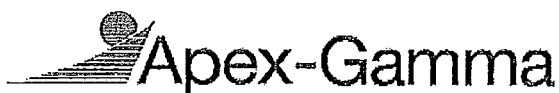
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Analysis Report for FSS-2014-0274  
FSSP-OOL10-11-011-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	8.07E-01	2.40E-01	1.06E+00
	1085.78	10.00	-2.30E-01		1.24E+00
	1112.02	13.30	-9.96E-01		8.17E-01
	1407.95	20.70	-1.46E-01		4.76E-01
Eu-154	123.07	40.50	-1.08E-01	1.70E-01	1.70E-01
	247.94	6.60	-1.44E+00		1.02E+00
	723.30	19.70	1.05E-01		5.04E-01
	873.19	11.50	1.66E-01		8.39E-01
	996.32	10.30	5.96E-01		1.31E+00
	1004.76	17.90	3.92E-01		6.51E-01
	1274.45	35.50	4.26E-03		4.18E-01
	105.31	20.70	2.56E-02	3.13E-01	3.13E-01
Pb-206	803.10	100.00	5.22E-02	1.12E-01	1.12E-01
Ac-228	338.32	11.40	4.02E-01	6.13E-01	7.87E-01
	911.07	27.70	6.49E-01		6.13E-01
	969.11	16.60	1.60E-01		9.41E-01
Th-234	63.29	3.80	-8.05E-01	1.74E+00	3.99E+00
	92.59	5.41	-2.13E-01		1.74E+00
U-235	143.76	10.50	-1.01E-01	1.42E-01	6.47E-01
	163.35	4.70	-1.40E-01		1.34E+00
	185.72	54.00	9.43E-02		1.42E-01
	205.31	4.70	-5.27E-01		1.43E+00
Np-237	311.98	38.60	-4.64E-02	1.61E-01	1.61E-01
Am-241	59.54	35.90	-1.48E-01	4.67E-01	4.67E-01

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



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Analysis Report for FSS-2014-0275  
FSSP-OOL10-11-012-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0275  
 Sample Description : FSSP-OOL10-11-012-F  
 Sample Type : 1L Soil

Sample Size : 1.256E+03 grams  
 Facility : Default

Sample Taken On : 4/28/2014 10:30:00AM  
 Acquisition Started : 4/29/2014 12:48:41PM

Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds

Dead Time : 0.01 %

Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1672

*Am. Russell 5-9-14*

*W. Sherman 5-9-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/9/2014 12:49:09PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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5/9/2014 12:49:28PM

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Analysis Report for FSS-2014-0275

FSSP-OOL10-11-012-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.52	148 -	157	153.03	1.01E+02	23.22	1.63E+02	2.56
F	2	238.52	471 -	483	477.00	1.34E+02	25.52	1.31E+02	1.37
F	3	351.81	698 -	709	703.58	7.62E+01	19.88	7.93E+01	1.61
F	4	583.26	1161 -	1172	1166.52	5.18E+01	15.80	3.44E+01	1.39
F	5	609.29	1214 -	1225	1218.58	5.69E+01	16.73	3.60E+01	1.62
F	6	1460.84	2914 -	2928	2921.50	1.57E+02	25.42	1.50E+01	2.05

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-xRay	0.50	77.11	*	100.00	1.59E-01	3.86E-02
		87.20		36.00		
K-40	1.00	1460.81	*	10.67	8.93E+00	1.53E+00
Tl-208	0.69	277.35		6.80		
		583.14	*	84.20	1.74E-01	5.40E-02
		860.37		12.46		
Pb-212	0.89	238.63	*	44.60	4.13E-01	8.24E-02
		300.09		3.41		
Bi-214	0.48	609.31	*	46.30	3.60E-01	1.08E-01
		1120.29		15.10		
		1764.49		15.80		

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Analysis Report for FSS-2014-0275

FSSP-OOL10-11-012-F

\* = 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 = 0.40  
 Errors quoted at 2.000sigma

## INTERFERENCE CORRECTED REPORT

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
Bi-xRay	0.508	1.59E-01	3.86E-02	
K-40	1.000	8.93E+00	1.53E+00	
Tl-208	0.693	1.74E-01	5.40E-02	
Pb-212	0.893	4.13E-01	8.24E-02	
Bi-214	0.486	3.60E-01	1.08E-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



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Analysis Report for FSS-2014-0275  
FSSP-OOL10-11-012-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on		: 5/9/2014 12:49:09PM			
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	351.81	1.27024E-01	13.04	Tol.	Pb-214

MA 5-9-14

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	8.93E+00	1.03E+00	1.03E+00
	Co-60	1173.22	100.00	-3.10E-02	6.79E-02	1.37E-01
		1332.49	100.00	-1.00E-01		6.79E-02
	Nb-94	702.63	100.00	-4.65E-03	8.10E-02	8.10E-02
		871.10	100.00	-3.41E-02		9.31E-02
	Ag-108m	79.20	7.10	-7.17E-01	6.60E-02	1.58E+00
		433.93	89.90	-6.31E-02		6.60E-02
		614.37	90.40	-2.76E-02		1.48E-01
		722.95	90.50	1.04E-02		1.12E-01
	Cs-134	569.31	15.43	3.19E-01	9.16E-02	5.97E-01
		604.70	97.60	-5.73E-02		1.29E-01
		795.84	85.40	1.18E-02		9.16E-02
	Cs-137	661.65	85.12	9.40E-02	1.25E-01	1.25E-01
	Eu-152	121.78	28.40	-1.47E-01	2.13E-01	2.13E-01
		244.69	7.49	-3.38E-01		8.64E-01
		344.27	26.50	-3.28E-01		2.45E-01
		778.89	12.74	-6.64E-01		6.65E-01
		867.32	4.16	-8.73E-01		2.18E+00

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Analysis Report for FSS-2014-0275

FSSP-OOL10-11-012-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	8.75E-01	2.13E-01	1.07E+00
	1085.78	10.00	-1.26E+00		9.59E-01
	1112.02	13.30	-6.96E-01		7.58E-01
	1407.95	20.70	1.26E-01		5.37E-01
Eu-154	123.07	40.50	-7.37E-02	1.51E-01	1.51E-01
	247.94	6.60	-5.34E-01		9.23E-01
	723.30	19.70	4.79E-02		5.13E-01
	873.19	11.50	-1.13E-01		8.80E-01
	996.32	10.30	-2.96E-01		8.10E-01
	1004.76	17.90	4.17E-01		5.87E-01
	1274.45	35.50	-5.72E-02		3.69E-01
Eu-155	105.31	20.70	1.02E-02	2.94E-01	2.94E-01
Pb-206	803.10	100.00	-5.11E-02	7.20E-02	7.20E-02
Ac-228	338.32	11.40	5.19E-01	4.77E-01	7.24E-01
	911.07	27.70	3.65E-01		4.77E-01
	969.11	16.60	7.17E-01		9.29E-01
Th-234	63.29	3.80	2.27E+00	1.48E+00	3.83E+00
	92.59	5.41	-1.05E-01		1.48E+00
U-235	143.76	10.50	-3.28E-01	1.21E-01	5.80E-01
	163.35	4.70	9.86E-01		1.29E+00
	185.72	54.00	3.74E-02		1.21E-01
	205.31	4.70	1.08E-02		1.37E+00
Np-237	311.98	38.60	3.59E-02	1.54E-01	1.54E-01
Am-241	59.54	35.90	-1.69E-01	4.50E-01	4.50E-01

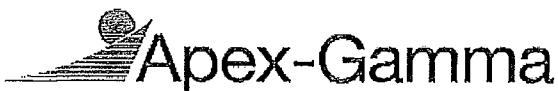
+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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



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Analysis Report for FSS-2014-0276  
FSSP-OOL10-11-013-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0276  
 Sample Description : FSSP-OOL10-11-013-F  
 Sample Type : 1L Soil  
  
 Sample Size : 1.366E+03 grams  
 Facility : Default  
  
 Sample Taken On : 4/29/2014 9:40:00AM  
 Acquisition Started : 4/30/2014 5:01:29PM  
  
 Procedure : 1L Soil HD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli HD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli HD

Sample Number : 1601

*Run Summary 5-1-14*

*M. Alderson 5-7-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 4/30/2014 5:11:36PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0276

FSSP-OOL10-11-013-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	77.07	148 -	159	154.13	6.42E+01	21.41	2.22E+02	1.05
F	2	238.52	471 -	483	477.00	1.29E+02	26.04	1.77E+02	1.05
F	3	351.87	699 -	710	703.70	8.65E+01	19.89	4.98E+01	1.53
F	4	583.28	1160 -	1171	1166.54	5.14E+01	16.06	4.03E+01	1.50
F	5	609.52	1213 -	1223	1219.03	4.64E+01	15.54	3.85E+01	1.42
F	6	1460.72	2913 -	2928	2921.27	1.70E+02	26.05	3.90E+00	2.22

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-xRay	0.54	77.11	*	100.00	1.18E-01	4.02E-02
		87.20		36.00		
K-40	0.99	1460.81	*	10.67	9.46E+00	1.54E+00
Tl-208	0.69	277.35		6.80		
		583.14	*	84.20	1.70E-01	5.40E-02
		860.37		12.46		
Pb-212	0.89	238.63	*	44.60	3.99E-01	8.39E-02
		300.09		3.41		
Bi-214	0.48	609.31	*	46.30	2.89E-01	9.83E-02
		1120.29		15.10		
		1764.49		15.80		

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Analysis Report for FSS-2014-0276  
FSSP-OOL10-11-013-F

\* = 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 = 0.40  
Errors quoted at 2.000sigma

## INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
Bi-xRay	0.543	1.18E-01	4.02E-02	
K-40	0.999	9.46E+00	1.54E+00	
Tl-208	0.694	1.70E-01	5.40E-02	
Pb-212	0.893	3.99E-01	8.39E-02	
Bi-214	0.481	2.89E-01	9.83E-02	

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

Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0276  
FSSP-OOL10-11-013-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 4/30/2014 5:11:38PM  
Peak Locate From Channel : 100  
Peak Locate To Channel : 4098

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F 3	351.87	1.44096E-01	11.50	Tol.	Pb-214

MA 5-7-14

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	9.46E+00	5.93E-01	5.93E-01
	Co-60	1173.22	100.00	-9.16E-03	9.65E-02	1.34E-01
		1332.49	100.00	3.52E-02		9.65E-02
	Nb-94	702.63	100.00	-2.83E-02	7.81E-02	7.81E-02
		871.10	100.00	-3.11E-02		8.52E-02
	Ag-108m	79.20	7.10	-4.33E-01	6.73E-02	1.81E+00
		433.93	89.90	2.75E-02		6.73E-02
		614.37	90.40	-5.41E-02		1.42E-01
		722.95	90.50	3.56E-02		1.10E-01
	Cs-134	569.31	15.43	3.19E-01	9.72E-02	5.94E-01
		604.70	97.60	6.19E-03		1.24E-01
		795.84	85.40	-4.10E-02		9.72E-02
	Cs-137	661.65	85.12	8.48E-02	1.05E-01	1.05E-01
	Eu-152	121.78	28.40	1.27E-01	2.22E-01	2.37E-01
		244.69	7.49	-1.82E-02		9.70E-01
		344.27	26.50	-2.47E-01		2.22E-01
		778.89	12.74	1.13E-01		8.07E-01
		867.32	4.16	1.38E+00		2.38E+00

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Analysis Report for FSS-2014-0276

FSSP-OOL10-11-013-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	9.50E-02	2.22E-01	8.42E-01
	1085.78	10.00	-3.19E-01		1.08E+00
	1112.02	13.30	-6.75E-01		8.26E-01
	1407.95	20.70	2.27E-02		4.44E-01
Eu-154	123.07	40.50	-1.28E-02	1.64E-01	1.64E-01
	247.94	6.60	-1.12E+00		8.51E-01
	723.30	19.70	1.64E-01		5.04E-01
	873.19	11.50	-2.55E-02		7.62E-01
	996.32	10.30	-5.11E-01		9.02E-01
	1004.76	17.90	-7.68E-02		5.08E-01
	1274.45	35.50	-5.08E-02		3.03E-01
	105.31	20.70	2.25E-02	3.11E-01	3.11E-01
Pb-206	803.10	100.00	-1.15E-02	8.55E-02	8.55E-02
Ac-228	338.32	11.40	1.91E-01	4.53E-01	6.34E-01
	911.07	27.70	3.61E-01		4.53E-01
	969.11	16.60	3.48E-01		7.45E-01
Th-234	63.29	3.80	4.62E-01	1.72E+00	4.55E+00
	92.59	5.41	1.24E+00		1.72E+00
U-235	143.76	10.50	4.61E-01	1.28E-01	6.76E-01
	163.35	4.70	-2.10E-01		1.22E+00
	185.72	54.00	1.04E-01		1.28E-01
	205.31	4.70	9.65E-01		1.43E+00
Np-237	311.98	38.60	4.59E-03	1.49E-01	1.49E-01
Am-241	59.54	35.90	-9.20E-02	5.41E-01	5.41E-01

+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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



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Analysis Report for FSS-2014-0277  
FSSP-OOL10-11-014-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0277  
 Sample Description : FSSP-OOL10-11-014-F  
 Sample Type : 1L Soil

Sample Size : 1.118E+03 grams  
 Facility : Default

Sample Taken On : 4/29/2014 10:05:00AM  
 Acquisition Started : 4/30/2014 5:16:31PM

Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds

Dead Time : 0.01 %

Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1602

*R. Smith 5-1-14*

*M. Adams 5-7-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 4/30/2014 5:26:38PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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4/30/2014 5:26:58PM

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Analysis Report for FSS-2014-0277

FSSP-OOL10-11-014-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.57	471 -	483	477.09	1.30E+02	25.33	1.47E+02	1.59
F	2	351.81	697 -	708	703.59	8.07E+01	19.94	7.25E+01	1.35
F	3	609.39	1215 -	1224	1218.77	5.45E+01	17.13	4.20E+01	1.67
F	4	1460.85	2916 -	2928	2921.52	2.09E+02	29.30	6.50E+00	2.17

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.81	*	10.67	1.34E+01	2.01E+00
Pb-212	0.89	238.63	*	44.60	4.50E-01	9.17E-02
		300.09		3.41		
Bi-214	0.48	609.31	*	46.30	3.88E-01	1.24E-01
		1120.29		15.10		
		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 = 0.40

Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0277

FSSP-OOL10-11-014-F

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*INTERFERENCE CORRECTED REPORT*

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<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	1.000	1.34E+01	2.01E+00	
Pb-212	0.895	4.50E-01	9.17E-02	
Bi-214	0.486	3.88E-01	1.24E-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

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Analysis Report for FSS-2014-0277  
FSSP-OOL10-11-014-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 4/30/2014 5:26:38PM  
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	351.81	1.34575E-01	12.35	Tol.	Pb-214

Wb 5-7-14

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.34E+01	7.94E-01	7.94E-01
	Co-60	1173.22	100.00	-1.85E-02	1.11E-01	1.40E-01
		1332.49	100.00	1.75E-02		1.11E-01
	Nb-94	702.63	100.00	3.69E-02	8.37E-02	1.08E-01
		871.10	100.00	3.92E-02		8.37E-02
	Ag-108m	79.20	7.10	-3.25E-01	8.66E-02	1.76E+00
		433.93	89.90	2.02E-02		8.66E-02
		614.37	90.40	-2.98E-02		1.73E-01
		722.95	90.50	-5.83E-02		1.27E-01
	Cs-134	569.31	15.43	2.35E-01	1.16E-01	6.85E-01
		604.70	97.60	-1.64E-01		1.48E-01
		795.84	85.40	2.64E-02		1.16E-01
	Cs-137	661.65	85.12	1.06E-01	1.42E-01	1.42E-01
	Eu-152	121.78	28.40	9.57E-02	2.50E-01	2.50E-01
		244.69	7.49	-7.28E-01		1.12E+00
		344.27	26.50	-3.75E-01		2.65E-01
		778.89	12.74	-3.57E-01		7.47E-01
		867.32	4.16	-5.59E-01		2.07E+00

4/30/2014 5:26:58PM

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Analysis Report for FSS-2014-0277

FSSP-OOL10-11-014-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	8.07E-01	2.50E-01	9.76E-01
	1085.78	10.00	5.49E-01		1.49E+00
	1112.02	13.30	-5.03E-01		8.99E-01
	1407.95	20.70	1.60E-01		6.25E-01
Eu-154	123.07	40.50	-2.46E-01	1.65E-01	1.65E-01
	247.94	6.60	-6.18E-01		1.12E+00
	723.30	19.70	-2.68E-01		5.84E-01
	873.19	11.50	-1.10E-01		7.03E-01
	996.32	10.30	-1.14E+00		9.73E-01
	1004.76	17.90	2.61E-01		7.41E-01
	1274.45	35.50	6.44E-02		4.79E-01
Eu-155	105.31	20.70	-1.66E-01	3.46E-01	3.46E-01
Pb-206	803.10	100.00	-3.16E-02	9.54E-02	9.54E-02
Ac-228	338.32	11.40	2.17E-01	6.15E-01	7.34E-01
	911.07	27.70	3.29E-01		6.15E-01
	969.11	16.60	9.01E-01		9.09E-01
Th-234	63.29	3.80	-2.32E-01	1.82E+00	4.23E+00
	92.59	5.41	7.70E-03		1.82E+00
U-235	143.76	10.50	1.86E-01	1.42E-01	7.15E-01
	163.35	4.70	8.03E-01		1.54E+00
	185.72	54.00	4.29E-02		1.42E-01
	205.31	4.70	4.12E-01		1.53E+00
Np-237	311.98	38.60	-1.55E-02	1.78E-01	1.78E-01
Am-241	59.54	35.90	-3.37E-01	5.04E-01	5.04E-01

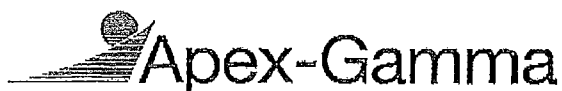
+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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



4/30/2014 5:41:59PM

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Analysis Report for FSS-2014-0278  
FSSP-OOL10-11-015-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0278  
 Sample Description : FSSP-OOL10-11-015-F  
 Sample Type : 1L Soil  
  
 Sample Size : 1.262E+03 grams  
 Facility : Default  
  
 Sample Taken On : 4/28/2014 8:20:30PM  
 Acquisition Started : 4/30/2014 5:31:33PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1603

*Ron Arnold 5-1-14*

*M. Arnold 5-9-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 4/30/2014 5:41:39PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0278

FSSP-OOL10-11-015-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.52	472 -	481	476.99	1.22E+02	27.21	1.86E+02	1.20
F	2	351.84	697 -	709	703.63	7.49E+01	18.49	4.77E+01	1.59
F	3	609.37	1212 -	1224	1218.74	6.01E+01	16.45	2.27E+01	1.57
F	4	1460.83	2915 -	2928	2921.48	1.84E+02	27.21	3.23E+00	2.12

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.81 *	10.67	1.05E+01	1.65E+00
Pb-212	0.89	238.63 *	44.60	3.75E-01	8.64E-02
		300.09	3.41		
Bi-214	0.48	609.31 *	46.30	3.79E-01	1.06E-01
		1120.29	15.10		
		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 = 0.40

Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0278  
FSSP-OOL10-11-015-F

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*INTERFERENCE CORRECTED REPORT*

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<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	1.000	1.05E+01	1.65E+00	
Pb-212	0.893	3.75E-01	8.64E-02	
Bi-214	0.486	3.79E-01	1.06E-01	

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

Errors quoted at 2.000sigma

4/30/2014 5:41:59PM

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Analysis Report for FSS-2014-0278

FSSP-OOL10-11-015-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 4/30/2014 5:41:39PM  
 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	351.84	1.24824E-01	12.34	Tol.	<del>Pb-214</del>

NA 5-9-14

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.05E+01	5.39E-01	5.39E-01
	Co-60	1173.22	100.00	-1.41E-02	9.38E-02	1.29E-01
		1332.49	100.00	-4.78E-02		9.38E-02
	Nb-94	702.63	100.00	1.86E-02	8.38E-02	8.38E-02
		871.10	100.00	4.24E-02		8.62E-02
	Ag-108m	79.20	7.10	7.44E-01	6.24E-02	1.60E+00
		433.93	89.90	2.45E-02		6.24E-02
		614.37	90.40	-4.54E-02		1.38E-01
		722.95	90.50	2.80E-02		1.08E-01
	Cs-134	569.31	15.43	7.22E-01	1.01E-01	6.77E-01
		604.70	97.60	4.30E-03		1.33E-01
		795.84	85.40	-7.87E-03		1.01E-01
	Cs-137	661.65	85.12	7.35E-02	1.22E-01	1.22E-01
	Eu-152	121.78	28.40	3.19E-03	2.20E-01	2.20E-01
		244.69	7.49	-1.73E-01		9.93E-01
		344.27	26.50	-3.50E-01		2.33E-01
		778.89	12.74	3.29E-02		7.31E-01
		867.32	4.16	-2.01E+00		1.84E+00



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Analysis Report for FSS-2014-0278

FSSP-OOL10-11-015-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	8.79E-01	2.20E-01	9.79E-01
	1085.78	10.00	2.97E-02		1.06E+00
	1112.02	13.30	-8.46E-01		7.76E-01
	1407.95	20.70	-9.24E-02		3.41E-01
Eu-154	123.07	40.50	2.82E-02	1.57E-01	1.57E-01
	247.94	6.60	-9.67E-01		9.53E-01
	723.30	19.70	1.29E-01		4.97E-01
	873.19	11.50	-2.63E-01		6.91E-01
	996.32	10.30	-5.03E-01		8.35E-01
	1004.76	17.90	-4.02E-02		5.44E-01
	1274.45	35.50	4.16E-02		3.34E-01
	105.31	20.70	-1.21E-01	3.05E-01	3.05E-01
Pb-206	803.10	100.00	-2.02E-02	8.65E-02	8.65E-02
Ac-228	338.32	11.40	4.68E-01	4.91E-01	7.25E-01
	911.07	27.70	4.12E-01		4.91E-01
	969.11	16.60	6.66E-01		8.05E-01
Th-234	63.29	3.80	1.68E+00	1.53E+00	3.82E+00
	92.59	5.41	2.43E-01		1.53E+00
U-235	143.76	10.50	2.16E-01	1.23E-01	5.82E-01
	163.35	4.70	5.53E-01		1.32E+00
	185.72	54.00	4.61E-02		1.23E-01
	205.31	4.70	3.67E-01		1.41E+00
Np-237	311.98	38.60	-6.47E-02	1.52E-01	1.52E-01
Am-241	59.54	35.90	-2.18E-01	4.45E-01	4.45E-01

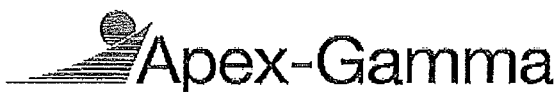
+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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



5/1/2014 4:23:26PM

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Analysis Report for FSS-2014-0279  
FSSP-OOL10-11-016-F-S

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0279  
 Sample Description : FSSP-OOL10-11-016-F-S  
 Sample Type : 1L Soil  
  
 Sample Size : 1.020E+03 grams  
 Facility : Default  
  
 Sample Taken On : 4/29/2014 9:30:00AM  
 Acquisition Started : 5/1/2014 4:13:01PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1613

*Am. Samuel 5-1-14*

*W. A. Simon 5-9-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/1/2014 4:23:07PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0279

FSSP-OOL10-11-016-F-S

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	77.17	152 -	159	154.32	4.46E+01	29.93	1.74E+02	0.67
F	2	238.25	470 -	482	476.46	1.01E+02	23.70	1.63E+02	1.48
F	3	351.78	696 -	709	703.53	9.08E+01	18.93	2.36E+01	1.77
F	4	1460.75	2915 -	2927	2921.32	1.33E+02	23.37	6.63E+00	1.97

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-xRay	0.54	77.11 *	100.00	8.55E-02	5.77E-02
		87.20 *	36.00		
K-40	0.99	1460.81 *	10.67	9.33E+00	1.72E+00
Pb-212	0.87	238.63 *	44.60	3.82E-01	9.28E-02
		300.09	3.41		

\* = 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 = 0.40  
Errors quoted at 2.000sigma

5/1/2014 4:23:26PM

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Analysis Report for FSS-2014-0279

FSSP-OOL10-11-016-F-S

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**INTERFERENCE CORRECTED REPORT**

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<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
Bi-xRay	0.548	8.55E-02	5.77E-02	
K-40	0.999	9.33E+00	1.72E+00	
Pb-212	0.874	3.82E-01	9.28E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 2.000sigma

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5/1/2014 4:23:26PM

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Analysis Report for FSS-2014-0279

FSSP-OOL10-11-016-F-S

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/1/2014 4:23:07PM  
 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	351.78	1.51355E-01	10.42	Tol.	Pb-214

#66 5-7-14

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	9.33E+00	8.80E-01	8.80E-01
	Co-60	1173.22	100.00	8.24E-02	1.05E-01	1.63E-01
		1332.49	100.00	4.97E-04		1.05E-01
	Nb-94	702.63	100.00	6.17E-02	9.50E-02	9.77E-02
		871.10	100.00	-7.48E-02		9.50E-02
	Ag-108m	79.20	7.10	8.58E-01	9.15E-02	1.85E+00
		433.93	89.90	8.47E-02		9.15E-02
		614.37	90.40	9.94E-02		1.44E-01
		722.95	90.50	5.23E-04		1.13E-01
	Cs-134	569.31	15.43	2.01E-01	1.22E-01	6.87E-01
		604.70	97.60	1.28E-01		1.43E-01
		795.84	85.40	5.07E-02		1.22E-01
	Cs-137	661.65	85.12	6.24E-02	1.24E-01	1.24E-01
	Eu-152	121.78	28.40	3.74E-03	2.43E-01	2.43E-01
		244.69	7.49	-5.15E-02		1.06E+00
		344.27	26.50	-3.72E-01		2.67E-01
		778.89	12.74	1.13E-01		8.54E-01
		867.32	4.16	-2.04E-01		2.56E+00

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Analysis Report for FSS-2014-0279

FSSP-OOL10-11-016-F-S

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	8.92E-01	2.43E-01	1.10E+00
	1085.78	10.00	-8.99E-01		1.14E+00
	1112.02	13.30	-8.73E-01		9.06E-01
	1407.95	20.70	2.46E-01		5.28E-01
Eu-154	123.07	40.50	-5.12E-02	1.69E-01	1.69E-01
	247.94	6.60	-2.23E+00		9.84E-01
	723.30	19.70	2.41E-03		5.19E-01
	873.19	11.50	-4.82E-02		8.81E-01
	996.32	10.30	1.73E-01		1.03E+00
	1004.76	17.90	-1.88E-02		6.90E-01
	1274.45	35.50	1.28E-01		3.80E-01
	105.31	20.70	1.92E-01		3.55E-01
Pb-206	803.10	100.00	-7.23E-02	1.14E-01	1.14E-01
Ac-228	338.32	11.40	9.07E-01	5.07E-01	8.05E-01
	911.07	27.70	1.30E-01		5.07E-01
	969.11	16.60	7.87E-01		9.96E-01
Th-234	63.29	3.80	4.56E-01	1.79E+00	3.86E+00
	92.59	5.41	1.03E+00		1.79E+00
U-235	143.76	10.50	5.24E-02	1.35E-01	6.68E-01
	163.35	4.70	-6.87E-01		1.45E+00
	185.72	54.00	5.98E-02		1.35E-01
	205.31	4.70	-4.26E-01		1.59E+00
Np-237	311.98	38.60	-2.15E-02	1.61E-01	1.61E-01
Am-241	59.54	35.90	2.43E-01	5.14E-01	5.14E-01

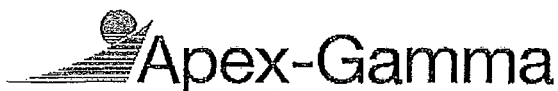
+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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



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Analysis Report for FSS-2014-0280  
FSSP-OOL10-11-017-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0280  
 Sample Description : FSSP-OOL10-11-017-F  
 Sample Type : 1L Soil  
  
 Sample Size : 1.195E+03 grams  
 Facility : Default  
  
 Sample Taken On : 4/29/2014 11:00:00AM  
 Acquisition Started : 4/30/2014 5:46:35PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1604

*Am Amund* 5-1-14

*M. S. H. H. H.* 5.7-14

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 4/30/2014 5:56:42PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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4/30/2014 5:57:01PM

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Analysis Report for FSS-2014-0280

FSSP-OOL10-11-017-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.52	470 -	483	477.00	1.16E+02	24.99	1.81E+02	1.43
F	2	338.08	673 -	679	676.11	3.17E+01	13.65	3.31E+01	1.12
F	3	351.70	699 -	709	703.35	7.92E+01	19.56	5.65E+01	1.33
F	4	609.27	1213 -	1223	1218.53	5.81E+01	17.09	3.81E+01	1.64
F	5	1460.85	2914 -	2928	2921.53	1.96E+02	28.24	1.12E+01	2.18

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.81	*	10.67	1.18E+01	1.81E+00
Pb-212	0.89	238.63	*	44.60	3.75E-01	8.40E-02
		300.09		3.41		
Bi-214	0.48	609.31	*	46.30	3.87E-01	1.16E-01
		1120.29		15.10		
		1764.49		15.80		



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Analysis Report for FSS-2014-0280

FSSP-OOL10-11-017-F

\* = 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 = 0.40  
 Errors quoted at 2.000sigma

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## INTERFERENCE CORRECTED REPORT

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<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	1.000	1.18E+01	1.81E+00	
Pb-212	0.893	3.75E-01	8.40E-02	
Bi-214	0.486	3.87E-01	1.16E-01	

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

Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0280

FSSP-OOL10-11-017-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 4/30/2014 5:58:42PM  
 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	338.08	5.28347E-02	21.53	Tol.	Ac-228
F 3	351.70	1.31994E-01	12.35	Tol.	Pb-214

4/4 5-7-14

M = First peak in a multiplet region  
 m = Other peak in a multiplet region  
 F = Filled singlet  
 Errors quoted at 2.00sigma

## NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.18E+01	9.56E-01	9.56E-01
	Co-60	1173.22	100.00	-6.27E-02	9.43E-02	1.04E-01
		1332.49	100.00	-1.62E-02		9.43E-02
	Nb-94	702.63	100.00	0.00E+00	8.87E-02	9.93E-02
		871.10	100.00	-4.41E-02		8.87E-02
	Ag-108m	79.20	7.10	3.67E-01	7.39E-02	1.64E+00
		433.93	89.90	-7.27E-02		7.39E-02
		614.37	90.40	-9.29E-02		1.59E-01
		722.95	90.50	6.78E-02		1.20E-01
	Cs-134	569.31	15.43	1.45E-01	1.19E-01	6.47E-01
		604.70	97.60	-9.11E-03		1.41E-01
		795.84	85.40	6.10E-02		1.19E-01
	Cs-137	661.65	85.12	4.45E-02	1.25E-01	1.25E-01
	Eu-152	121.78	28.40	-6.14E-02	2.14E-01	2.14E-01
		244.69	7.49	1.75E-04		1.02E+00
		344.27	26.50	-9.40E-02		2.41E-01
		778.89	12.74	3.65E-01		7.72E-01

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Analysis Report for FSS-2014-0280

FSSP-OOL10-11-017-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	867.32	4.16	-2.60E-01	2.14E-01	2.39E+00
	964.01	14.40	6.56E-01		1.03E+00
	1085.78	10.00	-3.88E-01		9.09E-01
	1112.02	13.30	-2.02E+00		1.02E+00
	1407.95	20.70	1.05E-01		5.23E-01
Eu-154	123.07	40.50	2.23E-02	1.51E-01	1.51E-01
	247.94	6.60	-2.05E+00		9.01E-01
	723.30	19.70	3.12E-01		5.53E-01
	873.19	11.50	-2.30E-01		7.73E-01
	996.32	10.30	-4.23E-01		1.15E+00
	1004.76	17.90	8.16E-02		6.81E-01
	1274.45	35.50	9.88E-02		4.11E-01
Eu-155	105.31	20.70	-1.03E-01	3.18E-01	3.18E-01
Pb-206	803.10	100.00	3.93E-02	1.06E-01	1.06E-01
Ac-228	338.32	11.40	5.91E-01	5.29E-01	7.57E-01
	911.07	27.70	6.02E-01		5.29E-01
	969.11	16.60	7.62E-01		8.50E-01
Th-234	63.29	3.80	1.70E+00	1.69E+00	4.01E+00
	92.59	5.41	7.38E-01		1.69E+00
U-235	143.76	10.50	4.17E-01	1.33E-01	5.99E-01
	163.35	4.70	6.46E-01		1.40E+00
	185.72	54.00	2.03E-02		1.33E-01
	205.31	4.70	-3.18E-01		1.46E+00
Np-237	311.98	38.60	1.24E-01	1.77E-01	1.77E-01
Am-241	59.54	35.90	4.45E-02	4.66E-01	4.66E-01

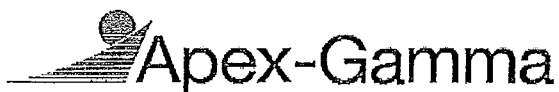
+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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



4/30/2014 6:12:03PM

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Analysis Report for FSS-2014-0281  
FSSP-OOL10-11-018-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0281  
 Sample Description : FSSP-OOL10-11-018-F  
 Sample Type : 1L Soil  
  
 Sample Size : 1.069E+03 grams  
 Facility : Default  
  
 Sample Taken On : 4/28/2014 12:00:00PM  
 Acquisition Started : 4/30/2014 6:01:36PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1605

*For Review 5-1-14*

*M. Aden 5-7-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 4/30/2014 6:11:43PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0281

FSSP-OOL10-11-018-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	186.02	367 -	377	372.00	4.08E+01	16.43	1.06E+02	1.02
F	2	238.61	471 -	480	477.17	1.12E+02	25.22	1.33E+02	1.39
F	3	351.97	699 -	707	703.90	8.19E+01	19.17	3.00E+01	1.41
F	4	609.40	1212 -	1225	1218.80	6.08E+01	15.90	1.61E+01	1.67
F	5	1460.91	2915 -	2929	2921.65	1.72E+02	26.26	0.00E+00	2.12

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81	*	10.67	1.15E+01	1.87E+00
Pb-212	0.89	238.63	*	44.60	4.08E-01	9.46E-02
		300.09		3.41		
Bi-214	0.48	609.31	*	46.30	4.53E-01	1.21E-01
		1120.29		15.10		
		1764.49		15.80		
U-235	0.55	143.76		10.50		
		163.35		4.70		
		185.72	*	54.00	1.05E-01	4.26E-02
		205.31		4.70		

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Analysis Report for FSS-2014-0281

FSSP-OOL10-11-018-F

\* = 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 = 0.40  
 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	0.998	1.15E+01	1.87E+00	
Pb-212	0.895	4.08E-01	9.46E-02	
Bi-214	0.486	4.53E-01	1.21E-01	
U-235/Ra226	0.550	1.05E-01	4.26E-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

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Analysis Report for FSS-2014-0281

FSSP-OOL10-11-018-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 4/30/2014 6:11:43PM  
 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	351.97	1.36514E-01	11.70	To1.	Pb-214

*NA 5-7-14 was 5.714  
5-7-14*

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.15E+01	1.81E-01	1.81E-01
	Co-60	1173.22	100.00	-4.49E-03	1.05E-01	1.44E-01
		1332.49	100.00	-1.39E-02		1.05E-01
	Nb-94	702.63	100.00	-2.72E-02	8.04E-02	8.04E-02
		871.10	100.00	-6.98E-03		8.44E-02
	Ag-108m	79.20	7.10	-4.15E-01	9.06E-02	1.71E+00
		433.93	89.90	-3.18E-02		9.06E-02
		614.37	90.40	-1.06E-02		1.63E-01
		722.95	90.50	5.16E-02		1.18E-01
	Cs-134	569.31	15.43	-2.58E-02	1.14E-01	6.94E-01
		604.70	97.60	-4.03E-02		1.52E-01
		795.84	85.40	2.29E-02		1.14E-01
	Cs-137	661.65	85.12	7.04E-02	1.42E-01	1.42E-01
	Eu-152	121.78	28.40	-3.34E-02	2.52E-01	2.52E-01
		244.69	7.49	-2.41E+00		1.02E+00
		344.27	26.50	-7.05E-02		2.99E-01
		778.89	12.74	-4.06E-01		7.64E-01
		867.32	4.16	-9.19E-01		2.37E+00

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Analysis Report for FSS-2014-0281

FSSP-OOL10-11-018-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	-1.16E-01	2.52E-01	1.04E+00
	1085.78	10.00	9.43E-01		1.48E+00
	1112.02	13.30	-8.59E-01		1.12E+00
	1407.95	20.70	2.52E-02		5.32E-01
Eu-154	123.07	40.50	8.22E-02	1.80E-01	1.80E-01
	247.94	6.60	-1.55E+00		9.70E-01
	723.30	19.70	2.37E-01		5.43E-01
	873.19	11.50	-3.89E-02		7.63E-01
	996.32	10.30	1.46E-01		1.22E+00
	1004.76	17.90	3.44E-01		8.01E-01
	1274.45	35.50	2.28E-02		4.24E-01
	105.31	20.70	-9.89E-02		3.36E-01
Pb-206	803.10	100.00	-7.14E-02	8.74E-02	8.74E-02
Ac-228	338.32	11.40	4.81E-01	5.54E-01	7.73E-01
	911.07	27.70	2.93E-01		5.54E-01
	969.11	16.60	8.53E-01		9.51E-01
Th-234	63.29	3.80	8.30E-01	1.79E+00	4.31E+00
	92.59	5.41	-1.72E-01		1.79E+00
+ U-235	143.76	10.50	3.91E-01	1.11E-01	6.53E-01
	163.35	4.70	-1.03E-02		1.55E+00
	185.72	* 54.00	1.05E-01		1.11E-01
	205.31	4.70	1.81E-01		1.56E+00
Np-237	311.98	38.60	-1.19E-01	1.71E-01	1.71E-01
Am-241	59.54	35.90	-7.21E-02	5.21E-01	5.21E-01

+ = Nuclide identified during the nuclide identification

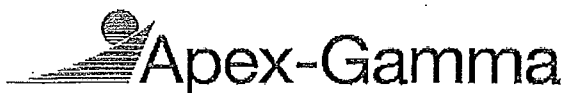
\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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





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Analysis Report for FSS-2014-0282  
FSSP-OOL10-11-019-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0282  
 Sample Description : FSSP-OOL10-11-019-F  
 Sample Type : 1L Soil  
  
 Sample Size : 1.107E+03 grams  
 Facility : Default  
  
 Sample Taken On : 4/28/2014 11:30:00AM  
 Acquisition Started : 4/30/2014 6:16:38PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1606

*Ken Samuel 5-1-14*

*M. Johnson 5-9-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 4/30/2014 6:26:45PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0282

FSSP-OOL10-11-019-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.49	471	481	476.93	9.58E+01	24.00	1.48E+02	1.34
F	2	1460.84	2914	2929	2921.52	2.02E+02	28.43	4.22E+00	2.14

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.81 *	10.67	1.31E+01	1.97E+00
Pb-212	0.89	238.63 *	44.60	3.36E-01	8.63E-02
		300.09	3.41		

\* = 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 = 0.40

Errors quoted at 2.000sigma

4/30/2014 6:27:03PM

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Analysis Report for FSS-2014-0282

FSSP-OOL10-11-019-F

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**INTERFERENCE CORRECTED REPORT**

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<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	1.000	1.31E+01	1.97E+00	
Pb-212	0.892	3.36E-01	8.63E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 2.000sigma

4/30/2014 6:27:03PM

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Analysis Report for FSS-2014-0282

FSSP-OOL10-11-019-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 4/30/2014 6:26:45PM  
 Peak Locate From Channel : 100  
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

## NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	*	10.67	1.31E+01	7.22E-01
	Co-60	1173.22	100.00	-2.84E-02	7.71E-02	1.23E-01
		1332.49	100.00	-8.18E-02		7.71E-02
	Nb-94	702.63	100.00	3.47E-02	9.57E-02	1.02E-01
		871.10	100.00	5.12E-03		9.57E-02
	Ag-108m	79.20	7.10	1.40E+00	7.98E-02	1.76E+00
		433.93	89.90	1.87E-02		7.98E-02
		614.37	90.40	2.14E-01		1.73E-01
		722.95	90.50	-2.80E-02		1.16E-01
	Cs-134	569.31	15.43	-2.73E-01	1.15E-01	5.75E-01
		604.70	97.60	1.89E-01		1.51E-01
		795.84	85.40	7.08E-03		1.15E-01
	Cs-137	661.65	85.12	9.92E-02	1.33E-01	1.33E-01
	Eu-152	121.78	28.40	5.28E-02	2.36E-01	2.36E-01
		244.69	7.49	-3.05E-01		1.03E+00
		344.27	26.50	-2.20E-01		2.65E-01
		778.89	12.74	-2.32E-01		7.55E-01
		867.32	4.16	-7.75E-01		2.53E+00
		964.01	14.40	9.95E-01		1.01E+00

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Analysis Report for FSS-2014-0282

FSSP-OOL10-11-019-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	1085.78	10.00	-4.99E-01	2.36E-01	1.12E+00
	1112.02	13.30	-9.25E-01		1.02E+00
	1407.95	20.70	-7.83E-02		4.57E-01
Eu-154	123.07	40.50	-5.38E-03	1.71E-01	1.71E-01
	247.94	6.60	-1.32E+00		9.66E-01
	723.30	19.70	-1.29E-01		5.33E-01
	873.19	11.50	-3.15E-01		7.63E-01
	996.32	10.30	4.08E-01		1.10E+00
	1004.76	17.90	-2.41E-02		5.87E-01
	1274.45	35.50	2.12E-02		3.61E-01
Eu-155	105.31	20.70	-2.48E-02	3.18E-01	3.18E-01
Pb-206	803.10	100.00	-7.63E-02	8.94E-02	8.94E-02
Ac-228	338.32	11.40	5.11E-01	5.02E-01	7.00E-01
	911.07	27.70	2.47E-01		5.02E-01
	969.11	16.60	7.13E-01		8.71E-01
Th-234	63.29	3.80	2.02E+00	1.68E+00	4.24E+00
	92.59	5.41	-3.03E-01		1.68E+00
U-235	143.76	10.50	-3.64E-02	1.41E-01	6.56E-01
	163.35	4.70	2.22E-01		1.43E+00
	185.72	54.00	1.44E-01		1.41E-01
	205.31	4.70	-7.01E-01		1.47E+00
Np-237	311.98	38.60	1.28E-02	1.77E-01	1.77E-01
Am-241	59.54	35.90	-8.99E-02	5.11E-01	5.11E-01

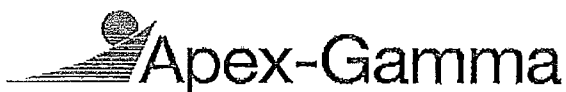
+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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



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Analysis Report for FSS-2014-0283  
FSSP-OOL10-11-020-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0283  
 Sample Description : FSSP-OOL10-11-020-F  
 Sample Type : 1L Soil

Sample Size : 1.110E+03 grams  
 Facility : Default

Sample Taken On : 4/28/2014 11:05:00AM  
 Acquisition Started : 4/30/2014 3:31:22PM

Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds

Dead Time : 0.01 %

Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1595

*Ron Arnold 5-1-14*

*M. Alderman 5-7-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 4/30/2014 3:41:29PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0283

FSSP-OOL10-11-020-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.49	473 -	482	476.93	1.52E+02	27.85	1.44E+02	1.43
F	2	295.24	586 -	595	590.43	4.52E+01	16.13	6.92E+01	1.00
F	3	351.72	697 -	709	703.40	8.44E+01	19.71	5.65E+01	1.50
F	4	609.56	1213 -	1226	1219.11	5.90E+01	16.15	2.56E+01	1.72
F	5	1461.02	2916 -	2929	2921.87	1.64E+02	26.11	1.69E+01	2.03

M = First peak in a multiplet region  
m = Other peak in a multiplet region  
F = Fitted singlet  
Errors quoted at 2,000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81 *	10.67	1.06E+01	1.78E+00
Pb-212	0.89	238.63 *	44.60	5.33E-01	1.02E-01
		300.09	3.41		
Bi-214	0.48	609.31 *	46.30	4.23E-01	1.18E-01
		1120.29	15.10		
		1764.49	15.80		
Pb-214	0.78	241.98	7.49		
		295.21 *	19.20	4.30E-01	1.55E-01
		351.92 *	37.20	4.77E-01	1.14E-01

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Analysis Report for FSS-2014-0283

FSSP-OOL10-11-020-F

\* = 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 = 0.40  
 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	0.993	1.06E+01	1.78E+00	
Pb-212	0.892	5.33E-01	1.02E-01	
Bi-214	0.480	4.23E-01	1.18E-01	
Pb-214	0.788	4.61E-01	9.20E-02	

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

Errors quoted at 2.000sigma



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Analysis Report for FSS-2014-0283  
FSSP-OOL10-11-020-F

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### UNIDENTIFIED PEAKS

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Peak Locate Performed on : 4/30/2014 3:41:29PM  
Peak Locate From Channel : 100  
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

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

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### NUCLIDE MDA REPORT

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Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.06E+01	1.20E+00	1.20E+00
	Co-60	1173.22	100.00	-5.32E-03	1.25E-01	1.44E-01
		1332.49	100.00	-9.60E-03		1.25E-01
	Nb-94	702.63	100.00	-5.84E-03	8.79E-02	8.79E-02
		871.10	100.00	-1.34E-02		1.10E-01
	Ag-108m	79.20	7.10	7.79E-01	7.84E-02	1.85E+00
		433.93	89.90	-1.32E-02		7.84E-02
		614.37	90.40	1.93E-02		1.62E-01
		722.95	90.50	3.22E-02		1.16E-01
	Cs-134	569.31	15.43	-1.50E-02	1.15E-01	6.39E-01
		604.70	97.60	-2.53E-02		1.45E-01
		795.84	85.40	5.83E-02		1.15E-01
	Cs-137	661.65	85.12	5.63E-03	1.14E-01	1.14E-01
	Eu-152	121.78	28.40	1.42E-01	2.37E-01	2.37E-01
		244.69	7.49	-3.73E-01		1.10E+00
		344.27	26.50	-3.19E-01		2.73E-01
		778.89	12.74	-2.30E-01		7.36E-01
		867.32	4.16	-7.63E-01		2.63E+00
		964.01	14.40	6.61E-01		9.84E-01

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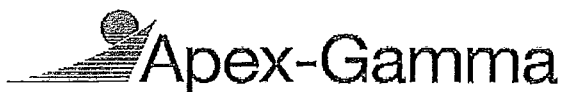
Analysis Report for FSS-2014-0283

FSSP-OOL10-11-020-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	1085.78	10.00	3.08E-01	2.37E-01	1.50E+00
	1112.02	13.30	-1.77E-01		8.82E-01
	1407.95	20.70	-2.31E-03		4.85E-01
Eu-154	123.07	40.50	-8.06E-02	1.61E-01	1.61E-01
	247.94	6.60	-1.27E+00		1.04E+00
	723.30	19.70	1.48E-01		5.32E-01
	873.19	11.50	3.89E-01		9.77E-01
	996.32	10.30	5.58E-01		1.20E+00
	1004.76	17.90	-2.40E-01		7.59E-01
	1274.45	35.50	1.85E-02		3.70E-01
Eu-155	105.31	20.70	-1.78E-01	3.39E-01	3.39E-01
Pb-206	803.10	100.00	-1.09E-01	7.87E-02	7.87E-02
Ac-228	338.32	11.40	-2.28E-02	6.04E-01	6.87E-01
	911.07	27.70	7.00E-01		6.04E-01
	969.11	16.60	4.99E-01		8.45E-01
Th-234	63.29	3.80	3.53E+00	1.71E+00	4.47E+00
	92.59	5.41	2.72E-01		1.71E+00
U-235	143.76	10.50	-3.12E-01	1.44E-01	6.43E-01
	163.35	4.70	1.27E+00		1.51E+00
	185.72	54.00	1.59E-01		1.44E-01
	205.31	4.70	-1.20E-01		1.54E+00
Np-237	311.98	38.60	-7.49E-02	1.42E-01	1.42E-01
Am-241	59.54	35.90	-3.50E-01	4.98E-01	4.98E-01

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



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Analysis Report for FSS-2014-0283rc  
FSSP-OOL10-11-020-F-RC

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0283rc  
 Sample Description : FSSP-OOL10-11-020-F-RC  
 Sample Type : 1L Soil

Sample Size : 1.110E+03 grams  
 Facility : Default

Sample Taken On : 4/28/2014 11:05:00AM  
 Acquisition Started : 4/30/2014 6:31:39PM

Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.0 seconds

Dead Time : 0.00 %

Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1607

*Rm Amiel* 5-1-14

*M. H. Brown* 5-1-14

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 4/30/2014 6:41:46PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0283rc

FSSP-OOL10-11-020-F-RC

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	77.05	152 -	159	154.09	2.31E+01	13.15	8.64E+01	0.69
F	2	238.59	473 -	481	477.14	4.04E+01	16.18	7.90E+01	0.98
F	3	1460.68	2916 -	2927	2921.20	7.32E+01	17.34	2.60E+00	2.05

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-xRay	0.54	77.11 *	100.00	4.09E-02	2.34E-02
		87.20	36.00		
K-40	0.99	1460.81 *	10.67	4.73E+00	1.15E+00
Pb-212	0.89	238.63 *	44.60	1.41E-01	5.72E-02
		300.09	3.41		

\* = 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 = 0.40

Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0283rc  
FSSP-OOL10-11-020-F-RC

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## INTERFERENCE CORRECTED REPORT

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<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
Bi-xRay	0.548	4.09E-02	2.34E-02	
K-40	0.997	4.73E+00	1.15E+00	
Pb-212	0.895	1.41E-01	5.72E-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

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Analysis Report for FSS-2014-0283rc  
FSSP-OOL10-11-020-F-RC

### UNIDENTIFIED PEAKS

Peak Locate Performed on : 4/30/2014 6:41:46PM  
Peak Locate From Channel : 100  
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

### NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	4.73E+00	5.45E-01	5.45E-01
	Co-60	1173.22	100.00	-3.89E-02	8.65E-02	8.65E-02
		1332.49	100.00	2.58E-02		1.02E-01
	Nb-94	702.63	100.00	8.57E-03	7.04E-02	7.04E-02
		871.10	100.00	2.13E-02		8.13E-02
	Ag-108m	79.20	7.10	-4.75E-02	5.59E-02	1.16E+00
		433.93	89.90	-7.79E-02		5.59E-02
		614.37	90.40	7.95E-02		1.09E-01
		722.95	90.50	1.79E-02		9.73E-02
	Cs-134	569.31	15.43	-6.79E-03	8.12E-02	4.22E-01
		604.70	97.60	7.28E-02		9.96E-02
		795.84	85.40	-2.88E-02		8.12E-02
	Cs-137	661.65	85.12	1.83E-02	8.90E-02	8.90E-02
	Eu-152	121.78	28.40	1.78E-02	1.78E-01	1.78E-01
		244.69	7.49	-2.56E-01		7.34E-01
		344.27	26.50	-2.55E-01		2.20E-01
		778.89	12.74	2.83E-01		6.03E-01
		867.32	4.16	1.40E+00		2.09E+00
		964.01	14.40	8.75E-01		9.26E-01

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Analysis Report for FSS-2014-0283rc

FSSP-OOL10-11-020-F-RC

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	1085.78	10.00	-1.21E-01	1.78E-01	9.79E-01
	1112.02	13.30	-1.41E-01		8.82E-01
	1407.95	20.70	2.26E-01		4.85E-01
Eu-154	123.07	40.50	-5.73E-03	1.25E-01	1.25E-01
	247.94	6.60	-9.44E-02		7.53E-01
	723.30	19.70	8.22E-02		4.47E-01
	873.19	11.50	-9.31E-01		5.51E-01
	996.32	10.30	-1.05E-01		8.84E-01
	1004.76	17.90	-6.50E-02		4.92E-01
	1274.45	35.50	1.04E-01		2.45E-01
	105.31	20.70	7.11E-02		2.31E-01
Eu-155	105.31	20.70	7.11E-02	2.31E-01	2.31E-01
Pb-206	803.10	100.00	-3.79E-02	6.28E-02	6.28E-02
Ac-228	338.32	11.40	-2.00E-02	4.12E-01	5.75E-01
	911.07	27.70	3.21E-01		4.12E-01
	969.11	16.60	6.40E-01		7.53E-01
Th-234	63.29	3.80	-1.71E-01	1.24E+00	2.58E+00
	92.59	5.41	5.15E-01		1.24E+00
U-235	143.76	10.50	1.28E-01	8.87E-02	4.64E-01
	163.35	4.70	2.55E-04		1.11E+00
	185.72	54.00	-1.43E-02		8.87E-02
	205.31	4.70	8.74E-01		1.25E+00
Np-237	311.98	38.60	3.02E-02	1.35E-01	1.35E-01
Am-241	59.54	35.90	-2.83E-01	2.85E-01	2.85E-01

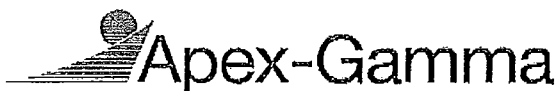
+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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



5/8/2014 11:26:06AM

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Analysis Report for FSS-2014-0284  
FSSP-OOL10-12-001-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0284  
 Sample Description : FSSP-OOL10-12-001-F  
 Sample Type : 1L Soil  
  
 Sample Size : 8.616E+02 grams  
 Facility : Default  
  
 Sample Taken On : 4/28/2014 9:05:00AM  
 Acquisition Started : 5/8/2014 11:15:41AM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.0 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1646

*[Signature]* *S. A. 14* *[Signature]* 5-9-14

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/8/2014 11:25:48AM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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5/8/2014 11:26:06AM

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Analysis Report for FSS-2014-0284

FSSP-OOL10-12-001-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	661.77	1318 -	1329	1323.55	5.90E+01	16.18	1.80E+01	1.72
F	2	1460.86	2915 -	2927	2921.54	8.91E+01	19.23	6.45E+00	1.82

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.81	*	10.67	7.41E+00	1.65E+00
Cs-137	0.99	661.65	*	85.12	3.18E-01	8.89E-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 = 0.40

Errors quoted at 2.000sigma

5/8/2014 11:26:06AM

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Analysis Report for FSS-2014-0284

FSSP-OOL10-12-001-F

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**INTERFERENCE CORRECTED REPORT**

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<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	1.000	7.41E+00	1.65E+00	
✓ Cs-137	0.998	3.18E-01	8.89E-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

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5/8/2014 11:26:06AM

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Analysis Report for FSS-2014-0284

FSSP-OOL10-12-001-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/8/2014 11:25:48AM  
 Peak Locate From Channel : 100  
 Peak Locate To Channel : 4096

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

All peaks were identified.

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

## NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	7.41E+00	1.03E+00	1.03E+00
	Co-60	1173.22	100.00	-3.72E-03	1.24E-01	1.50E-01
		1332.49	100.00	-1.22E-01		1.24E-01
	Nb-94	702.63	100.00	-1.44E-02	8.39E-02	8.39E-02
		871.10	100.00	-1.59E-02		9.62E-02
	Ag-108m	79.20	7.10	6.62E-01	8.42E-02	1.66E+00
		433.93	89.90	8.36E-03		8.42E-02
		614.37	90.40	2.00E-02		1.26E-01
		722.95	90.50	6.74E-02		1.49E-01
	Cs-134	569.31	15.43	5.88E-01	1.10E-01	8.09E-01
		604.70	97.60	-3.76E-02		1.20E-01
		795.84	85.40	2.37E-02		1.10E-01
+	Cs-137	661.65	* 85.12	3.18E-01	9.88E-02	9.88E-02
	Eu-152	121.78	28.40	-2.20E-01	2.34E-01	2.34E-01
		244.69	7.49	-2.47E+00		1.06E+00
		344.27	26.50	-3.99E-01		2.57E-01
		778.89	12.74	-6.55E-01		8.04E-01
		867.32	4.16	1.26E-01		2.51E+00
		964.01	14.40	7.19E-01		1.14E+00

5/8/2014 11:26:06AM

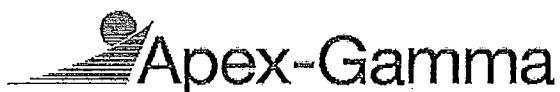
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Analysis Report for FSS-2014-0284

FSSP-OOL10-12-001-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	1085.78	10.00	-5.86E-01	2.34E-01	7.49E-01
	1112.02	13.30	-5.41E-01		8.01E-01
	1407.95	20.70	2.50E-01		5.88E-01
Eu-154	123.07	40.50	-3.74E-02	1.70E-01	1.70E-01
	247.94	6.60	-1.28E+00		9.96E-01
	723.30	19.70	3.10E-01		6.86E-01
	873.19	11.50	3.78E-02		8.78E-01
	996.32	10.30	-2.54E-01		9.44E-01
	1004.76	17.90	1.50E-01		5.47E-01
	1274.45	35.50	-2.62E-02		3.16E-01
	105.31	20.70	-1.26E-01		3.26E-01
Eu-155	105.31	20.70	-1.26E-01	3.26E-01	3.26E-01
Pb-206	803.10	100.00	-1.02E-01	7.06E-02	7.06E-02
Ac-228	338.32	11.40	1.27E-01	6.59E-01	6.59E-01
	911.07	27.70	7.50E-01		6.79E-01
	969.11	16.60	8.81E-01		1.01E+00
Th-234	63.29	3.80	-4.19E-01	1.82E+00	4.13E+00
	92.59	5.41	1.04E+00		1.82E+00
U-235	143.76	10.50	1.16E-01	1.50E-01	6.96E-01
	163.35	4.70	3.88E-01		1.41E+00
	185.72	54.00	1.38E-01		1.50E-01
	205.31	4.70	-3.56E-01		1.39E+00
Np-237	311.98	38.60	-2.41E-02	1.43E-01	1.43E-01
Am-241	59.54	35.90	4.75E-02	5.29E-01	5.29E-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



5/8/2014 11:41:07AM

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Analysis Report for FSS-2014-0285  
FSSP-OOL10-12-002-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0285  
 Sample Description : FSSP-OOL10-12-002-F  
 Sample Type : 1L Soil

Sample Size : 9.294E+02 grams  
 Facility : Default

Sample Taken On : 4/28/2014 9:10:00AM  
 Acquisition Started : 5/8/2014 11:30:42AM

Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.0 seconds

Dead Time : 0.01 %

Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1647

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/8/2014 11:40:49AM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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5/8/2014 11:41:07AM

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Analysis Report for FSS-2014-0285

FSSP-OOL10-12-002-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.57	471 -	483	477.11	1.22E+02	24.41	1.25E+02	1.49
F	2	351.87	699 -	708	703.70	5.40E+01	16.27	3.63E+01	1.19
F	3	1460.97	2916 -	2929	2921.78	1.34E+02	23.36	2.93E+00	2.09

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81	*	10.67	1.03E+01	1.89E+00
Pb-212	0.89	238.63	*	44.60	5.09E-01	1.06E-01
		300.09		3.41		

\* = 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 = 0.40

Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0285

FSSP-OOL10-12-002-F

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## INTERFERENCE CORRECTED REPORT

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<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	0.996	1.03E+01	1.89E+00	
Pb-212	0.895	5.09E-01	1.06E-01	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0285

FSSP-OOL10-12-002-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/8/2014 11:40:49AM  
 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	351.87	9.00031E-02	15.06	Tol.	Pb-214

WA 5-9-19

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

## NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.03E+01	6.93E-01	6.93E-01
	Co-60	1173.22	100.00	-5.49E-02	1.08E-01	1.39E-01
		1332.49	100.00	-6.51E-02		1.08E-01
	Nb-94	702.63	100.00	4.89E-02	9.32E-02	1.07E-01
		871.10	100.00	-5.96E-02		9.32E-02
	Ag-108m	79.20	7.10	-9.28E-01	1.00E-01	1.86E+00
		433.93	89.90	8.00E-02		1.00E-01
		614.37	90.40	2.34E-01		1.91E-01
		722.95	90.50	3.42E-02		1.40E-01
	Cs-134	569.31	15.43	3.49E-01	1.38E-01	7.96E-01
		604.70	97.60	1.05E-01		1.65E-01
		795.84	85.40	4.28E-02		1.38E-01
	Cs-137	661.65	85.12	1.62E-01	1.73E-01	1.73E-01
	Eu-152	121.78	28.40	-7.35E-02	2.34E-01	2.34E-01
		244.69	7.49	-4.82E-01		1.24E+00
		344.27	26.50	-6.50E-01		3.10E-01
		778.89	12.74	-2.87E-01		7.20E-01
		867.32	4.16	-9.47E-01		2.33E+00



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Analysis Report for FSS-2014-0285

FSSP-OOL10-12-002-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	1.01E+00	2.34E-01	1.19E+00
	1085.78	10.00	9.03E-02		1.52E+00
	1112.02	13.30	-8.86E-01		6.49E-01
	1407.95	20.70	6.96E-02		5.07E-01
Eu-154	123.07	40.50	-5.70E-03	1.69E-01	1.69E-01
	247.94	6.60	-1.59E+00		1.20E+00
	723.30	19.70	1.57E-01		6.46E-01
	873.19	11.50	4.41E-01		8.79E-01
	996.32	10.30	5.24E-01		1.31E+00
	1004.76	17.90	3.98E-02		6.80E-01
	1274.45	35.50	-1.45E-01		4.18E-01
	105.31	20.70	-5.96E-02	3.33E-01	3.33E-01
Pb-206	803.10	100.00	-4.46E-02	1.25E-01	1.25E-01
Ac-228	338.32	11.40	8.55E-01	5.48E-01	9.52E-01
	911.07	27.70	5.62E-01		5.48E-01
	969.11	16.60	5.88E-01		1.01E+00
Th-234	63.29	3.80	2.24E+00	1.90E+00	4.45E+00
	92.59	5.41	5.91E-01		1.90E+00
U-235	143.76	10.50	-9.29E-02	1.52E-01	6.28E-01
	163.35	4.70	-7.85E-01		1.41E+00
	185.72	54.00	1.38E-01		1.52E-01
	205.31	4.70	-5.14E-01		1.65E+00
Np-237	311.98	38.60	-3.68E-02	1.92E-01	1.92E-01
Am-241	59.54	35.90	-5.65E-02	5.28E-01	5.28E-01

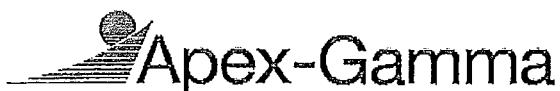
+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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



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Analysis Report for FSS-2014-0286  
FSSP-OOL10-12-003-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0286  
 Sample Description : FSSP-OOL10-12-003-F  
 Sample Type : 1L Soil  
  
 Sample Size : 1.372E+03 grams  
 Facility : Default  
  
 Sample Taken On : 4/30/2014 1:15:00PM  
 Acquisition Started : 5/8/2014 11:45:43AM  
  
 Procedure : 1L Soil HD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli HD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli HD

Sample Number : 1648

*[Signature]* 5-8-14

*[Signature]* 5-9-14

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/8/2014 11:55:50AM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0286

FSSP-OOL10-12-003-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.47	470 -	483	476.90	1.19E+02	23.87	1.09E+02	1.30
F	2	351.68	697 -	707	703.31	5.51E+01	16.45	3.05E+01	1.47
F	3	609.34	1214 -	1225	1218.67	4.66E+01	14.97	2.89E+01	1.39
F	4	661.84	1318 -	1330	1323.68	4.82E+01	14.95	2.39E+01	1.63
F	5	1460.93	2914 -	2928	2921.69	1.15E+02	21.67	7.56E+00	2.19

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81 *	10.67	6.39E+00	1.25E+00
Cs-137	0.99	661.65 *	85.12	1.74E-01	5.50E-02
Pb-212	0.89	238.63 *	44.60	3.68E-01	7.66E-02
		300.09	3.41		
Bi-214	0.48	609.31 *	46.30	2.89E-01	9.44E-02
		1120.29	15.10		
		1764.49	15.80		

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Analysis Report for FSS-2014-0286

FSSP-OOL10-12-003-F

\* = 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 = 0.40  
 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	0.998	6.39E+00	1.25E+00	
✓ Cs-137	0.994	1.74E-01	5.50E-02	
Pb-212	0.891	3.68E-01	7.66E-02	
Bi-214	0.485	2.89E-01	9.44E-02	

? = nuclide is part of an undetermined solution  
 X = nuclide rejected by the interference analysis  
 @ = nuclide contains energy lines not used in Weighted Mean Activity  
 Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0286  
FSSP-OOL10-12-003-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/8/2014 11:55:50AM  
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	351.68	9.18327E-02	14.92	Tol.	Pb-214

MA 5-9-14

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	6.39E+00	7.59E-01	7.59E-01
	Co-60	1173.22	100.00	-6.42E-03	9.71E-02	9.71E-02
		1332.49	100.00	-2.00E-02		1.08E-01
	Nb-94	702.63	100.00	-2.48E-02	7.94E-02	7.94E-02
		871.10	100.00	4.81E-02		9.51E-02
	Ag-108m	79.20	7.10	-2.66E-01	6.59E-02	1.58E+00
		433.93	89.90	2.67E-02		6.59E-02
		614.37	90.40	1.45E-02		1.32E-01
		722.95	90.50	4.89E-02		1.00E-01
	Cs-134	569.31	15.43	1.88E-01	9.51E-02	4.43E-01
+		604.70	97.60	-2.55E-02		1.25E-01
		795.84	85.40	-6.12E-03		9.51E-02
	Cs-137	661.65	* 85.12	1.74E-01	7.82E-02	7.82E-02
	Eu-152	121.78	28.40	-1.43E-01	1.77E-01	2.12E-01
		244.69	7.49	-5.87E-02		9.15E-01
		344.27	26.50	-2.79E-01		1.77E-01
		778.89	12.74	-9.53E-02		5.91E-01
		867.32	4.16	-4.32E-01		2.28E+00

5/8/2014 11:56:09AM

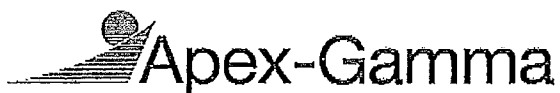
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Analysis Report for FSS-2014-0286

FSSP-OOL10-12-003-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	3.04E-01	1.77E-01	8.39E-01
	1085.78	10.00	-1.01E-01		9.39E-01
	1112.02	13.30	-6.47E-01		6.74E-01
	1407.95	20.70	1.66E-01		4.42E-01
Eu-154	123.07	40.50	-1.03E-01	1.51E-01	1.51E-01
	247.94	6.60	-5.84E-01		8.54E-01
	723.30	19.70	2.25E-01		4.61E-01
	873.19	11.50	-2.87E-01		7.96E-01
	996.32	10.30	-2.46E-01		9.00E-01
	1004.76	17.90	-1.65E-01		4.60E-01
	1274.45	35.50	-8.40E-02		2.92E-01
Eu-155	105.31	20.70	8.82E-02	3.08E-01	3.08E-01
Pb-206	803.10	100.00	2.88E-03	7.72E-02	7.72E-02
Ac-228	338.32	11.40	3.00E-01	4.88E-01	5.75E-01
	911.07	27.70	4.17E-01		4.88E-01
	969.11	16.60	7.64E-01		7.52E-01
Th-234	63.29	3.80	-4.36E-01	1.52E+00	4.20E+00
	92.59	5.41	-2.77E-01		1.52E+00
U-235	143.76	10.50	8.09E-02	1.15E-01	5.84E-01
	163.35	4.70	1.45E-03		1.28E+00
	185.72	54.00	2.51E-02		1.15E-01
	205.31	4.70	1.55E+00		1.44E+00
Np-237	311.98	38.60	3.91E-03	1.42E-01	1.42E-01
Am-241	59.54	35.90	-2.43E-01	4.95E-01	4.95E-01

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



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Analysis Report for FSS-2014-0287  
FSSP-OOL10-12-004-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0287  
 Sample Description : FSSP-OOL10-12-004-F  
 Sample Type : 1L Soil  
  
 Sample Size : 8.810E+02 grams  
 Facility : Default  
  
 Sample Taken On : 4/30/2014 1:25:00PM  
 Acquisition Started : 5/8/2014 12:00:44PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.0 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1649

*222 5-21-14*

*M. Alderman 5-9-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/8/2014 12:10:51PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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5/8/2014 12:11:11PM

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Analysis Report for FSS-2014-0287

FSSP-OOL10-12-004-F

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F 1	238.58	471 -	483	477.11	9.85E+01	22.57	1.22E+02	1.29
F 2	351.96	699 -	708	703.88	3.70E+01	14.23	4.34E+01	1.01
F 3	661.64	1318 -	1329	1323.28	6.17E+01	16.54	2.13E+01	1.60
F 4	1460.87	2914 -	2928	2921.57	1.46E+02	24.04	0.00E+00	2.27

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81 *	10.67	1.19E+01	2.06E+00
Cs-137	1.00	661.65 *	85.12	3.25E-01	8.89E-02
Pb-212	0.89	238.63 *	44.60	4.34E-01	1.03E-01
		300.09	3.41		

\* = 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 = 0.40

Errors quoted at 2.000sigma



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Analysis Report for FSS-2014-0287

FSSP-OOL10-12-004-F

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## INTERFERENCE CORRECTED REPORT

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<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	0.999	1.19E+01	2.06E+00	
✓ Cs-137	1.000	3.25E-01	8.89E-02	
Pb-212	0.895	4.34E-01	1.03E-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

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Analysis Report for FSS-2014-0287

FSSP-OOL10-12-004-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/8/2014 12:10:51PM  
 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	351.96	6.17489E-02	19.20	Tol.	Pb-214

NA 5-9-14

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.19E+01	2.20E-01	2.20E-01
	Co-60	1173.22	100.00	1.45E-02	1.21E-01	1.32E-01
		1332.49	100.00	2.54E-02		1.21E-01
	Nb-94	702.63	100.00	4.45E-02	1.17E-01	1.22E-01
		871.10	100.00	2.74E-02		1.17E-01
	Ag-108m	79.20	7.10	1.14E+00	1.00E-01	2.05E+00
		433.93	89.90	-2.28E-02		1.00E-01
		614.37	90.40	1.84E-01		1.72E-01
		722.95	90.50	7.45E-02		1.23E-01
	Cs-134	569.31	15.43	2.81E-01	1.55E-01	6.32E-01
+		604.70	97.60	1.54E-01		1.55E-01
		795.84	85.40	7.30E-02		1.71E-01
	Cs-137	661.65	* 85.12	3.25E-01	1.04E-01	1.04E-01
	Eu-152	121.78	28.40	-5.79E-02	2.59E-01	2.59E-01
		244.69	7.49	-3.73E-01		1.21E+00
		344.27	26.50	-8.81E-02		3.47E-01
		778.89	12.74	-3.51E-01		7.03E-01
		867.32	4.16	1.05E+00		2.88E+00

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Analysis Report for FSS-2014-0287

FSSP-OOL10-12-004-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	5.22E-01	2.59E-01	1.19E+00
	1085.78	10.00	-2.75E-02		1.33E+00
	1112.02	13.30	-1.12E+00		1.02E+00
	1407.95	20.70	3.05E-01		7.10E-01
Eu-154	123.07	40.50	4.84E-02	1.89E-01	1.89E-01
	247.94	6.60	-1.55E+00		1.12E+00
	723.30	19.70	3.43E-01		5.64E-01
	873.19	11.50	1.89E-01		9.60E-01
	996.32	10.30	-1.30E-01		1.31E+00
	1004.76	17.90	1.25E-01		7.59E-01
	1274.45	35.50	7.79E-02		4.41E-01
	105.31	20.70	-9.26E-02		3.39E-01
Pb-206	803.10	100.00	-1.80E-01	1.09E-01	1.09E-01
Ac-228	338.32	11.40	6.23E-01	5.49E-01	8.24E-01
	911.07	27.70	2.55E-01		5.49E-01
	969.11	16.60	5.19E-01		1.05E+00
Th-234	63.29	3.80	-1.21E+00	1.99E+00	4.42E+00
	92.59	5.41	3.37E-01		1.99E+00
U-235	143.76	10.50	5.71E-01	1.54E-01	7.35E-01
	163.35	4.70	-3.52E-01		1.51E+00
	185.72	54.00	8.84E-02		1.54E-01
	205.31	4.70	4.19E-01		1.83E+00
Np-237	311.98	38.60	-1.19E-02	1.98E-01	1.98E-01
Am-241	59.54	35.90	-2.81E-01	5.43E-01	5.43E-01

+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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



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Analysis Report for FSS-2014-0288  
FSSP-OOL10-12-005-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0288  
 Sample Description : FSSP-OOL10-12-005-F  
 Sample Type : 1L Soil  
  
 Sample Size : 9.561E+02 grams  
 Facility : Default  
  
 Sample Taken On : 4/30/2014 1:30:00PM  
 Acquisition Started : 5/8/2014 12:15:46PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.0 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1650

*[Signature]* 5-8-14

*[Signature]* 5-9-14

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/8/2014 12:25:52PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0288

FSSP-OOL10-12-005-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.37	472 -	482	476.70	7.63E+01	20.63	1.08E+02	1.30
F	2	351.91	698 -	709	703.78	4.86E+01	14.95	2.76E+01	1.35
F	3	609.49	1214 -	1224	1218.97	5.50E+01	15.59	1.84E+01	1.50
F	4	1461.04	2915 -	2929	2921.90	1.16E+02	21.71	3.45E+00	2.18

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81 *	10.67	8.71E+00	1.69E+00
Pb-212	0.88	238.63 *	44.60	3.10E-01	8.56E-02
		300.09	3.41		
Bi-214	0.48	609.31 *	46.30	4.57E-01	1.32E-01
		1120.29	15.10		
		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 = 0.40

Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0288

FSSP-OOL10-12-005-F

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## INTERFERENCE CORRECTED REPORT

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<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	0.992	8.71E+00	1.69E+00	
Pb-212	0.885	3.10E-01	8.56E-02	
Bi-214	0.483	4.57E-01	1.32E-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

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Analysis Report for FSS-2014-0288

FSSP-OOL10-12-005-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/8/2014 12:25:52PM  
 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 2	351.91	8.10677E-02	15.37	Tol.	Pb-214

WA 5.9.14

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	8.71E+00	7.40E-01	7.40E-01
	Co-60	1173.22	100.00	7.20E-02	9.76E-02	1.50E-01
		1332.49	100.00	3.72E-02		9.76E-02
	Nb-94	702.63	100.00	2.39E-02	9.74E-02	9.74E-02
		871.10	100.00	1.21E-02		9.79E-02
	Ag-108m	79.20	7.10	3.82E-01	9.50E-02	1.76E+00
		433.93	89.90	3.87E-02		9.50E-02
		614.37	90.40	-7.64E-02		1.74E-01
		722.95	90.50	5.43E-02		1.30E-01
	Cs-134	569.31	15.43	4.42E-01	1.37E-01	7.54E-01
		604.70	97.60	-4.84E-02		1.60E-01
		795.84	85.40	6.75E-02		1.37E-01
	Cs-137	661.65	85.12	4.57E-02	1.19E-01	1.19E-01
	Eu-152	121.78	28.40	2.17E-01	2.51E-01	2.51E-01
		244.69	7.49	-5.39E-01		1.03E+00
		344.27	26.50	-1.61E-01		3.04E-01
		778.89	12.74	1.77E-01		6.74E-01
		867.32	4.16	2.05E-01		2.51E+00

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Analysis Report for FSS-2014-0288

FSSP-OOL10-12-005-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	7.27E-01	2.51E-01	1.00E+00
	1085.78	10.00	6.29E-01		1.30E+00
	1112.02	13.30	-6.62E-01		8.01E-01
	1407.95	20.70	3.76E-02		2.76E-01
Eu-154	123.07	40.50	-9.01E-02	1.71E-01	1.71E-01
	247.94	6.60	-1.12E+00		1.02E+00
	723.30	19.70	2.50E-01		5.98E-01
	873.19	11.50	4.60E-01		9.13E-01
	996.32	10.30	-5.42E-01		1.07E+00
	1004.76	17.90	-1.77E-01		6.60E-01
	1274.45	35.50	-1.51E-01		3.03E-01
Eu-155	105.31	20.70	-1.46E-01	3.32E-01	3.32E-01
Pb-206	803.10	100.00	-4.35E-02	1.01E-01	1.01E-01
Ac-228	338.32	11.40	4.64E-01	5.58E-01	7.72E-01
	911.07	27.70	1.12E-01		5.58E-01
	969.11	16.60	6.86E-01		8.06E-01
Th-234	63.29	3.80	1.08E+00	1.63E+00	4.07E+00
	92.59	5.41	-9.58E-01		1.63E+00
U-235	143.76	10.50	3.69E-01	1.27E-01	6.53E-01
	163.35	4.70	-9.83E-01		1.29E+00
	185.72	54.00	7.46E-02		1.27E-01
	205.31	4.70	1.63E-01		1.43E+00
Np-237	311.98	38.60	7.34E-02	1.87E-01	1.87E-01
Am-241	59.54	35.90	-8.96E-02	4.98E-01	4.98E-01

+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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





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Analysis Report for FSS-2014-0289  
FSSP-OOL10-12-006-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0289  
 Sample Description : FSSP-OOL10-12-006-F  
 Sample Type : 1L Soil  
  
 Sample Size : 1.486E+03 grams  
 Facility : Default  
  
 Sample Taken On : 4/30/2014 1:17:00PM  
 Acquisition Started : 5/8/2014 12:30:47PM  
  
 Procedure : 1L Soil HD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli HD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli HD

Sample Number : 1651

*5-8-14*

*M. Alderman 5-9-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/8/2014 12:40:54PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0289

FSSP-OOL10-12-006-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	338.50	671 -	682	676.95	3.39E+01	13.85	5.96E+01	1.02
F	2	351.87	697 -	709	703.71	5.66E+01	16.75	5.63E+01	1.50
F	3	583.32	1162 -	1171	1166.62	3.09E+01	11.95	1.33E+01	1.13
F	4	609.31	1213 -	1224	1218.62	4.85E+01	15.10	2.69E+01	1.45
F	5	1461.06	2915 -	2928	2921.94	1.52E+02	24.65	3.45E+00	2.43

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.00sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81	*	10.67	7.78E+00	1.33E+00
Tl-208	0.69	277.35		6.80		
		583.14	*	84.20	9.38E-02	3.67E-02
		860.37		12.46		
Bi-214	0.48	609.31	*	46.30	2.77E-01	8.79E-02
		1120.29		15.10		
		1764.49		15.80		

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Analysis Report for FSS-2014-0289

FSSP-OOL10-12-006-F

\* = 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 = 0.40  
 Errors quoted at 2.000sigma

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## INTERFERENCE CORRECTED REPORT

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<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	0.990	7.78E+00	1.33E+00	
Tl-208	0.692	9.38E-02	3.67E-02	
Bi-214	0.485	2.77E-01	8.79E-02	

? = nuclide is part of an undetermined solution  
 X = nuclide rejected by the Interference analysis  
 @ = nuclide contains energy lines not used in Weighted Mean Activity  
 Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0289

FSSP-OOL10-12-006-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/8/2014 12:40:54PM  
 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	338.50	5.64743E-02	20.44	Tol.	Ac-228
F 2	351.87	9.42738E-02	14.81	Tol.	Pb-214

MA 5-9-14

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	7.78E+00	5.05E-01	5.05E-01
	Co-60	1173.22	100.00	4.06E-03	9.26E-02	1.06E-01
		1332.49	100.00	2.51E-02		9.26E-02
	Nb-94	702.63	100.00	-3.31E-02	7.02E-02	7.02E-02
		871.10	100.00	2.07E-02		7.83E-02
	Ag-108m	79.20	7.10	7.37E-01	6.37E-02	1.64E+00
		433.93	89.90	-1.57E-02		6.37E-02
		614.37	90.40	-7.38E-04		1.21E-01
		722.95	90.50	6.62E-02		9.53E-02
	Cs-134	569.31	15.43	1.13E-01	9.78E-02	4.47E-01
		604.70	97.60	2.15E-02		1.15E-01
		795.84	85.40	-8.97E-03		9.78E-02
	Cs-137	661.65	85.12	-1.04E-02	8.35E-02	8.35E-02
	Eu-152	121.78	28.40	-5.07E-02	1.99E-01	1.99E-01
		244.69	7.49	-1.31E+00		8.84E-01
		344.27	26.50	-5.54E-02		2.08E-01
		778.89	12.74	-3.15E-01		4.98E-01

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Analysis Report for FSS-2014-0289

FSSP-OOL10-12-006-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	867.32	4.16	-2.21E+00	1.99E-01	1.67E+00
	964.01	14.40	6.09E-02		6.51E-01
	1085.78	10.00	3.68E-01		8.93E-01
	1112.02	13.30	-1.53E-01		7.04E-01
	1407.95	20.70	5.25E-02		3.63E-01
Eu-154	123.07	40.50	-9.48E-02	1.41E-01	1.41E-01
	247.94	6.60	-1.30E+00		8.11E-01
	723.30	19.70	3.05E-01		4.39E-01
	873.19	11.50	3.09E-01		7.18E-01
	996.32	10.30	1.27E-02		7.59E-01
	1004.76	17.90	3.05E-02		4.68E-01
	1274.45	35.50	3.46E-02		3.03E-01
Eu-155	105.31	20.70	-7.96E-02	2.91E-01	2.91E-01
Pb-206	803.10	100.00	-3.28E-02	7.85E-02	7.85E-02
Ac-228	338.32	11.40	6.94E-01	4.31E-01	6.59E-01
	911.07	27.70	4.96E-01		4.31E-01
	969.11	16.60	3.85E-01		5.54E-01
Th-234	63.29	3.80	-8.82E-01	1.49E+00	3.81E+00
	92.59	5.41	1.19E+00		1.49E+00
U-235	143.76	10.50	4.09E-01	1.08E-01	5.63E-01
	163.35	4.70	-9.56E-02		1.16E+00
	185.72	54.00	1.70E-02		1.08E-01
	205.31	4.70	-2.82E-01		1.17E+00
Np-237	311.98	38.60	-7.22E-02	1.30E-01	1.30E-01
Am-241	59.54	35.90	-9.59E-02	4.59E-01	4.59E-01

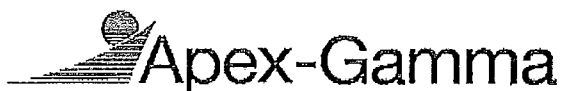
+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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



5/8/2014 12:56:12PM

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Analysis Report for FSS-2014-0290  
FSSP-OOL10-12-007-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0290  
 Sample Description : FSSP-OOL10-12-007-F  
 Sample Type : 1L Soil  
  
 Sample Size : 5.960E+02 grams  
 Facility : Default  
  
 Sample Taken On : 4/30/2014 1:50:00PM  
 Acquisition Started : 5/8/2014 12:45:48PM  
  
 Procedure : 1L Soil LD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli LD  
 Live Time : 600.0 seconds  
 Real Time : 600.0 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli LD

Sample Number : 1652

*[Signature]* 5-8-14 *[Signature]* 5-9-14

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/8/2014 12:55:54PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0290

FSSP-OOL10-12-007-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.51	472 -	480	476.97	4.60E+01	16.68	6.82E+01	0.99
F	2	351.97	700 -	709	703.89	3.42E+01	12.95	2.28E+01	1.25
F	3	1460.96	2916 -	2928	2921.75	6.55E+01	16.50	2.86E+00	1.69

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81 *	10.67	7.36E+00	1.90E+00
Pb-212	0.89	238.63 *	44.60	2.66E-01	9.76E-02
		300.09	3.41		

\* = 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 = 0.40

Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0290

FSSP-OOL10-12-007-F

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**INTERFERENCE CORRECTED REPORT**

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<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	0.996	7.36E+00	1.90E+00	
Pb-212	0.893	2.66E-01	9.76E-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

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Analysis Report for FSS-2014-0290

FSSP-OOL10-12-007-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/8/2014 12:55:54PM  
 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	351.97	5.70779E-02	18.91	Tol.	Pb-214

WA 5-9-14

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	7.36E+00	9.98E-01	9.98E-01
	Co-60	1173.22	100.00	4.44E-02	1.67E-01	1.74E-01
		1332.49	100.00	2.11E-02		1.67E-01
	Nb-94	702.63	100.00	-4.36E-04	1.09E-01	1.16E-01
		871.10	100.00	2.02E-02		1.09E-01
	Ag-108m	79.20	7.10	1.01E-01	9.72E-02	1.88E+00
		433.93	89.90	7.03E-02		9.72E-02
		614.37	90.40	4.02E-02		1.51E-01
		722.95	90.50	-2.95E-02		1.21E-01
	Cs-134	569.31	15.43	1.92E-01	1.64E-01	7.99E-01
		604.70	97.60	1.13E-01		1.66E-01
		795.84	85.40	3.15E-02		1.64E-01
	Cs-137	661.65	85.12	1.24E-01	2.24E-01	2.24E-01
	Eu-152	121.78	28.40	-4.48E-03	2.26E-01	2.26E-01
		244.69	7.49	-5.77E-01		1.18E+00
		344.27	26.50	-1.15E-01		3.21E-01
		778.89	12.74	-1.37E-02		7.74E-01
		867.32	4.16	-4.61E-02		2.60E+00

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Analysis Report for FSS-2014-0290

FSSP-OOL10-12-007-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	9.78E-01	2.26E-01	1.46E+00
	1085.78	10.00	-3.26E-01		1.22E+00
	1112.02	13.30	-9.52E-01		9.38E-01
	1407.95	20.70	1.90E-01		7.93E-01
Eu-154	123.07	40.50	-1.27E-01	1.53E-01	1.53E-01
	247.94	6.60	-1.08E+00		1.20E+00
	723.30	19.70	-1.36E-01		5.55E-01
	873.19	11.50	-2.46E-01		9.47E-01
	996.32	10.30	-2.36E-02		1.33E+00
	1004.76	17.90	-2.92E-01		5.25E-01
	1274.45	35.50	-3.24E-01		3.62E-01
Eu-155	105.31	20.70	-1.42E-01	3.39E-01	3.39E-01
Pb-206	803.10	100.00	7.68E-03	1.44E-01	1.44E-01
Ac-228	338.32	11.40	4.90E-01	5.44E-01	9.50E-01
	911.07	27.70	1.09E-01		5.44E-01
	969.11	16.60	7.88E-01		1.20E+00
Th-234	63.29	3.80	-5.97E-01	1.85E+00	4.19E+00
	92.59	5.41	-1.05E+00		1.85E+00
U-235	143.76	10.50	1.27E-01	1.51E-01	6.30E-01
	163.35	4.70	7.42E-01		1.63E+00
	185.72	54.00	8.09E-02		1.51E-01
	205.31	4.70	1.09E-01		1.69E+00
Np-237	311.98	38.60	-6.46E-02	1.90E-01	1.90E-01
Am-241	59.54	35.90	-5.04E-01	4.93E-01	4.93E-01

+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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



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Analysis Report for FSS-2014-0290RC  
FSSP-OOL10-12-007-F-RC

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0290RC  
 Sample Description : FSSP-OOL10-12-007-F-RC  
 Sample Type : 1L Soil  
  
 Sample Size : 5.960E+02 grams  
 Facility : Default  
  
 Sample Taken On : 4/30/2014 1:50:00PM  
 Acquisition Started : 5/8/2014 4:16:12PM  
  
 Procedure : 1L Soil LD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli LD  
 Live Time : 600.0 seconds  
 Real Time : 600.0 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli LD

Sample Number : 1671

*Dave 5-9-14*

*W. Alvarado 5-9-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/9/2014 9:11:35AM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0290RC

FSSP-OOL10-12-007-F-RC

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	1461.05	2917 -	2926	2921.93	5.61E+01	15.70	5.10E+00	1.88

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81 *	10.67	6.30E+00	1.80E+00

\* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.40

Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0290RC

FSSP-OOL10-12-007-F-RC

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**INTERFERENCE CORRECTED REPORT**

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<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	0.991	6.30E+00	1.80E+00	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0290RC  
FSSP-OOL10-12-007-F-RC

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### UNIDENTIFIED PEAKS

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Peak Locate Performed on : 5/9/2014 9:11:35AM  
Peak Locate From Channel : 100  
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

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### NUCLIDE MDA REPORT

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Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	6.30E+00	1.20E+00	1.20E+00
	Co-60	1173.22	100.00	-4.44E-02	1.67E-01	1.95E-01
		1332.49	100.00	7.79E-02		1.67E-01
	Nb-94	702.63	100.00	2.87E-02	1.28E-01	1.40E-01
		871.10	100.00	4.64E-02		1.28E-01
	Ag-108m	79.20	7.10	7.47E-01	1.08E-01	1.79E+00
		433.93	89.90	4.30E-02		1.08E-01
		614.37	90.40	1.07E-01		1.69E-01
		722.95	90.50	8.18E-02		1.66E-01
	Cs-134	569.31	15.43	3.83E-01	1.50E-01	6.31E-01
		604.70	97.60	3.37E-02		1.50E-01
		795.84	85.40	1.19E-02		1.58E-01
	Cs-137	661.65	85.12	1.78E-01	2.21E-01	2.21E-01
	Eu-152	121.78	28.40	-1.07E-01	2.47E-01	2.47E-01
		244.69	7.49	-2.65E+00		1.10E+00
		344.27	26.50	-1.95E-01		2.63E-01
		778.89	12.74	-2.54E-01		8.71E-01
		867.32	4.16	-2.68E+00		2.93E+00
		964.01	14.40	8.62E-01		1.40E+00

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Analysis Report for FSS-2014-0290RC

FSSP-OOL10-12-007-F-RC

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	1085.78	10.00	5.44E-02	2.47E-01	1.31E+00
	1112.02	13.30	-5.40E-01		1.25E+00
	1407.95	20.70	1.12E-01		5.22E-01
Eu-154	123.07	40.50	-8.18E-02	1.81E-01	1.81E-01
	247.94	6.60	-8.69E-01		1.12E+00
	723.30	19.70	3.76E-01		7.66E-01
	873.19	11.50	1.85E-01		1.12E+00
	996.32	10.30	8.41E-01		1.46E+00
	1004.76	17.90	-4.96E-01		7.32E-01
	1274.45	35.50	4.22E-01		6.07E-01
Eu-155	105.31	20.70	-1.55E-01	3.42E-01	3.42E-01
Pb-206	803.10	100.00	-2.56E-04	1.44E-01	1.44E-01
Ac-228	338.32	11.40	4.59E-01	7.23E-01	8.17E-01
	911.07	27.70	4.53E-01		7.23E-01
	969.11	16.60	6.48E-01		1.17E+00
Th-234	63.29	3.80	4.45E-01	2.02E+00	4.23E+00
	92.59	5.41	1.56E+00		2.02E+00
U-235	143.76	10.50	5.64E-01	1.63E-01	7.22E-01
	163.35	4.70	-7.64E-01		1.40E+00
	185.72	54.00	1.35E-01		1.63E-01
	205.31	4.70	9.44E-02		1.53E+00
Np-237	311.98	38.60	3.08E-02	1.94E-01	1.94E-01
Am-241	59.54	35.90	1.56E-01	5.34E-01	5.34E-01

+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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



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Analysis Report for FSS-2014-0291  
FSSP-OOL10-12-008-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0291  
 Sample Description : FSSP-OOL10-12-008-F  
 Sample Type : 1L Soil  
  
 Sample Size : 9,306E+02 grams  
 Facility : Default  
  
 Sample Taken On : 4/30/2014 2:10:00PM  
 Acquisition Started : 5/8/2014 1:00:49PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.0 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1653

*Peak 5-8-14*

*William 5-9-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/8/2014 1:10:56PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0291

FSSP-OOL10-12-008-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.53	472 -	483	477.02	8.97E+01	21.62	1.10E+02	1.18
F	2	609.43	1213 -	1223	1218.85	4.45E+01	14.34	1.93E+01	1.40
F	3	661.79	1319 -	1330	1323.57	5.49E+01	15.32	1.08E+01	1.69
F	4	1461.03	2915 -	2927	2921.88	1.17E+02	21.67	0.00E+00	1.89

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81 *	10.67	8.98E+00	1.74E+00
Cs-137	0.99	661.65 *	85.12	2.73E-01	7.79E-02
Pb-212	0.89	238.63 *	44.60	3.74E-01	9.27E-02
		300.09	3.41		
Bi-214	0.48	609.31 *	46.30	3.80E-01	1.24E-01
		1120.29	15.10		
		1764.49	15.80		

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Analysis Report for FSS-2014-0291

FSSP-OOL10-12-008-F

\* = 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 = 0.40  
 Errors quoted at 2.000sigma

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## INTERFERENCE CORRECTED REPORT

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Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.993	8.98E+00	1.74E+00	
✓ Cs-137	0.997	2.73E-01	7.79E-02	
Pb-212	0.894	3.74E-01	9.27E-02	
Bi-214	0.485	3.80E-01	1.24E-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

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5/8/2014 1:11:13PM

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Analysis Report for FSS-2014-0291

FSSP-OOL10-12-008-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/8/2014 1:10:56PM  
 Peak Locate From Channel : 100  
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

## NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	*	10.67	8.98E+00	2.08E-01
	Co-60	1173.22		100.00	2.41E-02	1.49E-01
		1332.49		100.00	1.63E-02	1.49E-01
	Nb-94	702.63		100.00	4.68E-02	1.12E-01
		871.10		100.00	2.18E-02	1.28E-01
	Ag-108m	79.20		7.10	1.44E+00	9.35E-02
		433.93		89.90	-1.72E-02	9.35E-02
		614.37		90.40	-6.63E-02	1.75E-01
		722.95		90.50	9.76E-02	1.38E-01
	Cs-134	569.31		15.43	1.59E-01	1.24E-01
		604.70		97.60	7.38E-04	1.56E-01
		795.84		85.40	3.10E-03	1.24E-01
+	Cs-137	661.65	*	85.12	2.73E-01	7.30E-02
	Eu-152	121.78		28.40	-2.51E-02	2.53E-01
		244.69		7.49	-2.29E-01	1.10E+00
		344.27		26.50	-5.91E-01	2.66E-01
		778.89		12.74	-2.22E-01	8.36E-01
		867.32		4.16	-2.19E+00	2.80E+00
		964.01		14.40	6.99E-02	1.19E+00

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Analysis Report for FSS-2014-0291

FSSP-OOL10-12-008-F

<i>Nuclide Name</i>	<i>Energy (keV)</i>	<i>Yield(%)</i>	<i>Activity (pCi/grams)</i>	<i>Nuclide MDA (pCi/grams)</i>	<i>Line MDA (pCi/grams)</i>
Eu-152	1085.78	10.00	1.36E-02	2.53E-01	1.25E+00
	1112.02	13.30	-8.57E-01		1.05E+00
	1407.95	20.70	-2.30E-01		5.06E-01
Eu-154	123.07	40.50	-3.07E-02	1.74E-01	1.74E-01
	247.94	6.60	-2.03E+00		9.84E-01
	723.30	19.70	4.49E-01		6.35E-01
	873.19	11.50	3.74E-01		1.12E+00
	996.32	10.30	5.28E-01		1.31E+00
	1004.76	17.90	-5.92E-01		6.35E-01
	1274.45	35.50	9.53E-02		4.42E-01
Eu-155	105.31	20.70	4.26E-02	3.79E-01	3.79E-01
Pb-206	803.10	100.00	-3.78E-02	1.09E-01	1.09E-01
Ac-228	338.32	11.40	3.92E-01	5.73E-01	8.39E-01
	911.07	27.70	2.98E-01		5.73E-01
	969.11	16.60	1.21E+00		1.11E+00
Th-234	63.29	3.80	8.83E-01	1.90E+00	4.38E+00
	92.59	5.41	1.29E+00		1.90E+00
U-235	143.76	10.50	-9.66E-01	1.57E-01	6.47E-01
	163.35	4.70	-9.02E-01		1.52E+00
	185.72	54.00	1.06E-01		1.57E-01
	205.31	4.70	4.12E-01		1.62E+00
Np-237	311.98	38.60	4.93E-02	1.81E-01	1.81E-01
Am-241	59.54	35.90	4.78E-02	5.58E-01	5.58E-01

+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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



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Analysis Report for FSS-2014-0292  
FSSP-OOL10-12-009-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0292  
 Sample Description : FSSP-OOL10-12-009-F  
 Sample Type : 1L Soil  
  
 Sample Size : 9.243E+02 grams  
 Facility : Default  
  
 Sample Taken On : 4/30/2014 2:00:00PM  
 Acquisition Started : 5/8/2014 1:15:50PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.0 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1654

*PR-22 SQ-14*

*Miss Hume 5-9-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/8/2014 1:25:57PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0292

FSSP-OOL10-12-009-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.99	148 -	157	153.96	6.24E+01	21.14	1.71E+02	1.10
F	2	185.90	369 -	377	371.77	3.82E+01	17.20	1.19E+02	0.98
F	3	238.56	472 -	481	477.08	1.27E+02	26.02	1.29E+02	1.13
F	4	351.96	697 -	710	703.89	5.72E+01	16.26	4.20E+01	1.45
F	5	1460.95	2914 -	2929	2921.74	1.45E+02	24.23	8.00E+00	2.22

M = First peak in a multiplet region  
m = Other peak in a multiplet region  
F = Fitted singlet  
Errors quoted at 2.00sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-xRay	0.54	77.11 *	100.00	1.32E-01	4.60E-02
		87.20	36.00		
K-40	0.99	1460.81 *	10.67	1.12E+01	1.97E+00
Pb-212	0.89	238.63 *	44.60	5.32E-01	1.13E-01
		300.09	3.41		
U-235	0.55	143.76	10.50		
		163.35	4.70		
		185.72 *	54.00	1.13E-01	5.14E-02
		205.31	4.70		

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Analysis Report for FSS-2014-0292

FSSP-OOL10-12-009-F

\* = 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 = 0.40  
 Errors quoted at 2.000sigma

## INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
Bi-xRay	0.547	1.32E-01	4.60E-02	
K-40	0.997	1.12E+01	1.97E+00	
Pb-212	0.894	5.32E-01	1.13E-01	
U-235/Ra-226	0.557	1.13E-01	5.14E-02	

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

Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0292

FSSP-OOL10-12-009-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/8/2014 1:25:57PM  
 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 4	351.96	9.52886E-02	14.22	Tol.	Pb-214

MA 5-9-14

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\Default\Library\HBPP.NLB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.12E+01	1.09E+00
	Co-60	1173.22	100.00	-1.33E-01	1.16E-01
		1332.49	100.00	-3.35E-02	1.16E-01
	Nb-94	702.63	100.00	2.84E-02	1.18E-01
		871.10	100.00	4.90E-03	1.18E-01
	Ag-108m	79.20	7.10	-7.70E-01	8.83E-02
		433.93	89.90	2.08E-02	8.83E-02
		614.37	90.40	1.19E-01	1.76E-01
		722.95	90.50	9.95E-02	1.39E-01
	Cs-134	569.31	15.43	3.03E-01	1.44E-01
		604.70	97.60	1.68E-01	1.67E-01
		795.84	85.40	3.94E-02	1.44E-01
	Cs-137	661.65	85.12	5.74E-02	1.44E-01
	Eu-152	121.78	28.40	-1.96E-01	2.62E-01
		244.69	7.49	-1.40E-01	1.19E+00
		344.27	26.50	-2.96E-01	3.11E-01
		778.89	12.74	2.11E-01	8.84E-01
		867.32	4.16	-5.37E-02	2.89E+00



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Analysis Report for FSS-2014-0292

FSSP-OOL10-12-009-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	7.97E-01	2.62E-01	1.15E+00
	1085.78	10.00	-2.34E-01		1.49E+00
	1112.02	13.30	2.56E-01		1.00E+00
	1407.95	20.70	2.33E-01		5.48E-01
Eu-154	123.07	40.50	-1.85E-01	1.89E-01	1.89E-01
	247.94	6.60	-2.50E+00		1.09E+00
	723.30	19.70	4.58E-01		6.39E-01
	873.19	11.50	-1.77E-01		1.05E+00
	996.32	10.30	3.06E-01		1.06E+00
	1004.76	17.90	-3.77E-01		5.10E-01
	1274.45	35.50	3.60E-02		4.91E-01
Eu-155	105.31	20.70	-2.38E-04	3.83E-01	3.83E-01
Pb-206	803.10	100.00	-5.42E-02	9.78E-02	9.78E-02
Ac-228	338.32	11.40	4.82E-01	6.55E-01	8.57E-01
	911.07	27.70	5.15E-01		6.55E-01
	969.11	16.60	4.09E-01		9.99E-01
Th-234	63.29	3.80	4.30E+00	2.09E+00	4.98E+00
	92.59	5.41	-2.77E-02		2.09E+00
+ U-235	143.76	10.50	-4.01E-02	1.28E-01	7.43E-01
	163.35	4.70	6.42E-01		1.69E+00
	185.72	* 54.00	1.13E-01		1.28E-01
	205.31	4.70	-2.73E-01		1.58E+00
Np-237	311.98	38.60	-9.00E-03	1.75E-01	1.75E-01
Am-241	59.54	35.90	-1.33E-01	5.62E-01	5.62E-01

+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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



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Analysis Report for FSS-2014-0293  
FSSP-OOL10-12-010-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0293  
 Sample Description : FSSP-OOL10-12-010-F  
 Sample Type : 1L Soil  
  
 Sample Size : 1.307E+03 grams  
 Facility : Default  
  
 Sample Taken On : 4/30/2014 1:05:00PM  
 Acquisition Started : 5/8/2014 1:30:52PM  
  
 Procedure : 1L Soil HD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli HD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli HD

Sample Number : 1655

*1655-8-14*

*W. J. Herman 5-9-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/8/2014 1:40:58PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0293

FSSP-OOL10-12-010-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.55	472 -	483	477.06	1.40E+02	26.23	1.39E+02	1.48
F	2	351.92	699 -	709	703.79	8.61E+01	19.69	3.98E+01	1.43
F	3	583.14	1160 -	1170	1166.26	3.44E+01	13.44	2.64E+01	1.25
F	4	609.39	1213 -	1225	1218.77	6.01E+01	16.65	3.01E+01	1.53
F	5	1461.06	2914 -	2930	2921.96	1.14E+02	21.38	0.00E+00	1.95

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81 *	10.67	6.66E+00	1.30E+00
Tl-208	0.69	277.35	6.80		
		583.14 *	84.20	1.19E-01	4.69E-02
		860.37	12.46		
Pb-212	0.89	238.63 *	44.60	4.52E-01	8.88E-02
		300.09	3.41		
Bi-214	0.48	609.31 *	46.30	3.91E-01	1.11E-01
		1120.29	15.10		
		1764.49	15.80		

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Analysis Report for FSS-2014-0293

FSSP-OOL10-12-010-F

\* = 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 = 0.40  
 Errors quoted at 2.000sigma

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## INTERFERENCE CORRECTED REPORT

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<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	0.990	6.66E+00	1.30E+00	
Tl-208	0.696	1.19E-01	4.69E-02	
Pb-212	0.894	4.52E-01	8.88E-02	
Bi-214	0.485	3.91E-01	1.11E-01	

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

Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0293

FSSP-OOL10-12-010-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/8/2014 1:40:58PM  
 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 2	351.92	1.43442E-01	11.44	Tol.	Pb-214

WA 5-9-14

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	6.66E+00	1.58E-01	1.58E-01
	Co-60	1173.22	100.00	-5.91E-02	1.02E-01	1.02E-01
		1332.49	100.00	2.18E-02		1.05E-01
	Nb-94	702.63	100.00	2.02E-02	6.78E-02	8.65E-02
		871.10	100.00	-4.37E-02		6.78E-02
	Ag-108m	79.20	7.10	-3.26E-01	6.33E-02	1.88E+00
		433.93	89.90	-8.33E-03		6.33E-02
		614.37	90.40	-2.77E-02		1.53E-01
		722.95	90.50	2.56E-02		9.98E-02
	Cs-134	569.31	15.43	1.46E-01	8.94E-02	6.43E-01
		604.70	97.60	-2.19E-02		1.35E-01
		795.84	85.40	-2.06E-02		8.94E-02
	Cs-137	661.65	85.12	1.19E-02	9.49E-02	9.49E-02
	Eu-152	121.78	28.40	-5.07E-02	2.40E-01	2.50E-01
		244.69	7.49	-5.06E-02		9.83E-01
		344.27	26.50	-5.31E-01		2.40E-01
		778.89	12.74	2.40E-01		7.82E-01
		867.32	4.16	0.00E+00		1.70E+00

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Analysis Report for FSS-2014-0293

FSSP-OOL10-12-010-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	7.28E-01	2.40E-01	9.66E-01
	1085.78	10.00	7.88E-01		1.13E+00
	1112.02	13.30	-1.08E+00		5.96E-01
	1407.95	20.70	2.34E-01		4.64E-01
Eu-154	123.07	40.50	-2.74E-02	1.73E-01	1.73E-01
	247.94	6.60	-7.81E-01		9.47E-01
	723.30	19.70	1.18E-01		4.59E-01
	873.19	11.50	-3.11E-01		6.18E-01
	996.32	10.30	2.77E-01		1.04E+00
	1004.76	17.90	4.55E-01		6.54E-01
	1274.45	35.50	1.52E-01		3.17E-01
Eu-155	105.31	20.70	1.30E-01	3.29E-01	3.29E-01
Pb-206	803.10	100.00	-1.97E-02	7.64E-02	7.64E-02
Ac-228	338.32	11.40	6.45E-01	4.61E-01	6.98E-01
	911.07	27.70	2.93E-01		4.61E-01
	969.11	16.60	6.15E-01		8.61E-01
Th-234	63.29	3.80	7.22E-01	1.66E+00	4.82E+00
	92.59	5.41	-6.87E-02		1.66E+00
U-235	143.76	10.50	1.60E-01	1.32E-01	6.01E-01
	163.35	4.70	2.81E-01		1.31E+00
	185.72	54.00	1.04E-01		1.32E-01
	205.31	4.70	1.37E+00		1.47E+00
Np-237	311.98	38.60	4.33E-02	1.47E-01	1.47E-01
Am-241	59.54	35.90	-1.25E-01	5.91E-01	5.91E-01

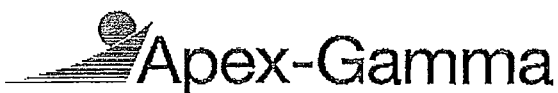
+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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



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Analysis Report for FSS-2014-0294  
FSSP-OOL10-12-011-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0294  
 Sample Description : FSSP-OOL10-12-011-F  
 Sample Type : 1L Soil  
  
 Sample Size : 9.662E+02 grams  
 Facility : Default  
  
 Sample Taken On : 4/30/2014 1:40:00PM  
 Acquisition Started : 5/8/2014 1:45:53PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1656

*ASD 58-14*

*M. Alderman 5-9-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/8/2014 1:56:00PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0294

FSSP-OOL10-12-011-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.61	473 -	483	477.18	9.93E+01	24.30	1.78E+02	1.22
F	2	351.74	698 -	709	703.45	5.06E+01	15.73	4.38E+01	0.92
F	3	583.55	1163 -	1170	1167.08	3.30E+01	13.19	2.62E+01	1.11
F	4	609.48	1214 -	1223	1218.96	4.29E+01	15.19	3.73E+01	1.38
F	5	911.65	1817 -	1828	1823.34	3.00E+01	11.56	1.21E+01	1.30
F	6	1460.99	2915 -	2927	2921.80	1.45E+02	24.60	9.61E+00	2.01

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81	*	10.67	1.08E+01	1.92E+00
Tl-208	0.67	277.35		6.80		
		583.14	*	84.20	1.44E-01	5.82E-02
		860.37		12.46		
Pb-212	0.89	238.63	*	44.60	3.99E-01	1.00E-01
		300.09		3.41		
Bi-214	0.48	609.31	*	46.30	3.53E-01	1.27E-01
		1120.29		15.10		
		1764.49		15.80		



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Analysis Report for FSS-2014-0294

FSSP-OOL10-12-011-F

\* = 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 = 0.40  
 Errors quoted at 2.000sigma

## INTERFERENCE CORRECTED REPORT

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	0.995	1.08E+01	1.92E+00	
Tl-208	0.674	1.44E-01	5.82E-02	
Pb-212	0.895	3.99E-01	1.00E-01	
Bi-214	0.484	3.53E-01	1.27E-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

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Analysis Report for FSS-2014-0294

FSSP-OOL10-12-011-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/8/2014 1:56:00PM  
 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	351.74	8.44012E-02	15.53	Tol.	Pb-214
F 5	911.65	5.00027E-02	19.26	Tol.	Ac-228

WA 5-9-14

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.08E+01	1.06E+00	1.06E+00
	Co-60	1173.22	100.00	3.69E-02	1.41E-01	1.41E-01
		1332.49	100.00	-1.37E-02		1.44E-01
	Nb-94	702.63	100.00	4.87E-02	1.00E-01	1.17E-01
		871.10	100.00	1.94E-02		1.00E-01
	Ag-108m	79.20	7.10	3.99E-01	8.44E-02	1.82E+00
		433.93	89.90	-1.56E-02		8.44E-02
		614.37	90.40	-9.31E-02		1.73E-01
		722.95	90.50	7.43E-02		1.24E-01
	Cs-134	569.31	15.43	3.13E-02	1.20E-01	6.82E-01
		604.70	97.60	-4.68E-02		1.65E-01
		795.84	85.40	7.38E-02		1.20E-01
	Cs-137	661.65	85.12	1.56E-01	1.61E-01	1.61E-01
	Eu-152	121.78	28.40	3.25E-03	2.42E-01	2.42E-01
		244.69	7.49	-4.74E-01		1.27E+00
		344.27	26.50	-4.15E-01		2.88E-01
		778.89	12.74	5.68E-01		9.56E-01

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Analysis Report for FSS-2014-0294

FSSP-OOL10-12-011-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	867.32	4.16	-1.16E+00	2.42E-01	2.32E+00
	964.01	14.40	9.28E-01		1.16E+00
	1085.78	10.00	-1.89E-01		1.43E+00
	1112.02	13.30	-1.07E+00		1.09E+00
	1407.95	20.70	-8.36E-02		5.90E-01
Eu-154	123.07	40.50	7.17E-02	1.77E-01	1.77E-01
	247.94	6.60	-3.07E+00		9.95E-01
	723.30	19.70	3.42E-01		5.71E-01
	873.19	11.50	-6.59E-01		8.45E-01
	996.32	10.30	3.64E-01		1.29E+00
	1004.76	17.90	1.46E-01		7.11E-01
	1274.45	35.50	1.32E-01		4.37E-01
Eu-155	105.31	20.70	7.00E-02	3.46E-01	3.46E-01
Pb-206	803.10	100.00	-4.93E-02	9.04E-02	9.04E-02
Ac-228	338.32	11.40	3.61E-01	6.48E-01	8.72E-01
	911.07	27.70	5.49E-01		6.48E-01
	969.11	16.60	7.40E-01		9.98E-01
Th-234	63.29	3.80	2.88E+00	1.94E+00	4.61E+00
	92.59	5.41	1.45E+00		1.94E+00
U-235	143.76	10.50	-2.08E-01	1.59E-01	6.70E-01
	163.35	4.70	4.91E-01		1.59E+00
	185.72	54.00	1.19E-01		1.59E-01
	205.31	4.70	-2.63E-01		1.56E+00
Np-237	311.98	38.60	3.22E-02	1.95E-01	1.95E-01
Am-241	59.54	35.90	-9.88E-02	5.28E-01	5.28E-01

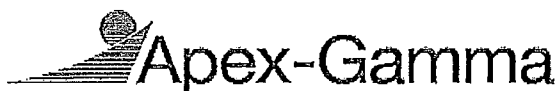
+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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



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Analysis Report for FSS-2014-0295  
FSSP-OOL10-12-012-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0295  
 Sample Description : FSSP-OOL10-12-012-F  
 Sample Type : 1L Soil  
  
 Sample Size : 7.275E+02 grams  
 Facility : Default  
  
 Sample Taken On : 4/30/2014 2:15:00PM  
 Acquisition Started : 5/8/2014 2:00:54PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.0 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1657

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/8/2014 2:11:01PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0295

FSSP-OOL10-12-012-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.66	474 -	481	477.28	8.04E+01	22.45	1.18E+02	1.21
F	2	351.75	697 -	710	703.47	6.70E+01	16.76	2.80E+01	1.82
F	3	583.15	1161 -	1169	1166.28	2.67E+01	11.52	1.46E+01	1.17
F	4	661.80	1318 -	1328	1323.61	6.18E+01	16.65	1.93E+01	1.51
F	5	1460.86	2914 -	2928	2921.55	1.17E+02	21.69	3.75E+00	2.37

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.81	*	10.67	1.15E+01	2.23E+00
Cs-137	0.99	661.65	*	85.12	3.94E-01	1.08E-01
Tl-208	0.69	277.35		6.80		
		583.14	*	84.20	1.55E-01	6.74E-02
		860.37		12.46		
Pb-212	0.89	238.63	*	44.60	4.29E-01	1.22E-01
		300.09		3.41		

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Analysis Report for FSS-2014-0295

FSSP-OOL10-12-012-F

\* = 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 = 0.40  
 Errors quoted at 2.000sigma

## INTERFERENCE CORRECTED REPORT

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	1.000	1.15E+01	2.23E+00	
✓ Cs-137	0.996	3.94E-01	1.08E-01	
Tl-208	0.695	1.55E-01	6.74E-02	
Pb-212	0.895	4.29E-01	1.22E-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

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Analysis Report for FSS-2014-0295

FSSP-OOL10-12-012-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/8/2014 2:11:01PM  
 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	351.75	1.11685E-01	12.51	Tol.	Pb-214

445-5-9-14

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.15E+01	1.02E+00	1.02E+00
	Co-60	1173.22	100.00	1.67E-02	1.47E-01	2.12E-01
		1332.49	100.00	3.35E-02		1.47E-01
	Nb-94	702.63	100.00	2.52E-02	1.33E-01	1.34E-01
		871.10	100.00	-9.73E-03		1.33E-01
	Ag-108m	79.20	7.10	4.22E-01	1.16E-01	2.36E+00
		433.93	89.90	-1.33E-02		1.16E-01
		614.37	90.40	1.56E-01		1.91E-01
		722.95	90.50	-3.59E-02		1.22E-01
	Cs-134	569.31	15.43	3.62E-01	1.50E-01	9.31E-01
+		604.70	97.60	5.33E-02		1.59E-01
		795.84	85.40	5.28E-02		1.50E-01
	Cs-137	661.65	* 85.12	3.94E-01	1.18E-01	1.18E-01
	Eu-152	121.78	28.40	2.44E-01	3.43E-01	3.43E-01
		244.69	7.49	-1.84E-01		1.46E+00
		344.27	26.50	-1.39E-01		3.78E-01
		778.89	12.74	-2.03E-01		1.07E+00
		867.32	4.16	-1.71E+00		3.19E+00

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Analysis Report for FSS-2014-0295

FSSP-OOL10-12-012-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	9.79E-01	3.43E-01	1.44E+00
	1085.78	10.00	4.12E-02		1.60E+00
	1112.02	13.30	6.88E-01		1.49E+00
	1407.95	20.70	4.44E-01		8.22E-01
Eu-154	123.07	40.50	-8.76E-03	2.41E-01	2.41E-01
	247.94	6.60	-1.83E+00		1.30E+00
	723.30	19.70	-1.65E-01		5.59E-01
	873.19	11.50	4.76E-01		1.31E+00
	996.32	10.30	-4.79E-01		1.18E+00
	1004.76	17.90	2.57E-01		8.40E-01
	1274.45	35.50	-9.45E-02		4.21E-01
	105.31	20.70	-1.43E-01		4.34E-01
Pb-206	803.10	100.00	-7.02E-02	1.06E-01	1.06E-01
Ac-228	338.32	11.40	9.08E-01	7.44E-01	1.10E+00
	911.07	27.70	5.83E-01		7.44E-01
	969.11	16.60	1.03E+00		1.31E+00
Th-234	63.29	3.80	-1.99E+00	2.39E+00	5.51E+00
	92.59	5.41	1.21E+00		2.39E+00
U-235	143.76	10.50	3.79E-01	1.73E-01	8.45E-01
	163.35	4.70	4.76E-01		1.88E+00
	185.72	54.00	1.11E-01		1.73E-01
	205.31	4.70	1.08E-02		2.02E+00
Np-237	311.98	38.60	8.62E-02	2.22E-01	2.22E-01
Am-241	59.54	35.90	3.42E-01	7.01E-01	7.01E-01

+ = Nuclide identified during the nuclide identification

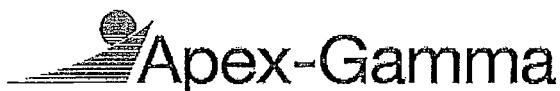
\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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





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Analysis Report for FSS-2014-0296  
FSSP-OOL10-12-013-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0296  
 Sample Description : FSSP-OOL10-12-013-F  
 Sample Type : 1L Soil

Sample Size : 6.940E+02 grams  
 Facility : Default

Sample Taken On : 4/30/2014 2:14:00PM  
 Acquisition Started : 5/8/2014 2:15:55PM

Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.0 seconds

Dead Time : 0.01 %

Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1658

*APR 5-8-14*

*Allderman 5-9-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/8/2014 2:26:02PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0296

FSSP-OOL10-12-013-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.73	472 -	483	477.41	7.66E+01	19.98	9.18E+01	1.34
F	2	661.81	1318 -	1330	1323.62	1.79E+02	26.84	2.03E+01	1.75
F	3	1460.98	2916 -	2928	2921.78	9.25E+01	19.36	0.00E+00	2.21

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81	*	10.67	9.55E+00	2.06E+00
Cs-137	0.99	661.65	*	85.12	1.19E+00	1.92E-01
Pb-212	0.89	238.63	*	44.60	4.29E-01	1.14E-01
		300.09		3.41		

\* = 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 = 0.40  
Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0296

FSSP-OOL10-12-013-F

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**INTERFERENCE CORRECTED REPORT**

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<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	0.996	9.55E+00	2.06E+00	
✓ Cs-137	0.996	1.19E+00	1.92E-01	
Pb-212	0.894	4.29E-01	1.14E-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

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Analysis Report for FSS-2014-0296

FSSP-OOL10-12-013-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/8/2014 2:26:02PM  
 Peak Locate From Channel : 100  
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

## NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	9.55E+00	2.79E-01	2.79E-01
	Co-60	1173.22	100.00	7.15E-02	1.54E-01	1.91E-01
		1332.49	100.00	-2.93E-02		1.54E-01
	Nb-94	702.63	100.00	-6.22E-02	1.27E-01	1.27E-01
		871.10	100.00	-6.35E-02		1.40E-01
	Ag-108m	79.20	7.10	-1.11E+00	1.22E-01	2.23E+00
		433.93	89.90	3.11E-02		1.22E-01
		614.37	90.40	1.72E-01		1.72E-01
		722.95	90.50	7.73E-03		1.36E-01
	Cs-134	569.31	15.43	4.19E-01	1.56E-01	8.80E-01
		604.70	97.60	6.76E-03		1.56E-01
		795.84	85.40	1.06E-01		1.71E-01
+	Cs-137	661.65	* 85.12	1.19E+00	1.33E-01	1.33E-01
	Eu-152	121.78	28.40	5.97E-02	2.88E-01	2.88E-01
		244.69	7.49	-6.98E-02		1.27E+00
		344.27	26.50	-4.10E-01		3.63E-01
		778.89	12.74	-5.64E-01		7.22E-01
		867.32	4.16	-1.47E+00		3.35E+00
		964.01	14.40	1.08E+00		1.53E+00

5/8/2014 2:26:20PM

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Analysis Report for FSS-2014-0296

FSSP-OOL10-12-013-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	1085.78	10.00	1.40E-01	2.88E-01	1.37E+00
	1112.02	13.30	-6.81E-01		1.05E+00
	1407.95	20.70	-1.81E-01		4.80E-01
Eu-154	123.07	40.50	3.55E-02	2.07E-01	2.07E-01
	247.94	6.60	-1.82E+00		1.21E+00
	723.30	19.70	3.56E-02		6.27E-01
	873.19	11.50	-1.60E-01		1.33E+00
	996.32	10.30	2.38E-01		1.36E+00
	1004.76	17.90	1.28E-01		7.54E-01
	1274.45	35.50	2.23E-01		4.41E-01
Eu-155	105.31	20.70	2.47E-02	4.31E-01	4.31E-01
Pb-206	803.10	100.00	-5.43E-02	1.11E-01	1.11E-01
Ac-228	338.32	11.40	-2.12E-01	7.22E-01	1.02E+00
	911.07	27.70	4.71E-01		7.22E-01
	969.11	16.60	3.90E-01		1.27E+00
Th-234	63.29	3.80	4.97E+00	2.36E+00	5.91E+00
	92.59	5.41	5.21E-01		2.36E+00
U-235	143.76	10.50	9.94E-02	2.11E-01	9.74E-01
	163.35	4.70	-1.09E+00		1.77E+00
	185.72	54.00	7.50E-02		2.11E-01
	205.31	4.70	1.69E-01		2.08E+00
Np-237	311.98	38.60	-9.41E-02	2.39E-01	2.39E-01
Am-241	59.54	35.90	-6.43E-01	6.52E-01	6.52E-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



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Analysis Report for FSS-2014-0297  
FSSP-OOL10-12-014-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0297  
 Sample Description : FSSP-OOL10-12-014-F  
 Sample Type : 1L Soil  
  
 Sample Size : 9.091E+02 grams  
 Facility : Default  
  
 Sample Taken On : 4/30/2014 2:11:00PM  
 Acquisition Started : 5/8/2014 2:30:56PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.0 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1659

*5-8-14*

*W. Alderman 5-9-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/8/2014 2:41:02PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0297

FSSP-OOL10-12-014-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.57	471 -	482	477.11	1.10E+02	24.45	1.48E+02	1.15
F	2	661.63	1318 -	1330	1323.27	5.47E+01	15.18	1.03E+01	1.47
F	3	1460.87	2914 -	2929	2921.57	1.70E+02	26.01	0.00E+00	2.19

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81	*	10.67	1.34E+01	2.17E+00
Cs-137	1.00	661.65	*	85.12	2.79E-01	7.90E-02
Pb-212	0.89	238.63	*	44.60	4.69E-01	1.08E-01
		300.09		3.41		

\* = 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 = 0.40  
Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0297

FSSP-OOL10-12-014-F

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**INTERFERENCE CORRECTED REPORT**

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<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	0.999	1.34E+01	2.17E+00	
✓ Cs-137	1.000	2.79E-01	7.90E-02	
Pb-212	0.895	4.69E-01	1.08E-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



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Analysis Report for FSS-2014-0297

FSSP-OOL10-12-014-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/8/2014 2:41:02PM  
 Peak Locate From Channel : 100  
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

## NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.34E+01	2.13E-01	2.13E-01
	Co-60	1173.22	100.00	-5.28E-02	1.03E-01	1.83E-01
		1332.49	100.00	-5.83E-02		1.03E-01
	Nb-94	702.63	100.00	4.15E-02	1.07E-01	1.19E-01
		871.10	100.00	-4.64E-02		1.07E-01
	Ag-108m	79.20	7.10	2.19E-01	8.97E-02	1.98E+00
		433.93	89.90	-6.03E-02		8.97E-02
		614.37	90.40	1.80E-01		1.73E-01
		722.95	90.50	5.42E-02		1.29E-01
	Cs-134	569.31	15.43	2.57E-01	1.31E-01	7.35E-01
		604.70	97.60	3.77E-02		1.32E-01
		795.84	85.40	4.65E-02		1.31E-01
+	Cs-137	661.65	* 85.12	2.79E-01	7.68E-02	7.68E-02
	Eu-152	121.78	28.40	-6.02E-02	2.81E-01	2.81E-01
		244.69	7.49	8.74E-02		1.22E+00
		344.27	26.50	-5.66E-01		3.06E-01
		778.89	12.74	-3.00E-01		8.11E-01
		867.32	4.16	-2.05E-02		2.79E+00
		964.01	14.40	3.88E-01		1.20E+00

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Analysis Report for FSS-2014-0297

FSSP-OOL10-12-014-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	1085.78	10.00	-4.20E-01	2.81E-01	1.24E+00
	1112.02	13.30	3.79E-02		1.24E+00
	1407.95	20.70	2.76E-01		5.93E-01
Eu-154	123.07	40.50	1.72E-01	2.07E-01	2.07E-01
	247.94	6.60	-1.39E+00		1.18E+00
	723.30	19.70	2.50E-01		5.95E-01
	873.19	11.50	2.34E-01		9.60E-01
	996.32	10.30	2.43E-01		1.30E+00
	1004.76	17.90	1.55E-01		7.56E-01
	1274.45	35.50	5.20E-02		4.40E-01
Eu-155	105.31	20.70	8.74E-03	3.62E-01	3.62E-01
Pb-206	803.10	100.00	-3.50E-02	1.06E-01	1.06E-01
Ac-228	338.32	11.40	9.99E-02	6.74E-01	8.46E-01
	911.07	27.70	4.51E-01		6.74E-01
	969.11	16.60	3.84E-01		1.03E+00
Th-234	63.29	3.80	3.27E+00	1.94E+00	5.10E+00
	92.59	5.41	2.78E-01		1.94E+00
U-235	143.76	10.50	-3.93E-02	1.60E-01	6.86E-01
	163.35	4.70	1.92E-01		1.61E+00
	185.72	54.00	5.76E-02		1.60E-01
	205.31	4.70	9.69E-02		1.66E+00
Np-237	311.98	38.60	-3.79E-02	1.85E-01	1.85E-01
Am-241	59.54	35.90	7.92E-02	5.98E-01	5.98E-01

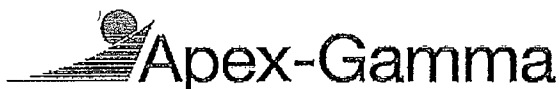
+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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



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Analysis Report for FSS-2014-0298  
FSSP-OOL10-12-015-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0298  
 Sample Description : FSSP-OOL10-12-015-F  
 Sample Type : 1L Soil  
  
 Sample Size : 6.067E+02 grams  
 Facility : Default  
  
 Sample Taken On : 4/30/2014 2:20:00PM  
 Acquisition Started : 5/8/2014 2:45:57PM  
  
 Procedure : 1L Soil LD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli LD  
 Live Time : 600.0 seconds  
 Real Time : 600.0 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli LD

Sample Number : 1660

*5-8-14*

*Ph. Alderman 5-9-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/8/2014 2:56:04PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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5/8/2014 2:56:23PM

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Analysis Report for FSS-2014-0298

FSSP-OOL10-12-015-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.47	471 -	482	476.90	7.68E+01	19.88	8.80E+01	1.48
F	2	661.75	1318 -	1328	1323.50	7.38E+01	17.26	5.50E+00	1.60
F	3	1460.99	2916 -	2928	2921.80	1.16E+02	21.53	0.00E+00	2.14

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81 *	10.67	1.28E+01	2.47E+00
Cs-137	0.99	661.65 *	85.12	5.17E-01	1.24E-01
Pb-212	0.89	238.63 *	44.60	4.36E-01	1.16E-01
		300.09	3.41		

\* = 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 = 0.40

Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0298  
FSSP-OOL10-12-015-F

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## INTERFERENCE CORRECTED REPORT

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Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.995	1.28E+01	2.47E+00	
✓ Cs-137	0.998	5.17E-01	1.24E-01	
Pb-212	0.892	4.36E-01	1.16E-01	

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

Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0298

FSSP-OOL10-12-015-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/8/2014 2:56:04PM  
 Peak Locate From Channel : 100  
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

## NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.28E+01	2.99E-01	2.99E-01
	Co-60	1173.22	100.00	-7.44E-02	1.54E-01	2.20E-01
		1332.49	100.00	3.28E-02		1.54E-01
	Nb-94	702.63	100.00	-6.26E-02	1.18E-01	1.18E-01
		871.10	100.00	-8.32E-02		1.26E-01
	Ag-108m	79.20	7.10	-9.95E-01	1.13E-01	2.29E+00
		433.93	89.90	-7.75E-03		1.13E-01
		614.37	90.40	2.77E-01		2.20E-01
		722.95	90.50	6.11E-02		1.52E-01
	Cs-134	569.31	15.43	3.08E-01	1.66E-01	8.55E-01
		604.70	97.60	1.49E-01		1.97E-01
		795.84	85.40	3.27E-02		1.66E-01
+	Cs-137	661.65	* 85.12	5.17E-01	7.78E-02	7.78E-02
	Eu-152	121.78	28.40	-5.31E-02	2.94E-01	2.94E-01
		244.69	7.49	-1.84E-02		1.26E+00
		344.27	26.50	-4.50E-01		3.34E-01
		778.89	12.74	-6.99E-01		1.01E+00
		867.32	4.16	2.71E+00		3.97E+00
		964.01	14.40	-1.64E-01		1.35E+00

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Analysis Report for FSS-2014-0298

FSSP-OOL10-12-015-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	1085.78	10.00	3.93E-02	2.94E-01	1.84E+00
	1112.02	13.30	-1.33E+00		1.28E+00
	1407.95	20.70	-1.43E-01		7.79E-01
Eu-154	123.07	40.50	-8.18E-02	2.04E-01	2.04E-01
	247.94	6.60	-1.17E+00		1.20E+00
	723.30	19.70	2.81E-01		6.97E-01
	873.19	11.50	-3.17E-01		1.10E+00
	996.32	10.30	3.51E-01		1.66E+00
	1004.76	17.90	-9.81E-02		8.34E-01
	1274.45	35.50	1.85E-03		5.58E-01
Eu-155	105.31	20.70	-1.88E-01	4.13E-01	4.13E-01
Pb-206	803.10	100.00	-4.76E-02	1.33E-01	1.33E-01
Ac-228	338.32	11.40	6.34E-01	7.88E-01	1.13E+00
	911.07	27.70	4.68E-01		7.88E-01
	969.11	16.60	1.09E+00		1.30E+00
Th-234	63.29	3.80	-1.56E+00	2.55E+00	5.21E+00
	92.59	5.41	1.28E+00		2.55E+00
U-235	143.76	10.50	7.97E-03	1.99E-01	8.22E-01
	163.35	4.70	4.64E-01		1.81E+00
	185.72	54.00	2.02E-01		1.99E-01
	205.31	4.70	-3.02E-02		2.10E+00
Np-237	311.98	38.60	3.78E-02	2.29E-01	2.29E-01
Am-241	59.54	35.90	2.82E-01	6.76E-01	6.76E-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



5/8/2014 3:11:31PM

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Analysis Report for FSS-2014-0299  
FSSP-OOL10-12-016-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0299  
 Sample Description : FSSP-OOL10-12-016-F  
 Sample Type : 1L Soil  
  
 Sample Size : 9.240E+02 grams  
 Facility : Default  
  
 Sample Taken On : 4/30/2014 1:10:00PM  
 Acquisition Started : 5/8/2014 3:01:07PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.0 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1661

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/8/2014 3:11:13PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0299

FSSP-OOL10-12-016-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.40	472 -	482	476.76	9.87E+01	24.41	1.85E+02	1.15
F	2	351.73	698 -	709	703.42	5.79E+01	15.67	2.05E+01	1.64
F	3	661.78	1319 -	1328	1323.56	5.04E+01	15.44	2.09E+01	1.57
F	4	1461.01	2915 -	2928	2921.85	1.60E+02	25.22	0.00E+00	2.26

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81 *	10.67	1.24E+01	2.07E+00
Cs-137	0.99	661.65 *	85.12	2.53E-01	7.88E-02
Pb-212	0.88	238.63 *	44.60	4.14E-01	1.05E-01
		300.09	3.41		

\* = 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 = 0.40

Errors quoted at 2.000sigma

5/8/2014 3:11:31PM

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Analysis Report for FSS-2014-0299

FSSP-OOL10-12-016-F

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## INTERFERENCE CORRECTED REPORT

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<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	0.994	1.24E+01	2.07E+00	
✓ Cs-137	0.997	2.53E-01	7.88E-02	
Pb-212	0.887	4.14E-01	1.05E-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

5/8/2014 3:11:31PM

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Analysis Report for FSS-2014-0299

FSSP-OOL10-12-016-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/8/2014 3:11:13PM  
 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	351.73	9.65650E-02	13.52	Tol.	Pb-214

MD 5-9-14

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\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.24E+01	2.10E-01	2.10E-01
	Co-60	1173.22	100.00	1.27E-02	1.45E-01	1.63E-01
		1332.49	100.00	9.63E-04		1.45E-01
	Nb-94	702.63	100.00	1.70E-02	1.18E-01	1.23E-01
		871.10	100.00	5.94E-02		1.18E-01
	Ag-108m	79.20	7.10	4.50E-01	9.27E-02	1.94E+00
		433.93	89.90	-6.87E-03		9.27E-02
		614.37	90.40	2.30E-01		1.82E-01
		722.95	90.50	1.14E-01		1.43E-01
	Cs-134	569.31	15.43	5.74E-02	1.55E-01	7.23E-01
+		604.70	97.60	1.75E-01		1.64E-01
		795.84	85.40	1.03E-01		1.55E-01
	Cs-137	661.65	* 85.12	2.53E-01	9.56E-02	9.56E-02
	Eu-152	121.78	28.40	-1.70E-03	2.64E-01	2.65E-01
		244.69	7.49	1.60E-01		1.24E+00
		344.27	26.50	-4.60E-01		2.64E-01
		778.89	12.74	-5.43E-01		9.25E-01
		867.32	4.16	-4.08E+00		2.34E+00

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Analysis Report for FSS-2014-0299

FSSP-OOL10-12-016-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	1.11E+00	2.64E-01	1.28E+00
	1085.78	10.00	-5.25E-01		1.30E+00
	1112.02	13.30	-7.55E-01		7.47E-01
	1407.95	20.70	3.11E-01		6.16E-01
Eu-154	123.07	40.50	-8.31E-02	1.85E-01	1.85E-01
	247.94	6.60	-1.84E+00		1.13E+00
	723.30	19.70	5.23E-01		6.60E-01
	873.19	11.50	5.99E-01		1.08E+00
	996.32	10.30	1.47E-01		1.21E+00
	1004.76	17.90	0.00E+00		6.83E-01
	1274.45	35.50	-1.94E-01		4.57E-01
	1274.45	35.50	-1.94E-01		4.57E-01
Eu-155	105.31	20.70	9.58E-02	3.92E-01	3.92E-01
Pb-206	803.10	100.00	-8.79E-03	1.10E-01	1.10E-01
Ac-228	338.32	11.40	4.01E-01	6.10E-01	7.85E-01
	911.07	27.70	4.54E-01		6.10E-01
	969.11	16.60	8.55E-01		1.13E+00
Th-234	63.29	3.80	6.75E-01	2.05E+00	4.64E+00
	92.59	5.41	-2.31E-01		2.05E+00
U-235	143.76	10.50	2.31E-01	1.55E-01	6.79E-01
	163.35	4.70	4.21E-01		1.48E+00
	185.72	54.00	6.10E-02		1.55E-01
	205.31	4.70	-3.81E-01		1.72E+00
Np-237	311.98	38.60	2.77E-02	1.68E-01	1.68E-01
Am-241	59.54	35.90	-2.21E-02	5.89E-01	5.89E-01

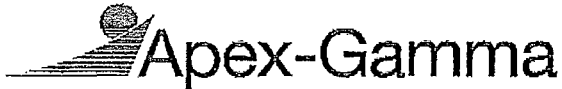
+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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



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Analysis Report for FSS-2014-0300  
FSSP-OOL10-12-017-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0300  
 Sample Description : FSSP-OOL10-12-017-F  
 Sample Type : 1L Soil  
  
 Sample Size : 9.562E+02 grams  
 Facility : Default  
  
 Sample Taken On : 4/30/2014 2:25:00PM  
 Acquisition Started : 5/8/2014 3:16:08PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1662

*SP-14*

*William 5-9-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/8/2014 3:26:14PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0300

FSSP-OOL10-12-017-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	77.13	149 -	158	154.25	6.21E+01	21.11	1.60E+02	0.85
F	2	238.56	473 -	480	477.09	9.67E+01	23.48	1.09E+02	1.06
F	3	295.09	586 -	594	590.15	4.30E+01	15.60	4.74E+01	1.17
F	4	351.85	698 -	709	703.65	5.05E+01	15.95	4.80E+01	1.21
F	5	1461.01	2914 -	2929	2921.84	1.40E+02	23.51	0.00E+00	2.33

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-xRay	0.54	77.11 *	100.00	1.27E-01	4.42E-02
		87.20	36.00		
K-40	0.99	1460.81 *	10.67	1.05E+01	1.85E+00
Pb-212	0.89	238.63 *	44.60	3.92E-01	9.79E-02
		300.09	3.41		
Pb-214	0.79	241.98	7.49		
		295.21 *	19.20	4.75E-01	1.74E-01
		351.92 *	37.20	3.31E-01	1.06E-01

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Analysis Report for FSS-2014-0300

FSSP-OOL10-12-017-F

\* = 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 = 0.40  
 Errors quoted at 2.000sigma

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## INTERFERENCE CORRECTED REPORT

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<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
Bi-xRay	0.548	1.27E-01	4.42E-02	
K-40	0.994	1.05E+01	1.85E+00	
Pb-212	0.894	3.92E-01	9.79E-02	
Pb-214	0.790	3.70E-01	9.06E-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

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Analysis Report for FSS-2014-0300  
FSSP-OOL10-12-017-F

### UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/8/2014 3:26:14PM  
Peak Locate From Channel : 100  
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2,000sigma

### NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.05E+01	2.03E-01	2.03E-01
	Co-60	1173.22	100.00	4.53E-02	1.35E-01	1.50E-01
		1332.49	100.00	3.89E-02		1.35E-01
	Nb-94	702.63	100.00	1.09E-01	1.01E-01	1.19E-01
		871.10	100.00	-6.24E-02		1.01E-01
	Ag-108m	79.20	7.10	-1.81E-01	1.00E-01	1.95E+00
		433.93	89.90	2.23E-02		1.00E-01
		614.37	90.40	1.84E-01		1.71E-01
		722.95	90.50	-2.19E-02		1.32E-01
	Cs-134	569.31	15.43	6.47E-01	1.39E-01	8.69E-01
		604.70	97.60	1.48E-01		1.53E-01
		795.84	85.40	7.12E-02		1.39E-01
	Cs-137	661.65	85.12	1.95E-01	1.94E-01	1.94E-01
	Eu-152	121.78	28.40	-5.74E-02	2.38E-01	2.38E-01
		244.69	7.49	-1.76E+00		1.11E+00
		344.27	26.50	-3.98E-01		3.26E-01
		778.89	12.74	-3.95E-01		8.35E-01
		867.32	4.16	-1.30E+00		2.66E+00
		964.01	14.40	6.36E-01		1.11E+00



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Analysis Report for FSS-2014-0300

FSSP-OOL10-12-017-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	1085.78	10.00	3.99E-01	2.38E-01	1.30E+00
	1112.02	13.30	-4.33E-01		1.02E+00
	1407.95	20.70	1.13E-01		4.04E-01
Eu-154	123.07	40.50	-1.07E-01	1.67E-01	1.67E-01
	247.94	6.60	-6.86E-01		1.16E+00
	723.30	19.70	-1.01E-01		6.08E-01
	873.19	11.50	-1.15E-01		9.13E-01
	996.32	10.30	2.50E-01		1.07E+00
	1004.76	17.90	-7.70E-02		6.39E-01
	1274.45	35.50	6.88E-02		3.66E-01
	105.31	20.70	-5.94E-03		3.67E-01
Pb-206	803.10	100.00	-7.16E-02	1.09E-01	1.09E-01
Ac-228	338.32	11.40	-6.92E-03	6.41E-01	8.22E-01
	911.07	27.70	5.76E-01		6.41E-01
	969.11	16.60	7.00E-01		8.90E-01
Th-234	63.29	3.80	3.45E-01	1.96E+00	4.66E+00
	92.59	5.41	2.91E-01		1.96E+00
U-235	143.76	10.50	8.41E-03	1.66E-01	7.01E-01
	163.35	4.70	9.17E-01		1.52E+00
	185.72	54.00	1.69E-01		1.66E-01
	205.31	4.70	1.34E+00		1.62E+00
Np-237	311.98	38.60	-4.74E-02	1.97E-01	1.97E-01
Am-241	59.54	35.90	2.04E-02	5.60E-01	5.60E-01

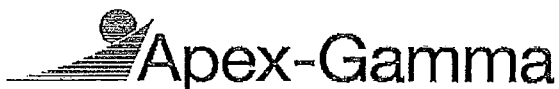
+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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



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Analysis Report for FSS-2014-0301  
FSSP-OOL10-12-018-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0301  
 Sample Description : FSSP-OOL10-12-018-F  
 Sample Type : 1L Soil  
  
 Sample Size : 8.375E+02 grams  
 Facility : Default  
  
 Sample Taken On : 4/30/2014 2:31:00PM  
 Acquisition Started : 5/8/2014 3:31:09PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number : 1663

*[Signature]*

5-8-14

*[Signature]*

5-9-14

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/8/2014 3:41:16PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0301

FSSP-OOL10-12-018-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.56	472 -	483	477.07	1.19E+02	25.12	1.62E+02	1.05
F	2	1461.07	2916 -	2928	2921.97	1.46E+02	24.21	0.00E+00	1.94

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.81 *	10.67	1.25E+01	2.18E+00
Pb-212	0.89	238.63 *	44.60	5.52E-01	1.21E-01
		300.09	3.41		

\* = 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 = 0.40  
Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0301  
FSSP-OOL10-12-018-F

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## INTERFERENCE CORRECTED REPORT

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<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	0.989	1.25E+01	2.18E+00	
Pb-212	0.894	5.52E-01	1.21E-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

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Analysis Report for FSS-2014-0301  
FSSP-OOL10-12-018-F

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### UNIDENTIFIED PEAKS

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Peak Locate Performed on : 5/8/2014 3:41:16PM  
Peak Locate From Channel : 100  
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

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### NUCLIDE MDA REPORT

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Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.25E+01	2.32E-01	2.32E-01
	Co-60	1173.22	100.00	6.59E-02	1.02E-01	1.76E-01
		1332.49	100.00	-2.97E-02		1.02E-01
	Nb-94	702.63	100.00	-2.64E-03	1.03E-01	1.03E-01
		871.10	100.00	-4.50E-02		1.12E-01
	Ag-108m	79.20	7.10	-9.86E-02	1.02E-01	2.10E+00
		433.93	89.90	1.60E-02		1.02E-01
		614.37	90.40	1.53E-01		2.00E-01
		722.95	90.50	5.78E-02		1.51E-01
	Cs-134	569.31	15.43	-2.26E-01	1.42E-01	7.29E-01
		604.70	97.60	1.26E-01		1.77E-01
		795.84	85.40	6.98E-02		1.42E-01
	Cs-137	661.65	85.12	1.47E-01	1.84E-01	1.84E-01
	Eu-152	121.78	28.40	9.88E-02	2.86E-01	2.86E-01
		244.69	7.49	-6.62E-01		1.31E+00
		344.27	26.50	-3.01E-01		3.21E-01
		778.89	12.74	-6.42E-01		7.70E-01
		867.32	4.16	-1.78E-01		3.19E+00
		964.01	14.40	7.80E-01		1.23E+00

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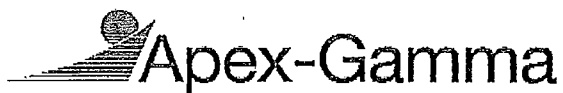
Analysis Report for FSS-2014-0301

FSSP-OOL10-12-018-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	1085.78	10.00	6.71E-01	2.86E-01	1.53E+00
	1112.02	13.30	-4.51E-02		1.10E+00
	1407.95	20.70	-6.19E-02		7.14E-01
Eu-154	123.07	40.50	-7.51E-02	1.95E-01	1.95E-01
	247.94	6.60	-1.01E+00		1.20E+00
	723.30	19.70	2.66E-01		6.94E-01
	873.19	11.50	-3.37E-01		9.75E-01
	996.32	10.30	-9.42E-01		1.38E+00
	1004.76	17.90	3.64E-01		8.41E-01
	1274.45	35.50	3.03E-01		5.05E-01
Eu-155	105.31	20.70	1.22E-02	4.13E-01	4.13E-01
Pb-206	803.10	100.00	-6.51E-02	8.32E-02	8.32E-02
Ac-228	338.32	11.40	9.05E-01	6.64E-01	9.18E-01
	911.07	27.70	2.17E-01		6.64E-01
	969.11	16.60	2.26E-01		1.07E+00
Th-234	63.29	3.80	1.97E+00	2.00E+00	4.91E+00
	92.59	5.41	-1.06E-01		2.00E+00
U-235	143.76	10.50	9.60E-01	1.69E-01	8.49E-01
	163.35	4.70	-2.62E-01		1.55E+00
	185.72	54.00	6.35E-02		1.69E-01
	205.31	4.70	1.99E-01		1.71E+00
Np-237	311.98	38.60	5.09E-02	2.01E-01	2.01E-01
Am-241	59.54	35.90	9.22E-03	5.71E-01	5.71E-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



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Analysis Report for FSS-2014-0302  
FSSP-OOL10-12-019-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0302  
 Sample Description : FSSP-OOL10-12-019-F  
 Sample Type : 1L Soil  
  
 Sample Size : 1.112E+03 grams  
 Facility : Default  
  
 Sample Taken On : 4/30/2014 2:28:00PM  
 Acquisition Started : 5/8/2014 3:46:10PM  
  
 Procedure : 1L Soil MD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli MD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli MD

Sample Number

: 1664

*1664-5814*

*M. (A. Deen) 5-9-14*

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/8/2014 3:56:16PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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5/8/2014 3:56:36PM

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Analysis Report for FSS-2014-0302

FSSP-OOL10-12-019-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.50	470 -	483	476.97	1.42E+02	26.60	1.66E+02	1.37
F	2	351.90	699 -	709	703.77	7.02E+01	17.74	3.02E+01	1.45
F	3	1460.99	2915 -	2929	2921.80	1.68E+02	26.03	3.42E+00	2.13

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81 *	10.67	1.08E+01	1.78E+00
Pb-212	0.89	238.63 *	44.60	4.94E-01	9.71E-02
		300.09	3.41		

\* = 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 = 0.40

Errors quoted at 2.000sigma



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Analysis Report for FSS-2014-0302

FSSP-OOL10-12-019-F

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**INTERFERENCE CORRECTED REPORT**

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<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	0.995	1.08E+01	1.78E+00	
Pb-212	0.893	4.94E-01	9.71E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

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

Errors quoted at 2.000sigma

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Analysis Report for FSS-2014-0302

FSSP-OOL10-12-019-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/8/2014 3:56:16PM  
 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 2	351.90	1.17049E-01	12.63	Tol.	Pb-214

44 5-9-14

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

## NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP,NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	1.08E+01	6.32E-01	6.32E-01
	Co-60	1173.22	100.00	2.96E-02	8.39E-02	1.60E-01
		1332.49	100.00	3.20E-02		8.39E-02
	Nb-94	702.63	100.00	-7.81E-02	8.58E-02	8.58E-02
		871.10	100.00	1.51E-02		1.10E-01
	Ag-108m	79.20	7.10	4.06E-01	6.53E-02	1.74E+00
		433.93	89.90	-3.15E-02		6.53E-02
		614.37	90.40	1.14E-01		1.45E-01
		722.95	90.50	-3.88E-03		1.26E-01
	Cs-134	569.31	15.43	4.29E-01	1.17E-01	6.86E-01
		604.70	97.60	6.71E-02		1.33E-01
		795.84	85.40	-4.01E-03		1.17E-01
	Cs-137	661.65	85.12	7.23E-02	1.18E-01	1.18E-01
	Eu-152	121.78	28.40	1.80E-02	2.25E-01	2.25E-01
		244.69	7.49	-9.57E-01		1.04E+00
		344.27	26.50	-3.47E-01		2.85E-01
		778.89	12.74	-2.88E-01		7.68E-01
		867.32	4.16	-1.66E+00		2.63E+00

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Analysis Report for FSS-2014-0302

FSSP-OOL10-12-019-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	964.01	14.40	6.27E-01	2.25E-01	1.15E+00
	1085.78	10.00	5.49E-01		1.24E+00
	1112.02	13.30	-1.61E+00		7.78E-01
	1407.95	20.70	2.02E-01		6.29E-01
Eu-154	123.07	40.50	-9.14E-02	1.59E-01	1.59E-01
	247.94	6.60	-2.12E+00		9.55E-01
	723.30	19.70	-1.79E-02		5.80E-01
	873.19	11.50	7.37E-01		1.01E+00
	996.32	10.30	-9.33E-02		1.01E+00
	1004.76	17.90	1.06E-01		4.92E-01
	1274.45	35.50	1.22E-01		3.02E-01
Eu-155	105.31	20.70	1.00E-01	3.40E-01	3.40E-01
Pb-206	803.10	100.00	-3.76E-02	8.90E-02	8.90E-02
Ac-228	338.32	11.40	4.26E-01	5.86E-01	7.53E-01
	911.07	27.70	5.42E-01		5.86E-01
	969.11	16.60	6.85E-01		9.68E-01
Th-234	63.29	3.80	3.26E-01	1.62E+00	4.18E+00
	92.59	5.41	-2.38E-01		1.62E+00
U-235	143.76	10.50	2.06E-02	1.41E-01	6.22E-01
	163.35	4.70	-2.22E-02		1.43E+00
	185.72	54.00	1.09E-01		1.41E-01
	205.31	4.70	2.36E-01		1.45E+00
Np-237	311.98	38.60	1.30E-01	1.88E-01	1.88E-01
Am-241	59.54	35.90	-7.13E-02	4.95E-01	4.95E-01

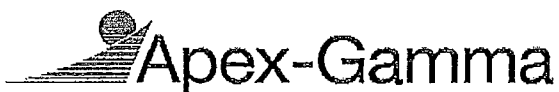
+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = MDA value not calculated

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

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



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Analysis Report for FSS-2014-0303  
FSSP-OOL10-12-020-F

## GAMMA SPECTRUM ANALYSIS

Sample Identification : FSS-2014-0303  
 Sample Description : FSSP-OOL10-12-020-F  
 Sample Type : 1L Soil  
  
 Sample Size : 1.286E+03 grams  
 Facility : Default  
  
 Sample Taken On : 4/30/2014 2:40:00PM  
 Acquisition Started : 5/8/2014 4:01:11PM  
  
 Procedure : 1L Soil HD  
 Operator : Administrator  
 Detector Name : DET06  
 Geometry : 1L Marinelli HD  
 Live Time : 600.0 seconds  
 Real Time : 600.1 seconds  
  
 Dead Time : 0.01 %  
  
 Peak Locate Threshold : 4.00  
 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 : 2/22/2012  
 Efficiency Calibration Used Done On : 4/27/2011  
 Efficiency Calibration Description : 1L Marinelli HD

Sample Number : 1665

*[Signature]* 5-8-14

*[Signature]* 5-9-14

## PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/8/2014 4:11:18PM

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

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for FSS-2014-0303

FSSP-OOL10-12-020-F

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.55	472 -	482	477.05	1.50E+02	27.52	1.45E+02	1.29
F	2	295.14	585 -	594	590.24	4.60E+01	15.85	5.33E+01	1.16
F	3	351.80	698 -	710	703.57	7.62E+01	18.34	3.78E+01	1.50
F	4	583.42	1162 -	1170	1166.83	3.16E+01	12.56	1.80E+01	1.26
F	5	609.49	1214 -	1224	1218.98	6.39E+01	17.11	2.70E+01	1.33
F	6	1461.01	2917 -	2927	2921.85	1.54E+02	25.18	8.56E+00	1.75

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

No background subtract performed on this spectrum.

## NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

### IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.81	*	10.67	9.10E+00	1.57E+00
Tl-208	0.68	277.35		6.80		
		583.14	*	84.20	1.11E-01	4.46E-02
		860.37		12.46		
Pb-212	0.89	238.63	*	44.60	4.92E-01	9.49E-02
		300.09		3.41		
Bi-214	0.48	609.31	*	46.30	4.23E-01	1.16E-01
		1120.29		15.10		
		1764.49		15.80		
Pb-214	0.79	241.98		7.49		
		295.21	*	19.20	4.08E-01	1.43E-01
		351.92	*	37.20	4.00E-01	9.86E-02

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Analysis Report for FSS-2014-0303

FSSP-OOL10-12-020-F

\* = 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 = 0.40  
 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	0.993	9.10E+00	1.57E+00	
Tl-208	0.686	1.11E-01	4.46E-02	
Pb-212	0.894	4.92E-01	9.49E-02	
Bi-214	0.482	4.23E-01	1.16E-01	
Pb-214	0.791	4.03E-01	8.11E-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

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Analysis Report for FSS-2014-0303

FSSP-OOL10-12-020-F

## UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/8/2014 4:11:18PM  
 Peak Locate From Channel : 100  
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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All peaks were identified.

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

## NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\HBPP.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	9.10E+00	7.92E-01	7.92E-01
	Co-60	1173.22	100.00	2.42E-04	9.65E-02	9.65E-02
		1332.49	100.00	1.03E-02		9.83E-02
	Nb-94	702.63	100.00	-1.30E-02	9.58E-02	9.58E-02
		871.10	100.00	3.48E-02		9.72E-02
	Ag-108m	79.20	7.10	1.56E+00	7.68E-02	1.92E+00
		433.93	89.90	-8.15E-02		7.68E-02
		614.37	90.40	-5.19E-02		1.58E-01
		722.95	90.50	-2.54E-02		1.12E-01
	Cs-134	569.31	15.43	2.63E-01	1.13E-01	5.72E-01
		604.70	97.60	-4.20E-02		1.37E-01
		795.84	85.40	3.52E-02		1.13E-01
	Cs-137	661.65	85.12	5.31E-02	1.10E-01	1.10E-01
	Eu-152	121.78	28.40	-4.76E-02	2.37E-01	2.37E-01
		244.69	7.49	1.98E-01		9.14E-01
		344.27	26.50	-4.81E-01		2.63E-01
		778.89	12.74	-2.57E-01		7.95E-01
		867.32	4.16	-2.19E+00		1.80E+00
		964.01	14.40	8.27E-01		8.96E-01

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Analysis Report for FSS-2014-0303

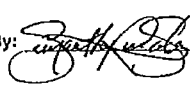

FSSP-OOL10-12-020-F

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-152	1085.78	10.00	1.58E-01	2.37E-01	1.17E+00
	1112.02	13.30	-1.27E+00		6.65E-01
	1407.95	20.70	4.21E-02		4.95E-01
Eu-154	123.07	40.50	-6.70E-02	1.69E-01	1.69E-01
	247.94	6.60	-9.21E-01		8.91E-01
	723.30	19.70	-1.17E-01		5.15E-01
	873.19	11.50	3.56E-01		9.03E-01
	996.32	10.30	-2.48E-01		1.01E+00
	1004.76	17.90	-1.05E-01		5.08E-01
	1274.45	35.50	1.96E-01		3.93E-01
Eu-155	105.31	20.70	-2.65E-02	3.40E-01	3.40E-01
Pb-206	803.10	100.00	-6.52E-02	7.27E-02	7.27E-02
Ac-228	338.32	11.40	5.30E-01	4.75E-01	7.62E-01
	911.07	27.70	3.13E-01		4.75E-01
	969.11	16.60	5.52E-01		8.13E-01
Th-234	63.29	3.80	1.40E+00	1.66E+00	4.76E+00
	92.59	5.41	-1.65E+00		1.66E+00
U-235	143.76	10.50	4.23E-02	1.43E-01	6.55E-01
	163.35	4.70	-3.70E-01		1.39E+00
	185.72	54.00	4.61E-02		1.43E-01
	205.31	4.70	2.38E-01		1.40E+00
Np-237	311.98	38.60	8.57E-02	1.59E-01	1.59E-01
Am-241	59.54	35.90	-1.02E-01	5.67E-01	5.67E-01

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



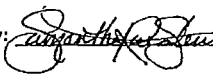

## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0264</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-11-001-F Fishermans Channel</u>					
Sample Collection Date/Time: <u>4/28/14 8:00</u>					
Counting Instrument: <u>Protean</u>		S/N: <u>7109</u>		Calibration Due Date: <u>10/16/2014</u>	
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0961	0.1011	57.96
Sample blank					0.00
Net Recovery					57.96
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.01	60.00	60.00	5/8/14 9:47	4.99E-01	5/8/14 18:30
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.63	3.17	0.241	0.342	0.577	0.277
Comments: <u>Batch: OOL10-11-Sr-2</u>					
<div style="display: flex; justify-content: space-between;"> <div>             Performed By: <u></u> Date <u>5-12-14</u> </div> <div>             Reviewed By: <u></u> Date <u>5-12-14</u> </div> </div>					

2014-0264.xls

V and V Date 11/14/13

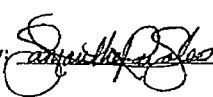
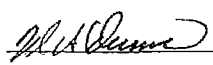
## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0265</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-11-002-F</u> <u>Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/28/14 8:10</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7108</u> Calibration Due Date: <u>10/29/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0960	0.1042	95.05
Sample blank					0.00
Net Recovery					95.05
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.00	60.00	60.00	5/1/14 14:48	9.55E-01	5/1/20 19:52
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.90	4.07	-0.028	0.118	0.208	0.100
Comments: <u>Batch: OOL10-11-Sr-1</u>					
<div style="display: flex; justify-content: space-between;"> <div>             Performed By: <u></u> Date <u>5.7.14</u> </div> <div>             Reviewed By: <u></u> Date <u>5-7-14</u> </div> </div>					

2014-0265.xls

V and V Date 11/14/13

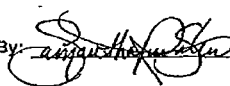
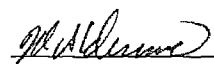
## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0266</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-11-0003-F Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/28/14 8:20</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0948	0.1009	70.71
Sample blank					0.00
Net Recovery					70.71
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.02	60.00	60.00	5/14/14 10:27	4.82E-01	5/14/14 15:46
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.68	3.85	-0.073	0.304	0.536	0.258
Comments: <u>Batch: OOL10-11-Sr-3</u>					
Performed By: <u></u> Date: <u>5-21-14</u> Reviewed By: <u></u> Date: <u>5-21-14</u>					

2014-0266.xls

V and V Date 11/14/13

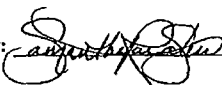

## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0267</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-11-004-F</u> <u>Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/28/14 8:40</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7108</u> Calibration Due Date: <u>10/29/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0959	0.1039	92.73
Sample blank					0.00
Net Recovery					92.73
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.01	60.00	60.00	5/1/14 15:03	9.55E-01	5/1/20 20:52
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.55	4.07	-0.087	0.118	0.213	0.103
Comments: <u>Batch: OOL10-11-Sr-1</u>					
<div style="display: flex; justify-content: space-between;"> <div>             Performed By: <u></u> Date <u>5.7.14</u> </div> <div>             Reviewed By: <u></u> Date <u>5-7-14</u> </div> </div>					

2014-0267.xls

V and V Date 11/14/13

## Strontium-90 Analysis Sheet

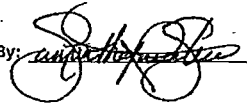

Sample Number: <u>2014 - 0268</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-11-005-F</u> <u>Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/28/14 8:50</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7108</u> Calibration Due Date: <u>10/29/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt. g	Sr Recovery (%)
Sample	5.12	1.00	0.0958	0.1036	90.42
Sample blank					0.00
Net Recovery					90.42
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.02	60.00	60.00	5/1/14 14:45	4.95E-01	5/1/14 21:53
<b>Count Data</b>		<b>Results</b>			
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.37	4.07	-0.233	0.230	0.418	0.202
Comments: <u>Batch: OOL10-11-Sr-1</u>					
<div style="display: flex; justify-content: space-between;"> <div>             Performed By: <u></u> Date: <u>5-7-14</u> </div> <div>             Reviewed By: <u></u> Date: <u>5-7-14</u> </div> </div>					

2014-0268.xls

V and V Date 11/14/13



## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0270</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-11-0007-F Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/28/14 9:00</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0959	0.1022	73.03
Sample blank					0.00
Net Recovery					73.03
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.01	60.00	60.00	5/14/14 10:27	4.87E-01	5/14/14 16:46
<b>Count Data</b>			<b>Results</b>		
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
4.05	3.85	0.084	0.299	0.515	0.249
Comments: <u>Batch: OOL10-11-Sr-3</u>					
Performed By: <u></u> Date <u>5.21.14</u>			Reviewed By: <u></u> Date <u>5.21.14</u>		

2014-0270.xls

V and V Date 11/14/13

## Strontium-90 Analysis Sheet

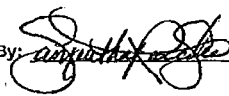

Sample Number: <u>2014 - 0271</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-11-008-F</u> <u>Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/28/14 9:45</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7108</u> Calibration Due Date: <u>10/29/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0952	0.1020	78.82
Sample blank					0.00
Net Recovery					78.82
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.00	60.00	60.00	5/1/14 15:20	5.03E-01	5/1/14 23:54
<b>Count Data</b>		<b>Results</b>			
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.23	4.07	-0.316	0.259	0.476	0.230
Comments: <u>Batch: OOL10-11-Sr-1</u>					
<div style="display: flex; justify-content: space-between;"> <div>             Performed By: <u>[Signature]</u> Date: <u>5.7.14</u> </div> <div>             Reviewed By: <u>[Signature]</u> Date: <u>5-7-14</u> </div> </div>					

2014-0271.xls

V and V Date 11/14/13



## Strontium-90 Analysis Sheet

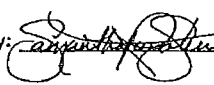

Sample Number: <u>2014 - 0272</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-11-0009-F Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/29/14 9:50</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0949	0.1025	88.10
Sample blank					0.00
Net Recovery					88.10
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.00	60.00	60.00	5/14/14 10:27	4.92E-01	5/14/14 17:47
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.28	3.85	-0.197	0.234	0.424	0.205
Comments: <u>Batch: OOL10-11-Sr-3</u>					
<div style="display: flex; justify-content: space-between;"> <div>             Performed By:  Date: <u>5.21.14</u> </div> <div>             Reviewed By:  Date: <u>5.21-14</u> </div> </div>					

2014-0272.xls

V and V Date 11/14/13



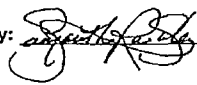

## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0274</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-11-011-F</u> <u>Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/28/14 9:55</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7108</u> Calibration Due Date: <u>10/29/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0960	0.1035	86.94
Sample blank					0.00
Net Recovery					86.94
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.04	60.00	60.00	5/1/14 15:45	5.05E-01	5/2/14 0:54
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.62	4.07	-0.152	0.236	0.423	0.204
Comments: <u>Batch: OOL10-11-Sr-1</u>					
<div style="display: flex; justify-content: space-between;"> <div>Performed By: <u></u> Date <u>5-7-14</u></div> <div>Reviewed By: <u></u> Date <u>5-7-14</u></div> </div>					

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V and V Date 11/14/13

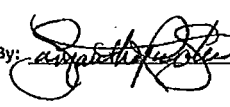
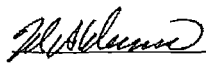
## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0275</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-11-012-F Fishermans Channel</u>					
Sample Collection Date/Time: <u>4/28/14 10:30</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0967	0.1038	82.30
Sample blank					0.00
Net Recovery					82.30
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.01	60.00	60.00	5/8/14 9:47	5.04E-01	5/8/14 19:31
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.48	3.17	0.114	0.236	0.402	0.193
Comments: <u>Batch: OOL10-11-Sr-2</u>					
<div style="display: flex; justify-content: space-between;"> <div>             Performed By: <u></u> Date <u>5-12-14</u> </div> <div>             Reviewed By: <u></u> Date <u>5-12-14</u> </div> </div>					

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V and V Date 11/14/13

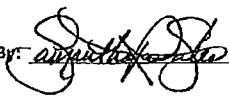
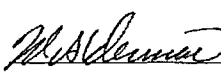
## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0276</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-11-013-F Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/29/14 9:40</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt. g	Sr Recovery (%)
Sample	5.12	1.00	0.0953	0.1025	83.46
Sample blank					0.00
Net Recovery					83.46
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.01	60.00	60.00	5/14/14 10:27	4.97E-01	5/14/14 18:47
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.37	3.85	-0.174	0.245	0.442	0.213
Comments: <u>Batch: OOL10-11-Sr-3</u>					
<div style="display: flex; justify-content: space-between;"> <div>             Performed By:  Date: <u>5.21.14</u> </div> <div>             Reviewed By:  Date: <u>5-21-14</u> </div> </div>					

2014-0276.xls

V and V Date 11/14/13

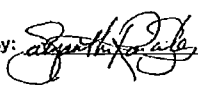
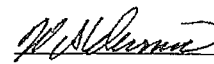
## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0277</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-11-014-F Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/29/14 10:05</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0960	0.1023	73.03
Sample blank					0.00
Net Recovery					73.03
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.00	60.00	60.00	5/14/14 10:31	5.02E-01	5/14/14 19:47
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.53	3.85	-0.130	0.282	0.502	0.242
Comments: <u>Batch: OOL10-11-Sr-3</u>					
Performed By: <u></u> Date <u>5-21-14</u>			Reviewed By: <u></u> Date <u>5-21-14</u>		

2014-0277.xls

V and V Date 11/14/13


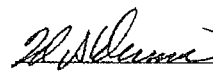
## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0278</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-11-015-F Fishermans Channel</u>					
Sample Collection Date/Time: <u>4/28/14 8:20</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0955	0.1004	56.80
Sample blank					0.00
Net Recovery					56.80
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
2.99	60.00	60.00	5/8/14 9:47	5.09E-01	5/8/14 20:31
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.83	3.17	0.347	0.349	0.581	0.279
Comments: <u>Batch: OOL10-11-Sr-2</u>					
Performed By: <u></u> Date <u>5-12-14</u> Reviewed By: <u></u> Date <u>5-12-14</u>					

2014-0278.xls

V and V Date 11/14/13

## Strontium-90 Analysis Sheet

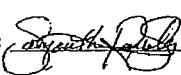

Sample Number: <u>2014 - 0279</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-11-016-F Fishermans Channel</u>					
Sample Collection Date/Time: <u>4/29/14 9:30</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0957	0.1020	73.03
Sample blank					0.00
Net Recovery					73.03
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.01	60.00	60.00	5/8/14 14:02	5.24E-01	5/9/14 4:05
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.88	3.17	0.280	0.263	0.436	0.209
Comments: <u>Batch: OOL10-11-Sr-2</u>					
<div style="display: flex; justify-content: space-between;"> <div>             Performed By:  Date: <u>5.12.14</u> </div> <div>             Reviewed By:  Date: <u>5-12-14</u> </div> </div>					

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V and V Date 11/14/13



## Strontium-90 Analysis Sheet

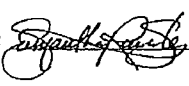

Sample Number: <u>2014 - 0280</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-11-017-F Fishermans Channel</u>					
Sample Collection Date/Time: <u>4/29/14 11:00</u>					
Counting Instrument: <u>Protean</u>		S/N: <u>7109</u>		Calibration Due Date: <u>10/16/2014</u>	
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0961	0.1015	62.60
Sample blank					0.00
Net Recovery					62.60
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.02	60.00	60.00	5/8/14 14:02	5.26E-01	5/9/14 4:34
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
2.95	3.17	-0.098	0.283	0.505	0.242
Comments: <u>Batch: OOL10-11-Sr-2</u>					
<div style="display: flex; justify-content: space-between;"> <div>             Performed By: <u></u> Date <u>5.12.14</u> </div> <div>             Reviewed By: <u></u> Date <u>5-12-14</u> </div> </div>					

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V and V Date 11/14/13

Sample Number: <u>2014 - 0281</u>					
General Information					
Sample Description: <u>FSSP-OOL10-11-018-F Fishermans Channel</u>					
Sample Collection Date/Time: <u>4/28/14 12:00</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
Sr Recovery					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0956	0.0994	44.05
Sample blank					0.00
<b>Net Recovery</b>					<b>44.05</b>
Counting Information					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.05	60.00	60.00	5/8/14 14:02	5.31E-01	5/9/14 5:34
Count Data			Results		
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2 $\sigma$ Error pCi/g	MDA pCi/g	Lc pCi/g
3.13	3.17	-0.021	0.401	0.704	0.338
Comments: <u>Batch: OOL10-11-Sr-2</u>					
Performed By: <u>[Signature]</u> Date <u>5.12.14</u>					
Reviewed By: <u>[Signature]</u> Date <u>5-12-14</u>					



## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0282</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-11-019-F Fishermans Channel</u>					
Sample Collection Date/Time: <u>4/28/14 11:30</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0961	0.1014	61.44
Sample blank					0.00
Net Recovery					61.44
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.01	60.00	60.00	5/8/14 14:02	5.22E-01	5/9/14 3:33
<b>Count Data</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.63	3.17	0.218	0.308	0.520	0.250
Comments: <u>Batch: OOL10-11-Sr-2</u>					
Performed By: <u></u> Date <u>5.12.14</u> Reviewed By: <u></u> Date <u>5-12-14</u>					

2014-0282.xls

V and V Date 11/14/13

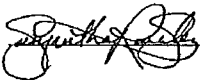

## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0283</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-11-020-F Fishermans Channel</u>					
Sample Collection Date/Time: <u>4/28/14 11:05</u>					
Counting Instrument: <u>Protean</u>		S/N: <u>7109</u>		Calibration Due Date: <u>10/16/2014</u>	
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0964	0.1028	74.19
Sample blank					0.00
Net Recovery					74.19
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.02	60.00	60.00	5/8/14 14:02	4.67E-01	5/8/14 16:28
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.38	3.17	0.093	0.279	0.480	0.230
Comments: <u>Batch: OOL10-11-Sr-2</u>					
Performed By: <u></u>		Date: <u>5-12-14</u>		Reviewed By: <u></u> Date: <u>5-12-14</u>	

2014-0283.xls

V and V Date 11/14/13

## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0283 RC</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-11-020-F Fishermans Channel</u>					
Sample Collection Date/Time: <u>4/28/14 11:05</u>					
Counting Instrument: <u>Prolean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0964	0.1028	74.19
Sample blank					0.00
Net Recovery					74.19
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.02	60.00	60.00	5/8/14 14:02	4.73E-01	5/8/14 17:30
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.67	3.17	0.213	0.282	0.474	0.228
Comments: <u>Batch: OOL10-11-Sr-2</u>					
<div style="display: flex; justify-content: space-between; align-items: flex-end;"> <div>             Performed By:  Date: <u>5-12-14</u> </div> <div>             Reviewed By:  Date: <u>5-12-14</u> </div> </div>					

2014-0283 RC.xls

V and V Date 11/14/13

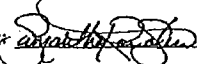
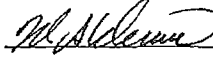
## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0284</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-12-001-F Land Adj. to Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/28/14 9:05</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0970	0.1032	71.87
Sample blank					0.00
Net Recovery					71.87
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.04	60.00	60.00	5/12/14 10:10	4.90E-01	5/12/14 17:04
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.75	3.50	0.105	0.287	0.492	0.237
Comments: <u>Batch: OOL10-12-Sr-1</u>					
<div style="display: flex; justify-content: space-between;"> <div>             Performed By: <u></u> Date: <u>5.13.14</u> </div> <div>             Reviewed By: <u></u> Date: <u>5-14-14</u> </div> </div>					

2014-0284.xls

V and V Date 11/14/13

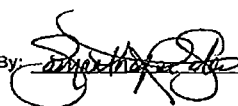

## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0285</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-12-002-F Land Adj. to Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/28/14 9:10</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0963	0.1039	88.10
Sample blank					0.00
Net Recovery					88.10
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.00	60.00	60.00	5/12/14 10:10	4.95E-01	5/12/14 18:05
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.23	3.50	-0.092	0.226	0.403	0.194
Comments: <u>Batch: OOL10-12-Sr-1</u>					
<div style="display: flex; justify-content: space-between;"> <div>             Performed By: <u></u> Date <u>5.13.14</u> </div> <div>             Reviewed By: <u></u> Date <u>5-14-14</u> </div> </div>					

2014-0285.xls

V and V Date 11/14/13

## Strontium-90 Analysis Sheet

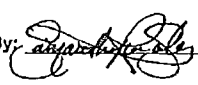
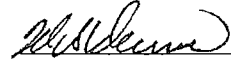
Sample Number: <u>2014 - 0286</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-12-003-F Land Adj. to Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/30/14 13:15</u>					
Counting Instrument: <u>Protean</u>		S/N: <u>7109</u>		Calibration Due Date: <u>10/16/2014</u>	
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0965	0.1030	75.35
Sample blank					0.00
Net Recovery					75.35
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.01	60.00	60.00	5/15/14 10:27	4.88E-01	5/15/14 16:56
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.40	3.20	0.081	0.265	0.456	0.219
Comments: <u>Batch: OOL10-12-Sr-3</u>					
<div style="display: flex; justify-content: space-between;"> <div> Performed By:  Date: <u>5-21-14</u> </div> <div> Reviewed By:  Date: <u>5-21-14</u> </div> </div>					

2014-0286.xls

V and V Date 11/14/13



## Strontium-90 Analysis Sheet

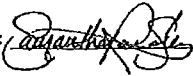

Sample Number: <u>2014 - 0287</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-12-004-F Land Adj. to Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/30/14 13:25</u>					
Counting Instrument: <u>Protean</u>		S/N: <u>7109</u>		Calibration Due Date: <u>10/16/2014</u>	
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0961	0.1035	85.78
Sample blank					0.00
Net Recovery					85.78
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.00	60.00	60.00	5/12/14 10:10	5.05E-01	5/12/14 20:06
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2 $\sigma$ Error pCi/g	MDA pCi/g	Lc pCi/g
4.32	3.50	0.283	0.245	0.406	0.195
Comments: <u>Batch: OOL10-12-Sr-1</u>					
<div style="display: flex; justify-content: space-between;"> <span>Performed By: <u></u> Date <u>5.13.14</u></span> <span>Reviewed By: <u></u> Date <u>5-14-14</u></span> </div>					

2014-0287.xls

V and V Date 11/14/13

Sample Number: <u>2014 - 0288</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-12-005-F Land Adj. to Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/30/14 13:30</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0950	0.1033	96.21
Sample blank					0.00
Net Recovery					96.21
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.02	60.00	60.00	5/12/14 10:10	5.10E-01	5/12/14 21:06
<b>Count Data</b>			<b>Results</b>		
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
4.27	3.60	0.233	0.215	0.356	0.171
Comments: <u>Batch: OOL10-12-Sr-1</u>					
Performed By: <u>[Signature]</u>		Date: <u>5.13.14</u>		Reviewed By: <u>[Signature]</u> Date: <u>5.14.14</u>	

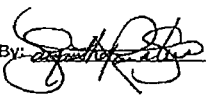
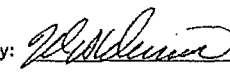
## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0289</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-12-006-F Land Adj. to Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/30/14 13:17</u>					
Counting Instrument: <u>Protean</u>		S/N: <u>7109</u>		Calibration Due Date: <u>10/16/2014</u>	
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0961	0.1042	93.89
Sample blank					0.00
Net Recovery					93.89
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
2.99	60.00	60.00	5/12/14 10:10	5.15E-01	5/12/14 22:07
<b>Count Data</b>			<b>Results</b>		
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.93	3.50	0.135	0.215	0.365	0.176
Comments: <u>Batch: OOL10-12-Sr-1</u>					
Performed By: <u></u> Date <u>5.13.14</u> Reviewed By: <u></u> Date <u>5.14.14</u>					

2014-0289.xls

V and V Date 11/14/13

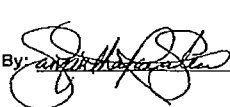

## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0290</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-12-007-F Land Adj. to Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/30/14 13:50</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt. g	Sr Recovery (%)
Sample	5.12	1.00	0.0952	0.1019	77.67
Sample blank					0.00
<b>Net Recovery</b>					77.67
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.01	60.00	60.00	5/15/14 10:31	4.77E-01	5/15/14 14:50
<b>Count Data</b>			<b>Results</b>		
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2 $\sigma$ Error pCi/g	MDA pCi/g	Lc pCi/g
3.50	3.20	0.121	0.265	0.453	0.218
Comments: <u>Batch: OOL10-12-Sr-3</u>					
Performed By: 		Date: <u>5-21-14</u>		Reviewed By:  Date: <u>5-21-14</u>	

2014-0290.xls

V and V Date 11/14/13

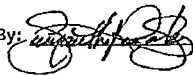
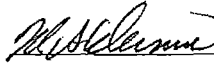
## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0290 RC</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-12-007-F Land Adj. to Fisherman's Channel (Recount)</u>					
Sample Collection Date/Time: <u>4/30/14 13:50</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0952	0.1019	77.67
Sample blank					0.00
Net Recovery					77.67
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.01	60.00	60.00	5/15/14 10:31	4.83E-01	5/15/14 15:56
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.32	3.20	0.047	0.258	0.447	0.215
Comments: <u>Batch: OOL10-12-Sr-3</u>					
<div style="display: flex; justify-content: space-between;"> <div> Performed By:  Date: <u>5-20-14</u> </div> <div> Reviewed By:  Date: <u>5-20-14</u> </div> </div>					

2014-0290 Recount.xls

V and V Date 11/14/13

## Strontium-90 Analysis Sheet

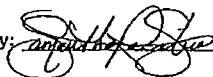

Sample Number: <u>2014 - 0291</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-12-008-F Land Adj. to Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/30/14 14:10</u>					
Counting Instrument: <u>Protean</u>		S/N: <u>7109</u>		Calibration Due Date: <u>10/16/2014</u>	
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0964	0.1045	93.89
Sample blank					0.00
Net Recovery					93.89
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.03	60.00	60.00	5/12/14 10:10	5.24E-01	5/13/14 0:07
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.53	3.50	0.010	0.203	0.354	0.170
Comments: <u>Batch: OOL10-12-Sr-1</u>					
<div style="display: flex; justify-content: space-between;"> <div>             Performed By:  Date <u>5-13-14</u> </div> <div>             Reviewed By:  Date <u>5-14-14</u> </div> </div>					

2014-0291.xls

V and V Date 11/14/13



## Strontium-90 Analysis Sheet



Sample Number: <u>2014 - 0293</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-12-010-F Land Adj. to Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/30/14 13:05</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0959	0.1029	81.14
Sample blank					0.00
Net Recovery					81.14
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.03	60.00	60.00	5/15/14 10:33	5.02E-01	5/15/14 19:57
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2 $\sigma$ Error pCi/g	MDA pCi/g	Lc pCi/g
3.37	3.20	0.061	0.237	0.409	0.196
Comments: <u>Batch: OOL10-12-Sr-3</u>					
<div style="display: flex; justify-content: space-between;"> <div> Performed By: <u></u> Date <u>5-20-14</u> </div> <div> Reviewed By: <u></u> Date <u>5-20-14</u> </div> </div>					

2014-0293.xls

V and V Date 11/14/13



## Strontium-90 Analysis Sheet

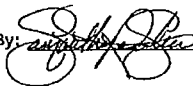

Sample Number: <u>2014 - 0294</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-12-011-F Land Adj. to Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/30/14 13:05</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0962	0.1025	73.03
Sample blank					0.00
Net Recovery					73.03
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.00	60.00	60.00	5/15/14 10:28	5.08E-01	5/15/14 20:58
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.38	3.20	0.074	0.263	0.454	0.218
Comments: <u>Batch: OOL10-12-Sr-3</u>					
<div style="display: flex; justify-content: space-between;"> <div>Performed By: <u></u> Date <u>5-20-14</u></div> <div>Reviewed By: <u></u> Date <u>5-20-14</u></div> </div>					

2014-0294.xls

V and V Date 11/14/13



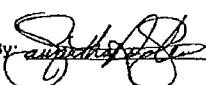

## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0296</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-12-013-F Land Adj. to Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/30/14 14:14</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0960	0.1017	66.07
Sample blank					0.00
Net Recovery					66.07
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.00	60.00	60.00	5/15/14 10:38	5.18E-01	5/15/14 22:59
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.47	3.20	0.118	0.288	0.493	0.237
Comments: <u>Batch: OOL10-12-Sr-3</u>					
Performed By: <u></u> Date: <u>5.20.14</u>			Reviewed By: <u></u> Date: <u>5.20.14</u>		

2014-0296.xls

V and V Date 11/14/13

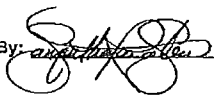

## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0297</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-12-014-F Land Adj. to Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/30/14 14:11</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt. g	Sr Recovery (%)
Sample	5.12	1.00	0.0969	0.1034	75.35
Sample blank					0.00
Net Recovery					75.35
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.02	60.00	60.00	5/15/14 12:51	5.15E-01	5/16/14 0:59
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.78	3.20	0.224	0.257	0.431	0.207
Comments: <u>Batch: OOL10-12-Sr-3</u>					
Performed By: <u></u>		Date: <u>5-20-14</u>		Reviewed By: <u></u> Date: <u>5-20-14</u>	

2014-0297.xls

V and V Date 11/14/13

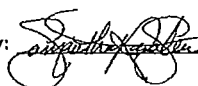

## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0298</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-12-015-F Land Adj. to Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/30/14 14:20</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt. g	Sr Recovery (%)
Sample	5.12	1.00	0.0953	0.1012	68.39
Sample blank					0.00
Net Recovery					68.39
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.02	60.00	60.00	5/15/14 10:35	5.21E-01	5/15/14 23:59
<b>Count Data</b>			<b>Results</b>		
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.55	3.20	0.147	0.275	0.469	0.225
Comments: <u>Batch: OOL10-12-Sr-3</u>					
Performed By: <u></u> Date <u>5-20-14</u>			Reviewed By: <u></u> Date <u>5-20-14</u>		

2014-0298.xls

V and V Date 11/14/13

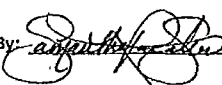

## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0299</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-12-018-F Land Adj. to Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/30/14 14:20</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt. g	Sr Recovery (%)
Sample	5.12	1.00	0.0960	0.1030	81.14
Sample blank					0.00
Net Recovery					81.14
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.00	60.00	60.00	5/15/14 10:32	5.31E-01	5/16/14 2:00
<b>Count Data</b>			<b>Results</b>		
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.63	3.20	0.151	0.231	0.391	0.188
Comments: <u>Batch: OOL10-12-Sr-3</u>					
Performed By: <u></u>		Date: <u>5-20-14</u>		Reviewed By: <u></u>	
				Date: <u>5-20-14</u>	

2014-0299.xls

V and V Date 11/14/13

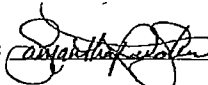

## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0300</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-12-017-F Land Adj. to Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/30/14 14:25</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0947	0.1020	84.62
Sample blank					0.00
Net Recovery					84.62
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.02	60.00	60.00	5/14/14 10:29	5.12E-01	5/14/14 21:48
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.73	3.85	-0.040	0.240	0.422	0.204
Comments: <u>Batch: OOL10-12-Sr-2</u>					
<div style="display: flex; justify-content: space-between;"> <div>             Performed By: <u></u> Date <u>5.15.14</u> </div> <div>             Reviewed By: <u></u> Date <u>5-15-14</u> </div> </div>					

2014-0300.xls

V and V Date 11/14/13

## Strontium-90 Analysis Sheet

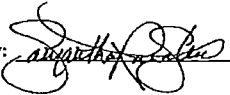

Sample Number: <u>2014 - 0301</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-12-018-F Land Adj. to Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/30/14 14:31</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0951	0.1022	82.30
Sample blank					0.00
Net Recovery					82.30
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.01	60.00	60.00	5/14/14 10:29	5.16E-01	5/14/14 22:49
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.23	3.85	-0.217	0.237	0.431	0.208
Comments: <u>Batch: OOL10-12-Sr-2</u>					
<div style="display: flex; justify-content: space-between;"> <div>             Performed By:  Date <u>5-15-14</u> </div> <div>             Reviewed By:  Date <u>5-15-14</u> </div> </div>					

2014-0301.xls

V and V Date 11/14/13



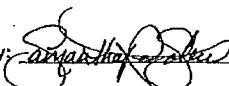

## Strontium-90 Analysis Sheet

Sample Number; <u>2014 - 0302</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-12-019-F Land Adj. to Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/30/14 14:31</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0964	0.1032	78.82
Sample blank					0.00
Net Recovery					78.82
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.01	60.00	60.00	5/14/14 10:29	5.21E-01	5/14/14 23:49
<b>Count Data</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.22	3.85	-0.231	0.245	0.446	0.215
Comments: <u>Batch: OOL10-12-Sr-2</u>					
<div style="display: flex; justify-content: space-between;"> <div>             Performed By: <u></u> Date <u>5-15-14</u> </div> <div>             Reviewed By: <u></u> Date <u>5-15-14</u> </div> </div>					

2014-0302.xls

V and V Date 11/14/13

## Strontium-90 Analysis Sheet

Sample Number: <u>2014 - 0303</u>					
<b>General Information</b>					
Sample Description: <u>FSSP-OOL10-12-020-F Land Adj. to Fisherman's Channel</u>					
Sample Collection Date/Time: <u>4/30/14 14:40</u>					
Counting Instrument: <u>Protean</u> S/N: <u>7109</u> Calibration Due Date: <u>10/16/2014</u>					
<b>Sr Recovery</b>					
	Sr Carrier mg/ml	Sr Carrier Added ml	Filter Tare Wt. g	Filter Gross Wt g	Sr Recovery (%)
Sample	5.12	1.00	0.0946	0.1018	83.46
Sample blank					0.00
Net Recovery					83.46
<b>Counting Information</b>					
Sample Volume g	Sample Cnt Time (min)	Bkg Cnt Time (min)	Y-90 Extraction Date/Time	Ingrowth-Efficiency Factor	Sample Mid-Cnt Time date/time
3.02	60.00	60.00	5/14/14 10:31	5.25E-01	5/15/14 0:49
<b>Count Data      Results</b>					
Gross Sample (cpm)	Background (cpm)	Sr-90 Activity pCi/g	2σ Error pCi/g	MDA pCi/g	Lc pCi/g
3.52	3.85	-0.113	0.234	0.417	0.201
Comments: <u>Batch: OOL10-12-Sr-2</u>					
<div style="display: flex; justify-content: space-between;"> <div>             Performed By:  Date: <u>5.15.14</u> </div> <div>             Reviewed By:  Date: <u>5.15.14</u> </div> </div>					

2014-0303.xls

V and V Date 11/14/13

## Tritium Soil Results - Distilled

HBPP

Count Date: 05/02/2014		Std date: 04/11/2011						Water:				Soil:			
Standard dpm: 10390.60															
Smpl Number	DESCRIPTION	Background cpm	Gross cpm	Volume of Aliquot ml	Count time min	Moisture Content (Percent)	Efficiency c/d	Concentration: pCi/ml	Error: pCi/ml	MDA: pCi/ml	Critical Level: pCi/ml	Concentration: pCi/g	Error: pCi/g	MDA: pCi/g	Critical Level: pCi/g
	Bkg / Standard	16.3	3825.90	5	60		0.367								
2014-0264	FSSP-OOL10-11-001-F	16.3	16.80	5	60	0.217	0.367	0.12	0.36	0.61	0.30	0.03	0.08	0.13	0.07
2014-0265	FSSP-OOL10-11-002-F	16.3	16.80	5	60	0.528	0.367	0.12	0.36	0.61	0.30	0.06	0.19	0.32	0.16
2014-0266	FSSP-OOL10-11-003-F	16.3	17.00	5	60	0.546	0.367	0.17	0.36	0.61	0.30	0.09	0.20	0.33	0.16
2014-0267	FSSP-OOL10-11-004-F	16.3	17.00	5	60	0.595	0.367	0.17	0.36	0.61	0.30	0.10	0.21	0.36	0.18
2014-0268	FSSP-OOL10-11-005-F	16.3	16.60	5	60	0.730	0.367	0.07	0.36	0.61	0.30	0.05	0.26	0.45	0.22
2014-0269	FSSP-OOL10-11-006-F	16.3	16.60	5	60	0.797	0.367	0.07	0.36	0.61	0.30	0.06	0.29	0.49	0.24
2014-0270	FSSP-OOL10-11-007-F	16.3	18.00	5	60	0.623	0.367	0.42	0.37	0.61	0.30	0.26	0.23	0.38	0.19
2014-0271	FSSP-OOL10-11-008-F	16.3	17.40	5	60	0.885	0.367	0.27	0.36	0.61	0.30	0.24	0.32	0.54	0.27
2014-0272	FSSP-OOL10-11-009-F	16.3	15.60	5	60	0.444	0.367	-0.17	0.35	0.61	0.30	-0.08	0.16	0.27	0.13
2014-0273	FSSP-OOL10-11-010-F	16.3	17.30	5	60	0.346	0.367	0.25	0.36	0.61	0.30	0.09	0.12	0.21	0.10
2014-0274	FSSP-OOL10-11-011-F	16.3	16.60	5	60	0.955	0.367	0.07	0.36	0.61	0.30	0.07	0.34	0.58	0.29
2014-0275	FSSP-OOL10-11-012-F	16.3	16.50	5	60	0.840	0.367	0.05	0.36	0.61	0.30	0.04	0.30	0.51	0.25
2014-0276	FSSP-OOL10-11-013-F	16.3	16.60	5	60	0.382	0.367	0.07	0.36	0.61	0.30	0.03	0.14	0.23	0.11
2014-0277	FSSP-OOL10-11-014-F	16.3	15.90	5	60	0.653	0.367	-0.10	0.36	0.61	0.30	-0.07	0.24	0.40	0.20
2014-0278	FSSP-OOL10-11-015-F	16.3	16.70	5	60	0.655	0.367	0.10	0.36	0.61	0.30	0.07	0.24	0.40	0.20

## QC Sample Results

QC Sample Results						DPM / ml				Range	Satisfactory
HBS-584	Laboratory Control Sample	16.3	3821.80	5	60	0.367	2073.84	Within ± 5%	YES		
2014-0268	Sample	16.3	16.60	5	60	0.367	0.07	0.36	Normalized Absolute Difference < 1.95 YES-Satisfactory		
2014-0268	Replicate	16.3	16.30	5	60	0.367	0.00	0.36			

Comments

Performed by

Reviewed by

Date:

Date:

\*Error at 95% confidence

## HBPP

QC Sample Results						Range				Satisfactory
HBS-584	Laboratory Control Sample	16.3	3784.40	5	60	0.367	2053.46	Within ± 5%	YES	
2014-0281	Sample	16.3	16.30	5	60	0.367	0.00	0.36	Normalized Absolute Difference < 1.96 YES-Satisfactory	
2014-0281	Replicate	16.3	17.30	5	60	0.367	0.25	0.36		

### Comments

Performed by

Reviewed by

Date: 5.7.14

Date: 5-7-14

\*Error at 95% confidence

## MOISTURE CONTENT DETERMINATION FORM

HBPP Sample Number	Tare Weight (g)	Wet Weight (g)	Dry Weight (g)	Net Moisture Weight (g)	Moisture Content (%)
FSS-2014-0265	289.7	582.1	481.0	101.1	52.8
FSS-2014-0267	290.1	559.7	459.1	100.6	59.5
FSS-2014-0268	293.1	607.5	474.8	132.7	73.0
FSS-2014-0269	290.0	536.2	427.0	109.2	79.7
FSS-2014-0271	291.1	558.4	432.9	125.5	88.5
FSS-2014-0274	289.6	536.5	415.9	120.6	95.5
FSS-2014-0275	291.1	596.9	457.3	139.6	84.0
FSS-2014-0278	289.9	611.2	484.0	127.2	65.5
FSS-2014-0281	293.0	590.3	445.2	145.1	95.3
FSS-2014-0282	289.6	583.4	447.7	135.7	85.8
FSS-2014-0283	289.7	632.1	512.4	119.7	53.7
FSS-2014-0266	290.2	608.7	496.2	112.5	54.6

Performed By:

Date 5.6.14

## MOISTURE CONTENT DETERMINATION FORM

HBPP Sample Number	Tare Weight (g)	Wet Weight (g)	Dry Weight (g)	Net Moisture Weight (g)	Moisture Content (%)
FSS-2014-0264	293.1	826.8	731.8	95.0	21.7
FSS-2014-0270	290.1	627.0	497.7	129.3	62.3
FSS-2014-0279 Split	289.7	772.9	609.0	163.9	51.3
FSS-2014-0280	291.1	627.5	478.3	149.2	79.7
FSS-2014-0273	293.0	628.3	542.1	86.2	34.6
FSS-2014-0272	289.7	679.8	559.8	120.0	44.4
FSS-2014-0276	289.6	776.9	642.1	134.8	38.2
FSS-2014-0277	290.1	711.4	545.0	166.4	65.3
			NA		

Performed By: Date 5/6/14

## Tritium Soil Results - Distilled

HBPP

Count Date: 05/08/2014 Standard dpm: 10381.00 Std date: 04/11/2011								Water				Soil			
Smpl Number	DESCRIPTION	Background cpm	Gross cpm	Volume of Aliquot ml	Count time min	Moisture Content (Fraction)	Efficiency c/d	Concentration pCi/ml	Error pCi/ml	MDA pCi/ml	Critical Level pCi/ml	Concentration pCi/g	Error pCi/g	MDA pCi/g	Critical Level pCi/g
	Bkg / Standard	16.6	3818.10	5	60		0.366								
2014-0284	FSSP-OOL10-12-001-F	16.6	16.90	5	60	0.247	0.366	0.07	0.36	0.61	0.30	0.02	0.09	0.15	0.07
2014-0285	FSSP-OOL10-12-002-F	16.6	16.90	5	60	0.316	0.366	0.07	0.36	0.61	0.30	0.02	0.11	0.19	0.09
2014-0286	FSSP-OOL10-12-003-F	16.6	18.10	5	60	0.089	0.366	0.37	0.37	0.61	0.30	0.03	0.03	0.05	0.03
2014-0287	FSSP-OOL10-12-004-F	16.6	17.50	5	60	0.364	0.366	0.22	0.37	0.61	0.30	0.08	0.13	0.22	0.11
2014-0288	FSSP-OOL10-12-005-F	16.6	17.50	5	60	1.267	0.366	0.22	0.37	0.61	0.30	0.28	0.47	0.77	0.38
2014-0289	FSSP-OOL10-12-006-F	16.6	17.60	5	60	0.131	0.366	0.25	0.37	0.61	0.30	0.03	0.05	0.08	0.04
2014-0290	FSSP-OOL10-12-007-F	16.6	16.10	5	60	1.538	0.366	-0.12	0.36	0.61	0.30	-0.18	0.55	0.94	0.46
2014-0291	FSSP-OOL10-12-008-F	16.6	17.60	5	60	0.530	0.366	0.25	0.37	0.61	0.30	0.13	0.20	0.32	0.16
2014-0292	FSSP-OOL10-12-009-F	16.6	17.10	5	60	0.832	0.366	0.12	0.36	0.61	0.30	0.10	0.30	0.51	0.25
2014-0293	FSSP-OOL10-12-010-F	16.6	17.80	5	60	0.201	0.366	0.30	0.37	0.61	0.30	0.06	0.07	0.12	0.06
2014-0294	FSSP-OOL10-12-011-F	16.6	17.20	5	60	0.285	0.366	0.15	0.37	0.61	0.30	0.04	0.11	0.17	0.09
2014-0295	FSSP-OOL10-12-012-F	16.6	18.20	5	60	0.821	0.366	0.39	0.37	0.61	0.30	0.32	0.30	0.50	0.25
2014-0296	FSSP-OOL10-12-013-F	16.6	18.70	5	60	1.073	0.366	0.52	0.37	0.61	0.30	0.56	0.40	0.65	0.32
2014-0297	FSSP-OOL10-12-014-F	16.6	17.60	5	60	0.489	0.366	0.25	0.37	0.61	0.30	0.12	0.18	0.30	0.15
2014-0298	FSSP-OOL10-12-015-F	16.6	16.50	5	60	0.867	0.366	-0.02	0.36	0.61	0.30	-0.02	0.31	0.53	0.26

## QC Sample Results

						DPM / ml		Range	Satisfactory
HBS-584	Laboratory Control Sample	16.6	3779.90	5	60	0.366	2056.45	Within ± 5%	YES
2014-0291	Sample	16.6	17.60	5	60	0.366	0.25	0.37	Normalized Absolute
2014-0291	Replicate	16.6	17.20	5	60	0.366	0.15	0.37	Difference < 1.96
						YES-Satisfactory			

Comments

Performed by

Reviewed by

Date:

Date:

\*Error at 95% confidence

## HBPP

[illegible]

QC Sample Results					
HBS-584	Laboratory Control Sample	16.6	3801.60	5	60
2014-0302	Sample	16.6	17.80	5	60
2014-0302	Replicate	16.6	17.20	5	60

DPM / ml		Range	Satisfactory
0.366	2068.31	Within $\pm 5\%$	YES

0.366	0.30	0.37	Normalized Absolute Difference < 1.96 YES-Satisfactory
0.366	0.15	0.37	

### Comments

Performed by

Reviewed by

Date:

Date \_\_\_\_\_

\*Error at 95% confidence

1 of 1

V and V Date 3/22/12



## Attachment 3 Lab Data for HBPP-FSSP-OOL10-11 &amp; HBPP-FSSP-OOL10-12

HBPP Sample Number	Tare Weight (g)	Wet Weight (g)	Dry Weight (g)	Net Moisture Weight (g)	Moisture Content (%)
FSS-2014-0284	309.3	590.2	534.5	55.7	24.7
FSS-2014-0285	301.9	656.1	571.1	85.0	31.6
FSS-2014-0286	289.5	756.8	718.6	38.2	8.9
FSS-2014-0287	290.0	577.7	500.9	76.8	36.4
FSS-2014-0288	302.0	670.0	464.3	205.7	126.7
FSS-2014-0289	293.0	715.6	666.7	48.9	13.1
FSS-2014-0290	308.8	540.0	399.9	140.1	153.8
FSS-2014-0291	289.7	585.5	483.0	102.5	53.0
FSS-2014-0292	301.9	639.1	486.0	153.1	83.2
FSS-2014-0293	290.0	878.7	780.3	98.4	20.1
FSS-2014-0294	289.6	589.0	522.6	66.4	28.5
FSS-2014-0295	308.8	678.0	511.5	166.5	82.1

Performed By:

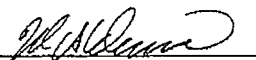
Date \_\_\_\_\_

5-12-14

## MOISTURE CONTENT DETERMINATION FORM

HBPP Sample Number	Tare Weight (g)	Wet Weight (g)	Dry Weight (g)	Net Moisture Weight (g)	Moisture Content (%)
FSS-2014-0296	290.0	571.9	426.0	145.9	107.3
FSS-2014-0297	312.4	668.8	551.7	117.1	48.9
FSS-2014-0298	308.3	663.6	498.6	165.0	86.7
FSS-2014-0299	289.7	630.1	519.3	110.8	48.3
FSS-2014-0300	308.8	685.1	579.1	106.0	39.2
FSS-2014-0301	309.2	616.3	496.2	120.1	64.2
FSS-2014-0302	290.1	620.3	542.7	77.6	30.7
FSS-2014-0303	308.8	732.3	687.1	45.2	11.9

Performed By:



Date:

5-12-14

## HBPP

100-100000

### QC Sample Results

Sample Results						DPM / ml				Range	Satisfaction
HBS-584	Laboratory Control Sample	16.1	3807.10	5	60	0.365	2071.58	Within $\pm 5\%$		YES	
2014-2127	Sample	16.1	17.00	5	60	0.366	0.22	0.36	Normalized Absolute		
2014-2127	Replicate	16.1	16.20	5	60	0.366	0.02	0.36	Difference < 1.95		
									YES-Satisfaction		

### Comments

Performed by

Reviewed by

Date:

Date:

\*Error at 95% confidence

Copy

### MOISTURE CONTENT DETERMINATION FORM

[illegible]

Performed By:

Date : 3.27.14



a member of **The GEL Group** INC.



PO Box 30712 Charleston, SC 29417  
2040 Savage Road Charleston, SC 29407  
P 843.556.8171 F 843.766.1178

[www.gel.com](http://www.gel.com)

May 30, 2014

Ms. Dee Anderson  
Pacific Gas and Electric, Humboldt Bay Power Plant  
1000 King Salmon Avenue  
Eureka, California 95503

Re: Final Status Survey  
Work Order: 348598

Dear Ms. Anderson:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on May 13, 2014. 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. 4504.

Sincerely,

A handwritten signature in black ink that reads "Erin B. Trent".

Erin Trent  
Project Manager

Purchase Order: 3500953353, Line item #4  
Enclosures



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# Case Narrative

## Attachment 3: Lab Data for OOL 10-11 &amp; OOL 10-12

**Case Narrative  
for  
Pacific Gas and Electric Company  
SDG: 348598**

**May 30, 2014**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary**

**Sample Receipt** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on May 13, 2014 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. Please see attached email regarding required analyses and MDCs.

**Sample Identification** The laboratory received the following samples:

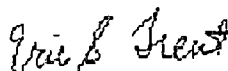
<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
348598001	FSS 0294 OOL10 12 011 F S
348598002	FSS-0302 OOL10-12-019-F-S
348598003	FSS 0266 OOL10 11 003 F S
348598004	FSS-0279 OOL10-11-016-F-S

**Case Narrative**

Sample analyses were conducted using methodology as outlined in GEL Laboratories, LLC (GEL) Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

**Data Package**

The enclosed data package contains the following sections: General Narrative, Chain of Custody and Supporting Documentation, and data from the following fractions: Radiochemistry.



Erin Trent  
Project Manager



# **Chain of Custody and Supporting Documentation**

PO# 3500953353		<h1>Lab: GEL Chain of Custody and Analytical Request</h1>										Page 1 of 1							
Contract #												Laboratory Number							
Vendor #												Individual sampled:							
Line Item # 004												Excavation Permit #							
Work Order #		348598%																	
Client Name: PG & E				707-444-0746				Sample Analysis Requested <sup>(5)</sup> (Fill in the number of containers for each test)											
Project/Site Name: HBPP				Fax #: 707-441-2671				Should this sample be considered:		Total number of containers		Hard To Detect Nuclides		Gamma		Preservative Type (6)		Comments Note: extra sample is required for sample specific QC	
Address: 1000 King Salmon, Eureka, Ca 95503				Collected by: RP Count Room		Send Results To: HBPP.LABFSS@pgce.com													
Sample ID		Date Collected (mm-dd-yy)	Time Collected (Military) (hh:mm)	QC Code <sup>(4)</sup>	Field Filtered <sup>(3)</sup>	Sample Matrix <sup>(5)</sup>	Radiactive	TSCA Regulated	Total number of containers	Hard To Detect Nuclides	Gamma								
FSS-0294		4/30/2014	13:40	N	N	SO	X		2	X	X								
OOL10-12-011-F-S																			
FSS-0302		4/30/2014	14:28	N	N	SO	X		2	X	X								
OOL10-12-019-F-S																			
FSS-0266		4/28/2014	8:20	N	N	SO	X		2	X	X								
OOL10-11-003-F-S																			
FSS-0279		4/29/2014	9:30	N	N	SO	X		2	X	X								
OOL10-11-016-F-S																			
TAT Requested: Normal: Rush: Specify: (Subject to Surcharge)				Fax Results: Yes / No				Circle Deliverable: C of A / QC Summary / Level 1 / Level 2 / Level 3 / Level 4											
Remarks: Are there any known hazards applicable to these samples? If so, please list the hazards. Thank you PG&E (Samples can be discarded appropriately) In case of emergency please call 707-444-0809 ***Analyze for attached list of nuclides as listed in letter attached from FSS engineer. SOIL FOR GAMMA ANALYSIS HAS ALREADY BEEN PROCESSED/DRIED, PLEASE COUNT IN THE CONFIGURATION AS SENT TO YOU. ****																			
Chain of Custody Signatures										Sample Shipping and Delivery Details									
Relinquished By (Signed)			Date		Time		Received By (Signed)			Date		Time		GEL PM:					
1 [Signature]			5-12-14		1100		2 [Signature]			5-13-14		0920		Method of Shipment:					
2							2							Date Shipped:					
1.) Chain of Custody Number = Client Determined										Airbill #:									
2.) QC Codes: N = Normal, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate, Sample G = Grab, C = Composite										For Lab Receiving Use Only									
3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered.										Custody Seal Intact?									
4.) Matrix Codes: DW = Drinking Water, GW = Groundwater, SW = Surface Water, WW = Waste Water, W = Water, SO = Soil, SD = Sediment, SL = Sludge, SS = Solid Waste, O = Oil, P = Filter, P = Wipe, U = Urine, F = Fecal, N = Nasal										YES NO									
5.) 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)										Cooler Temp:									
6.) 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										22 C									
WHITE = LABORATORY										YELLOW = FILE									
										PINK = CLIENT									

### Fishermans Channel and Adjacent Land Area Split Samples

The following samples were collected for split sample analyses between HBPP and the NRC:

- Two samples of sediment from the Fishermans Channel
- Three samples from the open land area adjacent to the channel

The split samples will be analyzed at the HBPP Countroom for the following radionuclides to the MDC's:

Nuclide	10% of DCGL MDC (pCi/g)	50% of DCGL MDC (pCi/g)
Co-60	3.8E-01	1.9E+00
Nb-94	7.1E-01	3.55E+00
I-129	4.8E-01	2.4E+00
Cs-137*	7.58E-01	3.79E+00
Eu-152	1.0E+00	5.0E+00
Eu-154	9.40E-01	4.70E+00
Np-237	1.1E-01	5.5E-01
H-3	6.8E+01	3.4E+02
Sr-90	1.5E-01	7.5E-01

\* The DCGL for Cs-137, the only nuclide expected to be present has been reduced to 24 mrem/y to account for any HTDs that might be present.

The desired MDCs in the laboratory analyses of soil samples will be the 10% DCGL values. If it is impractical to achieve those, the 50% DCGL values must be achieved in the laboratory analyses of the samples.

## Characterization MDCs for GEL for FSS Samples

Gamma Analysis:		10% to 50% of the DGGL		
Co-60	3.82E-01	to	1.91E+00	pCi/g
Nb-94	7.13E-01	to	3.57E+00	pCi/g
I-129	4.83E-01	to	2.42E+00	pCi/g
Cs-137	7.93E-01	to	3.97E+00	pCi/g
Eu-152	1.01E+00	to	5.05E+00	pCi/g
Eu-154	9.40E-01	to	4.70E+00	pCi/g
Np-237	1.11E-01	to	5.55E-01	pCi/g

Hard to Detect Nuclides:		10% to 50% of the DGGL		
H-3	6.88E+01	to	3.43E+02	pCi/g
C-14	6.30E-01	to	3.15E+00	pCi/g
Ni-59	1.97E+02	to	9.85E+02	pCi/g
Ni-63	7.24E+01	to	3.62E+02	pCi/g
Sr-90	1.51E-01	to	7.55E-01	pCi/g
Tc-99	1.24E+00	to	6.20E+00	pCi/g
Pu-239	2.97E+00	to	1.49E+01	pCi/g
Pu-239/240	2.67E+00	to	1.34E+01	pCi/g
Pu-241	8.61E+01	to	4.31E+02	pCi/g
Am-241	2.58E+00	to	1.29E+01	pCi/g
Cm-243	2.90E+00	to	1.45E+01	pCi/g
Cm-244	4.81E+00	to	2.41E+01	pCi/g
Cm-245	1.78E+00	to	8.90E+00	pCi/g
Cm-246	2.58E+00	to	1.29E+01	pCi/g



Laboratories LLC

## SAMPLE RECEIPT &amp; REVIEW FORM

Client: <u>PCGE</u>		SDG/AH/COC/Work Order: <u>348598</u>	
Received By: <u>MR</u>		Date Received: <u>5-13-14</u>	
Suspected Hazard Information		Yes	No
COC/Samples marked as radioactive?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Classified Radioactive II or III by RSO?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
COC/Samples marked containing PCBs?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Package, COC, and/or Samples marked as beryllium or asbestos containing?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Samples identified as Foreign Soil?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sample Receipt Criteria		Yes	No
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2a	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	VOA vials free of headspace (defined as < 6mm bubble)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
7	Are Encore containers present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
8	Samples received within holding time?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
12	Are sample containers identifiable as GEL provided?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
14	Carrier and tracking number.	Circle Applicable: <input checked="" type="checkbox"/> FedEx Air <input type="checkbox"/> FedEx Ground <input type="checkbox"/> UPS <input type="checkbox"/> Field Services <input type="checkbox"/> Courier <input type="checkbox"/> Other <u>8987 4170 351</u>	
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials EST Date 5/13/14 Page 1 of 1

Page 7 of 58

## Attachment 3: Lab Data for OOL 10-11 &amp; OOL 10-12

FW: FW:

**Subject:** FW: FW:**From:** "Oliver, Cynthia" <CCO1@pge.com>**Date:** Tue, 13 May 2014 15:14:44 +0000**To:** "Erin Trent (Erin.Trent@gel.com)" <Erin.Trent@gel.com>**CC:** "Anderson, Dee" <D1A6@pge.com>, "Alderman, Wayne" <WLAB@pge.com>

Erin – I am sorry the Engineer made a mistake in that letter – he did not include the nuclides you have listed below. Yes we need them analyzed for those nuclides also at the MDC's stated in the original letter from Dee. If this needs more clarification – we will have him type up a new letter with exactly what he wants, please let me know.

Thanks,  
Cyndi

**From:** Erin Trent [mailto:Erin.Trent@gel.com]**Sent:** Tuesday, May 13, 2014 8:10 AM**To:** Oliver, Cynthia**Subject:** Re: FW:

Thanks. So we DON'T need to do the analyses below?

Ni-63

Tc-99

C-14

Am/Cm

Pu-238,329/240,241

Ni-59

Erin Trent  
Project Manager  
GEL Laboratories, LLC  
2040 Savage Road  
Charleston, SC (USA) 29407  
Direct: 843.769.7374  
Main: 843.556.8171  
Fax: 843.766.1178  
Email: [Erin.Trent@gel.com](mailto:Erin.Trent@gel.com)  
Web: [www.gel.com](http://www.gel.com)

On 5/13/2014 11:06 AM, Oliver, Cynthia wrote:

Here is the attached letter from the FSS engineer – please apply this to the samples received today from Fisherman's Channel

Thanks,  
Cyndi

**From:** Oliver, Cynthia**Sent:** Tuesday, May 13, 2014 8:05 AM**To:** Oliver, Cynthia**Subject:**

FW: FW:

To learn more, please visit <http://www.pge.com/about/company/privacy/customer/>

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# Laboratory Certifications



**List of current GEL Certifications as of 30 May 2014**

State	Certification
Alaska	UST-110
Arkansas	88-0651
CLIA	42D0904046
California NELAP	01151CA
Colorado	SC00012
Connecticut	PH-0169
Delaware	SC000122013-10
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-12-00283, P330-12-00284
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC000122013-10
Idaho Chemistry	SC00012
Idaho Radiochemistry	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky	90129
Louisiana NELAP	03046 (AI33904)
Louisiana SDWA	LA130005
Maryland	270
Massachusetts	M-SC012
Michigan	9976
Mississippi	SC000122013-10
Nebraska	NE-OS-26-13
Nevada	SC000122014-1
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
Oklahoma	9904
Pennsylvania NELAP	68-00485
Plant Material Permit	PDEP-12-00260
South Carolina Chemistry	10120001
South Carolina GVL	23611001
South Carolina Radiochemi	10120002
Tennessee	TN 02934
Texas NELAP	T104704235-14-9
Utah NELAP	SC000122013-11
Vermont	VT87156
Virginia NELAP	460202
Washington	C780-12
Wisconsin	999887790

**GEL Laboratories LLC***problem solved*

P.O. Box 30712~Charleston, S.C. 29417~2040 Savage Road~29407  
(843)556-8171~Fax(843)766-1178

**Invoice for Analytical Services**

**Accounts Payable—PG&E**  
**Pacific Gas and Electric Company**  
**P.O. Box 7760**  
**San Francisco, California 94120**

PO: 3500953353, Line item #4

**Invoice #:** 288063  
**Invoice Date:** 30-MAY-14  
**Terms:** Net 30  
**Client:** Pacific Gas and Electric Company  
**Description (Order):** Final Status Survey  
**Workorder/SDG:** 348598  
**Project:** PCGE00606  
**Project Manager:** Erin Trent

GELID:348598001 Test	Matrix:SOIL Description	ClientID: FSS-0294 OOL10-12- Methods	Collected: 30-APR-14 Turn Days	Received: 13-MAY-14 Charge
GSCGAMMS	Gamma spec, Gamma, dried soil, Direct Count	DOE HASL 300, 4 5 2 3/Ga-01-R	21 (Receive)	\$73 46
LSC99TCS	Liquid Scint Tc99, Solid 1 24 pCi/g RDL	DOE EML HASL-300, Tc-02-RC Mo	21 (Receive)	\$106 25
GSC59NIS	Gamma Ni59, Solid 197 pCi/g RDL	DOE RESL Ni-1	21 (Receive)	\$110 50
LSC_14CS	Liquid Scint C14, Solid, 0 63 pCi/g RDL	EPA EERF C-01 Modified	21 (Receive)	\$110 50
LSC63NIS	Liquid Scint Ni63, Solid 72 4 pCi/g RDL	DOE RESL Ni-1, Modified	21 (Receive)	\$130 22
ASPAMCMS	Alphaspec Am241, Cm, Solid 1 78 pCi/g RDL	DOE EML HASL-300, Am-05-RC M	21 (Receive)	\$140 25
ASP_PUS	Alphaspec Pu, Solid 2 67 pCi/g RDL	DOE EML HASL-300, Pu-11-RC Mo	21 (Receive)	\$140 25
LSC41PUS	Liquid Scint Pu241, Solid 86 1 pCi/g RDL	DOE EML HASL-300, Pu-11-RC Mo	21 (Receive)	\$140 25
GFC90SRS	GFPC, Sr90, soil 0 151 pCi/g RDL	EPA 905 0 Modified	21 (Receive)	\$166 95
GSC_29IS	Gamma I129, Solid	DOE EML HASL-300,I-01 Modified	21 (Receive)	\$236 25
<b>Sample Total:</b>				<b>\$1,354.88</b>

GELID:348598002 Test	Matrix:SOIL Description	ClientID: FSS-0302 OOL10-12- Methods	Collected: 30-APR-14 Turn Days	Received: 13-MAY-14 Charge
GSCGAMMS	Gamma spec, Gamma, dried soil, Direct Count	DOE HASL 300, 4 5 2 3/Ga-01-R	21 (Receive)	\$73 46
LSC99TCS	Liquid Scint Tc99, Solid 1 24 pCi/g RDL	DOE EML HASL-300, Tc-02-RC Mo	21 (Receive)	\$106 25
GSC59NIS	Gamma Ni59, Solid 197 pCi/g RDL	DOE RESL Ni-1	21 (Receive)	\$110 50
LSC_14CS	Liquid Scint C14, Solid, 0 63 pCi/g RDL	EPA EERF C-01 Modified	21 (Receive)	\$110 50
LSC63NIS	Liquid Scint Ni63, Solid 72 4 pCi/g RDL	DOE RESL Ni-1, Modified	21 (Receive)	\$130 22
ASPAMCMS	Alphaspec Am241, Cm, Solid 1 78 pCi/g RDL	DOE EML HASL-300, Am-05-RC M	21 (Receive)	\$140 25
ASP_PUS	Alphaspec Pu, Solid 2 67 pCi/g RDL	DOE EML HASL-300, Pu-11-RC Mo	21 (Receive)	\$140 25
LSC41PUS	Liquid Scint Pu241, Solid 86 1 pCi/g RDL	DOE EML HASL-300, Pu-11-RC Mo	21 (Receive)	\$140 25
GFC90SRS	GFPC, Sr90, soil 0 151 pCi/g RDL	EPA 905 0 Modified	21 (Receive)	\$166 95
GSC_29IS	Gamma I129, Solid	DOE EML HASL-300,I-01 Modified	21 (Receive)	\$236 25
<b>Sample Total:</b>				<b>\$1,354.88</b>

GELID:348598003 Test	Matrix:SOIL Description	ClientID: FSS-0266 OOL10-11- Methods	Collected: 28-APR-14 Turn Days	Received: 13-MAY-14 Charge
GSCGAMMS	Gamma spec, Gamma, dried soil, Direct Count	DOE HASL 300, 4 5 2 3/Ga-01-R	21 (Receive)	\$73 46
LSC99TCS	Liquid Scint Tc99, Solid 1 24 pCi/g RDL	DOE EML HASL-300, Tc-02-RC Mo	21 (Receive)	\$106 25
GSC59NIS	Gamma Ni59, Solid 197 pCi/g RDL	DOE RESL Ni-1	21 (Receive)	\$110 50
LSC_14CS	Liquid Scint C14, Solid, 0 63 pCi/g RDL	EPA EERF C-01 Modified	21 (Receive)	\$110 50
LSC63NIS	Liquid Scint Ni63, Solid 72 4 pCi/g RDL	DOE RESL Ni-1, Modified	21 (Receive)	\$130 22
ASPAMCMS	Alphaspec Am241, Cm, Solid 1 78 pCi/g RDL	DOE EML HASL-300, Am-05-RC M	21 (Receive)	\$140 25
ASP_PUS	Alphaspec Pu, Solid 2 67 pCi/g RDL	DOE EML HASL-300, Pu-11-RC Mo	21 (Receive)	\$140 25
LSC41PUS	Liquid Scint Pu241, Solid 86 1 pCi/g RDL	DOE EML HASL-300, Pu-11-RC Mo	21 (Receive)	\$140 25
GFC90SRS	GFPC, Sr90, soil 0 151 pCi/g RDL	EPA 905 0 Modified	21 (Receive)	\$166 95
GSC_29IS	Gamma I129, Solid	DOE EML HASL-300,I-01 Modified	21 (Receive)	\$236 25
				<b>\$1,354.88</b>

## Attachment 3: Lab Data for OOL 10-11 &amp; OOL 10-12

**GEL Laboratories LLC***problem solved*

Accounts Payable—PG&E		Invoice #: 288063		
Description (Order): Final Status Survey		Invoice Date: 30-MAY-14		
		PO: 3500953353, Line item #4		
GELID:348598004	Matrix: SOIL	ClientID: FSS-0279 OOL10-11-	Collected: 29-APR-14	Received: 13-MAY-14
Test	Description	Methods	Turn Days	Charge
GSCGAMMS	Gammascpec, Gamma, dried soil, Direct Count	DOE HASL 300, 4 5 2 3/Ga-01-R	21 (Receive)	\$73 46
LSC99TCS	Liquid Scint Tc99, Solid 1 24 pCi/g RDL	DOE EML HASL-300, Tc-02-RC Mo	21 (Receive)	\$106 25
GSC59NIS	Gamma Ni59, Solid 197 pCi/g RDL	DOE RESL Ni-1	21 (Receive)	\$110 50
LSC_14CS	Liquid Scint C14, Solid, 0 63 pCi/g RDL	EPA EERF C-01 Modified	21 (Receive)	\$110 50
LSC63NIS	Liquid Scint Ni63, Solid 72 4 pCi/g RDL	DOE RESL Ni-1, Modified	21 (Receive)	\$130 22
ASPAMCMS	Alphaspec Am241, Cm, Solid 1 78 pCi/g RDL	DOE EML HASL-300, Am-05-RC Mo	21 (Receive)	\$140 25
ASP_PUS	Alphaspec Pu, Solid 2 67 pCi/g RDL	DOE EML HASL-300, Pu-11-RC Mo	21 (Receive)	\$140 25
LSC41PUS	Liquid Scint Pu241, Solid 86 1 pCi/g RDL	DOE EML HASL-300, Pu-11-RC Mo	21 (Receive)	\$140 25
GFC90SRS	GFPC, Sr90, soil 0 151 pCi/g RDL	EPA 905 0 Modified	21 (Receive)	\$166 95
GSC_29IS	Gamma I129, Solid	DOE EML HASL-300,I-01 Modified	21 (Receive)	\$236 25
Sample Total:				\$1,354.88
Miscellaneous Charge		Description	Charge	

**Invoice Total: \$5419.52**

# Radiological Analysis

## Attachment 3: Lab Data for OOL 10-11 &amp; OOL 10-12

**Radiochemistry Case Narrative**  
**Pacific Gas and Electric Company (PCGE)**  
**SDG 348598**

**Method/Analysis Information**

**Product:** Alphaspec Am241, Cm, Solid 1.78 pCi/g RDL  
**Analytical Method:** DOE EML HASL-300, Am-05-RC Modified  
**Prep Method:** Dry Soil Prep  
**Analytical Batch Number:** 1387983  
**Prep Batch Number:** 1387637

<b>Sample ID</b>	<b>Client ID</b>
348598001	FSS-0294 OOL10-12-011-F-S
348598003	FSS-0266 OOL10-11-003-F-S
348598004	FSS-0279 OOL10-11-016-F-S
1203088580	Method Blank (MB)
1203088581	348598001(FSS-0294 OOL10-12-011-F-S) Sample Duplicate (DUP)
1203088582	Laboratory Control Sample (LCS)

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

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-011 REV# 24.

**Calibration Information:****Calibration Information**

All initial and continuing calibration requirements have been met.

**Standards Information**

Standard solutions for these analysis are NIST traceable or verified with a NIST traceable standard and used before the expiration dates.

**Sample Geometry**

All counting sources were prepared in the same geometry as the calibration standards.

**Quality Control (QC) Information:****Blank Information**

The blank volume is representative of the sample volumes in this batch.

**Designated QC**

The following sample was used for QC: 348598001 (FSS-0294 OOL10-12-011-F-S).

## Attachment 3: Lab Data for OOL 10-11 &amp; OOL 10-12

**QC Information**

All of the QC samples met the required acceptance limits.

**Technical Information:****Holding Time**

All sample procedures for this sample set were performed within the required holding time.

**Sample Re-prep/Re-analysis**

None of the samples in this sample set required reprep or reanalysis.

**Recounts**

Samples 1203088580 (MB), 1203088581 (FSS-0294 OOL10-12-011-F-S) and 348598004 (FSS-0279 OOL10-11-016-F-S) were recounted due to a suspected false positive. The recounts are reported.

**Miscellaneous Information:****Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A data exception report (DER) was not generated for this SDG.

**Manual Integration**

No manual integrations were performed on data in this batch.

**Sample-Specific MDA/MDC**

The MDA/MDC reported on the certificate of analysis is a sample-specific MDA/MDC.

**Additional Comments**

Additional comments were not required for this sample set.

**Qualifier Information**

Manual qualifiers were not required.

**Method/Analysis Information**

<b>Product:</b>	<b>Alphaspec Pu, Solid 2.67 pCi/g RDL</b>
<b>Analytical Method:</b>	<b>DOE EML HASL-300, Pu-11-RC Modified</b>
<b>Prep Method:</b>	<b>Dry Soil Prep</b>
<b>Analytical Batch Number:</b>	<b>1387984</b>
<b>Prep Batch Number:</b>	<b>1387637</b>

<b>Sample ID</b>	<b>Client ID</b>
348598001	FSS-0294 OOL10-12-011-F-S
348598002	FSS-0302 OOL10-12-019-F-S
348598003	FSS-0266 OOL10-11-003-F-S

## Attachment 3: Lab Data for OOL 10-11 &amp; OOL 10-12

348598004	FSS-0279 OOL10-11-016-F-S
1203088587	Method Blank (MB)
1203088588	348598001(FSS-0294 OOL10-12-011-F-S) Sample Duplicate (DUP)
1203088589	Laboratory Control Sample (LCS)

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

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-011 REV# 24.

**Calibration Information:****Calibration Information**

All initial and continuing calibration requirements have been met.

**Standards Information**

Standard solutions for these analysis are NIST traceable or verified with a NIST traceable standard and used before the expiration dates.

**Sample Geometry**

All counting sources were prepared in the same geometry as the calibration standards.

**Quality Control (QC) Information:****Blank Information**

The blank volume is representative of the sample volume in this batch.

**Designated QC**

The following sample was used for QC: 348598001 (FSS-0294 OOL10-12-011-F-S).

**QC Information**

All of the QC samples met the required acceptance limits.

**Technical Information:****Holding Time**

All sample procedures for this sample set were performed within the required holding time.

**Sample Re-prep/Re-analysis**

None of the samples in this sample set required reprep or reanalysis.

**Recounts**

None of the samples in this batch were recounted.

**Miscellaneous Information:****Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A data exception report (DER) was not generated for this SDG.

**Manual Integration**

No manual integrations were performed on data in this batch.

## Attachment 3: Lab Data for OOL 10-11 &amp; OOL 10-12

**Sample-Specific MDA/MDC**

The MDA/MDC reported on the certificate of analysis is a sample-specific MDA/MDC.

**Additional Comments**

Additional comments were not required for this sample set.

**Qualifier Information**

Manual qualifiers were not required.

**Method/Analysis Information**

**Product:** Alphaspec Am241, Cm, Solid 1.78 pCi/g RDL  
**Analytical Method:** DOE EML HASL-300, Am-05-RC Modified  
**Prep Method:** Dry Soil Prep  
**Analytical Batch Number:** 1390686  
**Prep Batch Number:** 1387637

<b>Sample ID</b>	<b>Client ID</b>
348598002	FSS-0302 OOL10-12-019-F-S
1203095525	Method Blank (MB)
1203095526	348598002(FSS-0302 OOL10-12-019-F-S) Sample Duplicate (DUP)
1203095527	Laboratory Control Sample (LCS)

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

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-011 REV# 24.

**Calibration Information:****Calibration Information**

All initial and continuing calibration requirements have been met.

**Standards Information**

Standard solutions for these analysis are NIST traceable or verified with a NIST traceable standard and used before the expiration dates.

**Sample Geometry**

All counting sources were prepared in the same geometry as the calibration standards.

**Quality Control (QC) Information:****Blank Information**



## Attachment 3: Lab Data for OOL 10-11 &amp; OOL 10-12

The blank volume is representative of the sample volume in this batch.

**Designated QC**

The following sample was used for QC: 348598002 (FSS-0302 OOL10-12-019-F-S).

**QC Information**

All of the QC samples met the required acceptance limits.

**Technical Information:****Holding Time**

All sample procedures for this sample set were performed within the required holding time.

**Sample Re-prep/Re-analysis**

Sample 348598002 (FSS-0302 OOL10-12-019-F-S) was reprepared to verify activity. The re-analysis is reported.

**Recounts**

Sample 1203095527 (LCS) was recounted due to high recovery. The recount is reported. Samples 1203095526 (FSS-0302 OOL10-12-019-F-S) and 348598002 (FSS-0302 OOL10-12-019-F-S) were recounted due to a suspected false positive. The recounts are reported.

**Miscellaneous Information:****Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A data exception report (DER) was not generated for this SDG.

**Manual Integration**

No manual integrations were performed on data in this batch.

**Sample-Specific MDA/MDC**

The MDA/MDC reported on the certificate of analysis is a sample-specific MDA/MDC.

**Additional Comments**

Additional comments were not required for this sample set.

**Qualifier Information**

Manual qualifiers were not required.

**Method/Analysis Information**

<b>Product:</b>	<b>Gamma Ni59, Solid 197 pCi/g RDL</b>
<b>Analytical Method:</b>	<b>DOE RESL Ni-1</b>
<b>Prep Method:</b>	<b>Dry Soil Prep</b>
<b>Analytical Batch Number:</b>	<b>1387640</b>
<b>Prep Batch Number:</b>	<b>1387637</b>

## Attachment 3: Lab Data for OOL 10-11 &amp; OOL 10-12

Sample ID	Client ID
348598001	FSS-0294 OOL10-12-011-F-S
348598002	FSS-0302 OOL10-12-019-F-S
348598003	FSS-0266 OOL10-11-003-F-S
348598004	FSS-0279 OOL10-11-016-F-S
1203087730	Method Blank (MB)
1203087731	348598003(FSS-0266 OOL10-11-003-F-S) Sample Duplicate (DUP)
1203087732	Laboratory Control Sample (LCS)

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

#### SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-022 REV# 16.

#### Calibration Information:

##### Calibration Information

All initial and continuing calibration requirements have been met.

##### Standards Information

Standard solutions for these analysis are NIST traceable or verified with a NIST traceable standard and used before the expiration dates.

##### Sample Geometry

All counting sources were prepared in the same geometry as the calibration standards.

#### Quality Control (QC) Information:

##### Blank Information

The blank volume is representative of the sample volume in this batch.

##### Designated QC

The following sample was used for QC: 348598003 (FSS-0266 OOL10-11-003-F-S).

##### QC Information

All of the QC samples met the required acceptance limits.

#### Technical Information:

##### Holding Time

All sample procedures for this sample set were performed within the required holding time.

##### Sample Re-prep/Re-analysis

None of the samples in this sample set required reprep or reanalysis.

##### Chemical Recoveries

All chemical recoveries meet the required acceptance limits for this sample set.

##### Recounts

None of the samples in this batch were recounted.

## Attachment 3: Lab Data for OOL 10-11 &amp; OOL 10-12

**Miscellaneous Information:****Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A data exception report (DER) was not generated for this SDG.

**Sample-Specific MDA/MDC**

The MDA/MDC reported on the certificate of analysis is a sample-specific MDA/MDC.

**Additional Comments**

Additional comments were not required for this sample set.

**Qualifier Information**

Manual qualifiers were not required.

**Method/Analysis Information**

**Product:** Gammaspec, Gamma, dried soil, Direct Count  
**Analytical Method:** DOE HASL 300, 4.5.2.3/Ga-01-R  
**Analytical Batch Number:** 1387698

Sample ID	Client ID
348598001	FSS-0294 OOL10-12-011-F-S
348598002	FSS-0302 OOL10-12-019-F-S
348598003	FSS-0266 OOL10-11-003-F-S
348598004	FSS-0279 OOL10-11-016-F-S
1203087897	Method Blank (MB)
1203087898	348598001(FSS-0294 OOL10-12-011-F-S) Sample Duplicate (DUP)
1203087899	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-013 REV# 25.

**Calibration Information:****Calibration Information**

All initial and continuing calibration requirements have been met.

**Standards Information**

Standard solutions for these analysis are NIST traceable or verified with a NIST traceable standard and used before the expiration dates.

**Sample Geometry**

## Attachment 3: Lab Data for OOL 10-11 &amp; OOL 10-12

All counting sources were prepared in the same geometry as the calibration standards.

**Quality Control (QC) Information:****Blank Information**

The blank volume is representative of the sample volume in this batch.

**Designated QC**

The following sample was used for QC: 348598001 (FSS-0294 OOL10-12-011-F-S).

**QC Information**

All of the QC samples meet the required acceptance limits with the following exceptions: The sample and the duplicate, 1203087898 (FSS-0294 OOL10-12-011-F-S) and 348598001 (FSS-0294 OOL10-12-011-F-S), did not meet the relative percent difference requirement for Cs-137; however, they do meet the relative error ratio requirement with value of 1.23.

**Technical Information:****Holding Time**

All sample procedures for this sample set were performed within the required holding time.

**Sample Re-prep/Re-analysis**

None of the samples in this sample set required reprep or reanalysis.

**Recounts**

None of the samples in this batch were recounted.

**Miscellaneous Information:****Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A data exception report (DER) was not generated for this SDG.

**Sample-Specific MDA/MDC**

The MDA/MDC reported on the certificate of analysis is a sample-specific MDA/MDC.

**Additional Comments**

Additional comments were not required for this sample set.

**Qualifier Information**

Qualifier	Reason	Analyte	Sample	Client Sample
UI	Data rejected due to high peak-width.	Cerium-141	348598004	FSS-0279 OOL10-11-016-F-S
		Uranium-235	348598004	FSS-0279 OOL10-11-016-F-S
UI	Data rejected due to low abundance.	Bismuth-212	348598002	FSS-0302 OOL10-12-019-F-S
		Cesium-134	348598001	FSS-0294 OOL10-12-011-F-S

## Attachment 3: Lab Data for OOL 10-11 &amp; OOL 10-12

	348598002	FSS-0302 OOL10-12-019-F-S
	348598003	FSS-0266 OOL10-11-003-F-S
Cesium-136	348598001	FSS-0294 OOL10-12-011-F-S
Niobium-95	348598004	FSS-0279 OOL10-11-016-F-S

**Method/Analysis Information**

**Product:** Gamma I129, Solid

**Analytical Method:** DOE EML HASL-300,I-01 Modified

**Analytical Batch Number:** 1387906

Sample ID	Client ID
348598001	FSS-0294 OOL10-12-011-F-S
348598002	FSS-0302 OOL10-12-019-F-S
348598003	FSS-0266 OOL10-11-003-F-S
348598004	FSS-0279 OOL10-11-016-F-S
1203088381	Method Blank (MB)
1203088382	348598001(FSS-0294 OOL10-12-011-F-S) Sample Duplicate (DUP)
1203088383	348598001(FSS-0294 OOL10-12-011-F-S) Matrix Spike (MS)
1203088384	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-006 REV# 21.

**Calibration Information:****Calibration Information**

All initial and continuing calibration requirements have been met.

**Standards Information**

Standard solutions for these analysis are NIST traceable or verified with a NIST traceable standard and used before the expiration dates.

**Sample Geometry**

All counting sources were prepared in the same geometry as the calibration standards.

## Attachment 3: Lab Data for OOL 10-11 &amp; OOL 10-12

**Quality Control (QC) Information:****Blank Information**

The blank volume is representative of the sample volume in this batch.

**Designated QC**

The following sample was used for QC: 348598001 (FSS-0294 OOL10-12-011-F-S).

**QC Information**

All of the QC samples met the required acceptance limits.

**Technical Information:****Holding Time**

All sample procedures for this sample set were performed within the required holding time.

**Sample Re-prep/Re-analysis**

None of the samples in this sample set required prep or reanalysis.

**Recounts**

Sample 1203088383 (FSS-0294 OOL10-12-011-F-S) was recounted due to low recovery. The recount is reported.

**Miscellaneous Information:****Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A data exception report (DER) was not generated for this SDG.

**Sample-Specific MDA/MDC**

The MDA/MDC reported on the certificate of analysis is a sample-specific MDA/MDC.

**Additional Comments**

Additional comments were not required for this sample set.

**Qualifier Information**

Manual qualifiers were not required.

**Method/Analysis Information**

<b>Product:</b>	<b>GFPC, Sr90, soil 0.151 pCi/g RDL</b>
<b>Analytical Method:</b>	<b>EPA 905.0 Modified</b>
<b>Prep Method:</b>	<b>Dry Soil Prep</b>
<b>Analytical Batch Number:</b>	<b>1391080</b>
<b>Prep Batch Number:</b>	<b>1387637</b>

## Attachment 3: Lab Data for OOL 10-11 &amp; OOL 10-12

Sample ID	Client ID
348598001	FSS-0294 OOL10-12-011-F-S
348598002	FSS-0302 OOL10-12-019-F-S
348598003	FSS-0266 OOL10-11-003-F-S
348598004	FSS-0279 OOL10-11-016-F-S
1203096526	Method Blank (MB)
1203096527	348598001(FSS-0294 OOL10-12-011-F-S) Sample Duplicate (DUP)
1203096528	Laboratory Control Sample (LCS)

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

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-004 REV# 17.

**Calibration Information:****Calibration Information**

All initial and continuing calibration requirements have been met.

**Standards Information**

Standard solutions for these analysis are NIST traceable or verified with a NIST traceable standard and used before the expiration dates.

**Sample Geometry**

All counting sources were prepared in the same geometry as the calibration standards.

**Quality Control (QC) Information:****Blank Information**

The blank volume is representative of the sample volume in this batch.

**Designated QC**

The following sample was used for QC: 348598001 (FSS-0294 OOL10-12-011-F-S).

**QC Information**

All of the QC samples met the required acceptance limits.

**Technical Information:****Holding Time**

All sample procedures for this sample set were performed within the required holding time.

**Sample Re-prep/Re-analysis**

None of the samples in this sample set required reprep or reanalysis.

**Chemical Recoveries**

All chemical recoveries meet the required acceptance limits for this sample set.

**Recounts**

Sample 348598004 (FSS-0279 OOL10-11-016-F-S) was recounted due to a suspected false positive. The recount is reported.

## Attachment 3: Lab Data for OOL 10-11 &amp; OOL 10-12

**Miscellaneous Information:****Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A data exception report (DER) was not generated for this SDG.

**Sample-Specific MDA/MDC**

The MDA/MDC reported on the certificate of analysis is a sample-specific MDA/MDC.

**Additional Comments**

Additional comments were not required for this sample set.

**Qualifier Information**

Manual qualifiers were not required.

**Method/Analysis Information**

**Product:** Liquid Scint Pu241, Solid 86.1 pCi/g RDL  
**Analytical Method:** DOE EML HASL-300, Pu-11-RC Modified  
**Prep Method:** Dry Soil Prep  
**Analytical Batch Number:** 1387985  
**Prep Batch Number:** 1387637

Sample ID	Client ID
348598001	FSS-0294 OOL10-12-011-F-S
348598002	FSS-0302 OOL10-12-019-F-S
348598003	FSS-0266 OOL10-11-003-F-S
348598004	FSS-0279 OOL10-11-016-F-S
1203088590	Method Blank (MB)
1203088591	348598001(FSS-0294 OOL10-12-011-F-S) Sample Duplicate (DUP)
1203088592	Laboratory Control Sample (LCS)

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

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-035 REV# 16.

**Calibration Information:****Calibration Information**

All initial and continuing calibration requirements have been met.

**Standards Information**



## Attachment 3: Lab Data for OOL 10-11 &amp; OOL 10-12

Standard solutions for these analysis are NIST traceable or verified with a NIST traceable standard and used before the expiration dates.

**Sample Geometry**

All counting sources were prepared in the same geometry as the calibration standards.

**Quality Control (QC) Information:****Blank Information**

The blank volume is representative of the sample volume in this batch.

**Designated QC**

The following sample was used for QC: 348598001 (FSS-0294 OOL10-12-011-F-S).

**QC Information**

All of the QC samples met the required acceptance limits.

**Technical Information:****Holding Time**

All sample procedures for this sample set were performed within the required holding time.

**Sample Re-prep/Re-analysis**

None of the samples in this sample set required reprep or reanalysis.

**Recounts**

None of the samples in this batch were recounted.

**Miscellaneous Information:****Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A data exception report (DER) was not generated for this SDG.

**Manual Integration**

No manual integrations were performed on data in this batch.

**Sample-Specific MDA/MDC**

The MDA/MDC reported on the certificate of analysis is a sample-specific MDA/MDC.

**Additional Comments**

Additional comments were not required for this sample set.

**Qualifier Information**

Manual qualifiers were not required.

**Method/Analysis Information**

<b>Product:</b>	<b>Liquid Scint Ni63, Solid 72.4 pCi/g RDL</b>
<b>Analytical Method:</b>	<b>DOE RESL Ni-1, Modified</b>

## Attachment 3: Lab Data for OOL 10-11 &amp; OOL 10-12

Prep Method: Dry Soil Prep  
 Analytical Batch Number: 1387641  
 Prep Batch Number: 1387637

Sample ID	Client ID
348598001	FSS-0294 OOL10-12-011-F-S
348598002	FSS-0302 OOL10-12-019-F-S
348598003	FSS-0266 OOL10-11-003-F-S
348598004	FSS-0279 OOL10-11-016-F-S
1203087733	Method Blank (MB)
1203087734	348598003(FSS-0266 OOL10-11-003-F-S) Sample Duplicate (DUP)
1203087735	Laboratory Control Sample (LCS)

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

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-022 REV# 16.

**Calibration Information:****Calibration Information**

All initial and continuing calibration requirements have been met.

**Standards Information**

Standard solutions for these analysis are NIST traceable or verified with a NIST traceable standard and used before the expiration dates.

**Sample Geometry**

All counting sources were prepared in the same geometry as the calibration standards.

**Quality Control (QC) Information:****Blank Information**

The blank volume is representative of the sample volume in this batch.

**Designated QC**

The following sample was used for QC: 348598003 (FSS-0266 OOL10-11-003-F-S).

**QC Information**

All of the QC samples met the required acceptance limits.

**Technical Information:****Holding Time**

All sample procedures for this sample set were performed within the required holding time.

**Sample Re-prep/Re-analysis**

None of the samples in this sample set required reprep or reanalysis.

## Attachment 3: Lab Data for OOL 10-11 &amp; OOL 10-12

**Recounts**

None of the samples in this batch were recounted.

**Miscellaneous Information:****Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A data exception report (DER) was not generated for this SDG.

**Sample-Specific MDA/MDC**

The MDA/MDC reported on the certificate of analysis is a sample-specific MDA/MDC.

**Additional Comments**

Additional comments were not required for this sample set.

**Qualifier Information**

Manual qualifiers were not required.

**Method/Analysis Information**

**Product:** Liquid Scint Tc99, Solid 1.24 pCi/g RDL  
**Analytical Method:** DOE EML HASL-300, Tc-02-RC Modified  
**Analytical Batch Number:** 1387681

Sample ID	Client ID
348598001	FSS-0294 OOL10-12-011-F-S
348598002	FSS-0302 OOL10-12-019-F-S
348598003	FSS-0266 OOL10-11-003-F-S
348598004	FSS-0279 OOL10-11-016-F-S
1203087837	Method Blank (MB)
1203087838	348598001(FSS-0294 OOL10-12-011-F-S) Sample Duplicate (DUP)
1203087839	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-059 REV# 2.

**Calibration Information:****Calibration Information**

All initial and continuing calibration requirements have been met.

**Standards Information**

Standard solutions for these analysis are NIST traceable or verified with a NIST traceable standard and used

## Attachment 3: Lab Data for OOL 10-11 &amp; OOL 10-12

before the expiration dates.

**Sample Geometry**

All counting sources were prepared in the same geometry as the calibration standards.

**Quality Control (QC) Information:****Blank Information**

The blank volume is representative of the sample volume in this batch.

**Designated QC**

The following sample was used for QC: 348598001 (FSS-0294 OOL10-12-011-F-S).

**QC Information**

All of the QC samples met the required acceptance limits.

**Technical Information:****Holding Time**

All sample procedures for this sample set were performed within the required holding time.

**Sample Re-prep/Re-analysis**

None of the samples in this sample set required reprep or reanalysis.

**Recounts**

None of the samples in this batch were recounted.

**Miscellaneous Information:****Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A data exception report (DER) was not generated for this SDG.

**Sample-Specific MDA/MDC**

The MDA/MDC reported on the certificate of analysis is a sample-specific MDA/MDC.

**Additional Comments**

Additional comments were not required for this sample set.

**Qualifier Information**

Manual qualifiers were not required.

**Method/Analysis Information**

<b>Product:</b>	<b>Liquid Scint C14, Solid, 0.63 pCi/g RDL</b>
<b>Analytical Method:</b>	<b>EPA EERF C-01 Modified</b>
<b>Analytical Batch Number:</b>	<b>1388352</b>

## Attachment 3: Lab Data for OOL 10-11 &amp; OOL 10-12

Sample ID	Client ID
348598001	FSS-0294 OOL10-12-011-F-S
348598002	FSS-0302 OOL10-12-019-F-S
348598003	FSS-0266 OOL10-11-003-F-S
348598004	FSS-0279 OOL10-11-016-F-S
1203089505	Method Blank (MB)
1203089506	348598001(FSS-0294 OOL10-12-011-F-S) Sample Duplicate (DUP)
1203089507	348598001(FSS-0294 OOL10-12-011-F-S) Matrix Spike (MS)
1203089508	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-003 REV# 15.

**Calibration Information:****Calibration Information**

All initial and continuing calibration requirements have been met.

**Standards Information**

Standard solutions for these analysis are NIST traceable or verified with a NIST traceable standard and used before the expiration dates.

**Sample Geometry**

All counting sources were prepared in the same geometry as the calibration standards.

**Quality Control (QC) Information:****Blank Information**

The blank volume is representative of the sample volume in this batch.

**Designated QC**

The following sample was used for QC: 348598001 (FSS-0294 OOL10-12-011-F-S).

**QC Information**

All of the QC samples met the required acceptance limits.

**Technical Information:****Holding Time**

All sample procedures for this sample set were performed within the required holding time.

**Sample Re-prep/Re-analysis**

None of the samples in this sample set required reprep or reanalysis.

**Recounts**

Samples 348598001 (FSS-0294 OOL10-12-011-F-S) and 348598002 (FSS-0302 OOL10-12-019-F-S) were recounted due to the quench number being outside the calibration range. The recounts are reported. Samples 1203089506 (FSS-0294 OOL10-12-011-F-S) and 348598004 (FSS-0279 OOL10-11-016-F-S) were recounted due to a suspected false positive. The recounts are reported. Sample 348598003 (FSS-0266 OOL10-11-003-F-S) was recounted due to the quench number being outside the calibration range and then recounted due to results more negative than the three sigma TPU. The third count is reported.

Attachment 3: Lab Data for OOL 10-11 & OOL 10-12

**Miscellaneous Information:**

**Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A data exception report (DER) was not generated for this SDG.

**Sample-Specific MDA/MDC**

The MDA/MDC reported on the certificate of analysis is a sample-specific MDA/MDC.

**Additional Comments**

Additional comments were not required for this sample set.

**Qualifier Information**

Manual qualifiers were not required.

**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.

## GEL LABORATORIES LLC

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

### Qualifier Definition Report for

PCGE006 Pacific Gas and Electric Company

Client SDG: 348598 GEL Work Order: 348598

**The Qualifiers in this report are defined as follows:**

M Result is < LLD and > MDC

U Result is < LLD and < MDC

UI Uncertain identification for gamma spectroscopy

**Review/Validation**

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

**Signature:**



**Name:** Theresa Austin

**Date:** 02 JUN 2014

**Title:** Group Leader

# Sample Data Summary



**GEL LABORATORIES LLC**

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

**Certificate of Analysis**

GEL Sample ID: 348598001

Client: Pacific Gas and Electric Company

Client Sample ID: FSS-0294 OOL10-12-011-F-S

Collect Date: April 30, 2014

Client Matrix: Soil

Receive Date: May 13, 2014

Amount of Sample Received:

Report Date: June 02, 2014

Isotope	Run Date	Qualifier	Activity	2 Sigma Uncertainty	MDC	LLD	2 Sigma TPU	Units
C-14	05/22/14	U	-2.98E-01	3.40E-01	5.79E-01	6.30E-01	3.40E-01	pCi/g
Ni-63	05/22/14	U	-8.50E+00	2.55E+01	4.33E+01	7.24E+01	2.55E+01	pCi/g
Sr-90	05/29/14	U	1.67E-02	5.41E-02	8.67E-02	1.51E-01	5.42E-02	pCi/g
Tc-99	05/25/14	U	4.24E-04	4.69E-01	7.87E-01	1.24E+00	4.69E-01	pCi/g
Pu-241	05/27/14	U	-1.71E+01	3.07E+01	5.31E+01	8.61E+01	3.07E+01	pCi/g
<b>Alpha Spec</b>								
Pu-238	05/21/14	U	-2.33E-02	1.61E-01	3.92E-01	2.97E+00	1.61E-01	pCi/g
Pu-239/240	05/21/14	U	1.48E-01	2.40E-01	3.71E-01	2.67E+00	2.41E-01	pCi/g
Am-241	05/21/14	U	9.43E-02	1.86E-01	3.15E-01	2.58E+00	1.87E-01	pCi/g
Cm-243/244	05/21/14	U	3.21E-02	2.58E-01	5.15E-01	2.90E+00	2.58E-01	pCi/g
Cm-245/246	05/21/14	U	1.28E-01	1.85E-01	2.23E-01	1.78E+00	1.86E-01	pCi/g
<b>Gamma Spec</b>								
Be-7	05/14/14	U	9.47E-02	1.32E-01	2.34E-01		1.39E-01	pCi/g
Na-22	05/14/14	U	-8.06E-03	1.69E-02	2.67E-02		1.73E-02	pCi/g
K-40	05/14/14		1.24E+01	7.03E-01	1.82E-01		1.26E+00	pCi/g
Cr-51	05/14/14	U	-1.23E-01	1.57E-01	2.59E-01		1.67E-01	pCi/g
Mn-54	05/14/14	U	-5.73E-03	1.46E-02	2.42E-02		1.49E-02	pCi/g
Fe-59	05/14/14	U	-5.95E-03	3.53E-02	5.84E-02		3.54E-02	pCi/g
Co-56	05/14/14	U	8.96E-04	1.46E-02	2.50E-02		1.46E-02	pCi/g
Co-57	05/14/14	U	2.85E-03	1.29E-02	2.19E-02		1.29E-02	pCi/g
Co-58	05/14/14	U	9.64E-03	1.59E-02	2.86E-02		1.65E-02	pCi/g
Co-60	05/14/14	U	1.10E-02	1.56E-02	2.80E-02	3.82E-01	1.63E-02	pCi/g
Ni-59	05/21/14	U	-3.19E+01	1.49E+01	2.01E+01	1.97E+02	2.09E+01	pCi/g
Zn-65	05/14/14	U	-2.59E-02	4.35E-02	5.79E-02		4.52E-02	pCi/g
Y-88	05/14/14	U	-3.49E-03	1.04E-02	1.60E-02		1.05E-02	pCi/g
Zr-95	05/14/14	U	2.49E-02	2.92E-02	5.16E-02		3.14E-02	pCi/g
Nb-94	05/14/14	U	-8.88E-03	1.42E-02	2.22E-02	7.13E-01	1.48E-02	pCi/g
Nb-95	05/14/14	U	2.12E-02	1.87E-02	3.01E-02		2.11E-02	pCi/g
Ru-106	05/14/14	U	-6.80E-02	1.24E-01	1.97E-01		1.28E-01	pCi/g
Ag-110m	05/14/14	U	-9.17E-03	1.87E-02	3.04E-02		1.92E-02	pCi/g
Sn-113	05/14/14	U	1.00E-02	1.87E-02	3.30E-02		1.93E-02	pCi/g
Sb-124	05/14/14	U	1.42E-02	2.05E-02	4.04E-02		2.15E-02	pCi/g
Sb-125	05/14/14	U	1.70E-02	3.85E-02	6.72E-02		3.93E-02	pCi/g
I-129	05/27/14	U	3.03E-01	3.35E-01	4.63E-01	5.00E-01	3.63E-01	pCi/g
Cs-134	05/14/14	UI	3.57E-02	2.25E-02	3.57E-02		3.26E-02	pCi/g

**Notes:** 1. LLDs are a-priori values.

2. MDCs are calculated a-posteriori values.

3. Gamma spectroscopy analysis results are calculated from a measurement using only one gamma energy line.

4. Air sample volumes are received in units of ft3. GEL converts the units and reports them as m3.

**Qualifiers:** U Target isotope was analyzed for but not detected above the MDC and LLD.

UI Uncertain identification for gamma spectroscopy.

X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.

M Reported result is less than the LLD and greater than the MDC.

**GEL LABORATORIES LLC**

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

**Certificate of Analysis**

GEL Sample ID: 348598001

Client: Pacific Gas and Electric Company

Client Sample ID: FSS-0294 OOL10-12-011-F-S

Collect Date: April 30, 2014

Client Matrix: Soil

Receive Date: May 13, 2014

Amount of Sample Received:

Report Date: June 02, 2014

Isotope	Run Date	Qualifier	Activity	2 Sigma Uncertainty	MDC	LLD	2 Sigma TPU	Units
Cs-136	05/14/14	UI	6.99E-02	4.77E-02	6.99E-02		6.04E-02	pCi/g
Cs-137	05/14/14	M	1.11E-01	3.08E-02	2.49E-02	7.58E-01	3.20E-02	pCi/g
Ba-133	05/14/14	U	3.07E-03	2.02E-02	3.05E-02		2.03E-02	pCi/g
Ba-140	05/14/14	U	-9.62E-03	2.42E-02	3.38E-02		2.46E-02	pCi/g
Ce-139	05/14/14	U	7.21E-03	1.63E-02	2.45E-02		1.67E-02	pCi/g
Ce-141	05/14/14	U	1.23E-02	3.22E-02	5.49E-02		3.27E-02	pCi/g
Ce-144	05/14/14	U	-9.97E-03	9.84E-02	1.65E-01		9.86E-02	pCi/g
Nd-147	05/14/14	U	4.97E-03	2.14E-01	3.59E-01		2.14E-01	pCi/g
Pm-144	05/14/14	U	1.07E-03	1.43E-02	2.38E-02		1.43E-02	pCi/g
Pm-146	05/14/14	U	-1.27E-03	1.63E-02	2.74E-02		1.63E-02	pCi/g
Eu-152	05/14/14	U	-1.83E-02	4.96E-02	6.74E-02	1.01E+00	5.03E-02	pCi/g
Eu-154	05/14/14	U	-1.64E-02	4.75E-02	7.61E-02	9.40E-01	4.81E-02	pCi/g
Eu-155	05/14/14	U	7.40E-02	5.61E-02	9.98E-02		6.56E-02	pCi/g
Ir-192	05/14/14	U	-4.63E-03	1.50E-02	2.54E-02		1.51E-02	pCi/g
Hg-203	05/14/14	U	1.57E-02	2.01E-02	3.05E-02		2.13E-02	pCi/g
Tl-208	05/14/14		1.79E-01	2.38E-02	2.28E-02		2.79E-02	pCi/g
Pb-210	05/14/14	U	1.39E+00	2.77E+00	4.88E+00		2.85E+00	pCi/g
Pb-212	05/14/14		5.94E-01	4.62E-02	4.63E-02		6.77E-02	pCi/g
Pb-214	05/14/14		5.37E-01	6.78E-02	5.67E-02		8.06E-02	pCi/g
Bi-212	05/14/14		6.88E-01	2.93E-01	3.21E-01		3.00E-01	pCi/g
Bi-214	05/14/14		4.73E-01	6.26E-02	4.83E-02		7.33E-02	pCi/g
Ra-228	05/14/14		6.05E-01	1.11E-01	9.21E-02		1.34E-01	pCi/g
Ac-228	05/14/14		6.05E-01	1.11E-01	9.21E-02		1.34E-01	pCi/g
Th-234	05/14/14	U	1.19E+00	1.19E+00	1.38E+00		1.22E+00	pCi/g
U-235	05/14/14	U	-3.30E-02	1.08E-01	1.78E-01		1.08E-01	pCi/g
U-238	05/14/14	U	1.19E+00	1.19E+00	1.38E+00		1.22E+00	pCi/g
Np-237	05/14/14	U	1.50E-02	2.77E-02	4.90E-02	1.11E-01	2.85E-02	pCi/g
Np-239	05/14/14	U	-3.92E-02	2.12E-01	3.57E-01		2.13E-01	pCi/g
Am-241	05/14/14	U	5.31E-02	1.09E-01	1.69E-01		1.11E-01	pCi/g

Notes: 1. LLDs are a-priori values.

2. MDCs are calculated a-posteriori values.

3. Gamma spectroscopy analysis results are calculated from a measurement using only one gamma energy line.

4. Air sample volumes are received in units of ft3. GEL converts the units and reports them as m3.

Qualifiers: U Target isotope was analyzed for but not detected above the MDC and LLD.

UI Uncertain identification for gamma spectroscopy.

X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.

M Reported result is less than the LLD and greater than the MDC.

**GEL LABORATORIES LLC**

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

**Certificate of Analysis**

GEL Sample ID: 348598002

Client: Pacific Gas and Electric Company

Client Sample ID: FSS-0302 OOL10-12-019-F-S

Collect Date: April 30, 2014

Client Matrix: Soil

Receive Date: May 13, 2014

Amount of Sample Received:

Report Date: June 02, 2014

Isotope	Run Date	Qualifier	Activity	2 Sigma Uncertainty	MDC	LLD	2 Sigma TPU	Units
C-14	05/22/14	U	-4.06E-01	3.35E-01	5.73E-01	6.30E-01	3.35E-01	pCi/g
Ni-63	05/22/14	U	-1.55E+01	1.77E+01	3.06E+01	7.24E+01	1.77E+01	pCi/g
Sr-90	05/29/14	U	4.62E-02	6.18E-02	9.22E-02	1.51E-01	6.23E-02	pCi/g
Tc-99	05/25/14	U	2.49E-01	4.85E-01	8.02E-01	1.24E+00	4.86E-01	pCi/g
Pu-241	05/27/14	U	-2.64E+01	2.31E+01	4.11E+01	8.61E+01	2.30E+01	pCi/g
<b>Alpha Spec</b>								
Pu-238	05/21/14	U	2.99E-02	1.12E-01	1.88E-01	2.97E+00	1.12E-01	pCi/g
Pu-239/240	05/21/14	U	2.04E-02	1.14E-01	2.18E-01	2.67E+00	1.14E-01	pCi/g
Am-241	05/29/14	U	-4.78E-02	1.44E-01	4.05E-01	2.58E+00	1.45E-01	pCi/g
Cm-243/244	05/29/14	U	1.84E-02	1.92E-01	4.01E-01	2.90E+00	1.92E-01	pCi/g
Cm-245/246	05/29/14	U	5.77E-02	2.17E-01	3.64E-01	1.78E+00	2.17E-01	pCi/g
<b>Gamma Spec</b>								
Be-7	05/14/14	U	9.36E-03	1.03E-01	1.78E-01		1.03E-01	pCi/g
Na-22	05/14/14	U	7.75E-03	1.67E-02	2.57E-02		1.71E-02	pCi/g
K-40	05/14/14		1.33E+01	6.67E-01	1.82E-01		1.31E+00	pCi/g
Cr-51	05/14/14	U	-3.50E-02	1.29E-01	2.10E-01		1.30E-01	pCi/g
Mn-54	05/14/14	U	1.85E-03	1.46E-02	2.12E-02		1.47E-02	pCi/g
Fe-59	05/14/14	U	1.06E-02	3.09E-02	5.39E-02		3.13E-02	pCi/g
Co-56	05/14/14	U	-7.78E-03	1.30E-02	1.78E-02		1.35E-02	pCi/g
Co-57	05/14/14	U	-7.75E-03	1.22E-02	1.92E-02		1.27E-02	pCi/g
Co-58	05/14/14	U	1.45E-02	1.73E-02	2.06E-02		1.86E-02	pCi/g
Co-60	05/14/14	U	-1.39E-03	1.44E-02	2.03E-02	3.82E-01	1.45E-02	pCi/g
Ni-59	05/21/14	U	6.17E+00	1.52E+01	2.85E+01	1.97E+02	1.55E+01	pCi/g
Zn-65	05/14/14	U	-1.39E-03	3.60E-02	5.22E-02		3.60E-02	pCi/g
Y-88	05/14/14	U	9.87E-03	1.03E-02	2.03E-02		1.12E-02	pCi/g
Zr-95	05/14/14	U	3.79E-02	2.44E-02	4.57E-02		3.00E-02	pCi/g
Nb-94	05/14/14	U	2.58E-03	1.09E-02	1.85E-02	7.13E-01	1.09E-02	pCi/g
Nb-95	05/14/14	U	2.31E-02	1.68E-02	2.76E-02		1.99E-02	pCi/g
Ru-106	05/14/14	U	2.27E-02	1.05E-01	1.80E-01		1.05E-01	pCi/g
Ag-110m	05/14/14	U	6.80E-03	1.56E-02	2.75E-02		1.59E-02	pCi/g
Sn-113	05/14/14	U	1.24E-02	1.61E-02	2.79E-02		1.71E-02	pCi/g
Sb-124	05/14/14	U	-6.46E-03	2.36E-02	3.82E-02		2.38E-02	pCi/g
Sb-125	05/14/14	U	1.28E-02	3.44E-02	5.76E-02		3.49E-02	pCi/g
I-129	05/27/14	U	1.43E-03	9.80E-02	1.70E-01	5.00E-01	9.80E-02	pCi/g
Cs-134	05/14/14	UI	2.65E-02	2.16E-02	2.65E-02		2.51E-02	pCi/g

**Notes: 1. LLDs are a-priori values.****2. MDCs are calculated a-posteriori values.****3. Gamma spectroscopy analysis results are calculated from a measurement using only one gamma energy line.****4. Air sample volumes are received in units of ft3. GEL converts the units and reports them as m3.****Qualifiers: U Target isotope was analyzed for but not detected above the MDC and LLD.****UI Uncertain identification for gamma spectroscopy.****X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.****M Reported result is less than the LLD and greater than the MDC.**

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**GEL LABORATORIES LLC**

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**Certificate of Analysis**

GEL Sample ID: 348598002

Client: Pacific Gas and Electric Company

Client Sample ID: FSS-0302 OOL10-12-019-F-S

Collect Date: April 30, 2014

Client Matrix: Soil

Receive Date: May 13, 2014

Amount of Sample Received:

Report Date: June 02, 2014

Isotope	Run Date	Qualifier	Activity	2 Sigma Uncertainty	MDC	LLD	2 Sigma TPU	Units
Cs-136	05/14/14	U	-2.94E-03	3.32E-02	5.61E-02		3.32E-02	pCi/g
Cs-137	05/14/14	M	3.19E-02	1.96E-02	2.24E-02	7.58E-01	1.97E-02	pCi/g
Ba-133	05/14/14	U	7.48E-03	1.56E-02	2.36E-02		1.60E-02	pCi/g
Ba-140	05/14/14	U	2.54E-02	4.06E-02	4.67E-02		4.22E-02	pCi/g
Ce-139	05/14/14	U	2.27E-03	1.27E-02	2.19E-02		1.27E-02	pCi/g
Ce-141	05/14/14	U	7.78E-03	4.32E-02	4.71E-02		4.33E-02	pCi/g
Ce-144	05/14/14	U	-4.13E-02	8.66E-02	1.48E-01		8.87E-02	pCi/g
Nd-147	05/14/14	U	-3.72E-02	1.73E-01	2.90E-01		1.74E-01	pCi/g
Pm-144	05/14/14	U	1.04E-02	1.06E-02	1.92E-02		1.16E-02	pCi/g
Pm-146	05/14/14	U	8.59E-03	1.84E-02	2.46E-02		1.88E-02	pCi/g
Eu-152	05/14/14	U	-9.05E-03	4.22E-02	5.99E-02	1.01E+00	4.24E-02	pCi/g
Eu-154	05/14/14	U	-1.47E-03	5.05E-02	7.23E-02	9.40E-01	5.05E-02	pCi/g
Eu-155	05/14/14	U	3.91E-02	6.69E-02	8.76E-02		6.70E-02	pCi/g
Ir-192	05/14/14	U	5.31E-03	1.25E-02	2.13E-02		1.27E-02	pCi/g
Hg-203	05/14/14	U	2.08E-02	2.93E-02	2.36E-02		2.94E-02	pCi/g
Tl-208	05/14/14		1.60E-01	2.70E-02	1.93E-02		3.00E-02	pCi/g
Pb-210	05/14/14	U	-4.14E+00	3.13E+00	4.94E+00		3.66E+00	pCi/g
Pb-212	05/14/14		6.22E-01	4.45E-02	3.74E-02		7.12E-02	pCi/g
Pb-214	05/14/14		5.53E-01	5.92E-02	4.52E-02		7.52E-02	pCi/g
Bi-212	05/14/14	UI	3.86E-01	3.20E-01	3.86E-01		4.33E-01	pCi/g
Bi-214	05/14/14		4.04E-01	6.30E-02	3.91E-02		7.12E-02	pCi/g
Ra-228	05/14/14		5.23E-01	1.03E-01	7.73E-02		1.24E-01	pCi/g
Ac-228	05/14/14		5.23E-01	1.03E-01	7.73E-02		1.24E-01	pCi/g
Th-234	05/14/14	U	9.79E-01	9.29E-01	1.40E+00		9.58E-01	pCi/g
U-235	05/14/14	U	2.55E-02	1.41E-01	1.49E-01		1.42E-01	pCi/g
U-238	05/14/14	U	9.79E-01	9.29E-01	1.40E+00		9.58E-01	pCi/g
Np-237	05/14/14	U	-1.04E-02	2.46E-02	4.00E-02	1.11E-01	2.51E-02	pCi/g
Np-239	05/14/14	U	-3.31E-02	1.93E-01	3.11E-01		1.94E-01	pCi/g
Am-241	05/14/14	U	1.49E-01	1.11E-01	1.77E-01		1.31E-01	pCi/g

**Notes:** 1. LLDs are a-priori values.

2. MDCs are calculated a-posteriori values.

3. Gamma spectroscopy analysis results are calculated from a measurement using only one gamma energy line.

4. Air sample volumes are received in units of ft<sup>3</sup>. GEL converts the units and reports them as m<sup>3</sup>.**Qualifiers:** U Target isotope was analyzed for but not detected above the MDC and LLD.

UI Uncertain identification for gamma spectroscopy.

X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.

M Reported result is less than the LLD and greater than the MDC.

**GEL LABORATORIES LLC**

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

**Certificate of Analysis**

GEL Sample ID: 348598003

Client: Pacific Gas and Electric Company

Client Sample ID: FSS-0266 OOL10-11-003-F-S

Collect Date: April 28, 2014

Client Matrix: Soil

Receive Date: May 13, 2014

Amount of Sample Received:

Report Date: June 02, 2014

Isotope	Run Date	Qualifier	Activity	2 Sigma Uncertainty	MDC	LLD	2 Sigma TPU	Units
C-14	05/23/14	U	-3.00E-01	3.31E-01	5.64E-01	6.30E-01	3.31E-01	pCi/g
Ni-63	05/22/14	U	-2.49E+00	2.43E+01	4.09E+01	7.24E+01	2.43E+01	pCi/g
Sr-90	05/29/14	U	1.14E-02	4.20E-02	6.68E-02	1.51E-01	4.20E-02	pCi/g
Tc-99	05/25/14	U	3.32E-02	4.38E-01	7.34E-01	1.24E+00	4.38E-01	pCi/g
Pu-241	05/27/14	U	-1.70E+00	2.35E+01	3.97E+01	8.61E+01	2.35E+01	pCi/g
<b>Alpha Spec</b>								
Pu-238	05/21/14	U	-1.87E-02	8.26E-02	2.16E-01	2.97E+00	8.28E-02	pCi/g
Pu-239/240	05/21/14	U	1.40E-02	1.65E-01	3.48E-01	2.67E+00	1.65E-01	pCi/g
Am-241	05/21/14	U	-5.47E-02	7.71E-02	2.52E-01	2.58E+00	7.72E-02	pCi/g
Cm-243/244	05/21/14	U	8.88E-02	1.28E-01	1.54E-01	2.90E+00	1.28E-01	pCi/g
Cm-245/246	05/21/14	U	-1.79E-02	7.91E-02	2.06E-01	1.78E+00	7.92E-02	pCi/g
<b>Gamma Spec</b>								
Be-7	05/14/14	U	9.29E-02	1.38E-01	2.17E-01		1.38E-01	pCi/g
Na-22	05/14/14	U	-8.01E-03	1.69E-02	2.67E-02		1.73E-02	pCi/g
K-40	05/14/14		1.22E+01	6.61E-01	1.28E-01		1.23E+00	pCi/g
Cr-51	05/14/14	U	1.49E-01	1.48E-01	2.64E-01		1.63E-01	pCi/g
Mn-54	05/14/14	U	5.18E-03	1.42E-02	2.41E-02		1.44E-02	pCi/g
Fe-59	05/14/14	U	5.32E-03	3.74E-02	6.38E-02		3.75E-02	pCi/g
Co-56	05/14/14	U	-1.14E-02	1.51E-02	2.31E-02		1.60E-02	pCi/g
Co-57	05/14/14	U	1.02E-02	1.15E-02	2.00E-02		1.24E-02	pCi/g
Co-58	05/14/14	U	-1.93E-03	1.40E-02	2.29E-02		1.40E-02	pCi/g
Co-60	05/14/14	U	1.21E-02	1.39E-02	2.55E-02	3.82E-01	1.50E-02	pCi/g
Ni-59	05/21/14	U	-2.84E+00	4.85E+00	5.34E+00	1.97E+02	5.03E+00	pCi/g
Zn-65	05/14/14	U	1.61E-02	4.18E-02	6.31E-02		4.25E-02	pCi/g
Y-88	05/14/14	U	2.68E-03	1.04E-02	1.82E-02		1.04E-02	pCi/g
Zr-95	05/14/14	U	1.94E-03	2.81E-02	4.70E-02		2.81E-02	pCi/g
Nb-94	05/14/14	U	1.02E-02	1.28E-02	2.27E-02	7.13E-01	1.36E-02	pCi/g
Nb-95	05/14/14	U	1.55E-02	2.11E-02	3.25E-02		2.23E-02	pCi/g
Ru-106	05/14/14	U	4.57E-02	1.13E-01	1.97E-01		1.15E-01	pCi/g
Ag-110m	05/14/14	U	6.00E-03	1.61E-02	2.87E-02		1.64E-02	pCi/g
Sn-113	05/14/14	U	2.18E-03	1.73E-02	2.90E-02		1.73E-02	pCi/g
Sb-124	05/14/14	U	2.08E-02	2.61E-02	4.96E-02		2.77E-02	pCi/g
Sb-125	05/14/14	U	1.59E-02	3.46E-02	5.89E-02		3.54E-02	pCi/g
I-129	05/27/14	U	-2.12E-02	1.49E-01	2.11E-01	5.00E-01	1.50E-01	pCi/g
Cs-134	05/14/14	UI	3.09E-02	2.28E-02	3.09E-02		2.91E-02	pCi/g

**Notes:** 1. LLDs are a-priori values.

2. MDCs are calculated a-posteriori values.

3. Gamma spectroscopy analysis results are calculated from a measurement using only one gamma energy line.

4. Air sample volumes are received in units of ft<sup>3</sup>. GEL converts the units and reports them as m<sup>3</sup>.**Qualifiers:** U Target isotope was analyzed for but not detected above the MDC and LLD.

UI Uncertain identification for gamma spectroscopy.

X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.

M Reported result is less than the LLD and greater than the MDC.

**GEL LABORATORIES LLC**

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

**Certificate of Analysis**

GEL Sample ID: 348598003

Client: Pacific Gas and Electric Company

Client Sample ID: FSS-0266 OOL10-11-003-F-S

Collect Date: April 28, 2014

Client Matrix: Soil

Receive Date: May 13, 2014

Amount of Sample Received:

Report Date: June 02, 2014

Isotope	Run Date	Qualifier	Activity	2 Sigma Uncertainty	MDC	LLD	2 Sigma TPU	Units
Cs-136	05/14/14	U	3.28E-02	4.37E-02	7.86E-02		4.64E-02	pCi/g
Cs-137	05/14/14	M	5.74E-02	2.16E-02	2.29E-02	7.58E-01	2.21E-02	pCi/g
Ba-133	05/14/14	U	-4.78E-03	1.83E-02	2.62E-02		1.84E-02	pCi/g
Ba-140	05/14/14	U	3.36E-02	2.78E-02	5.25E-02		3.18E-02	pCi/g
Ce-139	05/14/14	U	-1.33E-02	1.29E-02	2.01E-02		1.45E-02	pCi/g
Ce-141	05/14/14	U	2.01E-02	3.03E-02	4.65E-02		3.17E-02	pCi/g
Ce-144	05/14/14	U	8.86E-02	1.01E-01	1.57E-01		1.09E-01	pCi/g
Nd-147	05/14/14	U	8.85E-02	2.19E-01	3.86E-01		2.23E-01	pCi/g
Pm-144	05/14/14	U	8.82E-04	1.25E-02	2.10E-02		1.25E-02	pCi/g
Pm-146	05/14/14	U	-3.70E-03	1.55E-02	2.50E-02		1.56E-02	pCi/g
Eu-152	05/14/14	U	2.16E-02	3.77E-02	6.12E-02	1.01E+00	3.90E-02	pCi/g
Eu-154	05/14/14	U	-3.26E-02	4.90E-02	7.58E-02	9.40E-01	5.12E-02	pCi/g
Eu-155	05/14/14	U	1.38E-02	4.74E-02	8.11E-02		4.78E-02	pCi/g
Ir-192	05/14/14	U	-4.74E-03	1.38E-02	2.28E-02		1.39E-02	pCi/g
Hg-203	05/14/14	U	7.43E-03	1.71E-02	2.64E-02		1.75E-02	pCi/g
Tl-208	05/14/14		1.64E-01	3.05E-02	2.23E-02		3.33E-02	pCi/g
Pb-210	05/14/14	U	-1.57E+00	3.33E+00	5.17E+00		3.41E+00	pCi/g
Pb-212	05/14/14		5.58E-01	4.24E-02	3.70E-02		6.35E-02	pCi/g
Pb-214	05/14/14		5.94E-01	6.39E-02	4.47E-02		8.05E-02	pCi/g
Bi-212	05/14/14		7.90E-01	3.58E-01	2.58E-01		3.65E-01	pCi/g
Bi-214	05/14/14		5.00E-01	5.75E-02	3.78E-02		7.07E-02	pCi/g
Ra-228	05/14/14		4.94E-01	1.17E-01	9.13E-02		1.32E-01	pCi/g
Ac-228	05/14/14		4.94E-01	1.17E-01	9.13E-02		1.32E-01	pCi/g
Th-234	05/14/14	U	1.02E+00	1.21E+00	1.31E+00		1.23E+00	pCi/g
U-235	05/14/14	U	1.17E-01	1.15E-01	1.42E-01		1.16E-01	pCi/g
U-238	05/14/14	U	1.02E+00	1.21E+00	1.31E+00		1.23E+00	pCi/g
Np-237	05/14/14	U	-3.21E-03	2.44E-02	4.09E-02	1.11E-01	2.44E-02	pCi/g
Np-239	05/14/14	U	3.35E-02	1.78E-01	3.02E-01		1.79E-01	pCi/g
Am-241	05/14/14	U	4.69E-02	1.06E-01	1.70E-01		1.08E-01	pCi/g

Notes: 1. LLDs are a-priori values.

2. MDCs are calculated a-posteriori values.

3. Gamma spectroscopy analysis results are calculated from a measurement using only one gamma energy line.

4. Air sample volumes are received in units of ft3. GEL converts the units and reports them as m3.

Qualifiers: U Target isotope was analyzed for but not detected above the MDC and LLD.

UI Uncertain identification for gamma spectroscopy.

X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.

M Reported result is less than the LLD and greater than the MDC.

**GEL LABORATORIES LLC**

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

**Certificate of Analysis****GEL Sample ID:** 348598004**Client:** Pacific Gas and Electric Company**Client Sample ID:** FSS-0279 OOL10-11-016-F-S**Collect Date:** April 29, 2014**Client Matrix:** Soil**Receive Date:** May 13, 2014**Amount of Sample Received:****Report Date:** June 02, 2014

Isotope	Run Date	Qualifier	Activity	2 Sigma Uncertainty	MDC	LLD	2 Sigma TPU	Units
C-14	05/23/14	U	-1.72E-01	3.46E-01	5.85E-01	6.30E-01	3.46E-01	pCi/g
Ni-63	05/22/14	U	3.02E+00	2.45E+01	4.10E+01	7.24E+01	2.45E+01	pCi/g
Sr-90	05/30/14	U	4.45E-02	4.39E-02	6.16E-02	1.51E-01	4.47E-02	pCi/g
Tc-99	05/25/14	U	-2.79E-01	4.79E-01	8.18E-01	1.24E+00	4.79E-01	pCi/g
Pu-241	05/27/14	U	-9.53E+00	2.60E+01	4.45E+01	8.61E+01	2.60E+01	pCi/g
<b>Alpha Spec</b>								
Pu-238	05/21/14	U	-3.98E-02	9.23E-02	2.73E-01	2.97E+00	9.25E-02	pCi/g
Pu-239/240	05/21/14	U	-4.98E-02	9.43E-02	2.91E-01	2.67E+00	9.45E-02	pCi/g
Am-241	05/23/14	U	1.30E-01	2.37E-01	2.92E-01	2.58E+00	2.38E-01	pCi/g
Cm-243/244	05/23/14	U	2.66E-01	3.01E-01	2.88E-01	2.90E+00	3.04E-01	pCi/g
Cm-245/246	05/23/14	U	-9.53E-03	1.58E-01	3.34E-01	1.78E+00	1.58E-01	pCi/g
<b>Gamma Spec</b>								
Be-7	05/14/14		2.53E-01	1.46E-01	2.13E-01		1.48E-01	pCi/g
Na-22	05/14/14	U	-1.54E-02	1.77E-02	2.68E-02		1.90E-02	pCi/g
K-40	05/14/14		1.23E+01	6.81E-01	1.82E-01		1.24E+00	pCi/g
Cr-51	05/14/14	U	1.75E-01	1.54E-01	2.81E-01		1.74E-01	pCi/g
Mn-54	05/14/14	U	4.87E-03	1.35E-02	2.38E-02		1.37E-02	pCi/g
Fe-59	05/14/14	U	4.52E-02	3.28E-02	6.23E-02		3.93E-02	pCi/g
Co-56	05/14/14	U	-5.16E-03	1.47E-02	2.43E-02		1.49E-02	pCi/g
Co-57	05/14/14	U	7.48E-03	1.34E-02	2.31E-02		1.38E-02	pCi/g
Co-58	05/14/14	U	-1.10E-02	1.57E-02	2.53E-02		1.65E-02	pCi/g
Co-60	05/14/14	U	-4.69E-03	1.35E-02	2.12E-02	3.82E-01	1.36E-02	pCi/g
Ni-59	05/22/14	U	-1.24E+01	1.45E+01	2.31E+01	1.97E+02	1.56E+01	pCi/g
Zn-65	05/14/14	U	-7.54E-03	3.91E-02	5.49E-02		3.92E-02	pCi/g
Y-88	05/14/14	U	-8.60E-03	9.44E-03	1.17E-02		1.02E-02	pCi/g
Zr-95	05/14/14	U	4.70E-02	2.73E-02	5.17E-02		3.48E-02	pCi/g
Nb-94	05/14/14	U	-5.89E-04	1.26E-02	2.07E-02	7.13E-01	1.26E-02	pCi/g
Nb-95	05/14/14	UI	3.11E-02	1.73E-02	3.11E-02		2.48E-02	pCi/g
Ru-106	05/14/14	U	-3.68E-02	1.30E-01	2.11E-01		1.31E-01	pCi/g
Ag-110m	05/14/14	U	-1.92E-02	1.86E-02	2.87E-02		2.07E-02	pCi/g
Sn-113	05/14/14	U	1.90E-02	1.82E-02	3.29E-02		2.01E-02	pCi/g
Sb-124	05/14/14	U	6.30E-03	2.32E-02	4.16E-02		2.34E-02	pCi/g
Sb-125	05/14/14	U	3.44E-02	3.94E-02	6.30E-02		4.25E-02	pCi/g
I-129	05/27/14	U	-6.99E-04	1.23E-01	2.00E-01	5.00E-01	1.23E-01	pCi/g
Cs-134	05/14/14	U	2.10E-02	1.75E-02	3.22E-02		2.00E-02	pCi/g

**Notes:** 1. LLDs are a-priori values.

2. MDCs are calculated a-posteriori values.

3. Gamma spectroscopy analysis results are calculated from a measurement using only one gamma energy line.

4. Air sample volumes are received in units of ft3. GEL converts the units and reports them as m3.

**Qualifiers:** U Target isotope was analyzed for but not detected above the MDC and LLD.

UI Uncertain identification for gamma spectroscopy.

X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.

M Reported result is less than the LLD and greater than the MDC.

**GEL LABORATORIES LLC**

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

**Certificate of Analysis**

GEL Sample ID: 348598004

Client: Pacific Gas and Electric Company

Client Sample ID: FSS-0279 OOL10-11-016-F-S

Collect Date: April 29, 2014

Client Matrix: Soil

Receive Date: May 13, 2014

Amount of Sample Received:

Report Date: June 02, 2014

Isotope	Run Date	Qualifier	Activity	2 Sigma Uncertainty	MDC	LLD	2 Sigma TPU	Units
Cs-136	05/14/14	U	-1.79E-02	4.13E-02	6.67E-02		4.22E-02	pCi/g
Cs-137	05/14/14	M	4.11E-02	1.86E-02	2.65E-02	7.58E-01	1.88E-02	pCi/g
Ba-133	05/14/14	U	6.63E-03	1.88E-02	2.89E-02		1.91E-02	pCi/g
Ba-140	05/14/14	U	-1.87E-03	2.93E-02	4.63E-02		2.93E-02	pCi/g
Ce-139	05/14/14	U	-5.21E-03	1.44E-02	2.37E-02		1.46E-02	pCi/g
Ce-141	05/14/14	UI	4.85E-02	6.64E-02	4.85E-02		6.66E-02	pCi/g
Ce-144	05/14/14	U	-6.34E-03	1.16E-01	1.71E-01		1.16E-01	pCi/g
Nd-147	05/14/14	U	5.19E-02	2.09E-01	3.59E-01		2.11E-01	pCi/g
Pm-144	05/14/14	U	5.57E-03	1.27E-02	2.13E-02		1.30E-02	pCi/g
Pm-146	05/14/14	U	-2.31E-03	1.59E-02	2.66E-02		1.59E-02	pCi/g
Eu-152	05/14/14	U	1.77E-02	4.23E-02	6.82E-02	1.01E+00	4.31E-02	pCi/g
Eu-154	05/14/14	U	-3.24E-02	4.91E-02	7.62E-02	9.40E-01	5.13E-02	pCi/g
Eu-155	05/14/14	U	8.54E-02	6.37E-02	9.52E-02		6.42E-02	pCi/g
Ir-192	05/14/14	U	-4.75E-03	1.47E-02	2.49E-02		1.49E-02	pCi/g
Hg-203	05/14/14	U	5.69E-03	1.81E-02	3.00E-02		1.83E-02	pCi/g
Tl-208	05/14/14		1.82E-01	2.69E-02	2.22E-02		3.06E-02	pCi/g
Pb-210	05/14/14	U	1.82E+00	2.67E+00	4.73E+00		2.80E+00	pCi/g
Pb-212	05/14/14		4.91E-01	4.61E-02	4.61E-02		6.17E-02	pCi/g
Pb-214	05/14/14		5.57E-01	7.20E-02	5.10E-02		8.50E-02	pCi/g
Bi-212	05/14/14		4.56E-01	2.48E-01	2.87E-01		2.52E-01	pCi/g
Bi-214	05/14/14		4.67E-01	6.13E-02	4.45E-02		7.19E-02	pCi/g
Ra-228	05/14/14		4.34E-01	1.27E-01	8.29E-02		1.38E-01	pCi/g
Ac-228	05/14/14		4.34E-01	1.27E-01	8.29E-02		1.38E-01	pCi/g
Th-234	05/14/14	U	1.61E-01	1.20E+00	1.43E+00		1.20E+00	pCi/g
U-235	05/14/14	UI	1.75E-01	2.09E-01	1.75E-01		2.10E-01	pCi/g
U-238	05/14/14	U	1.61E-01	1.20E+00	1.43E+00		1.20E+00	pCi/g
Np-237	05/14/14	U	1.47E-03	2.67E-02	4.60E-02	1.11E-01	2.67E-02	pCi/g
Np-239	05/14/14	U	-1.94E-01	2.10E-01	3.43E-01		2.28E-01	pCi/g
Am-241	05/14/14	U	1.38E-01	1.10E-01	1.78E-01		1.27E-01	pCi/g

Notes: 1. LLDs are a-priori values.

2. MDCs are calculated a-posteriori values.

3. Gamma spectroscopy analysis results are calculated from a measurement using only one gamma energy line.

4. Air sample volumes are received in units of ft<sup>3</sup>. GEL converts the units and reports them as m<sup>3</sup>.

Qualifiers: U Target isotope was analyzed for but not detected above the MDC and LLD.

UI Uncertain identification for gamma spectroscopy.

X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.

M Reported result is less than the LLD and greater than the MDC.



# Quality Control Data

**GEL LABORATORIES LLC**

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

**QC Summary**

Client : Pacific Gas and Electric, Humboldt Bay Power Plant  
1000 King Salmon Avenue

Report Date: June 2, 2014  
Page 1 of 15

Eureka, California

Contact: Ms. Dee Anderson

Workorder: 348598

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Alpha Spec</b>											
Batch	1387983										
QC1203088581	348598001	DUP									
Americium-241	U	0.0943	U	-0.0456	pCi/g	0		N/A	JXR1	05/23/1409:41	
	Uncert:	+/-0.186		+/-0.193							
	TPU:	+/-0.187		+/-0.194							
Curium-243/244	U	0.0321	U	0.0713	pCi/g	0		N/A			
	Uncert:	+/-0.258		+/-0.263							
	TPU:	+/-0.258		+/-0.263							
Curium-245/246	U	0.128	U	-0.0261	pCi/g	0		N/A			
	Uncert:	+/-0.185		+/-0.217							
	TPU:	+/-0.186		+/-0.218							
QC1203088582	LCS										
Americium-241	6.88			6.53	pCi/g		94.9	(75%-125%)	JXR1	05/21/1413:12	
	Uncert:			+/-0.871							
	TPU:			+/-1.16							
Curium-243/244	13.9			12.3	pCi/g		88.9	(75%-125%)			
	Uncert:			+/-1.19							
	TPU:			+/-1.87							
Curium-245/246			M	0.377	pCi/g						
	Uncert:			+/-0.233							
	TPU:			+/-0.237							
QC1203088580	MB										
Americium-241			U	0.112	pCi/g				JXR1	05/23/1409:41	
	Uncert:			+/-0.218							
	TPU:			+/-0.218							
Curium-243/244			U	-0.0376	pCi/g						
	Uncert:			+/-0.128							
	TPU:			+/-0.129							
Curium-245/246			U	0.0641	pCi/g						
	Uncert:			+/-0.203							
	TPU:			+/-0.204							
Batch	1387984										
QC1203088588	348598001	DUP									
Plutonium-238	U	-0.0233	U	0.0351	pCi/g	0		N/A	JXR1	05/21/1412:50	
	Uncert:	+/-0.161		+/-0.132							
	TPU:	+/-0.161		+/-0.132							
Plutonium-239/240	U	0.148	U	0.116	pCi/g	0		N/A			
	Uncert:	+/-0.240		+/-0.185							
	TPU:	+/-0.241		+/-0.186							
QC1203088589	LCS										
Plutonium-238			U	0.106	pCi/g		(75%-125%)	JXR1	05/21/1412:50		
	Uncert:			+/-0.169							
	TPU:			+/-0.169							

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**GEL LABORATORIES LLC**

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

**QC Summary**

Workorder: 348598

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec Batch 1387984											
Plutonium-239/240	9.61			10.3	pCi/g		107	(75%-125%)			
	Uncert:			+/-1.30							
	TPU:			+/-1.97							
QC1203088587 MB											
Plutonium-238			U	-0.0448	pCi/g				JXR1	05/21/14	12:50
	Uncert:			+/-0.104							
	TPU:			+/-0.104							
Plutonium-239/240			U	-0.0336	pCi/g						
	Uncert:			+/-0.102							
	TPU:			+/-0.102							
Batch 1387985											
QC1203088591 348598001 DUP											
Plutonium-241		U	-17	U	-21.4	pCi/g	0		N/A	JXR1	05/27/14
	Uncert:		+/-30.7		+/-28.5						
	TPU:		+/-30.7		+/-28.5						
QC1203088592 LCS											
Plutonium-241	417			345	pCi/g		82.8	(75%-125%)	JXR1	05/27/14	11:30
	Uncert:			+/-40.1							
	TPU:			+/-85.2							
QC1203088590 MB											
Plutonium-241			U	-29.3	pCi/g				JXR1	05/27/14	11:00
	Uncert:			+/-25.2							
	TPU:			+/-25.2							
Batch 1390686											
QC1203095526 348598002 DUP											
Americium-241		U	-0.0478	U	0.117	pCi/g	0		N/A	JXR1	05/29/14
	Uncert:		+/-0.144		+/-0.266						
	TPU:		+/-0.145		+/-0.267						
Curium-243/244		U	0.0184	M	0.518	pCi/g	25.5	(0% - 100%)			
	Uncert:		+/-0.192		+/-0.405						
	TPU:		+/-0.192		+/-0.410						
Curium-245/246		U	0.0577	U	-0.0179	pCi/g	0		N/A		
	Uncert:		+/-0.216		+/-0.154						
	TPU:		+/-0.217		+/-0.155						
QC1203095527 LCS											
Americium-241	12.5			12.8	pCi/g		103	(75%-125%)	JXR1	05/29/14	10:10
	Uncert:			+/-1.63							
	TPU:			+/-2.21							
Curium-243/244	25.2			24.3	pCi/g		96.5	(75%-125%)			
	Uncert:			+/-2.21							
	TPU:			+/-3.61							
Curium-245/246			M	1.17	pCi/g						
	Uncert:			+/-0.548							
	TPU:			+/-0.565							
QC1203095525 MB											

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**GEL LABORATORIES LLC**

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

**QC Summary**

Workorder: 348598

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Alpha Spec</b>											
Batch	1390686										
Americium-241			U	0.0344	pCi/g				JXR1	05/28/14	11:34
	Uncert:			+/-0.191							
	TPU:			+/-0.191							
Curium-243/244			U	-0.0156	pCi/g						
	Uncert:			+/-0.135							
	TPU:			+/-0.135							
Curium-245/246			U	0.00	pCi/g						
	Uncert:			+/-0.153							
	TPU:			+/-0.153							
<b>Rad Gamma Spec</b>											
Batch	1387640										
QC1203087731	348598003 DUP										
Nickel-59	U	-2.84	U	-2.58	pCi/g	0			N/A	TYJ1	05/22/14
	Uncert:	+/-4.85		+/-11.6							
	TPU:	+/-5.03		+/-11.7							
QC1203087732	LCS										
Nickel-59	657			719	pCi/g		110	(75%-125%)	TYJ1	05/22/14	10:45
	Uncert:			+/-49.6							
	TPU:			+/-86.7							
QC1203087730	MB										
Nickel-59			U	-23.8	pCi/g				TYJ1	05/22/14	10:44
	Uncert:			+/-15.2							
	TPU:			+/-18.8							
Batch	1387698										
QC1203087898	348598001 DUP										
Actinium-228		0.605		0.603	pCi/g	.397		(0%-20%)	MXR1	05/14/14	13:34
	Uncert:	+/-0.111		+/-0.112							
	TPU:	+/-0.134		+/-0.134							
Americium-241	U	0.0531	U	0.0424	pCi/g	0			N/A		
	Uncert:	+/-0.109		+/-0.108							
	TPU:	+/-0.111		+/-0.110							
Antimony-124	U	0.0142	U	0.00825	pCi/g	0			N/A		
	Uncert:	+/-0.0205		+/-0.027							
	TPU:	+/-0.0215		+/-0.0272							
Antimony-125	U	0.017	U	-0.0201	pCi/g	0			N/A		
	Uncert:	+/-0.0385		+/-0.038							
	TPU:	+/-0.0393		+/-0.0391							
Barium-133	U	0.00307	U	-0.00908	pCi/g	0			N/A		
	Uncert:	+/-0.0202		+/-0.0197							
	TPU:	+/-0.0203		+/-0.0202							
Barium-140	U	-0.00962	U	-0.025	pCi/g	0			N/A		
	Uncert:	+/-0.0242		+/-0.0326							
	TPU:	+/-0.0246		+/-0.0345							
Beryllium-7	U	0.0947	U	0.0305	pCi/g	0			N/A		
	Uncert:	+/-0.132		+/-0.134							
	TPU:			+/-0.135							

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**GEL LABORATORIES LLC**

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**QC Summary**

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch 1387698											
Bismuth-212				+/-0.139							
				0.688		0.448		pCi/g	42.3	(0% - 100%)	
	Uncert:			+/-0.293		+/-0.271					
Bismuth-214	TPU:			+/-0.300		+/-0.274		pCi/g	5.01	(0%-20%)	
				0.473		0.450					
	Uncert:			+/-0.0626		+/-0.063					
Cerium-139	TPU:			+/-0.0733		+/-0.0731					
	U		U	0.00721		0.00293		pCi/g	0	N/A	
	Uncert:			+/-0.0163		+/-0.0134					
Cerium-141	TPU:			+/-0.0167		+/-0.0134					
	U		U	0.0123		0.00617		pCi/g	0	N/A	
	Uncert:			+/-0.0322		+/-0.0274					
Cerium-144	TPU:			+/-0.0327		+/-0.0276					
	U		U	-0.00997		0.0137		pCi/g	0	N/A	
	Uncert:			+/-0.0984		+/-0.0991					
Cesium-134	TPU:			+/-0.0986		+/-0.0993					
	UI		U	0.00		0.018		pCi/g	0	N/A	
	Uncert:			+/-0.0225		+/-0.0302					
Cesium-136	TPU:			+/-0.0326		+/-0.0313					
	UI		U	0.00		0.0101		pCi/g	0	N/A	
	Uncert:			+/-0.0477		+/-0.0388					
Cesium-137	TPU:			+/-0.0604		+/-0.0391					
	M		M	0.111		0.140		pCi/g	23.2*	(0%-20%)	
	Uncert:			+/-0.0308		+/-0.0311					
Chromium-51	TPU:			+/-0.032		+/-0.0331					
	U		U	-0.123		-0.106		pCi/g	0	N/A	
	Uncert:			+/-0.157		+/-0.154					
Cobalt-56	TPU:			+/-0.167		+/-0.161					
	U		U	0.000896		-0.00779		pCi/g	0	N/A	
	Uncert:			+/-0.0146		+/-0.0159					
Cobalt-57	TPU:			+/-0.0146		+/-0.0163					
	U		U	0.00285		0.00688		pCi/g	0	N/A	
	Uncert:			+/-0.0129		+/-0.012					
Cobalt-58	TPU:			+/-0.0129		+/-0.0124					
	U		U	0.00964		-0.00162		pCi/g	0	N/A	
	Uncert:			+/-0.0159		+/-0.0168					
Cobalt-60	TPU:			+/-0.0165		+/-0.0168					
	U		U	0.011		0.0104		pCi/g	0	N/A	
	Uncert:			+/-0.0156		+/-0.0168					
Europium-152	TPU:			+/-0.0163		+/-0.0175					
	U		U	-0.0183		-0.0477		pCi/g	0	N/A	
	Uncert:			+/-0.0496		+/-0.0424					
Europium-154	TPU:			+/-0.0503		+/-0.0477					
	U		U	-0.0164		0.0559		pCi/g	0	N/A	
	Uncert:			+/-0.0475		+/-0.0792					
	TPU:			+/-0.0481		+/-0.0832					

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**GEL LABORATORIES LLC**

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

**QC Summary**

Workorder: 348598

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch 1387698											
Europium-155	U	0.074	U	0.0261	pCi/g	0			N/A		
	Uncert:	+/-0.0561		+/-0.0504							
	TPU:	+/-0.0656		+/-0.0518							
Iridium-192	U	-0.00463	U	0.00732	pCi/g	0			N/A		
	Uncert:	+/-0.015		+/-0.0144							
	TPU:	+/-0.0151		+/-0.0148							
Iron-59	U	-0.00595	U	-0.0149	pCi/g	0			N/A		
	Uncert:	+/-0.0353		+/-0.041							
	TPU:	+/-0.0354		+/-0.0416							
Lead-210	U	1.39	U	1.95	pCi/g	0			N/A		
	Uncert:	+/-2.77		+/-3.64							
	TPU:	+/-2.85		+/-3.75							
Lead-212		0.594		0.582	pCi/g	1.97		(0%-20%)			
	Uncert:	+/-0.0462		+/-0.0483							
	TPU:	+/-0.0677		+/-0.0691							
Lead-214		0.537		0.556	pCi/g	3.61		(0%-20%)			
	Uncert:	+/-0.0678		+/-0.0708							
	TPU:	+/-0.0806		+/-0.0843							
Manganese-54	U	-0.00573	U	-0.00582	pCi/g	0			N/A		
	Uncert:	+/-0.0146		+/-0.015							
	TPU:	+/-0.0149		+/-0.0152							
Mercury-203	U	0.0157	U	0.00301	pCi/g	0			N/A		
	Uncert:	+/-0.0201		+/-0.0178							
	TPU:	+/-0.0213		+/-0.0178							
Neodymium-147	U	0.00497	U	-0.0814	pCi/g	0			N/A		
	Uncert:	+/-0.214		+/-0.222							
	TPU:	+/-0.214		+/-0.225							
Neptunium-237	U	0.015	U	-0.00356	pCi/g	0			N/A		
	Uncert:	+/-0.0277		+/-0.0273							
	TPU:	+/-0.0285		+/-0.0274							
Neptunium-239	U	-0.0392	U	-0.0849	pCi/g	0			N/A		
	Uncert:	+/-0.212		+/-0.192							
	TPU:	+/-0.213		+/-0.196							
Niobium-94	U	-0.00888	U	-0.00143	pCi/g	0			N/A		
	Uncert:	+/-0.0142		+/-0.0138							
	TPU:	+/-0.0148		+/-0.0138							
Niobium-95	U	0.0212	U	0.0328	pCi/g	0			N/A		
	Uncert:	+/-0.0187		+/-0.0198							
	TPU:	+/-0.0211		+/-0.0249							
Potassium-40		12.4		12.7	pCi/g	2.38		(0%-20%)			
	Uncert:	+/-0.703		+/-0.715							
	TPU:	+/-1.26		+/-1.29							
Promethium-144	U	0.00107	U	-0.000129	pCi/g	0			N/A		
	Uncert:	+/-0.0143		+/-0.0128							
	TPU:	+/-0.0143		+/-0.0128							
Promethium-146	U	-0.00127	U	-0.0012	pCi/g	0			N/A		

**GEL LABORATORIES LLC**

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**QC Summary**

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	1387698										
		Uncert:		+/-0.0163							
		TPU:		+/-0.0163							
Radium-228				0.605	pCi/g	.397		(0%-20%)			
		Uncert:		+/-0.111							
		TPU:		+/-0.134							
Ruthenium-106		U		-0.068	U	0.000686	0		N/A		
		Uncert:		+/-0.124							
		TPU:		+/-0.128							
Silver-110m		U		-0.00917	U	-0.0108	0		N/A		
		Uncert:		+/-0.0187		+/-0.0202					
		TPU:		+/-0.0192		+/-0.0208					
Sodium-22		U		-0.00806	U	0.0204	0		N/A		
		Uncert:		+/-0.0169		+/-0.028					
		TPU:		+/-0.0173		+/-0.0295					
Thallium-208				0.179	pCi/g	14.7		(0%-20%)			
		Uncert:		+/-0.0238		+/-0.0305					
		TPU:		+/-0.0279		+/-0.0331					
Thorium-234		U		1.19	pCi/g	46.5		(0% - 100%)			
		Uncert:		+/-1.19		+/-1.49					
		TPU:		+/-1.22		+/-1.57					
Tin-113		U		0.010	U	0.0045	0		N/A		
		Uncert:		+/-0.0187		+/-0.0182					
		TPU:		+/-0.0193		+/-0.0183					
Uranium-235		U		-0.033	U	0.0342	0		N/A		
		Uncert:		+/-0.108		+/-0.0917					
		TPU:		+/-0.108		+/-0.0917					
Uranium-238		U		1.19	pCi/g	46.5		(0% - 100%)			
		Uncert:		+/-1.19		+/-1.49					
		TPU:		+/-1.22		+/-1.57					
Yttrium-88		U		-0.00349	U	-0.00204	0		N/A		
		Uncert:		+/-0.0104		+/-0.0101					
		TPU:		+/-0.0105		+/-0.0101					
Zinc-65		U		-0.0259	U	0.0163	0		N/A		
		Uncert:		+/-0.0435		+/-0.0426					
		TPU:		+/-0.0452		+/-0.0433					
Zirconium-95		U		0.0249	U	0.00202	0		N/A		
		Uncert:		+/-0.0292		+/-0.0277					
		TPU:		+/-0.0314		+/-0.0277					
QC1203087899 LCS											
Actinium-228			U	0.324	pCi/g				MXR1	05/14/1413:31	
		Uncert:		+/-0.822							
		TPU:		+/-0.836							
Americium-241	63.4			73.7	pCi/g		116	(75%-125%)			
		Uncert:		+/-2.78							
		TPU:		+/-8.23							
Antimony-124			U	0.0325	pCi/g						

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**GEL LABORATORIES LLC**

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

**QC Summary**

Workorder: 348598

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Parmname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec										
Batch	1387698									
Antimony-125	Uncert:		+/-0.136							
	TPU:		+/-0.136							
		U	0.133	pCi/g						
	Uncert:		+/-0.407							
	TPU:		+/-0.412							
Barium-133		U	-0.057	pCi/g						
	Uncert:		+/-0.189							
	TPU:		+/-0.191							
Barium-140		U	0.0267	pCi/g						
	Uncert:		+/-0.0602							
	TPU:		+/-0.0615							
Beryllium-7		U	-0.835	pCi/g						
	Uncert:		+/-1.21							
	TPU:		+/-1.27							
Bismuth-212		U	0.706	pCi/g						
	Uncert:		+/-1.89							
	TPU:		+/-1.92							
Bismuth-214			0.685	pCi/g						
	Uncert:		+/-0.417							
	TPU:		+/-0.522							
Cerium-139		U	-0.0924	pCi/g						
	Uncert:		+/-0.104							
	TPU:		+/-0.114							
Cerium-141		U	-0.11	pCi/g						
	Uncert:		+/-0.188							
	TPU:		+/-0.195							
Cerium-144		U	0.0381	pCi/g						
	Uncert:		+/-0.832							
	TPU:		+/-0.832							
Cesium-134		U	0.0741	pCi/g						
	Uncert:		+/-0.162							
	TPU:		+/-0.165							
Cesium-136		U	0.0719	pCi/g						
	Uncert:		+/-0.257							
	TPU:		+/-0.259							
Cesium-137	23.1		24.1	pCi/g			104 (75%-125%)			
	Uncert:		+/-0.615							
	TPU:		+/-2.16							
Chromium-51		U	-0.562	pCi/g						
	Uncert:		+/-1.06							
	TPU:		+/-1.09							
Cobalt-56		U	-0.0348	pCi/g						
	Uncert:		+/-0.151							
	TPU:		+/-0.152							
Cobalt-57			0.407	pCi/g						
	Uncert:		+/-0.173							
	TPU:									

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## Attachment 3: Lab Data for OOL 10-11 &amp; OOL 10-12

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**QC Summary**

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Parmname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec Batch 1387698									
Cobalt-58		U	+/-0.178 0.0368	pCi/g					
	Uncert:		+/-0.162						
	TPU:		+/-0.163						
Cobalt-60	22.9		23.5	pCi/g		102	(75%-125%)		
	Uncert:		+/-0.664						
	TPU:		+/-1.94						
Europium-152		U	-0.239	pCi/g					
	Uncert:		+/-0.416						
	TPU:		+/-0.431						
Europium-154		U	0.197	pCi/g					
	Uncert:		+/-0.270						
	TPU:		+/-0.285						
Europium-155		U	-0.258	pCi/g					
	Uncert:		+/-0.447						
	TPU:		+/-0.463						
Iridium-192		U	-0.013	pCi/g					
	Uncert:		+/-0.126						
	TPU:		+/-0.126						
Iron-59		U	0.139	pCi/g					
	Uncert:		+/-0.323						
	TPU:		+/-0.330						
Lead-210			876	pCi/g					
	Uncert:		+/-97.6						
	TPU:		+/-129						
Lead-212			1.07	pCi/g					
	Uncert:		+/-0.345						
	TPU:		+/-0.359						
Lead-214			1.51	pCi/g					
	Uncert:		+/-0.489						
	TPU:		+/-0.507						
Manganese-54		U	-0.065	pCi/g					
	Uncert:		+/-0.152						
	TPU:		+/-0.155						
Mercury-203		U	0.041	pCi/g					
	Uncert:		+/-0.122						
	TPU:		+/-0.124						
Neodymium-147		U	0.927	pCi/g					
	Uncert:		+/-0.899						
	TPU:		+/-0.994						
Neptunium-237			0.255	pCi/g					
	Uncert:		+/-0.272						
	TPU:		+/-0.296						
Neptunium-239		U	-0.276	pCi/g					
	Uncert:		+/-1.97						
	TPU:		+/-1.97						

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Parmname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec										
Batch 1387698										
Niobium-94		U	0.0142	pCi/g						
	Uncert:		+/-0.120							
	TPU:		+/-0.120							
Niobium-95		U	-0.0196	pCi/g						
	Uncert:		+/-0.135							
	TPU:		+/-0.135							
Potassium-40			1.77	pCi/g						
	Uncert:		+/-0.577							
	TPU:		+/-0.996							
Promethium-144		U	-0.00584	pCi/g						
	Uncert:		+/-0.114							
	TPU:		+/-0.114							
Promethium-146		U	0.0979	pCi/g						
	Uncert:		+/-0.203							
	TPU:		+/-0.208							
Radium-228		U	0.324	pCi/g						
	Uncert:		+/-0.822							
	TPU:		+/-0.836							
Ruthenium-106		U	-0.873	pCi/g						
	Uncert:		+/-1.18							
	TPU:		+/-1.25							
Silver-110m		U	0.124	pCi/g						
	Uncert:		+/-0.275							
	TPU:		+/-0.281							
Sodium-22		U	0.068	pCi/g						
	Uncert:		+/-0.0945							
	TPU:		+/-0.0995							
Thallium-208			0.253	pCi/g						
	Uncert:		+/-0.184							
	TPU:		+/-0.185							
Thorium-234		U	-0.604	pCi/g						
	Uncert:		+/-8.06							
	TPU:		+/-8.07							
Tin-113		U	0.0161	pCi/g						
	Uncert:		+/-0.171							
	TPU:		+/-0.172							
Uranium-235		U	0.195	pCi/g						
	Uncert:		+/-0.819							
	TPU:		+/-0.824							
Uranium-238		U	-0.604	pCi/g						
	Uncert:		+/-8.06							
	TPU:		+/-8.07							
Yttrium-88		U	0.0174	pCi/g						
	Uncert:		+/-0.0523							
	TPU:		+/-0.0529							
Zinc-65		U	-0.139	pCi/g						

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Parmname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec										
Batch	1387698									
Zirconium-95			Uncert: +/-0.417 TPU: +/-0.422							
		U	0.100	pCi/g						
			Uncert: +/-0.238 TPU: +/-0.243							
QC1203087897 MB										
Actinium-228		U	-0.00931	pCi/g				MXR1	05/14/1413:3	
			Uncert: +/-0.0241 TPU: +/-0.0245							
Americium-241		U	0.00265	pCi/g						
			Uncert: +/-0.0353 TPU: +/-0.0354							
Antimony-124		U	0.013	pCi/g						
			Uncert: +/-0.0131 TPU: +/-0.0143							
Antimony-125		U	0.014	pCi/g						
			Uncert: +/-0.0142 TPU: +/-0.0156							
Barium-133		U	-0.00334	pCi/g						
			Uncert: +/-0.00738 TPU: +/-0.00754							
Barium-140		U	0.00351	pCi/g						
			Uncert: +/-0.00722 TPU: +/-0.0074							
Beryllium-7		U	-0.00258	pCi/g						
			Uncert: +/-0.0475 TPU: +/-0.0475							
Bismuth-212		U	-0.0287	pCi/g						
			Uncert: +/-0.0735 TPU: +/-0.0747							
Bismuth-214		U	0.00289	pCi/g						
			Uncert: +/-0.0133 TPU: +/-0.0134							
Cerium-139		U	-0.0016	pCi/g						
			Uncert: +/-0.00455 TPU: +/-0.00462							
Cerium-141		U	0.00271	pCi/g						
			Uncert: +/-0.00775 TPU: +/-0.00785							
Cerium-144		U	0.0121	pCi/g						
			Uncert: +/-0.0297 TPU: +/-0.0302							
Cesium-134		U	-0.00137	pCi/g						
			Uncert: +/-0.00562 TPU: +/-0.00566							
Cesium-136		U	-0.00376	pCi/g						

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Parmname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec									
Batch	1387698								
			Uncert:						
			TPU:						
Cesium-137		U	0.00255	pCi/g					
			Uncert:						
			TPU:						
Chromium-51		U	-0.0015	pCi/g					
			Uncert:						
			TPU:						
Cobalt-56		U	-0.00349	pCi/g					
			Uncert:						
			TPU:						
Cobalt-57		U	0.00225	pCi/g					
			Uncert:						
			TPU:						
Cobalt-58		U	-0.00028	pCi/g					
			Uncert:						
			TPU:						
Cobalt-60		U	-0.000913	pCi/g					
			Uncert:						
			TPU:						
Europium-152		U	0.00356	pCi/g					
			Uncert:						
			TPU:						
Europium-154		U	0.00459	pCi/g					
			Uncert:						
			TPU:						
Europium-155		U	-0.00164	pCi/g					
			Uncert:						
			TPU:						
Iridium-192		U	-0.00125	pCi/g					
			Uncert:						
			TPU:						
Iron-59		U	0.0023	pCi/g					
			Uncert:						
			TPU:						
Lead-210		U	1.02	pCi/g					
			Uncert:						
			TPU:						
Lead-212		U	-0.0112	pCi/g					
			Uncert:						
			TPU:						
Lead-214		U	0.00363	pCi/g					
			Uncert:						
			TPU:						
Manganese-54		U	0.00293	pCi/g					
			Uncert:						
			TPU:						

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Parmname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec									
Batch	1387698								
Mercury-203		U	+/-0.00502 -0.00111	pCi/g					
	Uncert:		+/-0.00516						
	TPU:		+/-0.00518						
Neodymium-147		U	0.026	pCi/g					
	Uncert:		+/-0.0331						
	TPU:		+/-0.0352						
Neptunium-237		U	-0.00536	pCi/g					
	Uncert:		+/-0.0107						
	TPU:		+/-0.011						
Neptunium-239		U	-0.0046	pCi/g					
	Uncert:		+/-0.0736						
	TPU:		+/-0.0736						
Niobium-94		U	-0.00198	pCi/g					
	Uncert:		+/-0.00533						
	TPU:		+/-0.00541						
Niobium-95		U	0.00151	pCi/g					
	Uncert:		+/-0.0055						
	TPU:		+/-0.00555						
Potassium-40		U	0.0136	pCi/g					
	Uncert:		+/-0.0643						
	TPU:		+/-0.0646						
Promethium-144		U	0.0015	pCi/g					
	Uncert:		+/-0.00499						
	TPU:		+/-0.00504						
Promethium-146		U	0.00206	pCi/g					
	Uncert:		+/-0.00635						
	TPU:		+/-0.00643						
Radium-228		U	-0.00931	pCi/g					
	Uncert:		+/-0.0241						
	TPU:		+/-0.0245						
Ruthenium-106		U	-0.0148	pCi/g					
	Uncert:		+/-0.0501						
	TPU:		+/-0.0505						
Silver-110m		U	0.00354	pCi/g					
	Uncert:		+/-0.0073						
	TPU:		+/-0.00749						
Sodium-22		U	0.00161	pCi/g					
	Uncert:		+/-0.00456						
	TPU:		+/-0.00462						
Thallium-208		U	-0.00133	pCi/g					
	Uncert:		+/-0.00581						
	TPU:		+/-0.00584						
Thorium-234		U	-0.00135	pCi/g					
	Uncert:		+/-0.319						
	TPU:		+/-0.319						

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gamma Spec</b>											
Batch	1387698										
Tin-113			U	-0.0028	pCi/g						
	Uncert:			+/-0.00564							
	TPU:			+/-0.00579							
Uranium-235			U	-0.0234	pCi/g						
	Uncert:			+/-0.036							
	TPU:			+/-0.0375							
Uranium-238			U	-0.00135	pCi/g						
	Uncert:			+/-0.319							
	TPU:			+/-0.319							
Yttrium-88			U	0.00223	pCi/g						
	Uncert:			+/-0.00651							
	TPU:			+/-0.00659							
Zinc-65			U	-0.00132	pCi/g						
	Uncert:			+/-0.0108							
	TPU:			+/-0.0108							
Zirconium-95			U	-0.00348	pCi/g						
	Uncert:			+/-0.0086							
	TPU:			+/-0.00875							
Batch	1387906										
QC1203088382	348598001 DUP										
Iodine-129		U	0.303	U	-0.0211	pCi/g	0		N/A BSW1	05/27/1412:35	
	Uncert:		+/-0.335		+/-0.160						
	TPU:		+/-0.363		+/-0.160						
QC1203088384	LCS										
Iodine-129	8.60				6.99	pCi/g	81.3	(75%-125%)	BSW1	05/27/1412:36	
	Uncert:				+/-0.946						
	TPU:				+/-1.18						
QC1203088381	MB										
Iodine-129				U	0.133	pCi/g			BSW1	05/27/1412:34	
	Uncert:				+/-0.221						
	TPU:				+/-0.229						
QC1203088383	348598001 MS										
Iodine-129	9.13	U	0.303		7.31	pCi/g	80.1	(75%-125%)	BSW1	05/28/1408:19	
	Uncert:		+/-0.335		+/-0.696						
	TPU:		+/-0.363		+/-1.01						
<b>Rad Gas Flow</b>											
Batch	1391080										
QC1203096527	348598001 DUP										
Strontium-90		U	0.0167	U	0.000357	pCi/g	0		N/A KSD1	05/29/1416:16	
	Uncert:		+/-0.0541		+/-0.0508						
	TPU:		+/-0.0542		+/-0.0508						
QC1203096528	LCS										
Strontium-90	3.70				4.35	pCi/g	118	(75%-125%)	KSD1	05/29/1416:16	
	Uncert:				+/-0.251						
	TPU:				+/-0.845						
QC1203096526	MB										

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	1391080										
Strontium-90			U	0.0608	pCi/g				KSDI	05/29/14	16:16
	Uncert:			+/-0.0558							
	TPU:			+/-0.0569							
<b>Rad Liquid Scintillation</b>											
Batch	1387641										
QC1203087734	348598003	DUP									
Nickel-63		U	-2.49	U	-26.2	pCi/g	0		N/A TYJ1	05/22/14	20:56
	Uncert:		+/-24.3		+/-22.9						
	TPU:		+/-24.3		+/-22.9						
QC1203087735	LCS										
Nickel-63	972			999	pCi/g		103	(75%-125%)	TYJ1	05/22/14	21:27
	Uncert:			+/-39.7							
	TPU:			+/-193							
QC1203087733	MB										
Nickel-63		U		-8.7	pCi/g				TYJ1	05/22/14	20:25
	Uncert:			+/-20.0							
	TPU:			+/-20.0							
Batch	1387681										
QC1203087838	348598001	DUP									
Technetium-99		U	0.000424	U	0.117	pCi/g	0		N/AMYM1	05/25/14	12:44
	Uncert:		+/-0.469		+/-0.479						
	TPU:		+/-0.469		+/-0.480						
QC1203087839	LCS										
Technetium-99	33.6			31.4	pCi/g		93.7	(75%-125%)	MYM1	05/25/14	13:25
	Uncert:			+/-0.997							
	TPU:			+/-3.74							
QC1203087837	MB										
Technetium-99		U		-0.209	pCi/g				MYM1	05/25/14	12:02
	Uncert:			+/-0.419							
	TPU:			+/-0.419							
Batch	1388352										
QC1203089506	348598001	DUP									
Carbon-14		U	-0.298	U	0.143	pCi/g	0		N/A BYS1	05/23/14	02:55
	Uncert:		+/-0.340		+/-0.344						
	TPU:		+/-0.340		+/-0.344						
QC1203089508	LCS										
Carbon-14	36.9			38.2	pCi/g		104	(75%-125%)	BYS1	05/22/14	02:25
	Uncert:			+/-1.94							
	TPU:			+/-3.39							
QC1203089505	MB										
Carbon-14		U		0.365	pCi/g				BYS1	05/21/14	22:02
	Uncert:			+/-0.322							
	TPU:			+/-0.323							
QC1203089507	348598001	MS									
Carbon-14	37.5	U	-0.298	39.9	pCi/g		106	(75%-125%)	BYS1	05/22/14	02:05

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Parmname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Liquid Scintillation									
Batch	1388352								

Uncert: +/-0.340 +/-1.99  
 TPU: +/-0.340 +/-3.52

**Notes:**

TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- M Result is < LLD and > MDC
- U Result is < LLD and < MDC
- UI Uncertain identification for gamma spectroscopy
- X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details
- X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.

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.

\*\* Indicates analyte is a surrogate/tracer compound.

^ 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.

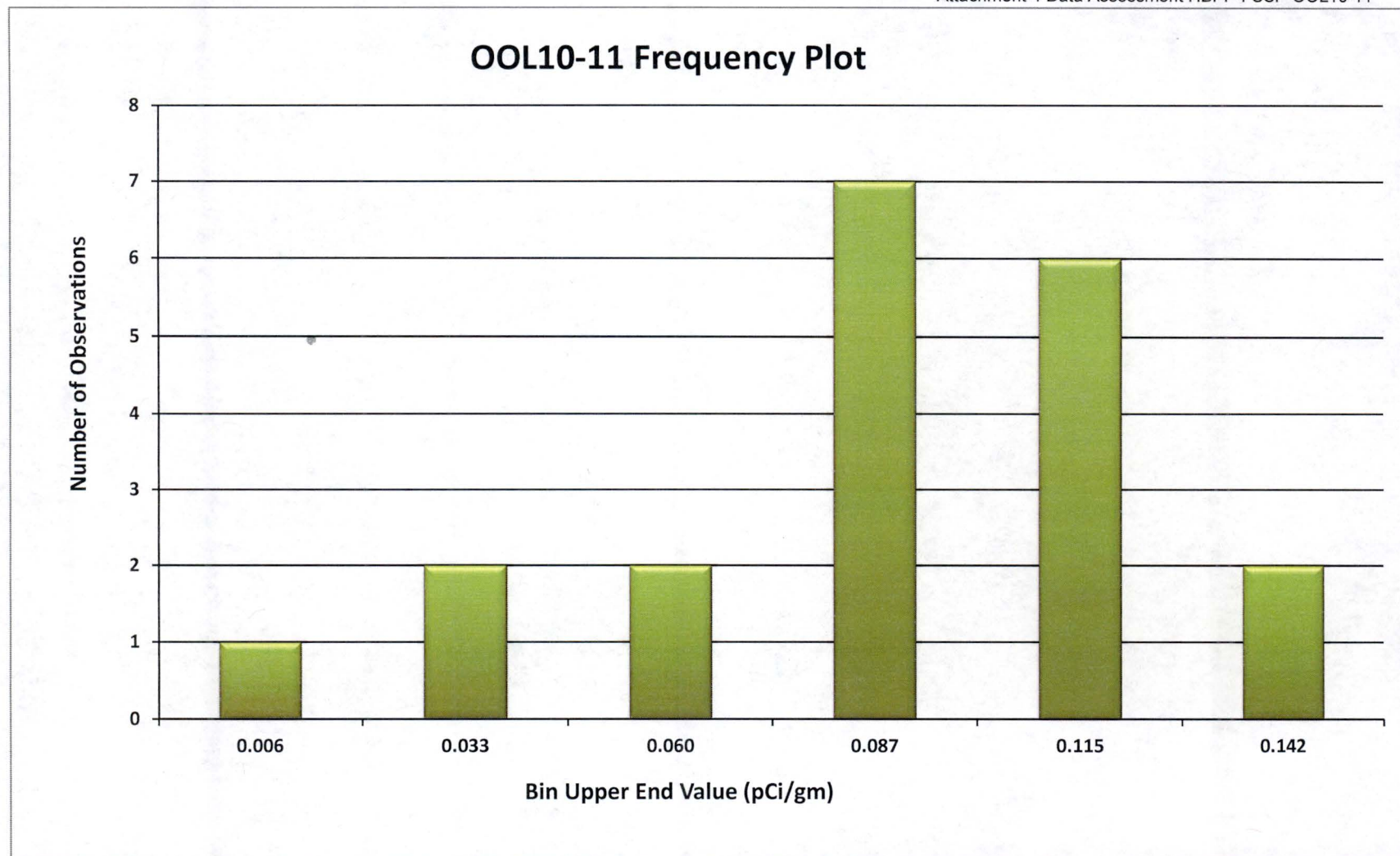
For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

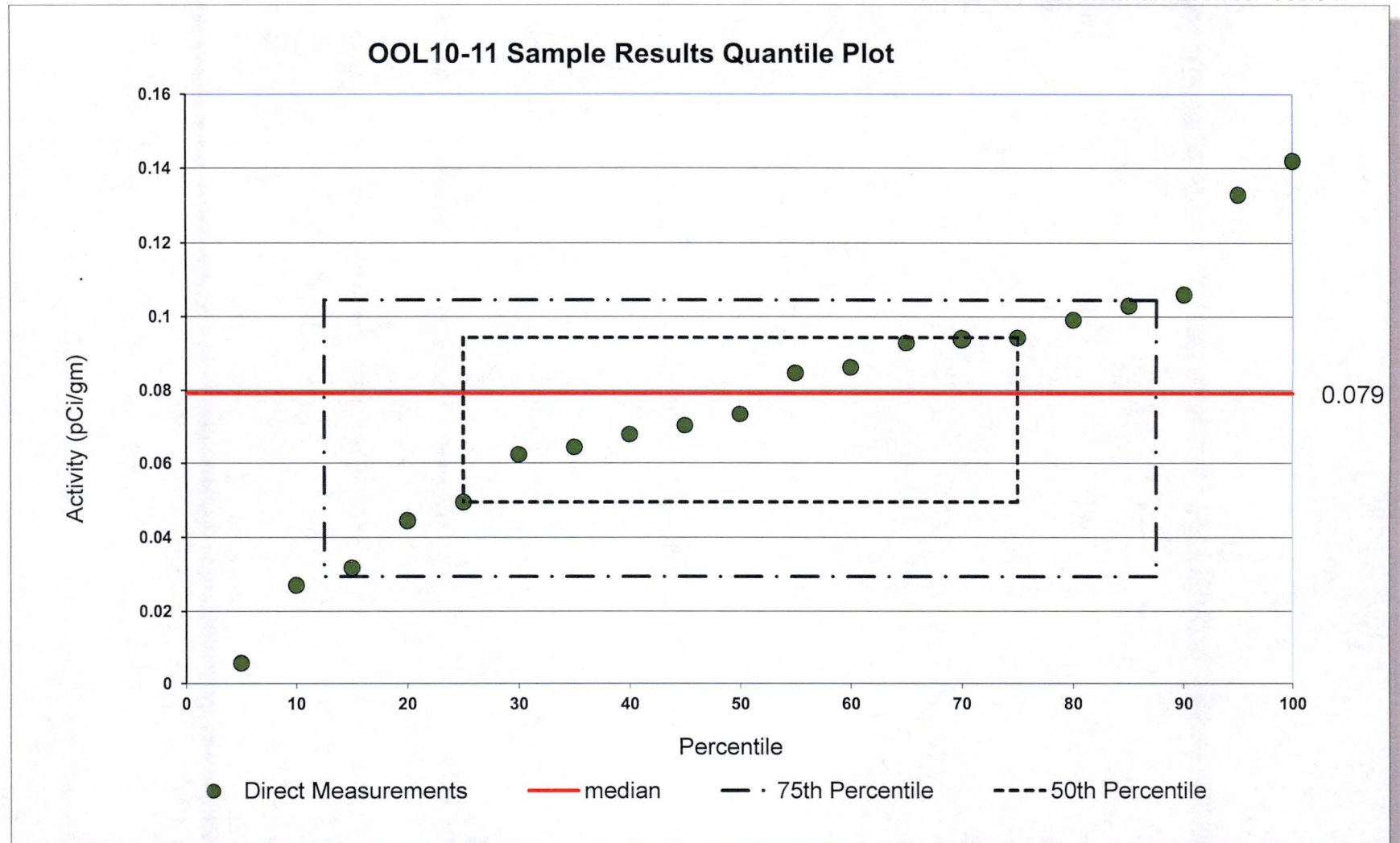
Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

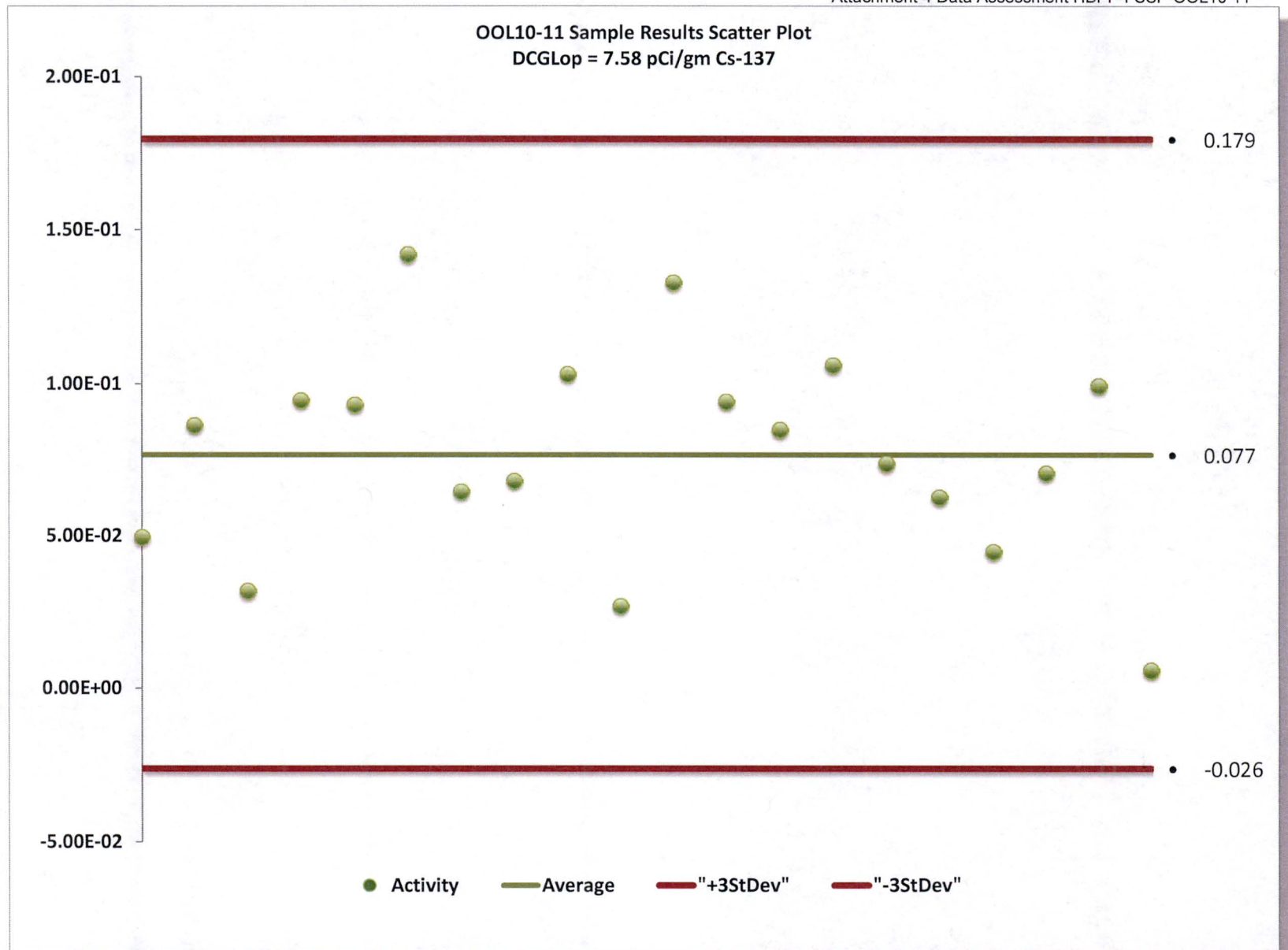


## **Attachment 4**

### **Data Assessment HBPP-FSSP-OOL10-11**

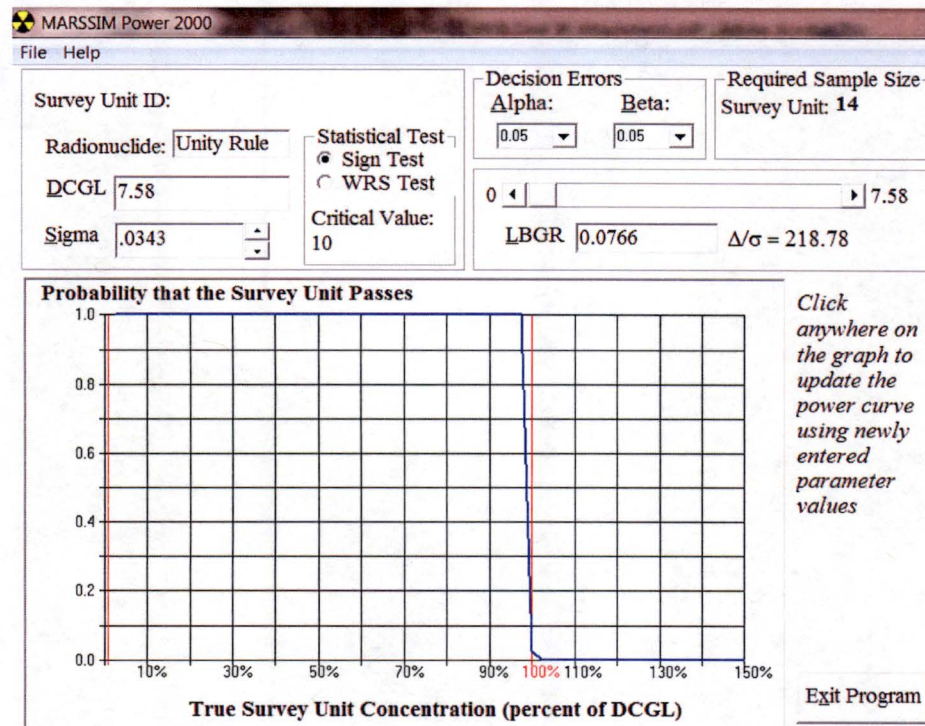




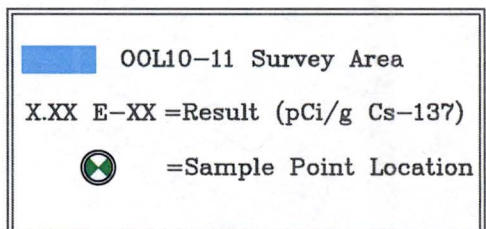
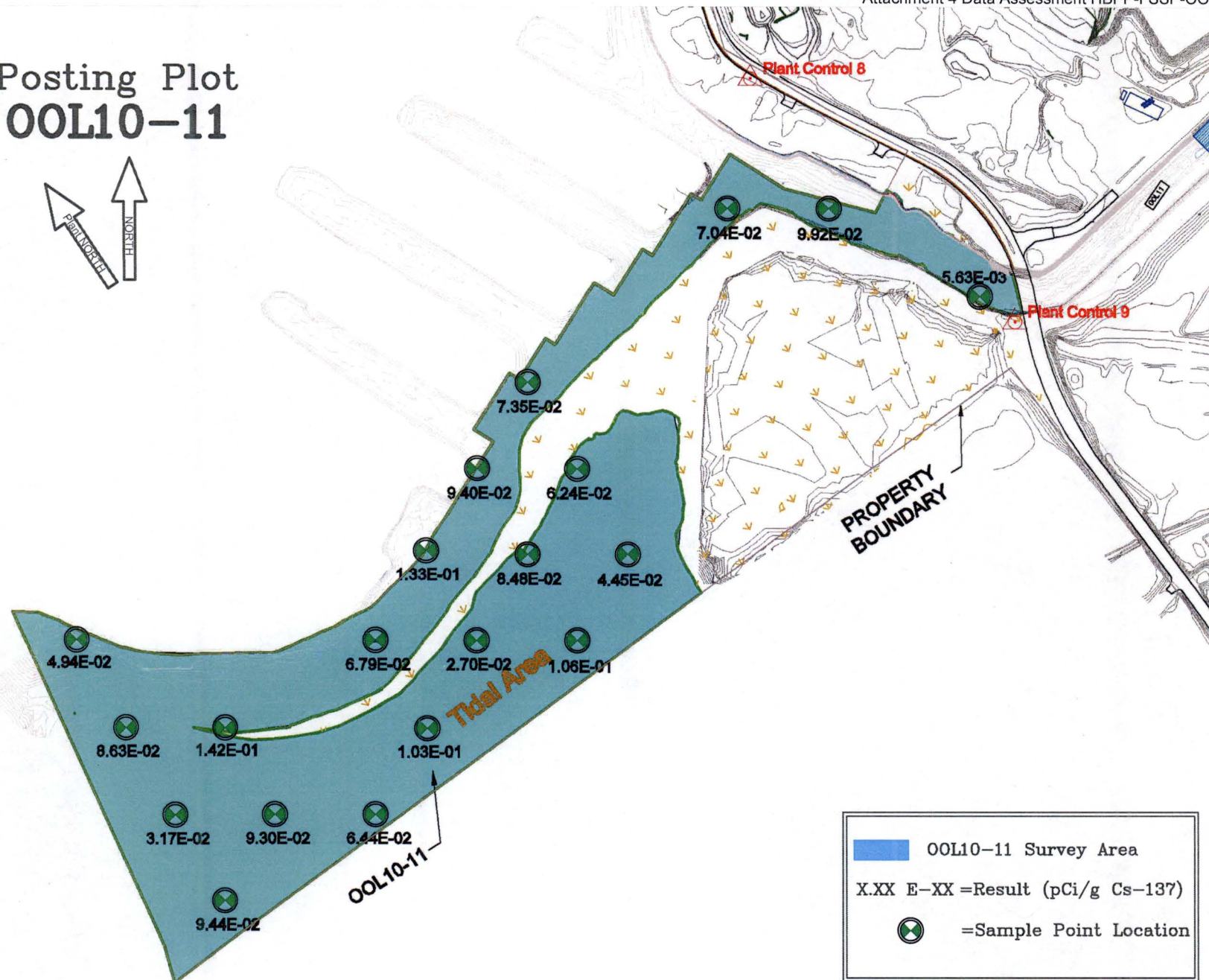
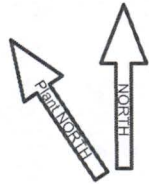




## Retrospective Power Curve OOL10-11

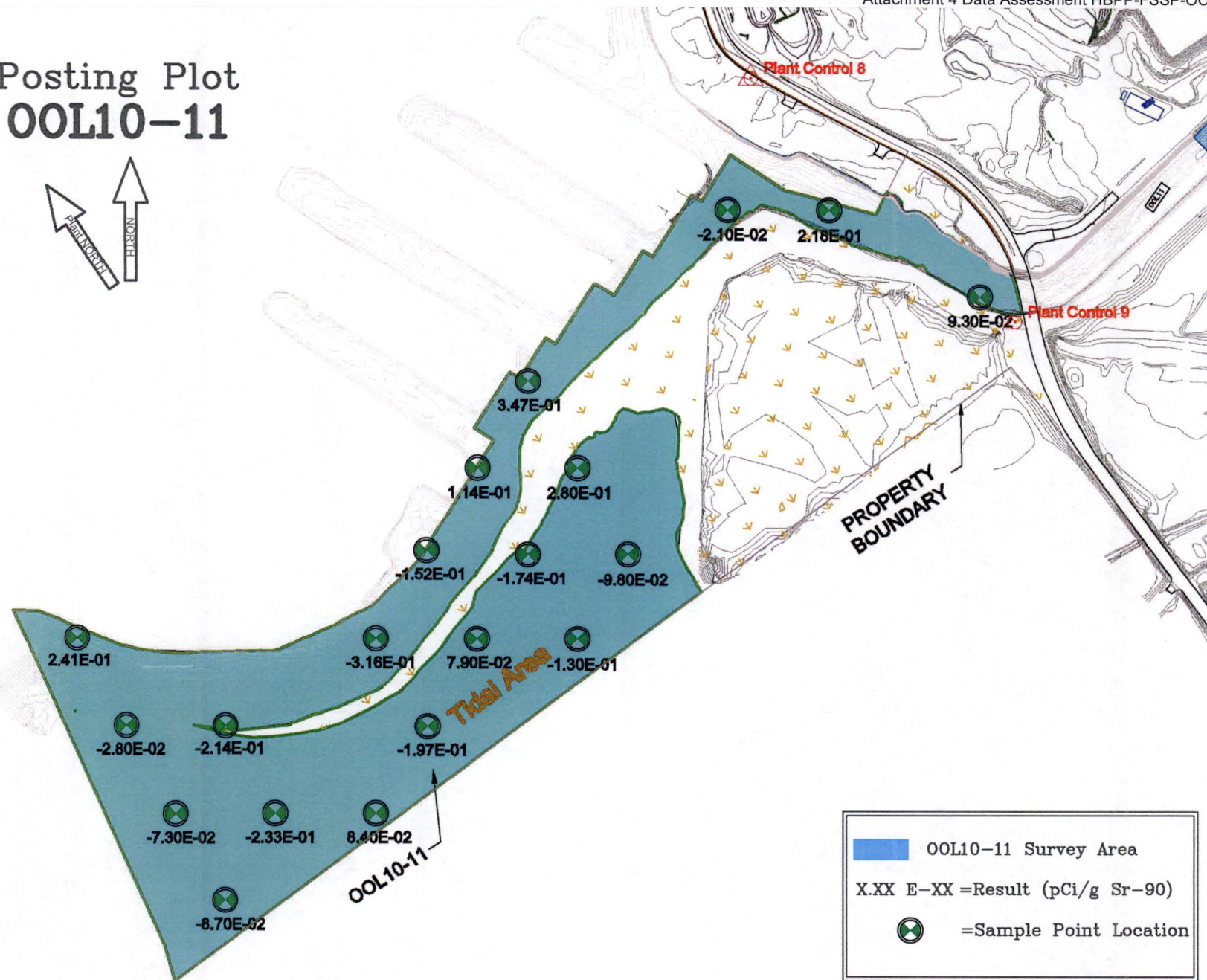
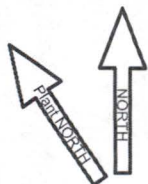


# Posting Plot OOL10-11





# Posting Plot OOL10-11



## Split Sample Assessment Form

Survey Area No.: OOL-10		Survey Unit No.: 11		Survey Unit Name: Fisherman's Channel													
Sample Plan No.: HBPP-FSS-OOL10-11-00						Sample Measurement Location: #03											
Sample Description: Comparison of split samples collected from sample measurement location #03 and analyzed using gamma spectroscopy by an off-site vendor laboratory. The on-site result is the standard count and the off-site is the comparison.																	
STANDARD					COMPARISON												
Radio-nuclide chosen (a)	Standard Activity (b)	1 $\sigma$ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)	Comparison Activity (f)	Comparison Error (g)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)									
K-40	1.19E+01	9.20E-01	13	0.6-1.66	1.22E+01	3.31E-01	1.03E+00	Y									
Pb-212	4.22E-01	4.65E-02	9	0.6-1.66	5.58E-01	2.12E-02	1.32E+00	Y									
Comments/Corrective Actions: None.					Table 1 is provided to show acceptance criteria to assess split samples.												
					<table border="1"> <thead> <tr> <th>Resolution (d)</th> <th>Agreement Range (e)</th> </tr> </thead> <tbody> <tr> <td>&lt;4</td> <td>No Comparison</td> </tr> <tr> <td>4 - 7</td> <td>0.5 - 2.0</td> </tr> <tr> <td>8 - 15</td> <td>0.6 - 1.66</td> </tr> <tr> <td>16 - 50</td> <td>0.75 - 1.33</td> </tr> <tr> <td>51 - 200</td> <td>0.80 - 1.25</td> </tr> <tr> <td>&gt;200</td> <td>0.85 - 1.18</td> </tr> </tbody> </table>				Resolution (d)	Agreement Range (e)	<4	No Comparison	4 - 7	0.5 - 2.0	8 - 15	0.6 - 1.66	16 - 50
Resolution (d)	Agreement Range (e)																
<4	No Comparison																
4 - 7	0.5 - 2.0																
8 - 15	0.6 - 1.66																
16 - 50	0.75 - 1.33																
51 - 200	0.80 - 1.25																
>200	0.85 - 1.18																
Performed By: <i>Oel Rumball</i>		Date: 9-1-14		Concurrence: <i>M. J. R.</i>			Date: 9/10/14										



## Split Sample Assessment Form

Survey Area No.: OOL-10		Survey Unit No.: 11		Survey Unit Name: Fisherman's Channel																		
Sample Plan No.: HBPP-FSS-OOL10-11-00						Sample Measurement Location: #16																
Sample Description: Comparison of split samples collected from sample measurement location #16 and analyzed using gamma spectroscopy by an off-site vendor laboratory. The on-site result is the standard count and the off-site is the comparison.																						
Radio-nuclide chosen (a)	STANDARD				COMPARISON																	
	Standard Activity (b)	1 $\sigma$ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)	Comparison Activity (f)	Comparison Error (g)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)														
K-40	9.33E+00	8.60E-01	11	0.6-1.66	1.23E+01	3.41E-01	1.32E+00	Y														
Pb-212	3.82E-01	4.64E-02	8	0.6-1.66	4.91E-01	2.31E-02	1.29E+00	Y														
Comments/Corrective Actions: None.					Table 1 is provided to show acceptance criteria to assess split samples. <table border="1"> <thead> <tr> <th>Resolution (d)</th> <th>Agreement Range (e)</th> </tr> </thead> <tbody> <tr> <td>&lt;4</td> <td>No Comparison</td> </tr> <tr> <td>4 - 7</td> <td>0.5 - 2.0</td> </tr> <tr> <td>8 - 15</td> <td>0.6 - 1.66</td> </tr> <tr> <td>16 - 50</td> <td>0.75 - 1.33</td> </tr> <tr> <td>51 - 200</td> <td>0.80 - 1.25</td> </tr> <tr> <td>&gt;200</td> <td>0.85 - 1.18</td> </tr> </tbody> </table>				Resolution (d)	Agreement Range (e)	<4	No Comparison	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 (d)	Agreement Range (e)												
<4	No Comparison																					
4 - 7	0.5 - 2.0																					
8 - 15	0.6 - 1.66																					
16 - 50	0.75 - 1.33																					
51 - 200	0.80 - 1.25																					
>200	0.85 - 1.18																					
Performed By: <i>Dan Randall</i>					Date: 9-1-14		Concurrence: <i>M. J. Smith</i>		Date: 9/10/14													

## Split Sample Assessment Form

Survey Area No.: OOL-10		Survey Unit No.: 11		Survey Unit Name: Fisherman's Channel						
Sample Plan No.: HBPP-FSS-OOL10-11-00						Sample Measurement Location: 20				
Sample Description: Comparison of a recounted sample collected from sample measurement location #20 and analyzed using gamma spectroscopy at the on-site laboratory.										
Radio-nuclide chosen (a)	STANDARD			Agreement Range (e)	COMPARISON					
	Standard Activity (b)	1 $\sigma$ Uncertainty (c)	Resolution (d)=(b)/(c)		Comparison Activity (f)	Comparison Error (g)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)		
K-40	1.06E+01	8.90E-01	12	0.6-1.66	4.73E+00	7.55E-01	0.446	N		
Pb-212	5.33E-01	5.10E-02	10	0.6-1.66	1.41E-01	2.86E-02	0.265	N		
Comments/Corrective Actions: Placed into the corrective action process by way of SAPN#1390520.					Table 1 is provided to show acceptance criteria to assess split samples.					
							Resolution (d)		Agreement Range (e)	
							<4		No Comparison	
							4 - 7		0.5 - 2.0	
							8 - 15		0.6 - 1.66	
							16 - 50		0.75 - 1.33	
							51 - 200		0.80 - 1.25	
							>200		0.85 - 1.18	
Performed By: <i>Oal Runkell</i>				Date: 9-1-14	Concurrence: <i>Mark E...</i>		Date: 9/10/14			

**Attachment 5**

**ALARA Statement**



*Pacific Gas and  
Electric Company®*

**Generic ALARA Review for Final Status Survey  
of Soil at HBPP**

**July, 08, 2013  
Martin C. Erickson**

Reviewed By: Larry Watkins

Date: 7/10/2013

Approved By: W. H. Barley

Date: 8/1/13

Page 1 of 9

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## Executive Summary

In addition to the requirement to limit the dose from residual, plant-related radioactivity in soil to members of the critical group to 25 mrem in any year, the License Termination Plan (LTP) requires an evaluation demonstrating that these levels are as low as reasonably achievable (ALARA). If compliance with the ALARA criterion cannot be demonstrated, remediation of the soil is required, even though this would further reduce the otherwise acceptable exposure to the critical group to levels below those required. This report is intended to provide a generic ALARA review to bound the conditions under which no further remediation is necessary for soils. Calculations were performed using LTP equations and conservative assumptions. The conclusion is that it is not cost-beneficial to remediate soil in which the levels of residual, plant-related radioactivity are below LTP release criteria.

## 1.0 Introduction

Section 4.4 of the LTP [1] states that a generic ALARA evaluation for soils may be developed to determine if the clean up of soils beyond the DCGLs will be cost-beneficial for HBPP. Section 4.5 of the LTP provides equations and default values for this calculation. This process will be followed, assuming that the soil is at the DCGL and using conservative estimates of costs, distances and other inputs that the worksheet requires. The equation will calculate an action level (AL) that represents the ratio of concentration to the DCGL that would be cost-beneficial to remediate. If that ratio is greater than 1, remediation is not cost-beneficial.

This calculation is meant to apply to areas of any MARSSIM class and any size. In a Class 1 area, where values of residual contamination may exceed the  $DCGL_w$  in limited areas, the mean concentration may never exceed the  $DCGL_w$ . Since it is assumed that the entire volume of soil removed is at  $DCGL_w$ , the assumed mean will be at  $DCGL_w$ . Therefore, the assumed case will be bounding.

## 2.0 Discussion

The total cost ( $Cost_T$ ) will be calculated using LTP equation in Section 4.4.1):

$$Cost_T = Cost_R + Cost_{WD} + Cost_{ACC} + Cost_{TF} + Cost_{WDose} + Cost_{PDose} + Cost_{other}$$

These terms are defined and their values calculated as follows:

### 2.1 Cost of performing remediation work ( $Cost_R$ ):

- Initially it will be assumed that the job is big enough to require earthmoving equipment. At a minimum, this would be either an excavator or a loader and truck. This turns out not to be a constraint, as explained later.
- To come up with a conservative scenario, the cost of remediating one square meter from a larger project is calculated. Any smaller job by, itself, would have planning and administration costs that would be dominant. Factors contributing to  $Cost_R$  are identified in Attachment 1. The initial estimate for  $Cost_R$  is based on a job to remediate 2000 square meters of soil, but to make it comparable to the other costs, that value is adjusted to reflect the cost of 1 square meter.
- The adjusted value of  $Cost_R$  is \$7.32 to remediate 1 square meter of soil.
- Rounding down to the dollar,  $Cost_R = \$7$

**Note:** The value of  $Cost_R$  calculated above bounds the cost of a smaller excavation, e.g., one that doesn't require earthmoving equipment. For example, two workers who take an hour to dig up some soil and bring it back

in wheelbarrow, with no work order or other formal planning, would cost the project about \$100 in labor costs (assuming the cost to the project is \$50/hr). So, the constraint that this only applies to jobs big enough to require earthmoving equipment can be removed.

## 2.2 Cost of waste disposal ( $Cost_{WD}$ ):

- As above, it will be assumed that one square meter of surface soil is to be remediated. Surface soil is considered to be the top 15 cm. The estimated waste volume will therefore be 15 cm times the area of 1 m<sup>2</sup>. This comes to 0.15 m<sup>3</sup>.
- The current cost of waste disposal for radiologically contaminated soil is \$100 per cubic meter. This includes burial fees and shipping.
- Rounding down to the dollar,  $Cost_{WD} = \$15$

## 2.3 Cost of workplace accident ( $Cost_{ACC}$ ):

- $Cost_{ACC} = (\$3,000,000) \times (4.2E-8/h) \times (\text{Time to perform remediation})$ .
- \$3,000,000 is the monetary value of a fatality equivalent to \$2000 per person-rem.
- 4.2E-8 is the workplace fatality rate, in fatalities per hour worked.
- For a 1 square meter excavation, this would not be more than a few person-hours. (Assume Time = 1.62 hr)
- $(\$3,000,000) \times (4.2E-8/h) \times (1.62 h) = \$0.20$
- Rounding down to the dollar,  $Cost_{ACC} = \$0$

## 2.4 Cost of traffic fatality ( $Cost_{TF}$ ):

- $Cost_{TF} = (\$3,000,000) \times (3.8E-8/km) \times (\text{Volume}) \times (\text{Distance}) / (\text{Volume/shipment})$ .
- Round trip distance from HBPP to Grand View, ID: 2292 km/shipment ... (from Google Maps)
- Waste volume per shipment: 13.6 m<sup>3</sup>/shpmt ... (default in LTP, Section 4.5.1.7.
- $(\$3,000,000) \times (3.8E-8/km) \times (0.15 m^3) (2292 km/shpmt) / (13.6 m^3/shpmt) = \$2.88$
- Rounding down to the dollar,  $Cost_{TF} = \$2$

## 2.5 Cost of worker dose ( $Cost_{WDose}$ ):

- $Cost_{WDose} = (\$2000/\text{person-rem}) \times (\text{Worker dose rate}) \times (\text{Time})$ .
- Dose rates would be insignificant. (Assume dose rate = 0.1 mrem/h = 1E-4 rem/h)



- $(\$2000/\text{person-rem}) \times (1\text{E-}4 \text{ rem/h}) \times (1.62 \text{ h}) = \$0.32$
- Rounding down to the dollar,  $\text{Cost}_{\text{WDose}} = \$0$

## 2.6 Cost of Dose to the Public ( $\text{Cost}_{\text{PDose}}$ ):

- $\text{Cost}_{\text{DP}}$  is assumed to be no more than the  $\text{Cost}_{\text{WD}}$ .
- Assumed  $\text{Cost}_{\text{PDose}} = \$0$

## 2.7 Other costs associated with this situation ( $\text{Cost}_{\text{other}}$ )

There are no other costs associated with this remediation.

## 3.0 Calculation

ALARA Action Level (AL):

$$AL = \frac{\text{Conc}}{\text{DCGL}_W} = \frac{\text{Cost}_T}{\$2,000 \times P_D \times 0.025 \times F \times A} \times \frac{r + \lambda}{1 - e^{-(r+\lambda)N}}$$

where:

- $\text{Cost}_T$  has been calculated above
- \$2000 is the monetary value of one person-rem (Table 4-1, LTP)
- F = removable fraction = 1 ... (most conservative possible)
- 0.025 is the annual dose in rem to an average member of critical group from residual radioactivity.
- r = monetary discount rate = 0.03/y ... (Table 4-1, LTP)
- N = Number of years over which the collective dose is calculated = 1000 y ... (Table 4-1, LTP)
- PD = Population density for the critical group = 0.0001 people/m<sup>2</sup>. (Table 4-1, LTP)
- A = Area being evaluated = 1 m<sup>2</sup>
- Most conservative nuclide of concern is that with the longest half-life, Tc-99, with a half-life of 2.13E5 years (Table 6-1, LTP) and a decay constant ( $\lambda$ ) of 3.254E-6 y<sup>-1</sup> (Note: With the values for other variables used for this calculation, the 1-e... term equals 1 for any value of  $\lambda$ . Therefore, the smallest AL, which is the most conservative, will occur when  $\lambda$ , in the top of the equation, is smallest.)

Applying these values to the equation:

$$AL = \frac{24}{2000 \times 0.0001 \times 0.025 \times 1 \times 1} \times \frac{0.03 + 3.254\text{E} - 06}{1 - e^{-(0.03+3.254\text{E}-6)*1000}}$$

$$\underline{AL = 144}$$

If Tc-99 were at DCGL:

- Sum of DCGL Fractions = 1

Since AL is greater than the Sum of DCGL Fractions, remediation is not cost-beneficial. In fact, remediation would not be cost-beneficial unless the concentration of any LTP nuclide in soil were at least 144 times the DCGL.

#### 4.0 Conclusions

Based upon the results of this ALARA evaluation, it is not cost-beneficial to remediate soil in which the levels of residual, plant-related radioactivity are below LTP release criteria.

#### 5.0 References

1. HBPP License Termination Plan
2. U.S. Nuclear Regulatory Commission, NUREG-1530, "Reassessment of NRC's Dollar per Person-Rem Conversion Factor Policy," December 1995

**Attachment 1**  
**Cost estimate basis**

Cost estimate for remediation work (Cost<sub>R</sub>)Assume larger project, to dilute fixed costs: 2000 m<sup>2</sup>, removing the top 15 cm of soil

	Time (hr)	Rate (\$/hr)	Cost
Const. Planner, Rad Engineer	50	\$100	\$5000
Supervision/management	1	\$200	\$200
Resurvey	50	\$50	\$2500
Additional off-site analysis			\$2400
Additional on-site analysis			\$1500
Equip + Operators	10	\$250	\$2500
RP Coverage	10	\$50	\$500
Total for 2000 m <sup>2</sup>			\$14,640
Cost per m <sup>2</sup>			\$7.32

**Attachment 6**

**Quality Verification Assessment Report**

QV Assessment 140830025

FSS Survey No. HBPP-FSSP-OOL10-11-00 Fisherman's Channel

## **Quality Verification**

### **Short Form Assessment # 140830025**

#### **Fisherman's Channel Final Status Survey (FSS) Planning FSS Survey No: HBPP-FSSP-OOL10-11-00**

Date: April 29, 2014

**To: Loren Sharp- Director Nuclear Plant Manager**

Organization Assessed: HBPP Site Closure

#### **DISTRIBUTION**

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QV Assessment 140830025

FSS Survey No. HBPP-FSSP-OOL10-11-00 Fisherman's Channel

**DECOMMISSIONING**  
**NUCLEAR QUALITY VERIFICATION**  
**Humboldt Bay Power Plant**

**Short Form Assessment # 140830025**

**Date:** April 29, 2014      **Organization Assessed:** Sight Closure / FSS

**Assessment Scope:**

This assessment will verify adequacy of the Survey Plan for the FSS of the Fisherman's Channel. This particular survey introduces a number of variables that are atypical of a FSS of soils areas. This assessment will verify that these variables are appropriately addressed in the survey plan.

**Summary Conclusions:**

FSS plan number HBPP-FSSP-OOL10-11-00 adequately addresses the unique challenges present by the FSS of the Fisherman's Channel. The plan provides sufficient detail to ensure trained, qualified and experienced technicians will be able to execute the survey as intended.

When the survey plan was compared against the procedure for the preparation of FSS survey plans a number of minor discrepancies were identified. Many of the discrepancies were a result of using an uncontrolled copy of the form. Other inconsistencies were noted in the plan. For example at one place in the survey plan, the area was referred to as the "Intake Canal" rather than the "Fisherman's Channel". Again, none of identified the discrepancies should affect the performance of a experienced technician. The Data quality is not compromised. These discrepancies could however affect the quality of records.

The results of this assessment were reviewed with the responsible engineer and appropriate actions are being formulated. The discrepancies identified are addressed in Notification 1388478.

**Observations/Results:**Background:

Survey area OOL-10 consists of the surface soils of the non-industrialized portion of the HBPP site. Survey Unit OOL-10-11 (Fisherman's Channel) is located at the west end of the site west of King Salmon Ave. The channel provided a flow path for water from Humboldt Bay to the Intake Canal. It also provides boat access for personnel docks in the community of King Salmon. The survey area is completely submerged at high tide. It will require a boat and sample dredge to acquire sediment samples for the FSS. It is anticipated that some of the preselected sample locations may be inaccessible due to safety reasons or other access constraints.

Other challenges presented by this survey unit are as follows

- The survey unit is under water and therefore the normal scan survey cannot be done.
- The area is accessible to the public and normal control of access to the area cannot be achieved as per RCP FSS-4 "Isolation and Control of Areas for Final Status Survey"
- This survey is intended to support partial release of this area prior to 2019. An early release may have consequences that were not accounted for in earlier planning.

Observations:

On April 28, 2014, Sample collection activities were observed at the Fisherman's channel. Observations were limited to what could be observed from the shore. It was noted during this observation that isolation and control measures prescribed by RCP FSS-4 were not apparent. This was discussed with the FSS engineer. He was aware that the normal Isolation and control measures could not be implemented for this survey area. This anomaly is to be addressed in the final report for this survey area.

The survey plan was reviewed to determine how the plan addressed some of the unique challenges of this survey unit. The plan acknowledged that a scan survey could not be performed on submerged sediment. To compensate, a number of compensatory measures were employed.

- The investigation level was reduced from the required 50% of the DCGL to 25%.
- Samples were collected in a triangular grid pattern with a random start point rather than all sample locations being selected at random
- Five additional samples above the normal statistically determined number of fifteen samples were collected.

The plan addressed the early release of the survey area. Because of the planned early release of the survey area (Prior to 2019) Fe-55 screened in as a potential nuclide of concern. While not required by the License Termination Plan (LTP) or the procedure the sample will be analyzed for Fe-55. Pending development of a site specific Derived Concentration Guideline Level (DCGL) for Fe-55 the screening value for Fe-55 from NUREG 1757 Vol. 2 will be used.

Based on the review of the survey plan and discussions with the responsible FSS engineer it is apparent that the unique challenges of this survey area are appropriately addressed.

The survey plan was also reviewed against the guidance provided in RCP FSS-2 "Preparation of FSS Survey Plans and RCP FSS-2 Attachment 9.1 "Final Status Survey Planning (FSSP) Worksheet." A number of discrepancies were noted.

- The form used to plan survey HBPP-FSSP-OOL10-11-00 was not the controlled form provided in the plant manual. The header information was missing. That information identifies the form as attachment 9.1 to RCP FSS-2 revision 0D. Using an uncontrolled copy of the form/procedure compromises document control measures designed to preclude the use of inappropriate or outdated documents. This can also create issues concerning the adequacy of records and determining what procedure/revision was used to generate the document in question. The use of an uncontrolled copy of the survey planning worksheet is inconsistent with guidance provided in the LTP section 5.8.1.6 Document Control.
- In the general section of the plan for Survey HBPP-FSSP-OOL10-11-00, fourth line it has a header stating "Preparation for Final Status Survey Activities." The approved controlled copy of the form refers to "Preparation for Characterization Activities." QV recognizes that the preparation for either survey is about the same. The procedure should somehow acknowledge and accommodate this
- On page 4 of the Survey Plan there is listed a value for an Adjusted "Lower Boundary of the Gray Region" (LBGR). The use of an Adjusted LBGR is not addressed in the procedure however it is consistent with guidance provided in the LTP.



QV Assessment 140830025

FSS Survey No. HBPP-FSSP-OOL10-11-00 Fisherman's Channel

- On page 3 of 5 of attachment 9.1 to RCP FSS-2 under the heading MDC,s for HTD (Hard To Detect) Nuclide, PU-239 and PU-240 are listed separately. They are also listed separately in the LTP. In the survey plan for the Fisherman's Channel, they are listed together as Pu-239/240.
- On page 4 of 5 of attachment 9.1 to RCP FSS-2 there are headings for MDCR and QC Checks and measurements. These heading s are not included in the plan. These should be retained in all survey plans and Checked N/A as appropriate.
- On page 7 of the survey plan under section 7.0, the plan is missing three data fields.
  - The type of statistical test to be used
  - Biased Sample information
  - Biased Sample locationsThese data fields should be retained in all plans and marked N/A If appropriate
- On page 8 of the survey plan, Table 1, "Sample Locations" is labeled as the Intake Canal rather than the Fisherman's Channel.

Many of the issues identified above are related to the first issue regarding the use of an uncontrolled document. Taken individually the items identified above are be considered minor with no significant impact on the quality of the survey. Taken together as a whole the problems may compromise the quality of the records of FSS activities.

**Recommendations:**

QV recommends that future FSS or Characterization survey plans be prepared using the approved form. QV also recommends the procedure and associated form be revised as appropriate.

QV Assessment 140830025

FSS Survey No. HBPP-FSSP-OOL10-11-00 Fisherman's Channel

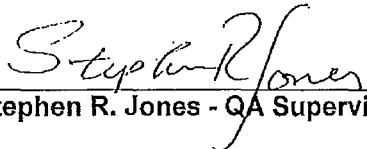
**Persons Contacted:**

M. Erickson FSS Consulting Engineer  
D. Randall FSS Engineer  
B. Endicott FSS Technical Specialist

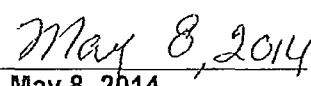
**Documents Reviewed:**

- Final Status Survey Planning worksheet (RCP FSS-2 Attachment 9.1) for FSS Survey number HBPP-FSSP-OOL10-11-00
- Generic ALARA Review for Final Status Survey of Soils at HBPP July 8, 2013
- RCP FSS-2 revision 0D "Preparation of FSS Survey Plans"
- Humboldt Bay Power Plant License Termination Plan Chapter 5 "Final Status Survey Plan"

Performed &  
Prepared by:

  
Stephen R. Jones - QA Supervisor

Date:

  
May 8, 2014

C. C.

Sokolsky, D (NSOC Secretary)  
Moore, B. (PSRC Secretary)  
Jones, S (RMS File)  
Schulz C (File Net)

## **Attachment 7**

### **Survey Plan HBPP-FSSP-OOL10-12**

**Final Status Survey Planning Worksheet**  
Page 1 of 13

<b>GENERAL SECTION</b>	
Survey Area No: OOL10	Survey Unit No: 012
Survey Unit Name: Land Adjacent to Fisherman's Channel	
Final Status Survey Number: HBPP-FSSP-OOL10-012-00	
<b>PREPARATION FOR FINAL STATUS SURVEY ACTIVITIES</b>	
<p>Check marks in the boxes below signify affirmative responses and completion of the action.</p> <p>1.1 Files have been established for survey unit FSS records. Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/></p> <p>1.2 ALARA review has been completed for the survey unit. Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/></p> <p>1.3 The survey unit has been turned over for final status survey. Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/></p> <p>1.4 An initial walkdown has been performed <input checked="" type="checkbox"/></p> <p>1.5 Activities conducted within area since turnover has been reviewed. <input checked="" type="checkbox"/></p> <p>Based on reviewed information, subsequent walkdown: <input checked="" type="checkbox"/> not warranted <input type="checkbox"/> warranted</p> <p>If warranted, subsequent walkdown has been performed and documented</p> <p align="center">OR</p> <p>The basis has been provided to and accepted for not performing a subsequent walkdown. <input type="checkbox"/></p> <p>1.6 A final classification has been performed. <input checked="" type="checkbox"/></p> <p align="center">Classification: CLASS 1 <input type="checkbox"/> CLASS 2 <input type="checkbox"/> CLASS 3 <input checked="" type="checkbox"/></p>	
<b>DATA QUALITY OBJECTIVES (DQO)</b>	

**Final Status Survey Planning Worksheet**  
**Page 2 of 13**

**1.0 State the problem:**

Survey Area OOL-10 consists of the surface area of the remainder of the HBPP land area. The open land area is comprised of soil. Survey Unit OOL10-12 is a sub unit of survey area OOL10. It is bordered by Survey Unit OOL10-11 over most of its boundary, in addition to off-site locations to plant south and King Salmon Avenue to plant east. It is approximately 46,364 square meters of surface area.

The problem as defined by this survey plan is to demonstrate that the years of plant operation did not result in an accumulation of plant-related radioactivity that exceeds the release criteria. PG&E intends to submit a request to the USNRC for an early site release for this and adjacent Survey Unit OOL10-11 in accordance with the HBPP LTP. The early site release causes Fe-55 to screen in as a potential nuclide of concern. At present a site specific DCGL for FE-55 does not exist.

The planning team for this effort consists of the Site Closure Manager, FSS Engineers, FSS Lead Technician and FSS Technicians. The FSS Engineers will make primary decisions with the concurrence of the Site Closure Manager.

**2.0 Identify the decision:**

Does residual plant-related radioactivity, if present in the survey unit, exceed the release criteria?

Alternative actions may include no action, investigation, resurvey, remediation and reclassification.

**3.0. Identify the inputs to the decision:**

<i>Sample media:</i>		Sediment			
<i>Types of measurements:</i>		Sediment samples			
<i>Radionuclides-of-concern:</i>		Cs-137			
<i>Applicable DCGL:</i>		The DCGLs applied under this survey plan correspond to the soil dose as determined in the LTP. For Fe-55 the screening level DCGLs of NUREG 1757 Vol. 2 were applied for interim use until a site specific DCGL is determined.			
Nuclide	DCGL (pCi/g)	Nuclide	DCGL (pCi/g)	Nuclide	DCGL (pCi/g)
H-3	6.8E+02	I-129	4.8E+00	Pu-241	8.6E+02
C-14	6.3E+00	Cs-137	7.9E+00	Am-241	2.5E+01
Ni-59	1.9E+03	Eu-152	1.0E+01	Cm-243	2.9E+01
Co-60	3.8E+00	Eu-154	9.4E+00	Cm-244	4.8E+01
Ni-63	7.2E+02	Np-237	1.1E+00	Cm-245	1.7E+01
Sr-90	1.5E+00	Pu-238	2.9E+01	Cm-246	2.5E+01
Nb-94	7.1E+00	Pu-239	2.6E+01	Fe-55	1.0E+04
Tc-99	1.2E+01	Pu-240	2.6E+01		

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Seventy one (71) samples from previous characterization data were used to provide the characterization data for survey area OOL10. The data is sufficient to support the planning of Survey Unit OOL10-12.

Based on a review of the characterization data, Cs-137 was the only plant-related radionuclide that was identified consistently in the characterization samples analyzed. The results from the characterization data are summarized below:

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• Cs-137 (51 detects)</li> <li>• Other HBPP ETD</li> <li>• HBPP HTD</li> </ul> | <p>Cs-137 is present in 72 % of the characterization samples.</p> <p>There were no other easy to detect nuclides identified &gt;MDA.</p> <p>There were no hard to detect nuclides identified in the four samples analyzed.</p> |
|---|--|

The presence of all radionuclides listed in this plan (gamma-emitters, HTD beta-emitters, and TRUs) in the soil (sediment) will be evaluated under this survey plan. Although no HTD nuclides are expected to be present, the contribution from HTD nuclides will be bounded by directly adding the dose contribution of a sample contaminated to approximately 3 times the DCGL (~22 pCi/g) for Cs-137. The resultant dose from HTD nuclides is presumed to be less than 1 mrem/y, which will be verified upon receipt of the sample result from General Engineering Laboratories (GEL), Savannah, SC prior to the implementation of this plan.

A consequence of the planned early site release for this area is that the earlier date (Prior to 2019) for site release causes Fe-55 to screen in as a potential nuclide of concern. Accordingly, although Fe-55 is not believed to be present, a DCGL must be developed to assess an appropriate MDC for its analysis. In the interim, the sample will be counted for Fe-55 based on the screening level DCGLs of NUREG 1757 Vol. 2. The sample will be retained, per the requirements of the FSS program, in case it is later determined that a re-analysis for Fe-55 is necessary.

The HBPP Site Closure Laboratory will analyze each soil sample for all listed gamma-emitting nuclides, Sr-90 and Tritium. In addition, 2 FSS soil samples will be sent to an independent laboratory for analyses of gamma-emitters and HTD radionuclides.

*Classification:* Class 3  
*Average Cs-137 concentration:* 0.38 pCi/g  
*Standard deviation Cs-137 ( $\sigma$ ):* 0.18 pCi/g  
*Surrogate DCGL:* N/A (a surrogate DCGL will not be used)  
*LBGR:* Initial =  $0.5 \times \text{DCGL} = 3.79 \text{ pCi/g Cs-137}$   
*Adjusted LBGR (set  $\Delta/\sigma = 2.0$ ):* = 7.22 pCi/g Cs-137  
*Number of Samples:* Calculated = 15  
*Survey Unit Area:* 46,364 m<sup>2</sup>  
*Grid Area (A/N):* N/A Class 3  
*DCGL<sub>emc</sub> Cs-137:* N/A Class 3  
  
*Investigation Level for soil samples:* > 50% DCGL for Cs-137 = 3.79 pCi/g Cs-137  
  
*Gamma scanning Coverage:* Approximately 10% of Survey Unit

*Investigation Level for SPA-3 Scans:* Reproducible indication above background using 44-10 and audible discrimination. The expected background range for 44-10 scans is between 3200 cpm and 5400 cpm.

*Radionuclides for analysis:* All listed nuclides with the focus on Cs-137

*MDCs for gamma analysis of soil samples:*

Nuclide                      10% to %50 of the DCGL (pCi/g)

Co-60	3.8E-01	to	1.9E+00
Nb-94	7.1E-01	to	3.55E+00
I-129	4.8E-01	to	2.4E+00
Cs-137*	7.58E-01	to	3.79E+00
Eu-152	1.0E+00	to	5.0E+00
Eu-154	9.40E-01	to	4.70E+00
Np-237	1.1E-01	to	5.5E-01

The desired MDCs in the laboratory analyses of soil samples will be the 10% DCGL values. If it is impractical to achieve those, the 50% DCGL values must be achieved in the laboratory analyses of the sediment samples.

\* The DCGL for Cs-137, the only nuclide expected to be present has been reduced to 24 mrem/y to account for any HTDs that might be present.

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*MDC's for HTD nuclide:*

<u>Nuclide</u>	<u>10%</u>	to	<u>50% of the DCGL (pCi/g)</u>
H-3	6.8E+01		3.4E+02
C-14	6.3E-01		3.15E+00
Fe-55	1.0E+03		5.0E+03
Ni-59	1.9E+02		9.5E+02
Ni-63	7.2E+01		3.6E+02
Sr-90	1.5E-01		7.5E-01
Tc-99	1.2E+00		6.0E+00
Pu-238	2.9E+00		1.45E+01
Pu-239/240	2.6E+00		1.3E+01
Pu-241	8.6E+01		4.3E+02
Am-241	2.5E+00		1.25E+01
Cm-243	2.9E+00		1.45E+01
Cm-244	4.8E+00		2.4E+01
Cm-245	1.7E+00		8.5E+00
Cm-246	2.5E+00		1.25E+01

The MDC values for difficult to detect nuclides will be conveyed to the outside laboratory via the sample Chain-Of-Custody form which will accompany the soil samples.

*QC checks and measurements:*

QC checks for the 44-10 will be performed in accordance with RCP-7U2

Two QC split samples will be collected

One QC recount for soil samples will be performed by the HBPP Site Closure Lab



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**4.0 Define the boundaries of the survey:**

- Boundaries of Survey Unit OOL10-12 are as shown on the attached map. This area is bordered by the Survey Area OOL10 and off-site locations on all sides.
- The survey will be performed under appropriate weather conditions (as defined by instrumentation limitations and human factors). Surveys will be performed during daylight hours.

**5.0 Develop a decision rule:**

Upon review of the FSS data collected under this survey plan:

- (a) If all the sample data show that the soil concentrations of plant related nuclides are below the DCGLs and the sum of fractions of nuclides are below unity, then reject the null hypothesis (i.e., Survey Unit OOL10-12 meets the release criteria).
- (b) If the investigation levels are exceeded, then perform an investigation survey.
- (c) If the average concentration of any listed nuclide exceeds its respective DCGL or the average sum of fractions for any listed nuclide exceeds one, then accept the null hypothesis (i.e., Survey Unit OOL10-12 fails to meet the release criteria).

Note: Alternate actions beyond investigations include, remediation, reclassification and resurvey

**6.0 Specify tolerable limits on decision errors:**

<i>Null hypothesis:</i>	Residual plant-related radioactivity in Survey Unit OOL10-12 exceeds the release criteria.
<i>Probability of type I error:</i>	0.05
<i>Probability of type II error:</i>	0.05
<i>LBGR:</i>	Adjusted to 7.22 pCi/g Cs-137

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**7.0 Optimize Design:**

Type of statistical test: WRS Test ☐ Sign Test ☒ (background will not be subtracted)

Number and Location of Samples:	Twenty (20) soil samples will be collected at locations based on a random selection
---------------------------------	---

**GENERAL INSTRUCTIONS**

1. Where possible, measurement locations will be identified using GPS. Each location will be marked to assist in identifying the location. Any locations that are not suitable for soil sampling will be relocated to the nearest suitable location and documented on the survey map.
2. Chain of Custody form/process will be used for all samples being shipped to the offsite laboratory.
3. All soil samples will be received and prepared as directed by the FSS Engineer.  
 Note: The split sample aliquot to be sent to an off-site lab for HTD analysis will not be dried prior to counting on site or shipping.
4. Survey instrument: Operation of the 2350-1 w/44-10 will be in accordance with RCP-7U3 with QC checks performed in accordance with RCP-7U2. The instrument response checks shall be performed before issue and after use.
5. All 44-10 scans will be performed with the audible feature activated. FSS Technicians will listen for upscale readings to which they will respond by slowing down or stopping the probe to distinguish between random fluctuations in the background and greater than background readings.
6. The job hazards associated with the Survey described in this package will be addressed in the pre-job brief.
7. All personnel participating in this survey shall be trained in the operation of the instrumentation.

**SPECIFIC INSTRUCTIONS**

1. All designated measurement locations will be identified by GPS or by use of reference points and tape measure as necessary. If a designated sample location is obstructed for any reason, the FSS Engineer or the Lead FSS Technician will select an alternate location within one

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**Page 8 of 13**

meter of the original location. A detailed description of the alternate location will be recorded on the survey form, the survey unit map will be annotated appropriately, and the alternate location will be conspicuously marked to facilitate re-visiting to identify and record the coordinates with GPS or by measurement from a known reference point when GPS is not available.

**2. Sample Requirements:**

- Collect twenty (20) random 1-liter soil samples in accordance with RCP FSS-8. Two (2) of the 20 random soil samples will be analyzed as QC split samples and one (1) will be a sample recount to fulfill the QC requirement. The QC split samples will also be analyzed for Hard-to-Detect nuclides.
- Collect any biased 1-liter soil samples as per field direction from the FSS engineer assigned to this survey unit and/or the FSS Lead Technician.
- If a sample location falls on an engineered surface, collect a sample of the engineered material and a sample of the soil below. The soil sample will be used as the statistical sample and not the engineered material sample. The engineered material sample will have the designation OOL10-12-xxx-EM where the "xxx" is the sample number corresponding to the soil sample location.
- Soil samples will be collected as follows:
  - At the sample location, using a clean implement, dig a hole in the soil approximately 4 inches in diameter to a depth of 15 cm placing the soil in a plastic bag.
  - Enlarge the hole as necessary radially until the desired amount of soils is collected. Do not dig deeper than 15 cm.
  - Label the plastic bag with the sample location identifier.
  - Transfer the bag of soils to the sample preparation area.

**3. Soil Sample Designation:**

Statistical soil samples:	OOL10-12-001-F through OOL10-12-020-F corresponding to sample locations 001 through 020.
Biased soil samples:	OOL10-12-021-F-B through OOL10-12-0xx-F-B corresponding to the biased sample locations.
QC split samples:	OOL10-12-011-F-S and OOL10-12-019-F-S are to be designated as QC split samples. These samples will be sent to the off-site laboratory.
Recount samples:	OOL10-12-007-F-RC is to be counted twice on site. The results will be compared as directed by the FSS Engineer.

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**4. Sample Analysis:**

- Gamma analysis will be performed on all soil samples. If any of the gamma analyses show that an investigation level has been exceeded an investigation survey will be conducted at that sample location as directed in specific instruction # 6.
- HBPP will analyze OOL10-12-001-F through OOL10-12-020-F and any biased samples for gamma-emitting nuclides, Tritium (H-3) and Sr-90.
- HBPP will analyze OOL10-12-007-F as a sample recount. The recounted sample will possess the naming convention OOL10-12-007-F-RC.
- HBPP will analyze OOL10-12-011-F-S and OOL10-12-019-F-S for gamma-emitting nuclides prior to being sent to the off-site laboratory. These samples will be analyzed for gamma emitting nuclides and HTD at the off-site laboratory.
- On-site gamma analysis of the samples shall achieve the MDC values stated in the DQO section of this plan. The MDC's for off-site analysis will be communicated to the laboratory using an attachment to the Chain-of-Custody form or previous direction that meets specified MDC's of this characterization survey plan.

**5. Gamma scans:**

- Scan 10% of the accessible survey area with a 44-10 in rate-meter mode moving the detector at a speed of 0.2 m or less per second, keeping the probe at a distance of approximately 3" from the surface and following a serpentine path that includes at least 3 passes across each square meter.
- Note the area scanned on the survey map
- If an indication of greater than background is discovered:
  - Rescan the area to determine if the indication was due to background fluctuation
  - If the indication was due to background fluctuation continue to scan the remainder of the area
  - If the indication was due to an elevated area then slowly scan the elevated area to determine the elevated activity boundaries and note on the map
  - Obtain a 1 liter biased soil sample at the point of the highest reading in the elevated area. Denote the sample using the naming methodology described in step 6.

**6. If the results of any sample (statistical and/or biased points) analysis exceed an investigation level, perform a first level investigation as follows:**

- Scan a 1 m radius footprint around the sample location with a 44-10 in rate-meter mode

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moving the detector at a speed of 0.2 m or less per second, keeping the probe at a distance of approximately 7-8 cm from the surface and following a serpentine path that includes at least 3 passes across each square meter. The area of scan should be increased as necessary to bound any areas of elevated activity identified.

- Mark the boundaries around any detected elevated areas in the soil and identify the boundaries on a survey map. Measure the total area of each outlined area in square centimeters.
- Mark the location of the highest identified activity for each of the elevated areas in the soil and on the survey map.
- At each of the highest identified activity area:
  - Perform and record a 1-minute scaler mode 44-10 measurement. Designate the reading as "OOL10-12-xxx-F-SC-I" where "xxx" continues sequentially from the last number assigned to an investigation measurement.
  - Obtain a soil sample at the location. Designate the sample as "OOL10-12-xxx-F-I" where "xxx" continues sequentially from the last number assigned to an investigative sample.
  - Perform and record a post sample 1-minute 44-10 measurement. Designate the reading as described above.

Prepared by: *DeL Russell*  
 FSS Engineer

Date: 4-16-14

Reviewed by: *Mark C. Smith*  
 FSS Engineer

Date: 4/16/14

Approved by: *W. A. Barley*  
 Site Closure Manager

Date: 4/17/14

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OOL10-12 VSP Sample Locations			
Sample	Easting*	Northing*	
01	5947081.59	2159247.24	
02	5947279.91	2159362.50	
03	5947896.89	2159566.82	
04	5947867.51	2159692.56	
05	5947779.37	2159944.03	
06	5948021.76	2159671.60	
07	5947749.99	2160069.77	Recount
08	5947933.62	2159985.94	
09	5948043.79	2159881.16	
10	5948220.07	2159786.86	
11	5947904.24	2160237.42	QC split
12	5948014.41	2160132.64	
13	5948198.04	2160048.81	
14	5948102.55	2160258.37	
15	5948168.66	2160174.55	
16	5948374.32	2159954.51	
17	5948278.83	2160164.07	
18	5948433.08	2160331.72	
19	5948455.11	2160352.68	QC Split
20	5948521.22	2160268.85	
*CA Zone 1 NAD83/NAVD88			

## HBPP-FSSP-OOL10-11 &amp; HBPP-FSSP-OOL10-12

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**44-10 Scan MDC/MDCR Values at Typically encountered count rates**

$$MDCR = 1.38 \frac{\sqrt{B}}{\sqrt{p} \times t} \quad (\text{RCP FSS 2})$$

Where,

B = background in the sampling interval (0.02 min)

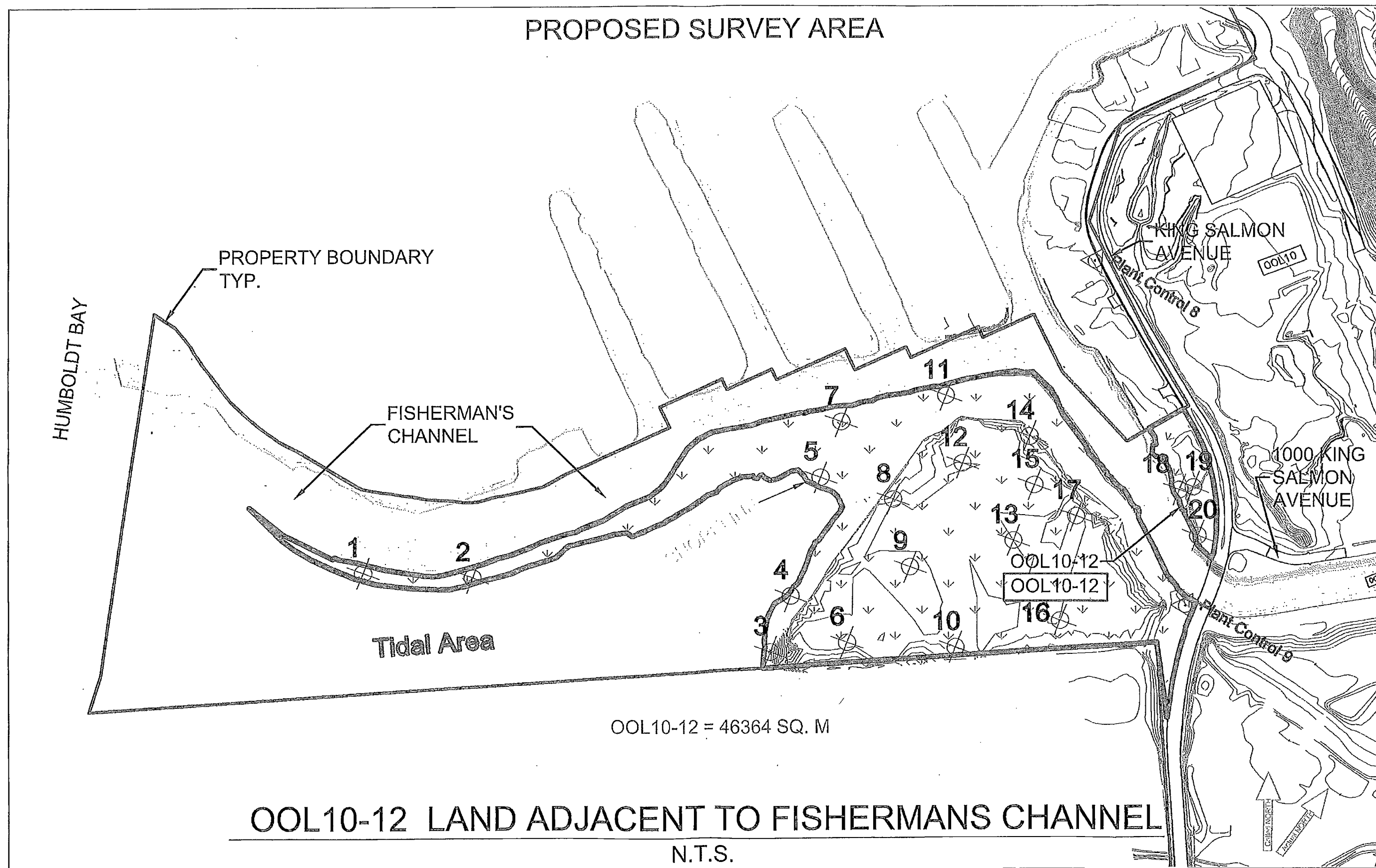
p = Surveyor Efficiency = 0.5

t = sampling time interval = 0.02 min

$B_i = 202 \text{ cpm/pCi/g}$  for Cs-137 (LTP Table 5-13)

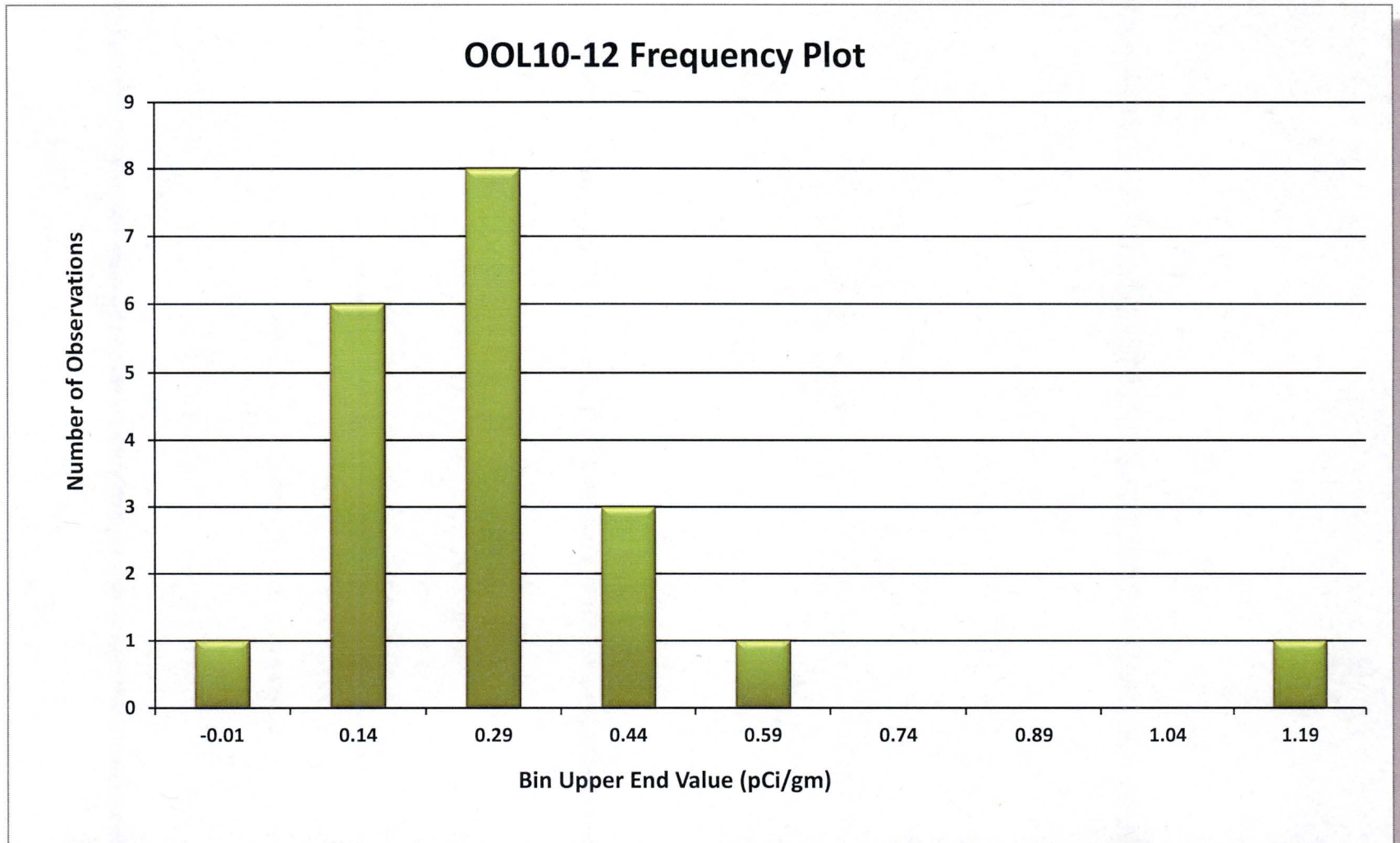
BKG	BKG/t	MDCR (CPM)	MDC (pCi/g Cs-137)
2000	40	617	2.9
2500	50	690	3.1
3000	60	756	3.4
3500	70	816	3.7
4000	80	873	4.0
4500	90	926	4.3
5000	100	976	4.6
5500	110	1023	4.8
6000	120	1069	5.1
6500	130	1113	5.3
7000	140	1155	5.5
7500	150	1195	5.7
8000	160	1234	5.9
8500	170	1272	6.1
9000	180	1309	6.3
9500	190	1345	6.5
10000	200	1380	6.7
10500	210	1414	6.8
11000	220	1447	7.0
11500	230	1480	7.2
12000	240	1512	7.3
12500	250	1543	7.5
13000	260	1573	7.6

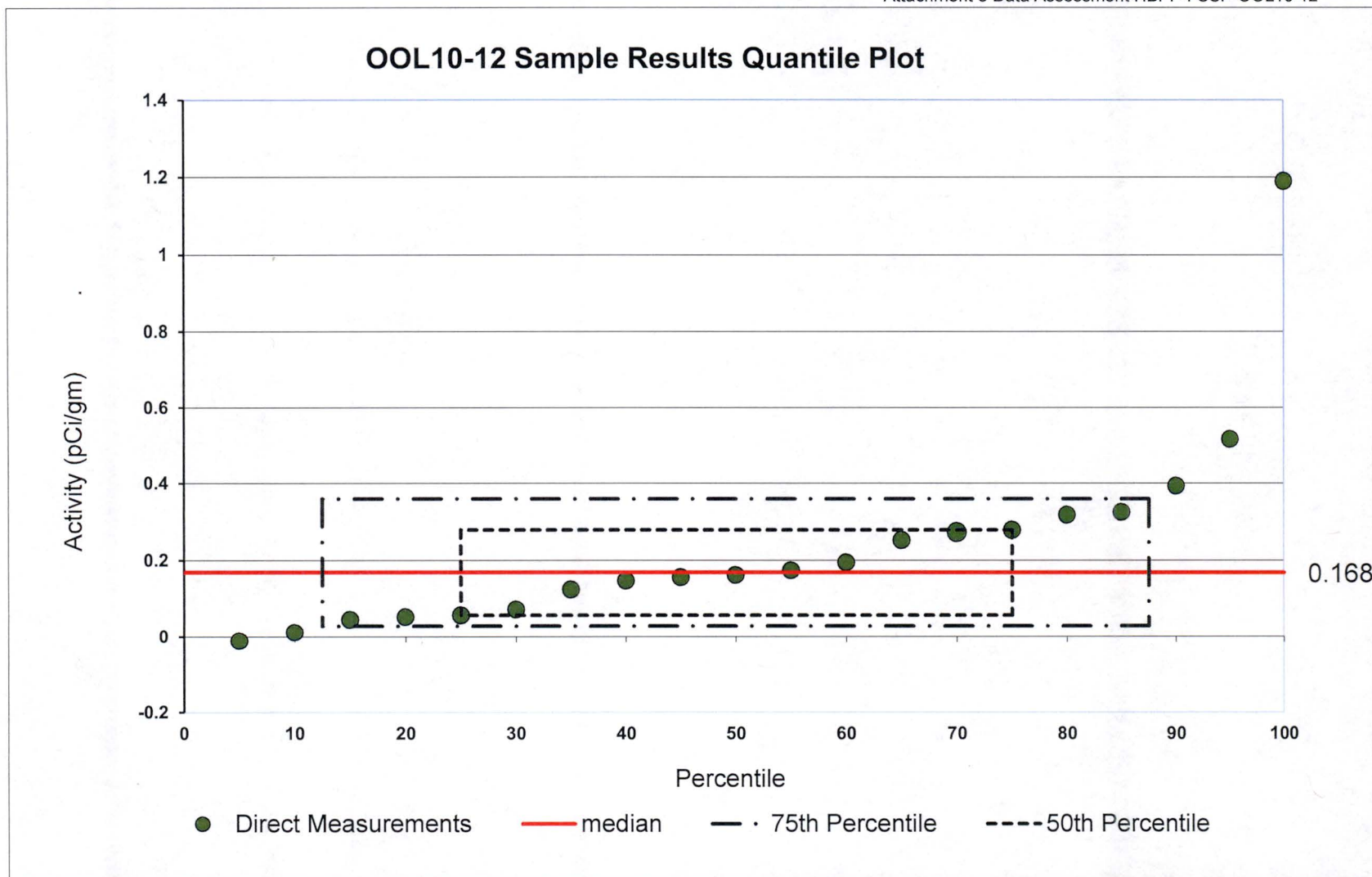


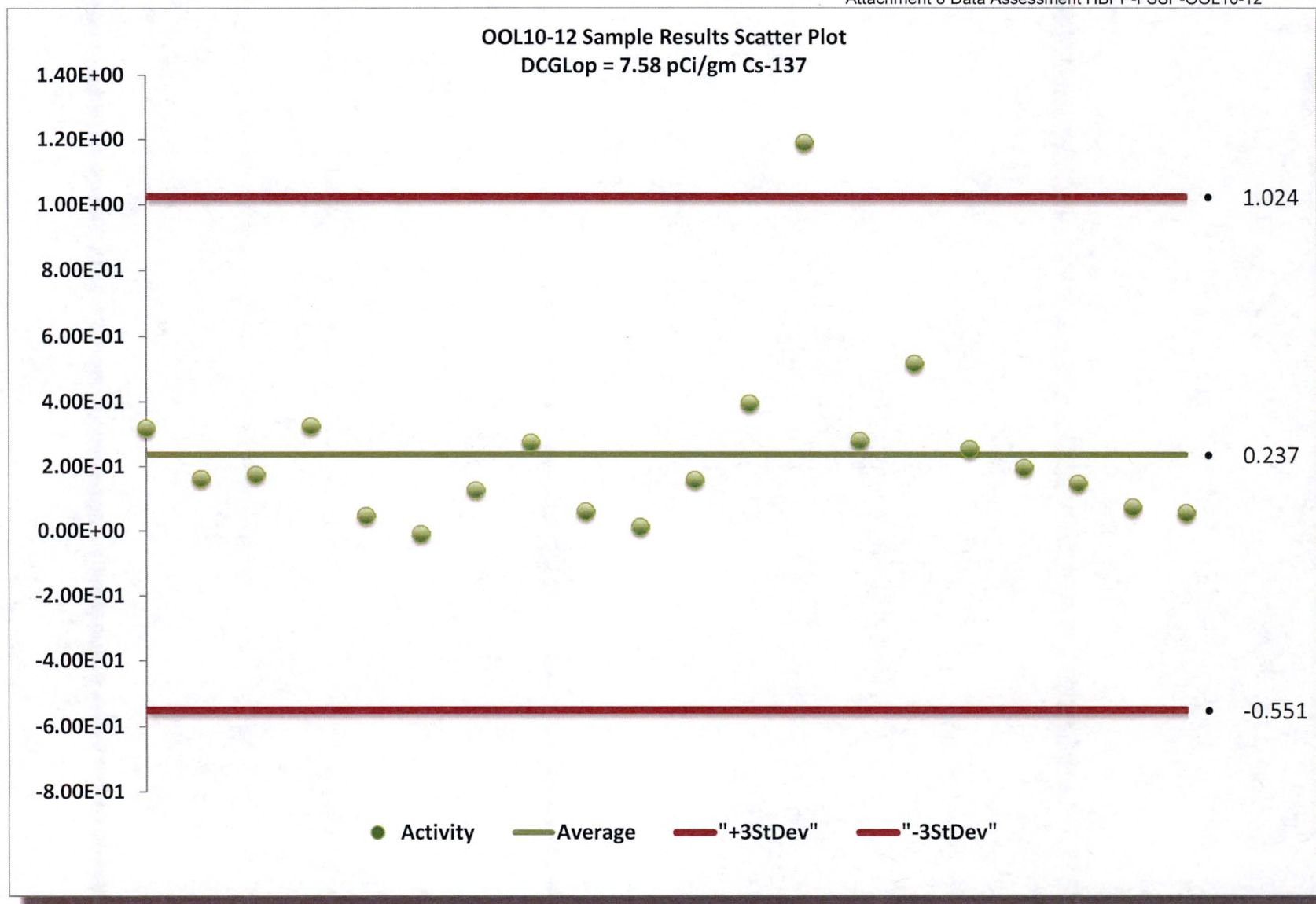


## **Attachment 8**

### **Data Assessment HBPP-FSSP-OOL10-12**

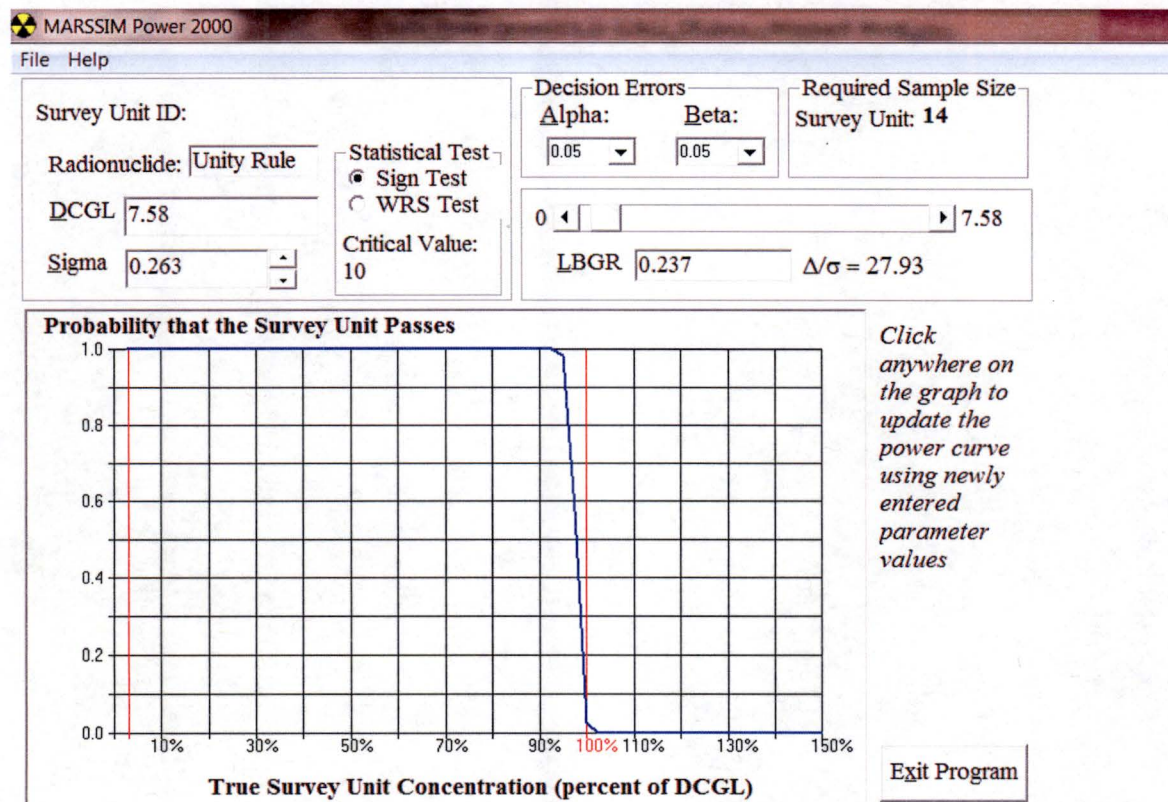




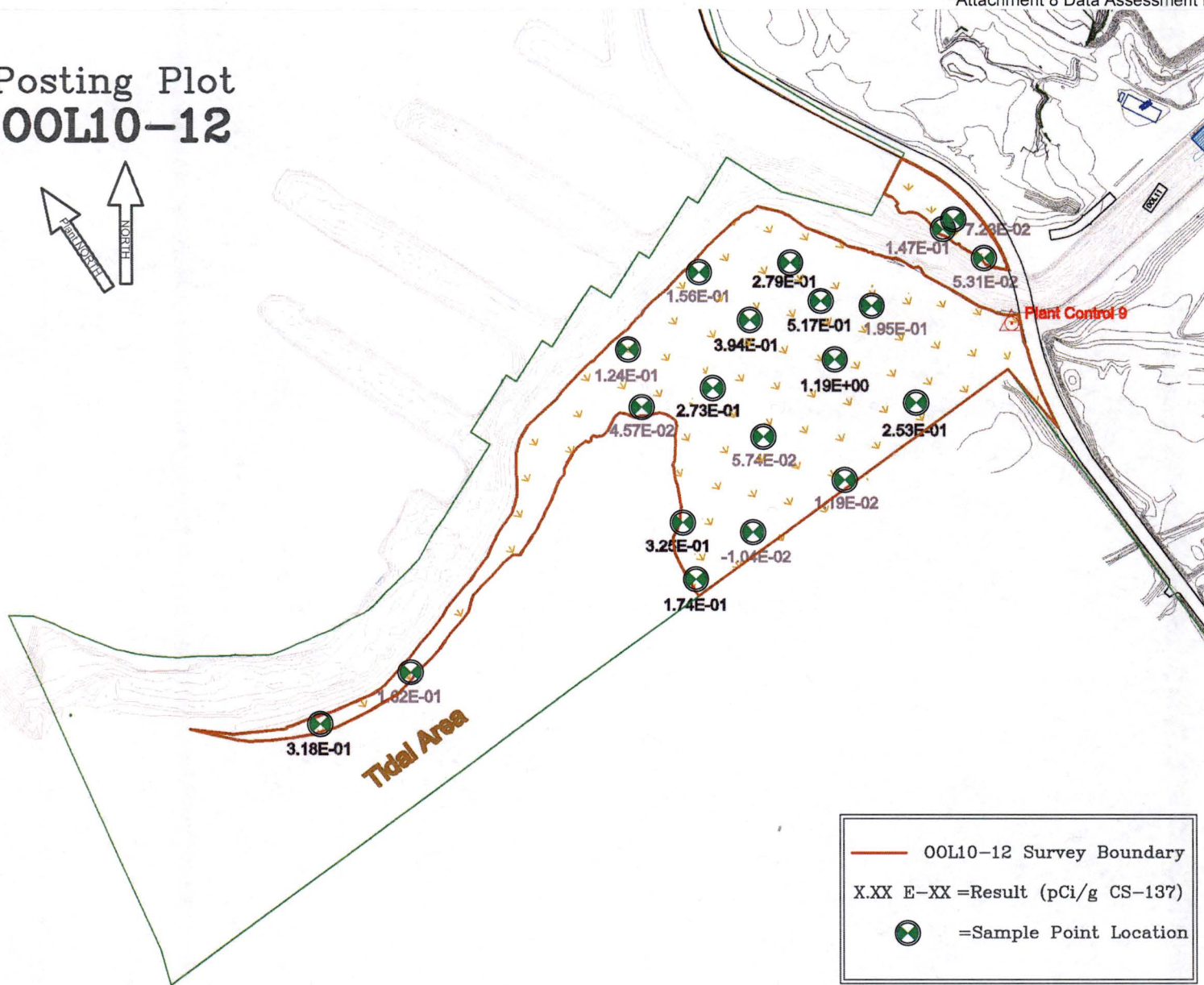
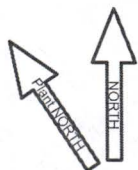




## Retrospective Power Curve OOL10-12

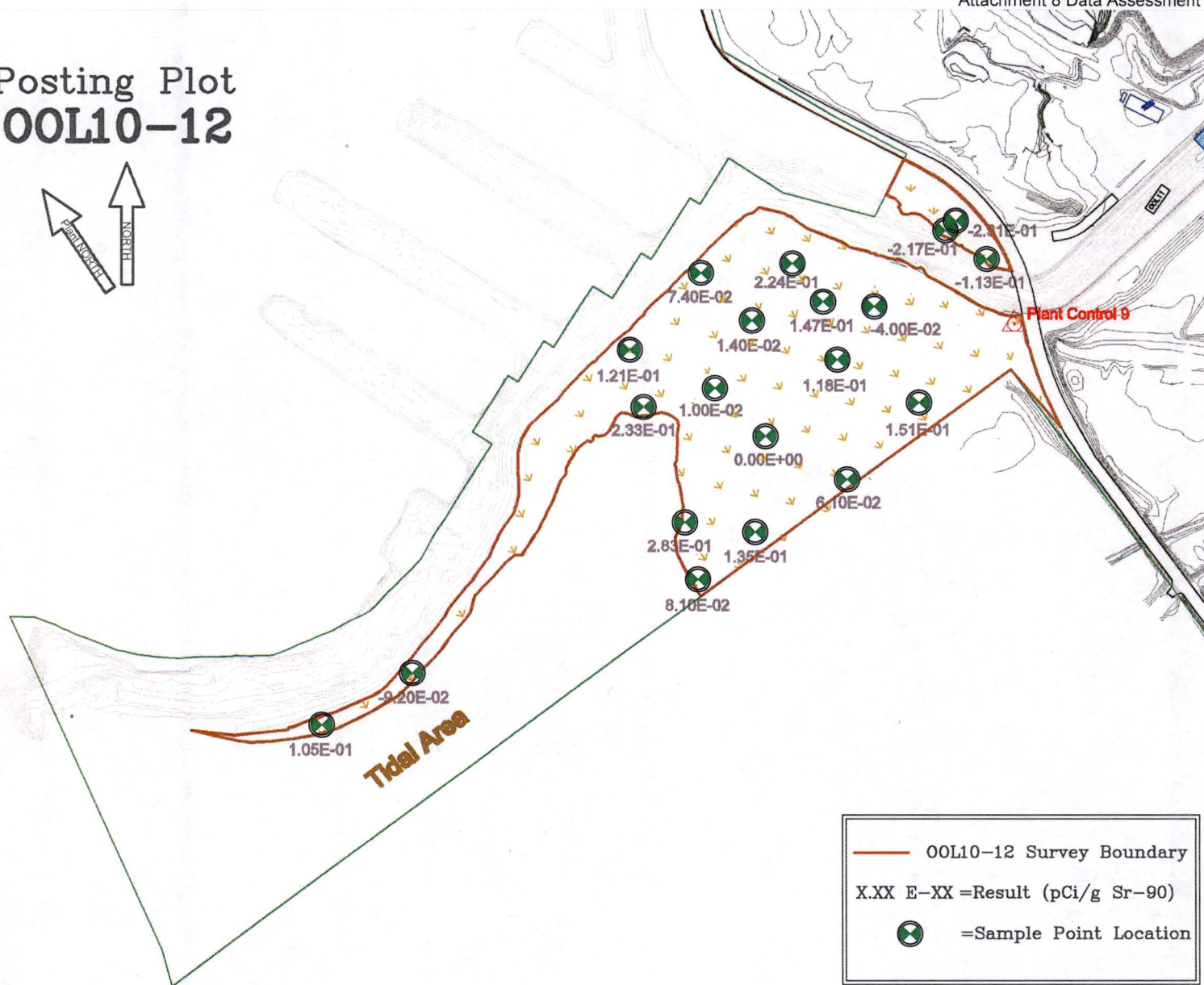
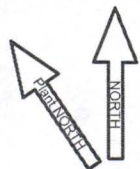


# Posting Plot 00L10-12





# Posting Plot OOL10-12





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## Split Sample Assessment Form

Survey Area No.: OOL-10		Survey Unit No.: 12		Survey Unit Name: Land Adjacent to Fisherman's Channel													
Sample Plan No.: HBPP-FSS-OOL10-12-00						Sample Measurement Location: #07											
Sample Description: Comparison of split samples collected from sample measurement location #07 and analyzed using gamma spectroscopy in repeated counting at the on-site laboratory. The official on-site result is the standard count and the recount is the comparison.																	
STANDARD					COMPARISON												
Radio-nuclide chosen (a)	Standard Activity (b)	1 $\sigma$ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)	Comparison Activity (f)	Comparison Error (g)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)									
K-40	7.36E+00	9.50E-01	8	0.6-1.66	6.30E+00	9.00E-01	8.56E-01	Y									
Comments/Corrective Actions: None.					Table 1 is provided to show acceptance criteria to assess split samples.												
					<table border="0"> <tr> <td><u>Resolution (d)</u></td> <td><u>Agreement Range (e)</u></td> </tr> <tr> <td>&lt;4</td> <td>No Comparison</td> </tr> <tr> <td>4-7</td> <td>0.5-2.0</td> </tr> <tr> <td>8-15</td> <td>0.6-1.66</td> </tr> <tr> <td>16-50</td> <td>0.75-1.33</td> </tr> <tr> <td>51-200</td> <td>0.80-1.25</td> </tr> <tr> <td>&gt;200</td> <td>0.85-1.18</td> </tr> </table>				<u>Resolution (d)</u>	<u>Agreement Range (e)</u>	<4	No Comparison	4-7	0.5-2.0	8-15	0.6-1.66	16-50
<u>Resolution (d)</u>	<u>Agreement Range (e)</u>																
<4	No Comparison																
4-7	0.5-2.0																
8-15	0.6-1.66																
16-50	0.75-1.33																
51-200	0.80-1.25																
>200	0.85-1.18																
Performed By: <i>Dal Randall</i>					Date: 8-30-14		Concurrence: <i>M. J. Smith</i>		Date: 9/10/14								

## Split Sample Assessment Form

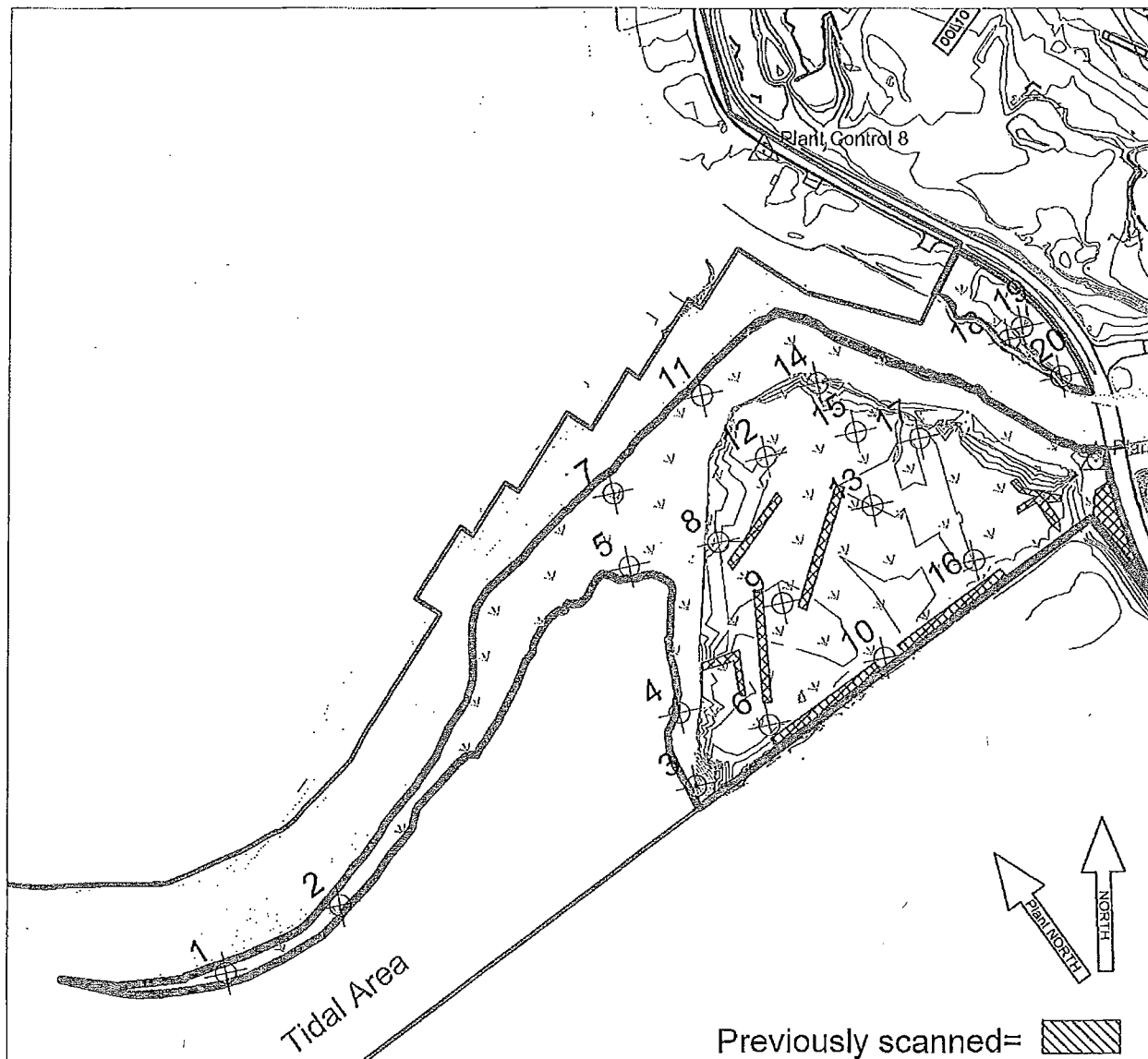
Survey Area No.: OOL-10		Survey Unit No.: 12		Survey Unit Name: Land Adjacent to Fisherman's Channel													
Sample Plan No.: HBPP-FSS-OOL10-12-00						Sample Measurement Location: #11											
Sample Description: Comparison of split samples collected from sample measurement location #11 and analyzed using gamma spectroscopy by an off-site vendor laboratory. The on-site result is the standard count and the off-site is the comparison.																	
Radio-nuclide chosen (a)	STANDARD			Agreement Range (e)	COMPARISON												
	Standard Activity (b)	1 $\sigma$ Uncertainty (c)	Resolution (d)=(b)/(c)		Comparison Activity (f)	Comparison Error (g)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)									
K-40	1.08E+01	9.60E-01	11	0.6-1.66	1.24E+01	3.52E-01	1.15E+00	Y									
Pb-212	3.99E-01	5.00E-02	8	0.6-1.66	5.94E-01	2.31E-02	1.49E+00	Y									
Comments/Corrective Actions: None.					Table 1 is provided to show acceptance criteria to assess split samples.												
							<table border="0"> <tr> <td><u>Resolution (d)</u></td> <td><u>Agreement Range (e)</u></td> </tr> <tr> <td>&lt;4</td> <td>No Comparison</td> </tr> <tr> <td>4 – 7</td> <td>0.5 – 2.0</td> </tr> <tr> <td>8 – 15</td> <td>0.6 – 1.66</td> </tr> <tr> <td>16 – 50</td> <td>0.75 – 1.33</td> </tr> <tr> <td>51 – 200</td> <td>0.80 – 1.25</td> </tr> <tr> <td>&gt;200</td> <td>0.85 – 1.18</td> </tr> </table>				<u>Resolution (d)</u>	<u>Agreement Range (e)</u>	<4	No Comparison	4 – 7	0.5 – 2.0	8 – 15
<u>Resolution (d)</u>	<u>Agreement Range (e)</u>																
<4	No Comparison																
4 – 7	0.5 – 2.0																
8 – 15	0.6 – 1.66																
16 – 50	0.75 – 1.33																
51 – 200	0.80 – 1.25																
>200	0.85 – 1.18																
Performed By: <i>Phil Rehill</i>		Date: <i>8-30-14</i>		Concurrence: <i>Mark E. K.</i>		Date: <i>9/10/14</i>											

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## Split Sample Assessment Form

Survey Area No.: OOL-10		Survey Unit No.: 12		Survey Unit Name: Land Adjacent to Fisherman's Channel																		
Sample Plan No.: HBPP-FSS-OOL10-12-00						Sample Measurement Location: #19																
Sample Description: Comparison of split samples collected from sample measurement location #19 and analyzed using gamma spectroscopy by an off-site vendor laboratory. The on-site result is the standard count and the off-site is the comparison.																						
Radio-nuclide chosen (a)	STANDARD				COMPARISON																	
	Standard Activity (b)	1 $\sigma$ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)	Comparison Activity (f)	Comparison Error (g)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)														
K-40	1.08E+01	8.90E-01	1.21E+01	0.6-1.66	1.33E+01	3.34E-01	1.23E+00	Y														
Pb-212	4.94E-01	4.86E-02	1.02E+01	0.6-1.66	6.22E-01	2.23E-02	1.26E+00	Y														
Comments/Corrective Actions: None.					Table 1 is provided to show acceptance criteria to assess split samples. <table border="1"> <thead> <tr> <th>Resolution (d)</th> <th>Agreement Range (e)</th> </tr> </thead> <tbody> <tr> <td>&lt;4</td> <td>No Comparison</td> </tr> <tr> <td>4 - 7</td> <td>0.5 - 2.0</td> </tr> <tr> <td>8 - 15</td> <td>0.6 - 1.66</td> </tr> <tr> <td>16 - 50</td> <td>0.75 - 1.33</td> </tr> <tr> <td>51 - 200</td> <td>0.80 - 1.25</td> </tr> <tr> <td>&gt;200</td> <td>0.85 - 1.18</td> </tr> </tbody> </table>				Resolution (d)	Agreement Range (e)	<4	No Comparison	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 (d)	Agreement Range (e)												
<4	No Comparison																					
4 - 7	0.5 - 2.0																					
8 - 15	0.6 - 1.66																					
16 - 50	0.75 - 1.33																					
51 - 200	0.80 - 1.25																					
>200	0.85 - 1.18																					
Performed By: <i>Debra Rumball</i>					Date: <i>8-30-14</i>																	
					Concurrence: <i>M. J. R.</i>																	
					Date: <i>9/10/14</i>																	

Humboldt Bay Power Plant  
Area Survey Report


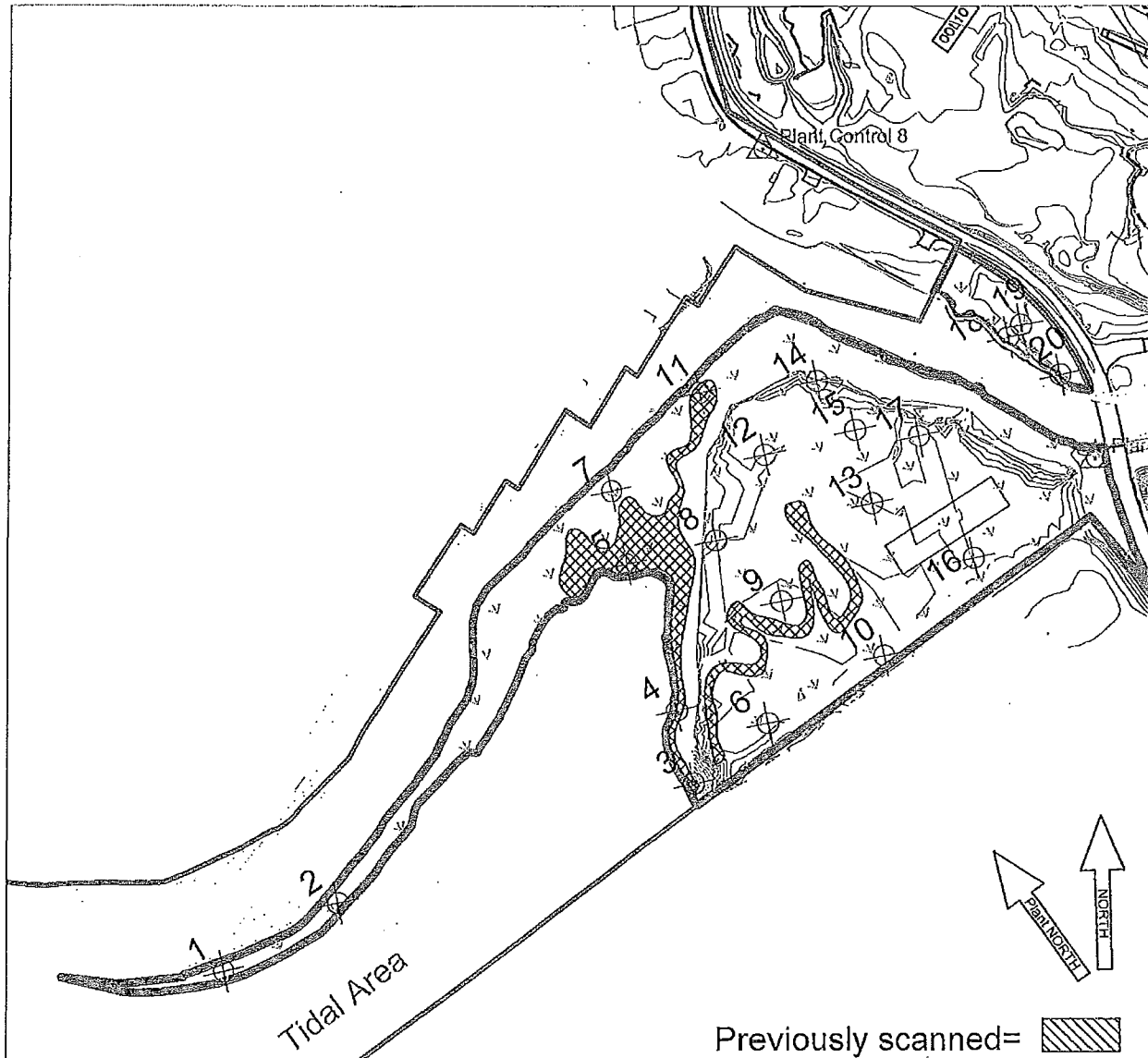
FSS Survey#: 2014-008Date: 7-30-10/14 Time: 1400 Location: Land Adjacent to Fisherman's ChannelScan Area= Purpose: OOL10-12 scan survey 2190 sq.m.










INSTRUMENT			SOURCE CHECK		SURVEY PERFORMED BY	
TYPE	SERIAL NO.	CAL. DUE	PRE	POST	PRINT	SIGN
2350-1	180738	8-7-14	PASS FAIL	PASS FAIL	Sharon Erickson	Sharon Erickson
44-10	171995	8-7-14	PASS FAIL	PASS FAIL	N	A

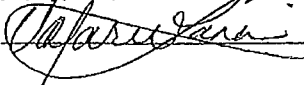
Comments: NO AUDIBLE INDICATIONS OF ELEVATED COUNTS SURVEY RANGE
4.02 Kcpm - 5.94 Kcpm Supervisor Review: [Signature] Date: 5/1/14

1/2

Humboldt Bay Power Plant  
Area Survey Report

FSS Survey#: 2014-008Date: 4-30-14 Time: 1400 Location: Land Adjacent to Fisherman's ChannelScan Area= Purpose: OOL10-12 scan survey 4579 sq.m.

INSTRUMENT			SOURCE CHECK		SURVEY PERFORMED BY	
TYPE	SERIAL NO.	CAL. DUE	PRE	POST	PRINT	SIGN
2350-1	149789	8-1-14	 FAIL 	 FAIL 	D Payeur	D Payeur
44-10	265497	8-1-14	 FAIL 	 FAIL 	N/A	

Comments: NO audible indications of elevated counts. Survey range  
2.98 kcpm - 4.67 kcpm Supervisor Review:  Date: 5/1/14

2 of 2

# SUBMITTAL PROCESSING CHECKLIST

Regulatory Services Engineer

SUBJECT: \_\_\_\_\_

PG&E LETTER: HBL-16-008

FIRM/TARGET DATE: 11-9-16

LOCATION: S:\LICENSE\LETTERS\

## DOCUMENT VERIFICATION

INITIALS/DATE

- REFERENCES/BASES IDENTIFIED FOR FACTUAL INFORMATION

JS 11/9/16

- COMMITMENT(S) PROPERLY IDENTIFIED (X11.ID1)(HBAP E-10)

N/A 11/9/16

- MANAGER'S CONCURRENCE FOR RELEASE

JS 11/9/16

- RECORD OF REVIEW CHECKLIST (X11.ID1) COMPLETE AND SIGNED

JS 11/9/16

- CLERICAL QUALITY/FORMAT REVIEW Draft # 1 CLW 11/7

Draft # \_\_\_\_\_ / \_\_\_\_\_

Draft # \_\_\_\_\_ / \_\_\_\_\_

FINAL CLERICAL REVIEW (Letterhead)

CLW 11/7

- PEER REVIEW OF FINAL LETTER/ENCLOSURE(S)

\_\_\_\_\_ / \_\_\_\_\_

- PROVIDE TO SIGNATORY:

- Final letter/enclosures, record of review, commitment memo

\_\_\_\_\_ / \_\_\_\_\_

- For **FIRM** submittals, was 2 days met? Yes ☐ No ☐

- COPY OF SUBMITTAL W/RECORD OF REVIEW, COMMITMENT DATA, AND COMPLETED CHECKLIST TO RMS (FIREPROOF) CABINET

\_\_\_\_\_ / \_\_\_\_\_

- INTERNAL -- provide this checklist, original of signed submittal, commitment data, and record of review to clerks

\_\_\_\_\_ / \_\_\_\_\_

- NCRs, ARs, AND LERtemplate.ppt (for LERs only) UPDATED FOR SUBMITTAL COMPLETION

\_\_\_\_\_ / \_\_\_\_\_

## TRACKING CLOSEOUT WITHIN 15 DAYS OF SUBMITTAL

- VERIFY COMMITMENT ENTRY ON NCR ACTs, AEs

\_\_\_\_\_ / \_\_\_\_\_

HBD/HIL-16-008

	DONE
<b>LETTERS SIGNED AT DCPD</b>	
<i><b>Prior to Signature</b></i>	
HBPP Supervisor of Licensing (SOL) completes Record of Review Checklist	JS
Regulatory Services (RS) engineer is responsible for having the Peer Review Checklist completed	JS
RS clerical is responsible for having an editorial review completed	CM
RS engineer meets with signatory to have letter signed	
<i><b>After Signature</b></i>	
RS clerical handles hard copy distribution (external and internal) <b>PERFORM PAGE CHECK - VERIFY ALL COPIES CONTAIN ALL PAGES &amp; COMPARE PAGES TO TABLE OF CONTENTS</b>	
RS clerical converts the letter WORD file to pdf file on s:\license\letters drive	
RS clerical handles electronic internal distribution of the pdf letter file via e-mail (HBPP Humboldt Distribution)	
RS clerical uploads the pdf letter file onto EDMS.	
RS clerical returns this Instruction sheet to SOL	
Front Office or Licensing sends pdf file (letter and enclosure) to Records Management to input the pdf file into RMS.	

## Regulatory Submittal - Record of Review Checklist

Submittal Title: Partial Site ReleaseTargeted Submittal Date: 10-27-16 Firm Submittal Date: NA☐ N/A

## Primary Reviewers

## Name

## Comments

## Resolved

Lead Technical Reviewer:<sup>1</sup>M. Erickson

Yes

No

Yes

No

☒☐☒☐Lead Technical Manager:<sup>1</sup>B. Barley☐☒☐☐Director Review:<sup>1,2</sup>L. Sharp☐☒☐☐Submittal Lead Management:<sup>1</sup>H. Hanzchee☒☐☒☐Independent Technical Reviewer:<sup>1</sup>B. Parish☒☐☒☐

Cross Discipline Reviewer(s):

☐

Operations:

☐☐☐☐☐

Maintenance:

☐☐☐☐☐

Engineering:

☐☐☐☐☐

Site Services:

☐☐☐☐☐

Quality:

☐☐☐☐☐

Law:

☐☐☐☐☐

Chemistry &amp; Env Ops:

☐☐☐☐☐

PSRC:

☐☐☐☐☐☐☐

## Secondary Reviewers

## Name

## Comments

## Resolved

☐LawT. Smith

Yes

No

Yes

No

☒☐☒☐☐RPK. Rowberry☐☒☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

I have reviewed and verified that all statements of fact in the submittal are correct.  
(Mark N/A and attach a copy of e-mail if documentation of ITR is electronic.)<sup>3</sup>

☒ N/A

Independent Technical Reviewer(s): \_\_\_\_\_

Date: \_\_\_\_\_

Date: \_\_\_\_\_

Concurrence has been received from primary reviewers. Technical comments have been resolved.  
The independent tech reviewer has reviewed all technical (non-editorial) changes to the submittal.

Lead Licensing Engineer: ASTDate: 10-26-16

<sup>1</sup> These reviewers are considered to be the minimum required primary reviewers for submittals not containing an oath or affirmation or requiring PSRC review. Regulatory Services Manager approval is required to not obtain the review from any of these reviewers.

<sup>2</sup> Director review is satisfied if the submittal undergoes a review by the PSRC.

<sup>3</sup> Attach a table of "statements requiring verification" and ITR approvals.



**Skov, Jeffrey**

---

**From:** David Sokolsky <ddsokolsky@yahoo.com>  
**Sent:** Wednesday, November 09, 2016 10:30 AM  
**To:** Skov, Jeffrey  
**Subject:** Fw: REVISED HBPP SUBMITTAL FOR YOUR REVIEW - PARTIAL SITE RELEASE

This is an EXTERNAL EMAIL. Stop and think before clicking links or opening attachments.

\*\*\*\*\*

Jeff - Below is the email from the ITR Bill Parish.

David

On Monday, October 24, 2016 6:33 AM, "Parish, William C" <WCP7@pge.com> wrote:

I have reviewed the letter HBL-16-008, the associated "HBPP Release Area Assessment" and found no technical issues that affect the validity of the submittal.

William C. Parish  
WCP7@pge.com  
W: 375-2641 (inside PG&E)  
W: 707-441-2641 (outside)  
parishwc@yahoo.com  
C: 979-557-9090

---

**From:** David Sokolsky [mailto:ddsokolsky@yahoo.com]  
**Sent:** Sunday, October 23, 2016 6:48 PM  
**To:** Erickson, Martin; MCERICKSON2001@YAHOO.COM; Barley, Bill; Sharp, Loren; Hamzehee, Hossein; Parish, William C  
**Cc:** Tyson R. Smith; Manheim, William (Law); Morris, James R; Rowberry, Kris; Halpin, Ed  
**Subject:** REVISED HBPP SUBMITTAL FOR YOUR REVIEW - PARTIAL SITE RELEASE

This is an EXTERNAL EMAIL. Stop and think before clicking links or opening attachments.

\*\*\*\*\*

Attached is a significant revision to the partial site release (PSR) request draft submittal. A major change was due to the fact that the original draft was incorrectly identified as a License Amendment Request (LAR). This was based on the fact that LTP Section 1.2 states the PSR requires an LAR. However, in a phone call with John Hickman on October 21, John mentioned that the statement in LTP Section 1.2 was incorrect and that the NRC should have caught it. Nevertheless, John clearly pointed out that the PSR does not affect the License nor the tech specs; therefore, an LAR is inappropriate.

Because this PSR request is no longer an LAR, the No Significant Hazards Consideration, previously contained in Enclosure 2 of the draft submittal, has been deleted from the PSR request. In addition, the letter does not have to be signed by an officer under penalty of perjury. Therefore, Loren Sharp

will sign the letter. Also, the Legal Department is now considered a Secondary Reviewer, not a Primary Reviewer.

There were no technical changes made in the revised draft submittal. Please note that the original draft was based on a similar submittal by Yankee Rowe (YR) in 2005. The YR submittal was not an LAR, but used the terminology "release a portion of the YR site from its 10 CFR Part 50 **License**," which is a bit confusing. The previous HBPP draft included similar terminology. However, the revised HBPP draft uses the terminology "release a portion of the HBPP property from the Part 50 **site**," which is more appropriate.

The attached draft incorporates comments received from the ITR and legal department. I am sending a separate email to the ITR and legal department describing resolution of their comments.

The following are Primary Reviewers. Please respond with comments or concurrence by **OCTOBER 25** so HBPP Plant Staff can submit the PSR by October 27.

Marty Erickson

Bill Barley  
Loren Sharp  
Hossein Hamzehee  
Bill Parish

The following are Secondary Reviewers. You do not have to respond, but if you have comments, please submit them to me by **OCTOBER 25**.

Tyson Smith (Legal)

Jim Morris  
Kris Rowberry

Thank you,

David Sokolsky  
415-961-3384

# PEER REVIEW CHECKLIST LICENSING SUBMITTAL

(To be performed on final draft only.)

PG&E Letter No. (e.g., HBL, HIL) 4BL-16-008

ITEM	DESCRIPTION	INITIALS*
Cover Letter	Correct signatory letterhead (Ref. XI1.ID2 or HBAP E-12)	JWS *
	Full names used for signatory & cc list; right people listed	JWS
	Title correct	JWS
	Letter number verified against outgoing correspondence log	JWS
	Letter number appears on all pages	JWS
	All pages numbered, except first page	JWS
	Date correct and appears on all pages (month, day, and year)	JWS
	Address and docket number(s) correct	JWS
	Text reviewed for obvious errors, including editorial review	JWS
	TS and/or 10 CFR references correct	JWS
	If affidavit required or NOV response, verify Law Department has reviewed	JWS
Enclosures	Enclosures labeled	JWS
	Text reviewed for obvious errors, including editorial review	JWS **
	Revision bars included (if applicable)	N/A
	References to other documents correct (e.g., HBLs, DSAR, etc.)	JWS
	Submittal addresses the specific regulation requirements	JWS
	Each enclosure is correctly paginated	JWS
Commitments	Commitment implemented before or after LA receipt (LARs/RAIs only)	N/A
	Commitment(s) quoted verbatim (& clarifications made if needed)	↓
	Tracking Document - SAPN and task numbers	
	Assigned To - Name & Organization Code	
	Commitment Type - Firm or Target & Due Date	
	CTS Commitment - Y or N indicator & Implementing Documents	
	An individual from all departments assigned commitments was a Cross-Discipline Reviewer	
LER Forms	LER number correct; consistent with cover letter	N/A
	LER number & docket number(s) on first & remaining pages	↓
	Title consistent with cover letter & Outgoing Correspondence Screen	
	Dates correct on first page header (month, day, & year)	
	Dates & times consistent with 10 CFR 50.72 ENS reports made	
	Dates & times consistent with other source documents	
	Dates & times consistent between abstract and narrative	
	Page numbers correct & all pages accounted for	
	Abstract word count <1400 characters (including spaces)	
	IEEE 803 codes entered and correct	
ROR Checklist	Record of Review Checklist completed and signed	JWS *** 11/9/16
Final Draft	All discrepancies resolved with Lead Licensing Engineer	JWS

\* Enter N/A where not applicable.

I have reviewed this submittal for the items initialed above. This submittal is ready for the signatory.

[Signature]  
Performed by

11/9/16  
Date

\* Appears HBAP E-12 has been cancelled.

\*\* Enclosure 2 review included only the Executive Summary.

11/9/16 JWS \*\*\* No ITR Checklist and Construction email included in packet for 11/9/16