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0CAN041407

April 30, 2014

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: Annual Radiological Environmental Operating Report for 2013
Arkansas Nuclear One – Units 1 and 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6

REFERENCES:
1. Entergy letter dated April 28, 2014, "Annual Radioactive Effluent Release Report for 2013" (0CAN041406)
2. Entergy letter dated May 14, 2013, "Annual Radiological Environment Operation Report for 2012" (0CAN051302) (ML13136A005)

Dear Sir or Madam:

In accordance with Arkansas Nuclear One (ANO), Unit 1 Technical Specification (TS) 5.6.2 and Unit 2 TS 6.6.2, the submittal of an annual radiological environmental operating report for the previous year is required by May 15 of each year. The subject ANO report for the calendar year 2013 is enclosed.

This report fulfills the reporting requirements of the TSs referenced above.

The radionuclides detected by the radiological environmental monitoring program during 2013 were significantly below the regulatory limits. The operation of the ANO station during 2013 had no harmful radiological effects nor resulted in any irreversible damage to the local environment.

Based on ANO's review, no environmental samples from the monitoring program equaled or exceeded the reporting levels for radioactivity concentration due to ANO effluents when averaged over any calendar quarter. A map of all sampling locations and a corresponding table providing the respective distances and directions from the reactor building is included in the Offsite Dose Calculation Manual (ODCM) submitted as part of the referenced Annual Radioactive Effluents Release Report.

During a self-assessment evaluation, ANO determined that three air sample deviations captured within the ANO Corrective Action Program were not included in Reference 2. These deviations were due to electrical power outages and equipment failures. These additional deviations did not result in the lower levels of detection specified in the ODCM to be exceeded. The omitted deviations have been added to the revised page of Reference 2, included at the end of the enclosed subject report.

This letter contains no new commitments.

If you have any questions or require additional information, please contact me.

Sincerely,

ORIGINAL SIGNED BY DAVID BICE FOR STEPHENIE L. PYLE

SLP/rwc

Enclosure: Annual Radiological Environmental Operating Report for 2013

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Enclosure to

0CAN041407

Annual Radiological Environmental Operating Report for 2013

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Summary

The Annual Radiological Environmental Operating Report (AREOR) presents data obtained through analyses of environmental samples collected for Arkansas Nuclear One's (ANO's) Radiological Environmental Monitoring Program (REMP) for the period January 1, 2013, through December 31, 2013. This report fulfills the requirements of ANO Unit 1 Technical Specification (TS) 5.6.2 and Unit 2 TS 6.6.2.

During 2013, as in previous years, ANO detected radionuclides attributable to plant operations at the discharge location (Station 8) where previously monitored liquid radioactive effluent from the plant is periodically discharged in accordance with the regulatory criteria established in the Offsite Dose Calculation Manual (ODCM). ANO personnel routinely monitor results from this area in order to note any trends. The review of results from this area indicates the following:

- Tritium levels in the surface water media continue to be below regulatory reporting limits and are consistent with concentrations that would typically be seen at this location as discussed in Section 2.3 of this AREOR.

Gross beta concentrations at the Station 14 (City of Russellville) indicator drinking water location continue to remain consistent with previous operational measurements and similar to the levels detected at the Station 57 (City of Danville) control drinking water location.

Radiological Environmental Monitoring Program

ANO established the REMP prior to the station becoming operational (1974) to provide data on background radiation and radioactivity normally present in the area. ANO has continued to monitor the environment by sampling air, water, sediment, fish and food products, as well as measuring radiation directly. ANO also samples milk if milk-producing animals are present commercially within five miles of the plant.

The REMP includes sampling indicator and control locations within an approximate 20-mile radius of the plant. The REMP utilizes indicator locations near the site to show any increases or buildup of radioactivity that might occur due to station operation, and control locations farther away from the site to indicate the presence of only naturally occurring radioactivity. ANO personnel compare indicator results with control and preoperational results to assess any impact ANO operation might have had on the surrounding environment.

In 2013, ANO personnel collected environmental samples for radiological analysis. Personnel compared results of indicator locations with control locations and previous studies and concluded that overall no significant relationship exists between ANO operation and effect on the plant environs. The review of 2013 data, in many cases, showed undetectable radiation levels in the environment and in all instances, no definable trends related to significant pathways associated with ANO.

Harmful Effects or Irreversible Damage

The REMP monitoring did not detect any harmful effects or evidence of irreversible damage in 2013. Therefore, no analysis or planned course of action to alleviate problems was necessary.

Reporting Levels

ANO's review indicates that no samples equaled or exceeded reporting levels for radioactivity concentration in environmental samples due to ANO effluents, as outlined in ODCM Table 2.5-2, when averaged over any calendar quarter. Therefore, 2013 results did not trigger any Radiological Monitoring Program special reports.

Radioactivity Not Attributable to ANO

The ANO REMP has detected radioactivity attributable to other sources. These include the 25th Chinese nuclear test explosion in 1980 and the radioactivity plume release due to reactor core degradation at the Chernobyl Nuclear Power Plant in 1986. Prior to 1981, the ANO REMP detected radioactivity resulting from nuclear weapons testing, with Cesium-137 continuing to be periodically detected. In 2011, ANO detected I-131 radioactivity attributed to the Fukushima Daiichi Nuclear Power Plant accident (March 11, 2011).

Comparison to Federal and State Programs

ANO personnel compared REMP data to state monitoring programs as results became available. Historically, the programs used for comparison have included the U.S. Nuclear Regulatory Commission (NRC) Thermoluminescent Dosimeter (TLD) Direct Radiation Monitoring Network and the Arkansas Department of Health (ADH).

The NRC TLD Network Program was discontinued in 1998. Historically these results have compared to those from the ANO REMP. ANO TLD results continue to remain similar to the historical average and continue to verify that plant operation is not affecting the ambient radiation levels in the environment.

The ADH and the ANO REMP entail similar radiological environmental monitoring program requirements. These programs include collecting air samples and splitting or sharing sample media such as water, sediment and fish. Both programs have obtained similar results over previous years.

Sample Deviations

- Milk

  The REMP did not include milk sampling within five miles of ANO in 2013 due to unavailability. The ODCM requires collection of milk samples, if available commercially within 5 miles of the plant. ANO personnel collected vegetation samples to monitor the ingestion pathway, as specified in the ODCM, because of milk unavailability.

- Lower Levels of Detection (LLDs) during this reporting period were within the acceptable limits required by Table 2.5-1 of the ODCM.

- Air Samples

  Listed below are air sampler deviations that occurred during 2013 due to electrical power outages and equipment failure. These deviations did not result in the excedence of the LLD values specified in the ODCM. As described in ODCM, B 2.5.1, Actions A.1 and A.2, deviations are permitted from the required sampling schedule due to malfunction of sampling equipment and other legitimate reasons.

Station	Sampling Period	Comment
02	03/19/2013 – 04/02/2013	On 03/24/2013, electrical power was lost to sample station. Entergy Arkansas contacted. (CR-ANO-C-2013-00772)
56	03/19/2013 – 04/02/2013	On 03/24/2013, electrical power was lost to sample station. Entergy Arkansas contacted. (CR-ANO-C-2013-00772)
07	03/19/2013 – 04/02/2013	On 03/26/2013, the run time totalizer failed. Replaced run time totalizer. (CR-ANO-C-2013-00801)
01	10/01/2013 – 10/15/2013	On 10/08/2013, the air filter was found not centered on filter holder. Procedure updated to address matter; training provided. (CR-ANO-C-2013-02585)
06	11/26/2013 – 12/10/2013	On 12/03/2013, the air pump failed. Replaced sample pump. (CR-ANO-C-2013-03009)
02	12/10/2013 – 12/24/2013	On 12/17/2013, electrical power was lost to sample station. Entergy Arkansas contacted. (CR-ANO-C-2013-03156)

- Missed Samples

  First quarter environmental TLD Station # 116 missing (CR-ANO-C-2013-01082).

  Third quarter environmental TLD Station # 148 missing (CR-ANO-C-2013-02650).

- Unavailable Results

  ANO received analytical results in adequate time for inclusion in this report.

Program Modifications

The following revisions were made to OP-1608.005, “Radiological Environmental Monitoring Program (REMP)” in 2013.

- References to ODCM Appendix 1 and 2 were deleted and reference to ODCM Table 2.5-1 was updated. The changes improved clarity.

- Deleted NRC Commitment P-15976; Subject: Annual Radiological Environmental Operating Report – 1997 Corrective Actions to Address Sampling Deviations As Noted in Summary Page 11 of 104 (Modify Procedures to Address Job Orders, Sample Tracking and Sample Storage Times). The following items implemented Commitment P-15976 from 0CAN049804:

  - OP-1608.005 Attachments 1 - 3 contain the sample station locations, which are normally used.
  - ODCM Work Orders identified on the Master Test Control List provide sampling requirements and are addressed in Procedures 1000.024, “Reviews and Comments – Control of Maintenance” and 1001.009, “Master Test Control List”.
  - Samples requested during a drill, accident, or post-accident situation which are not listed in this procedure are sampled using accepted radiation protection guidelines.
  - Procedure 1905.002, “Offsite Emergency Monitoring” contains requirements for labeling environmental samples during a drill, accident, or post-accident situation.

- Removed reference to hydrochloric acid (HCL) and uses of HCL. HCL is used as a preservative for water samples sent offsite for gamma analysis. ANO changed vendor laboratory and vendor requested not to acidify water samples. Vendor determined that acidification reduces the detection of I-131.

- Added “or approved contractor” to better clarify roles for various sampling activities.

- Added precautionary step of “Awareness of environmental hazards (heat, cold, insects, snakes, spiders, poision ivy)”.

- Added the words “from each sample” site to better define the amount of sample to be retained.

- Added the word “duplicate” to better define the sample being retained.

- Revised notes to identify Wastewater Holding Pond water and sediment samples are analyzed onsite.

- Better defined step by adding the designation of “onsite” for the collection and analysis of Stormwater samples.

- Added (Surface Water Source) to “Drinking Water Sample” reference. This better identifies the drinking water coming from a surface water source.

- The following changes were made to Groundwater Monitoring Well Sampling:
  - Deleted statement "This sample is not required for ODCM compliance". Replaced with "ODCM Table 2.5-1 requires two groundwater samples to be collected once per 92 days". During the original REMP program ANO sampled two wells for many years. It was determined that neither well was influenced by plant operations, thus ANO deleted this requirement from the ODCM. Now that groundwater wells are available, ANO is reinstating the requirement to sample groundwater and making it a requirement of the ODCM.
  - ANO has been sampling 4 groundwater wells (REMP station numbers: 58, 59, 60, and 61) since 2007. These were the first four groundwater wells installed at ANO. Since then, ANO has installed 16 more groundwater monitoring wells. Of these 16 wells, 4 are deep (150 foot) wells and 6 are located inside the protected area near potential radiological sources. ANO has chosen to better define the required REMP groundwater monitoring program. Station numbers 59, 60, 61 are deleted from the REMP and added station numbers 62, 63 and 64. Of these are two deep wells (more conductive to drinking water source) and one well located inside the protected area (more conductive to early detection). Also the requirement to analyze for gross beta has been added. Gross beta is only required for drinking water samples.
- Added (Surface Water Source) to "Drinking Water Sample" reference. This better identifies the drinking water coming from a surface water source.

Attachments

Attachment 1 contains results of air, TLD, water, sediment, fish, and food product samples collected in 2013. TLDs were analyzed by a vendor (Stanford Dosimetry). All remaining samples were analyzed GEL Laboratories, LLC (GEL).

Attachment 2 contains GEL's and Stanford Dosimetry's participation in the interlaboratory comparison program during 2013.

Attachment 3 contains dose calculations performed for sediment using a generalized equation from Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1.

Attachment 4 contains amendments made to the 2012 AREOR.

1.0 Introduction

1.1 Radiological Environmental Monitoring Program

ANO established the REMP to ensure that plant operating controls properly function to minimize any associated radiation endangerment to human health or the environment. The REMP is designed for:

- Analyzing applicable pathways for anticipated types and quantities of radionuclides released into the environment.
- Considering the possibility of a buildup of long-lived radionuclides in the environment and identifying physical and biological accumulations that may contribute to human exposures.
- Considering the potential radiation exposure to plant and animal life in the environment surrounding ANO.
- Correlating levels of radiation and radioactivity in the environment with radioactive releases from station operation.

1.2 Pathways Monitored

The airborne, direct radiation, waterborne and ingestion pathways are monitored as required by the ODCM. A description of the ANO REMP utilized to monitor the exposure pathways is described in Table 1.1 and shown in Figures 1-1, 1-2 and 1-3.

Section 2.0 of this report provides a discussion of 2013 sampling results and Section 3.0 provides a summary of results for the monitored exposure pathways.

1.3 Land Use Census

ANO personnel conducts land use census biannually (once every two years) as required by ODCM Section B 2.5.2. The latest land use census was conducted in 2013. The purpose of this census is to identify changes in uses of land within five miles of ANO that would require modifications to the REMP or ODCM. The most important criteria during this census are to determine location in each sector of the nearest:

1) Residence
2) Animal milked for human consumption
3) Garden of greater than 500 square feet producing fresh leafy (broadleaf) vegetables*

* ANO personnel did not perform a garden census since ODCM Section B 2.5.2, Actions A.1, A.2.1, and A.2.2 allows the routine sampling of broadleaf vegetation in the highest D/Q sector near the site boundary in lieu of the garden census.

The method used by ANO personnel for conducting the land use census is as follows:

- ANO personnel conducted door-to-door (drive by) field surveys in order to locate the nearest resident in each meteorological sector.
- Consultation with local agricultural authorities is used for the identification of commercial milk providers within five-miles of the Unit 1 reactor building.
- As a result of these surveys, the following information is obtained in each meteorological sector:
    1) Nearest permanent residence
    2) Nearest milking animal
- ANO personnel identify locations on the map, measure distances to ANO (or use a GPS system) and record results.
- Locations, if any, are identified which yield a calculated dose or dose commitments greater than those currently calculated in the ODCM.
- ANO personnel compare results to previous census.

TABLE 1.1

RADIOLOGICAL ENVIRONMENT SAMPLING PROGRAM

Exposure Pathway	Requirement	Sample Point Description, Distance and Direction	Sampling and Collection Frequency	Type and Frequency Of Analyses
Airborne	Radioiodine and Particulates 2 samples close to the Site Boundary, in (or near) different sectors with the highest calculated annual average ground level D/Q.	**Station 2 (243° - 0.5 miles)** - South of the sewage treatment plant. **Station 56 (264° - 0.4 miles)** – West end of the sewage treatment plant.	Continuous operation of sampler with sample collection as required by dust loading but at least once per 14 days.	Radioiodine Canister – Analyze at least once per 14 days for I-131. Particulate Sampler – Analyze for gross beta radioactivity following filter change.
	Radioiodine and Particulates 1 sample from the vicinity of a community having the highest calculated annual average ground level D/Q.	**Station 1 (88° - 0.5 miles)** - Near the meteorology tower.		
	Radioiodine and Particulates 1 sample from a control location 15 - 30 km (10 - 20 miles) distance.	**Station 7 (210° - 19.0 miles)** – Entergy Supply Yard on Highway 10 in Danville.		
	Radioiodine and Particulates One location sampled voluntarily by ANO.	**Station 6 (111° - 6.8 miles)** - Entergy local office in Russellville (305 South Knoxville Avenue).		
Direct Radiation	Thermoluminescent dosimetry (TLDs) 16 inner ring stations with two or more dosimeters in each meteorological sector in the general area of the Site Boundary.	**Station 1 (88° - 0.5 miles)** - On a pole near the meteorology tower. **Station 2 (243° - 0.5 miles)** - South of the sewage treatment plant. **Station 3 (5° - 0.7 miles)** – West of ANO Gate #2 on Highway 333 (approximately 0.35 miles) **Station 4 (181° - 0.5 miles)** – West of May Cemetery entrance on south side of the road.	Once per 92 days.	Gamma Dose – Once per 92 days.

TABLE 1.1 (continued)

RADIOLOGICAL ENVIRONMENT SAMPLING PROGRAM

Exposure Pathway	Requirement	Sample Point Description, Distance and Direction	Sampling and Collection Frequency	Type and Frequency Of Analyses
Direct Radiation	TLDs 16 inner ring stations with two or more dosimeters in each meteorological sector in the general area of the Site Boundary	**Station 56 (264° - 0.4 miles)** - West end of the sewage treatment plant. **Station 108 (306° - 0.9 miles)** - South on Flatwood Road on a utility pole. **Station 109 (291° - 0.6 miles)** - Utility pole across from the junction of Flatwood Road and Round Mountain Road. **Station 110 (138° - 0.8 miles)** - Bunker Hill Lane on the first utility pole on the left. **Station 145 (28° - 0.6 miles)** - Near west entrance to the RERTC on a utility pole. **Station 146 (45° - 0.6 miles)** - South end of east parking lot at RERTC on a utility pole. **Station 147 (61° - 0.6 miles)** - West side of Bunker Hill Road, approximately 100 yards from intersection with State Highway 333. **Station 148 (122° - 0.6 miles)** - Intersection of Bunker Hill Road with Scott Lane on county road sign post.	Once per 92 days.	Gamma Dose – Once per 92 days.

TABLE 1.1 (continued)

RADIOLOGICAL ENVIRONMENT SAMPLING PROGRAM

Exposure Pathway	Requirement	Sample Point Description, Distance and Direction	Sampling and Collection Frequency	Type and Frequency Of Analyses
Direct Radiation	TLDs 16 inner ring stations with two or more dosimeters in each meteorological sector in the general area of the Site Boundary.	**Station 149 (156° - 0.5 miles)** – On a utility pole on the south side of May Road. **Station 150 (205° - 0.6 miles)** – North side of May Road on a utility pole past the McCurley Place turn. **Station 151 (225° - 0.4 miles)** – West side of sewage treatment plant near the lake on a metal post. **Station 152 (338° - 0.8 miles)** – South side of State Highway 333 on a road sign post.	Once per 92 days.	Gamma Dose – Once per 92 days.
	TLDs 8 stations with two or more dosimeters in special interest areas such as population centers, nearby residences, schools, and in 1 - 2 areas to serve as control locations.	**Station 6 (111° - 6.8 miles)** - Entergy local office in Russellville (305 South Knoxville Avenue). **Station 7 (210° - 19.0 miles)** – Entergy Supply Yard on Highway 10 in Danville. **Station 111 (120° - 2.0 miles)** – Marina Road on a utility pole on the left just prior to curve. **Station 116 (318° - 1.8 miles)** - Highway 333 and Highway 64 in London on a utility pole north of the railroad tracks.		

TABLE 1.1 (continued)

RADIOLOGICAL ENVIRONMENT SAMPLING PROGRAM

Exposure Pathway	Requirement	Sample Point Description, Distance and Direction	Sampling and Collection Frequency	Type and Frequency Of Analyses
Direct Radiation	TLDs 8 stations with two or more dosimeters in special interest areas such as population centers, nearby residences, schools, and in 1 – 2 areas to serve as control locations.	**Station 125 (46° - 8.7 miles)** - College Street on a utility pole at the southeast corner of the red brick school building. **Station 127 (100° - 5.2 miles)** - Arkansas Tech Campus on a utility pole across from Paine Hall. **Station 137 (151° - 8.2 miles)** – On a speed limit sign on the right in front of the Morris R. Moore Arkansas National Guard Armory. Station **153 (304° - 9.2 miles)** - Knoxville Elementary School near the school entrance gate on a utility pole.	Once per 92 days.	Gamma Dose – Once per 92 days.
Waterborne	Surface Water 1 indicator location (influenced by plant discharge) 1 control location (uninfluenced by plant discharge)	**Station 8 (166° - 0.2 miles)** - Plant discharge canal. **Station 10 (95° - 0.5 miles)** – Plant intake canal.	Once per 92 days.	Gamma isotopic and tritium analyses once per 92 days.
	Drinking Water 1 indicator location (influenced by plant discharge) 1 control location (uninfluenced by plant discharge)	**Station 14 (70° - 5.1 miles)** - Russellville city water system from the Illinois Bayou. **Station 57 (208° - 19.5 miles)** - Danville public water supply treatment on Fifth Street.	Once per 92 days.	I-131, gross beta, gamma isotopic and tritium analyses once per 92 days.

TABLE 1.1 (continued)

RADIOLOGICAL ENVIRONMENT SAMPLING PROGRAM

Exposure Pathway	Requirement	Sample Point Description, Distance and Direction	Sampling and Collection Frequency	Type and Frequency Of Analyses
Waterborne	Sediment 1 indicator location (influenced by plant discharge) 1 control location (uninfluenced by plant discharge)	**Station 8 (243° - 0.9 miles)** - Plant discharge canal. **Station 16 (287° - 5.5 miles)** - Panther Bay on south side of Arkansas River across from mouth of Piney Creek.	Once per 365 days.	Gamma isotopic analysis once per 365 days.
Ingestion	Milk 1 indicator sample location within five-mile distance if commercially available. 1 control sample location at a distance of >five-miles when an indicator exists.	Currently, no available milking animals within 5 miles of ANO.	Once per 92 days.	Gamma isotopic and I-131 analyses once per 92 days.
	Fish 1 sample of commercially and/or recreationally important species in vicinity of plant discharge. 1 sample of same species in area not influenced by plant discharge.	**Station 8 (212° - 0.5 miles)** – Plant discharge canal. **Station 16 (287° - 5.5 miles)** - Panther Bay on south side of Arkansas River across from mouth of Piney Creek.	Once per 365 days.	Gamma isotopic on edible portions once per 365 days.
	Food Products 1 sample of broadleaf (edible or non-edible) near the Site Boundary from one of the highest anticipated annual average ground level D/Q sectors, if milk sampling is not performed. 1 sample location of broadleaf vegetation (edible or non-edible) from a control location 15 – 30 km (10 – 20 miles) distant, if milk sampling is not performed.	**Station 13 (273° - 0.5 miles)** - West from ANO toward Gate 4 onto Flatwood Road. **Station 55 (208° - 16.5 miles)** – Intersection of Highway 27 and 154.	Three per 365 days.	Gamma. isotopic and I-131 analyses three times per 365 days

TABLE 1.1 (continued)

RADIOLOGICAL ENVIRONMENT SAMPLING PROGRAM

Exposure Pathway	Requirement	Sample Point Description, Distance and Direction	Sampling and Collection Frequency	Type and Frequency Of Analyses
Ground water	2 sample locations of Groundwater from a control location up gradient from the protected area	**Station 58 (GWM-1, 22° - 0.3 miles)** – North of Protected Area on Owner Control Area (OCA). West of Security North Check Point, east side of access road.	Once per 92 days	Control, Tritium, Gross Beta and Gamma Isotopic, once per 92 days.
		Station 62 (GWM-101, 34° - 0.5 miles) – North of Protected Area on OCA. East of outside receiving building.	Once per 92 days	Control, Tritium, Gross Beta and Gamma Isotopic, once per 92 days.
	2 sample locations of Groundwater from indicator locations down gradient from the protected area.	**Station 63 (GWM-103, 206° - 0.1 miles)** – South of Protected area on OCA. North East of Stator Rewind Bld. Near wood line.	Once per 92 days	Indicator, Tritium, Gross Beta and Gamma Isotopic, once per 92 days.
		Station 64 (GWM-13, 112° - 0.1 miles) – South of Oily Water Separator facility, North West corner of U-2 Intake Structure. Inside Protected area.	Once per 92 days	Indicator, Tritium, Gross Beta and Gamma Isotopic, once per 92 days.

FIGURE 1-1

SAMPLE COLLECTION SITES – NEAR FIELD

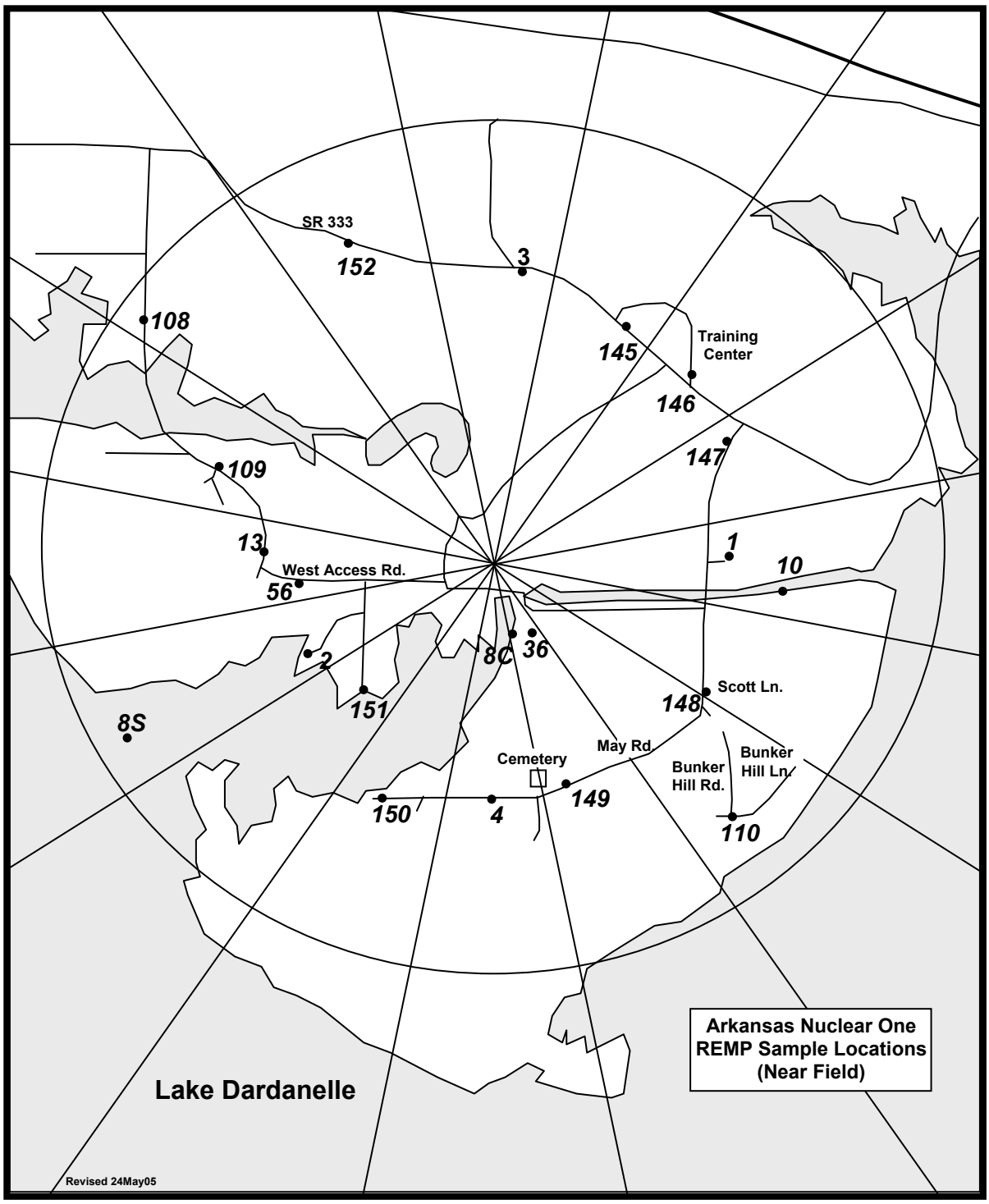


FIGURE 1-2

SAMPLE COLLECTION SITES – FAR FIELD

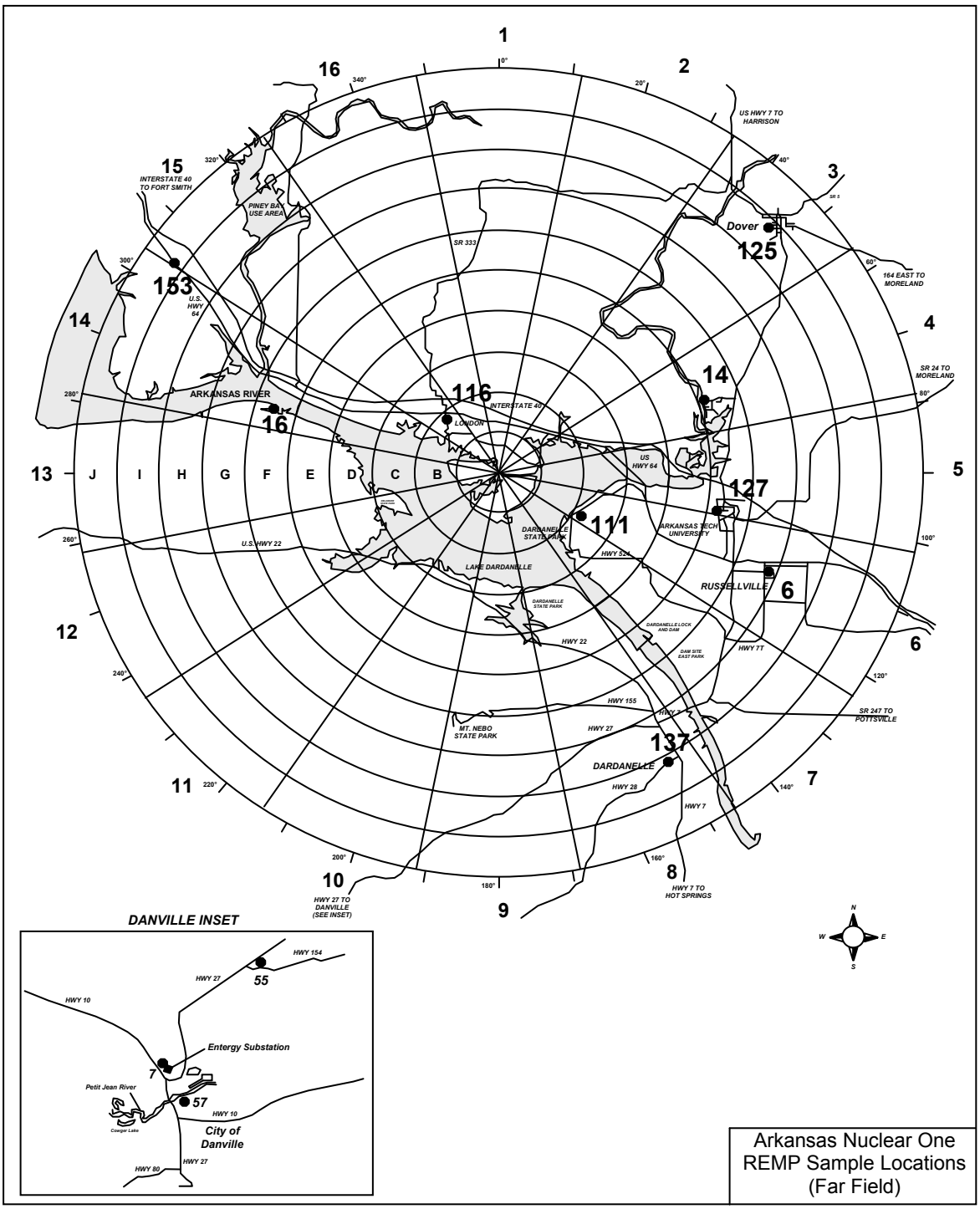
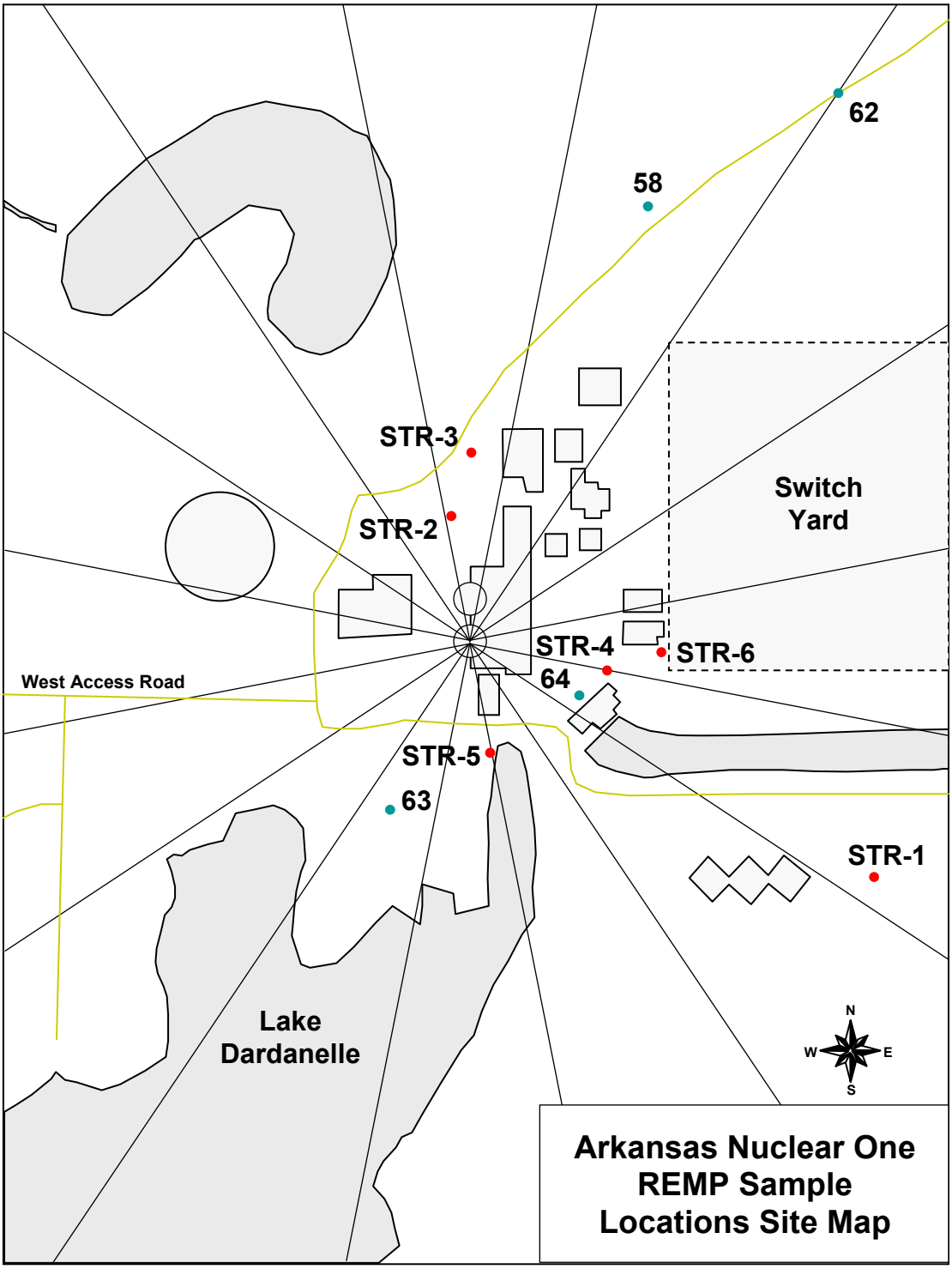


FIGURE 1-3

SAMPLE COLLECTION SITES – SITE MAP



2.0 Interpretation and Trends of Results

2.1 Air Particulate and Radioiodine Sample Results

The REMP has detected radioactivity in the airborne pathway attributable to other sources. These include the 25th Chinese nuclear test explosion in 1980, the radioactive plume release due to reactor core degradation at Chernobyl Nuclear Power Plant in 1986 and the Fukushima Daiichi Nuclear Power Plant accident (Mach 11, 2011).

As in past years, there were no other detections of I-131. Indicator gross beta air particulate results for 2013 were higher compared to results obtained in previous years of the operational REMP and below preoperational levels as seen below. Results are reported as annual average picocuries per cubic meter (pCi/m^3).

Monitoring Period	Result
2000 – 2012 (Minimum Value)	0.020
2013 Value	0.043
2000 – 2012 (Maximum Value)	0.032
Preoperational	0.050

In the absence of plant-related gamma radionuclides, gross beta activity is attributed to naturally occurring radionuclides. Table 3.1, which includes gross beta concentrations and provides a comparison of the indicator and control means and ranges, emphasizes the consistent trends seen in this pathway to support the presence of naturally occurring activity. Therefore, it can be concluded that the airborne pathway continues to be unaffected by ANO operations.

2.2 Thermoluminescent Dosimetry (TLD) Sample Results

ANO reports measured dose as net exposure (field reading less transit reading) normalized to 92 days and relies on comparison of the indicator locations to the control as a measure of plant impact. ANO's comparison of the inner ring and special interest area TLD results to the control, as seen in Table 3.1, identified no noticeable trend that would indicate that the ambient radiation levels are being affected by plant operations. In addition, the inner ring value of 8.3 millirem (mrem) shown in Table 3.1 is within the historical bounds of 2000 – 2012 annual average results, which have ranged from 6.7 to 8.8 mrem. Overall, ANO concluded that the ambient radiation levels are not being affected by plant operations.

2.3 Water Sample Results

Analytical results for 2013 drinking water samples were similar to those reported in previous years. Gamma radionuclides analytical results for 2013 surface water samples were similar to those reported in previous years. ANO experienced a couple of elevated tritium analytical results for 2013 surface water samples as explained below.

Surface water samples were collected and analyzed for gamma radionuclides and tritium. Gamma radionuclides were below detectable limits which is consistent with results seen in previous operational years. Tritium continues to be detected at the indicator location (Station 8)

where previously monitored liquid radioactive effluent from the plant is periodically discharged in accordance with the regulatory criteria established in the ODCM. However, the levels detected in the second and fourth quarter of 2013 are elevated with concentrations that would typically be seen at this location as shown below. The higher concentration of 2220 pCi/l reported from the second quarter sample is a result of effluent releases with only one circulating water pump (reduced dilution water) after the Stator Event that occurred on March 31, 2013. The higher concentration of 2940 pCi/l reported from the fourth quarter sample is a result of a 2E-35A shutdown cooling heater leak combined with Unit 2 Force Outage that started on December 09, 2013. Results are reported as annual average picocurie per liter (pCi/l).

Monitoring Period	**Result**
2000 – 2012 (Minimum Value)	272.0
2013 Value	2940
2000 – 2012 (Maximum Value)	1023.4
Preoperational	200.0

ANO personnel have noted no definable increasing trends associated with the tritium levels at the discharge location. Levels detected during 2013 and previous operational years have been well below regulatory reporting limits. Therefore, the operation of ANO had no definable impact on this waterborne pathway during 2013 and levels of radionuclides remain similar to those obtained in previous operational years.

Drinking water samples were collected from two locations (indicator and control). Although ANO personnel utilize Station 14 (City of Russellville) as an indicator location due to the potential for the drinking water pathway to exist, the City of Russellville has not withdrawn water from Lake Dardanelle in the past several years.

Drinking water samples were analyzed for gross beta radionuclides, Iodine-131, gamma radionuclides and tritium. Gamma radionuclides, Iodine-131 and tritium concentrations were below the LLD limits at the indicator and control locations, which is consistent with preoperational and operational years. Gross beta concentrations at the indicator and control locations are similar as shown in Table 3.1. Listed below is a comparison of 2013 indicator results to preoperational and operational years. Results are reported as annual average pCi/l.

Radionuclide	**2013**	**2000 – 2012**	**Preoperational**
Gross Beta	< LLD	2.59	2.0
Iodine-131	< LLD	< LLD	< LLD
Gamma	< LLD	< LLD	< LLD
Tritium	< LLD	< LLD	200.0

ANO personnel have noted no definable trends associated with drinking water results at the indicator location. Therefore, the operation of ANO had no definable impact on this waterborne pathway during 2013 and levels of radionuclides remain similar to those obtained in previous operational years.

Groundwater samples were collected from four REMP locations (1 control, and 3 indicator locations). During 2011, ANO incorporated sixteen additional groundwater monitoring wells into the Groundwater Protection Initiative (GPI) site program. Sample data was compiled, organized and is reviewed annually at a minimum to:

- Analyze for increasing or decreasing trends at individual sample points, wells or groups of wells.
- Review the radionuclides detected to determine whether changes should be made to the analysis suites or sampling frequencies for each sampling location.
- Evaluate the locations of radionuclides in ground water to determine if changes should be made to the sampling locations.
- Review current investigation levels and determine if changes should be made.
- Determine if any change to the ODCM is required.
- Determine if a corrective actions/remediation is required.

Groundwater samples were analyzed for Tritium and Gamma radionuclides. Tritium and Gamma concentrations were below the LLD limits at the indicator and control locations. Listed below is a comparison of 2013 indicator results to past operational years. Results are reported as annual average pCi/l. REMP Groundwater data is captured in Tables 8.1 and 8.2. Therefore, ANO operations had no significant impact on the environment or public by this waterborne pathway.

Radionuclide	2013	2006 – 2012
Iodine-131	< LLD	< LLD
Gamma	< LLD	< LLD
Tritium	< LLD	< LLD

2.4 Sediment Sample Results

Sediment samples were collected from two locations in 2013 and analyzed for gamma radionuclides. Listed below is a comparison of 2013 indicator results to past operational years. Therefore, ANO operations had no significant impact on the environment or public by this waterborne pathway. Results are reported as pCi/kg.

Monitoring Period	Result
2000 – 2012 (Minimum Value)	41.79
2013 Value	< LLD
2000 – 2012 (Maximum Value)	1170.0

Since reporting levels for radionuclides in sediment have not been established, an evaluation of potential dose to the public from this media was performed as shown in Attachment 3.

2.5 Milk Sample Results

Milk samples were not collected during 2013 due to the unavailability of indicator locations within five-miles of ANO.

2.6 Fish Sample Results

Fish samples were collected from two locations and analyzed for gamma radionuclides. In 2013, gamma radionuclides were below detectable limits which are consistent with the preoperational monitoring period and operational results since 1997. Therefore, based on these measurements, ANO operations had no significant radiological impact upon the environment or public by this ingestion pathway.

2.7 Food Product Sample Results

The REMP has detected radionuclides prior to 1990 that are attributable to other sources. These include the radioactive plume release due to reactor core degradation at Chernobyl Nuclear Power Plant in 1986 and atmospheric weapons testing.

In 2013, food product samples were collected when available from two locations and analyzed for Iodine-131 and gamma radionuclides. The 2013 levels remained undetectable, as has been the case in previous years. Therefore, based on these measurements, ANO operations had no significant radiological impact upon the environment or public by this ingestion pathway.

2.8 Interlaboratory Comparison Results

GEL Laboratories analyzed interlaboratory comparison samples to fulfill the requirements of ODCM Section 2.5.3. Attachment 2 contains these results.

2.9 Land Use Census Results

The latest land use census (performed in 2013) did not identify any new locations that yielded a calculated dose or dose commitment greater than those currently calculated (see Table 2.1).

Also, the land use census identified no milk-producing animals within a five-mile radius of the plant site. ANO personnel chose not to perform a garden census in 2013, which is allowed by ODCM Section L 2.5.2, in lieu of broadleaf vegetation sampling in the meteorological sector (Sector 13) with the highest D/Q.

TABLE 2.1

2013 LAND USE CENSUS

Nearest Residence Within Five Miles

Direction	Sector	Distance (miles)
N	1	0.9
NNE	2	1.3
NE	3	0.9
ENE	4	0.8
E	5	0.8
ESE	6	0.8
SE	7	0.8
SSE	8	0.8
S	9	0.8
SSW	10	0.7
SW	11	2.8
WSW	12	0.7
W	13	0.8
WNW	14	0.8
NW	15	1.0
NNW	16	0.9

3.0 Radiological Environmental Monitoring Program Summary

3.1 2013 Program Results Summary

Table 3.1 summarizes the 2013 REMP results.

TABLE 3.1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: ANO - Units 1 and 2 **Docket No:** 50-313 and 50-368.
Location of Facility: Pope County, Arkansas **Reporting Period:** January - December 2013

Sample Type (Units)	Type / Number of Analyses[a]	LLD[b]	Indicator Locations Mean (°F)[c] [Range]	Location with Highest Annual Mean		Control Locations Mean (°F)[c] [Range]	Number of Non-Routine Results[e]
				Location[d]	Mean (°F)[c] [Range]		
Air Particulates (pCi/m^3)	GB / 135	0.01	0.043 (81 / 81) [0.028 – 0.072]	Station 7 (210°, 19.0 mi)	0.044 (27 / 27) [0.020 - 0.080]	0.039 (54 / 54) [0.010 - 0.080]	0
Airborne Iodine (pCi/ m^3)	I-131 / 135	0.07	< LLD	N/A	N/A	< LLD	0
Inner Ring TLDs (mR/Qtr)	Gamma / 63	(f)	8.3 (63 / 64) [5.1 – 10.5]	Station 56 (264°, 0.4 mi)	9.7 (4 / 4) [8.8 – 10.5]	N/A	0
Special Interest TLDs (mR/Qtr)	Gamma / 27	(f)	7.6 (27 / 28) [4.6 – 9.3]	Station 116 (318°, 1.8 mi)	8.8 (4 / 4) [8.6 – 9.3]	N/A	0
Control TLD (mR/Qtr)	Gamma / 4	(f)	N/A	N/A	N/A	6.8 (4 / 4) [6.4 – 7.3]	0

TABLE 3.1 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Sample Type (Units)	Type / Number of Analyses[a]	LLD[b]	Indicator Locations Mean (°F)[c] [Range]	Location with Highest Annual Mean		Control Locations Mean (°F)[c] [Range]	Number of Non-Routine Results[e]
				Location[d]	Mean (°F)[c] [Range]		
Surface Water (pCi/l)	H-3 / 8	3000	1865 (3* / 4) [435– 2940]	Station 8 (166°, 0.2 mi)	1865 (3* / 4) [435 – 2940]	< LLD	0
	GS / 24						
	Mn-54	15	< LLD	N/A	N/A	< LLD	0
	Fe-59	30	< LLD	N/A	N/A	< LLD	0
	Co-58	15	< LLD	N/A	N/A	< LLD	0
	Co-60	15	< LLD	N/A	N/A	< LLD	0
	Zn-65	30	< LLD	N/A	N/A	< LLD	0
	Zr-95	30	< LLD	N/A	N/A	< LLD	0
	Nb-95	15	< LLD	N/A	N/A	< LLD	0
	I-131	15	< LLD	N/A	N/A	< LLD	0
	Cs-134	15	< LLD	N/A	N/A	< LLD	0
	Cs-137	18	< LLD	N/A	N/A	< LLD	0
	Ba-140	60	< LLD	N/A	N/A	< LLD	0
	La-140	15	< LLD	N/A	N/A	< LLD	0

* Positive tritium results

TABLE 3.1 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Sample Type (Units)	Type / Number of Analyses[a]	LLD[b]	Indicator Locations Mean (°F)[c] [Range]	Location with Highest Annual Mean		Control Locations Mean (°F)[c] [Range]	Number of Non-Routine Results[e]
				Location[d]	Mean (°F)[c] [Range]		
Drinking Water (pCi/1)	GB / 8	4	< LLD	N/A	N/A	< LLD	0
	I-131 / 8	1.0	< LLD	N/A	N/A	< LLD	0
	H-3 / 8	2000	< LLD	N/A	N/A	< LLD	0
	GS / 8						
	Mn-54	15	< LLD	N/A	N/A	< LLD	0
	Fe-59	30	< LLD	N/A	N/A	< LLD	0
	Co-58	15	< LLD	N/A	N/A	< LLD	0
	Co-60	15	< LLD	N/A	N/A	< LLD	0
	Zn-65	30	< LLD	N/A	N/A	< LLD	0
	Zr-95	30	< LLD	N/A	N/A	< LLD	0
	Nb-95	15	< LLD	N/A	N/A	< LLD	0
	Cs-134	15	< LLD	N/A	N/A	< LLD	0
	Cs-137	18	< LLD	N/A	N/A	< LLD	0
	Ba-140	60	< LLD	N/A	N/A	< LLD	0
	La-140	15	< LLD	N/A	N/A	< LLD	0
Bottom Sediment (pCi/kg)	GS / 2						
	Cs-134	150	< LLD	N/A	< LLD	< LLD	0
	Cs-137	180	< LLD	N/A	< LLD	< LLD	0

* Positive GB results.

TABLE 3.1 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Sample Type (Units)	Type / Number of Analyses[a]	LLD[b]	Indicator Locations Mean (°F)[c] [Range]	Location with Highest Annual Mean		Control Locations Mean (°F)[c] [Range]	Number of Non-Routine Results[e]
				Location[d]	Mean (°F)[c] [Range]		
Fish (pCi/kg)	GS / 2						
	Mn-54	130	< LLD	N/A	N/A	< LLD	0
	Fe-59	260	< LLD	N/A	N/A	< LLD	0
	Co-58	130	< LLD	N/A	N/A	< LLD	0
	Co-60	130	< LLD	N/A	N/A	< LLD	0
	Zn-65	260	< LLD	N/A	N/A	< LLD	0
	Cs-134	130	< LLD	N/A	N/A	< LLD	0
	Cs-137	150	< LLD	N/A	N/A	< LLD	0
Food Products (pCi/kg)	I-131 / 6	60	< LLD	N/A	N/A	N/A	0
	GS / 6						
	Cs-134	60	< LLD	N/A	N/A	N/A	0
	Cs-137	80	< LLD	N/A	N/A	N/A	0

[a] GB = Gross beta; I-131 = Iodine-131; H-3 = Tritium; GS = Gamma scan.

[b] LLD = Required lower limit of detection based on ANO Units 1 and 2 ODCM Table 2.5-1.

[c] Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parenthesis (F).

[d] Locations are specified (1) by name and (2) degrees relative to reactor site.

[e] Non-routine results are those which exceed ten times the control station value. If no control station value is available, the result is considered non-routine if it exceeds ten times the preoperational value for the location.

[f] LLD is not defined in ANO Units 1 and 2 ODCM Table 2.5-1.

Annual Radiological Environmental Operating Report for 2013

ATTACHMENT 1

SUMMARY OF MONITORING RESULTS

Table of Contents

Table 1.1

Sample Type: Air Particulate Analysis: Gross Beta Units: pCi/m^3

Start Date	End Date	Station 1 (Indicator)	Station 2 (Indicator)	Station 56 (Indicator)	Station 6 (Control)	Station 7* (Control)
Required LLD ➔		**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
12/19/2012	01/02/2013	0.066	0.072	0.066	0.063	0.066
01/02/2013	01/12/2013	0.048	0.040	0.047	0.037	0.052
01/12/2012	01/22/2013	0.058	0.058	0.057	0.040	0.050
01/22/2013	02/05/2013	0.042	0.040	0.044	0.037	0.037
02/05/2013	02/19/2013	0.032	0.033	0.033	0.029	0.033
02/19/2013	03/05/2013	0.046	0.042	0.044	0.041	0.080
03/05/2013	03/19/2013	0.043	0.035	0.033	0.030	0.035
03/19/2013	04/02/2013	0.036	0.032	0.031	0.032	0.031
04/02/2013	04/16/2013	0.035	0.029	0.036	0.033	0.030
04/16/2013	04/30/2013	0.031	0.029	0.030	0.023	0.028
04/30/2013	05/14/2013	0.036	0.037	0.038	0.031	0.032
05/14/2013	05/28/2013	0.034	0.031	0.028	0.024	0.020
05/28/2013	06/11/2013	0.038	0.034	0.038	0.029	0.030
06/11/2013	06/25/2013	0.042	0.046	0.039	0.036	0.039
06/25/2013	07/09/2013	0.031	0.037	0.037	0.026	0.033
07/09/2013	07/23/2013	0.033	0.032	0.030	0.028	0.033
07/23/2013	08/06/2013	0.044	0.035	0.039	0.028	0.040
08/06/2013	08/20/2013	0.050	0.046	0.046	0.040	0.060
08/20/2013	09/03/2013	0.059	0.065	0.060	0.045	0.062
09/03/2013	09/17/2013	0.065	0.048	0.058	0.050	0.064
09/17/2013	10/01/2013	0.036	0.038	0.045	0.032	0.040
10/01/2013	10/15/2013	0.044	0.040	0.040	0.036	0.042
10/15/2013	10/29/2013	0.042	0.038	0.040	0.029	0.043
10/29/2013	11/12/2013	0.045	0.063	0.053	0.045	0.062
11/12/2013	11/26/2013	0.040	0.043	0.044	<0.010	0.048
11/26/2013	12/10/2013	0.072	0.047	0.064	0.058	0.063
12/10/2013	12/24/2013	0.049	0.044	0.043	0.043	0.049

* Station with highest annual mean.

Table 1.2

Sample Type: Radioiodine Cartridge Analysis: Iodine-131 Units: pCi/m^3

Start Date	End Date	Station 1 (Indicator)	Station 2 (Indicator)	Station 56 (Indicator)	Station 6 (Control)	Station 7* (Control)
Required LLD ➔		**0.07**	**0.07**	**0.07**	**0.07**	**0.07**
12/19/2012	01/02/2013	< 0.012	< 0.013	< 0.014	< 0.020	< 0.015
01/02/2013	01/12/2013	< 0.022	< 0.021	< 0.026	< 0.024	< 0.019
01/12/2012	01/22/2013	< 0.018	< 0.031	< 0.020	< 0.024	< 0.014
01/22/2013	02/05/2013	< 0.012	< 0.024	< 0.020	< 0.013	< 0.017
02/05/2013	02/19/2013	< 0.013	< 0.019	< 0.019	< 0.015	< 0.015
02/19/2013	03/05/2013	< 0.016	< 0.011	< 0.014	< 0.013	< 0.048
03/05/2013	03/19/2013	< 0.013	< 0.026	< 0.011	< 0.010	< 0.012
03/19/2013	04/02/2013	< 0.008	< 0.009	< 0.009	< 0.007	< 0.007
04/02/2013	04/16/2013	< 0.016	< 0.017	< 0.020	< 0.015	< 0.014
04/16/2013	04/30/2013	< 0.008	< 0.009	< 0.010	< 0.009	< 0.009
04/30/2013	05/14/2013	< 0.014	< 0.018	< 0.013	< 0.015	< 0.013
05/14/2013	05/28/2013	< 0.030	< 0.029	< 0.018	< 0.022	< 0.015
05/28/2013	06/11/2013	< 0.013	< 0.018	< 0.025	< 0.010	< 0.011
06/11/2013	06/25/2013	< 0.017	< 0.014	< 0.020	< 0.017	< 0.027
06/25/2013	07/09/2013	< 0.025	< 0.021	< 0.018	< 0.020	< 0.012
07/09/2013	07/23/2013	< 0.026	< 0.016	< 0.014	< 0.010	< 0.020
07/23/2013	08/06/2013	< 0.018	< 0.023	< 0.056	< 0.047	< 0.033
08/06/2013	08/20/2013	< 0.018	< 0.016	< 0.023	< 0.016	< 0.030
08/20/2013	09/03/2013	< 0.031	< 0.020	< 0.025	< 0.011	< 0.029
09/03/2013	09/17/2013	< 0.019	< 0.011	< 0.014	< 0.012	< 0.020
09/17/2013	10/01/2013	< 0.014	< 0.016	< 0.011	< 0.013	< 0.021
10/01/2013	10/15/2013	< 0.013	< 0.012	< 0.016	< 0.014	< 0.010
10/15/2013	10/29/2013	< 0.031	< 0.017	< 0.015	< 0.014	< 0.033
10/29/2013	11/12/2013	< 0.030	< 0.020	< 0.009	< 0.031	< 0.019
11/12/2013	11/26/2013	< 0.026	< 0.024	< 0.020	< 0.013	< 0.016
11/26/2013	12/10/2013	< 0.011	< 0.049	< 0.012	< 0.043	< 0.024
12/10/2013	12/24/2013	< 0.012	< 0.021	< 0.025	< 0.025	< 0.025

* Station with highest annual mean.

Table 2.1

Sample Type: Thermoluminescent Dosimeters Analysis: Gamma Dose Units: mrem/Qtr

Inner Ring (Indicators)					
Station	**1st Qtr '13 (mrem)**	**2nd Qtr '13 (mrem)**	**3rd Qtr '13 (mrem)**	**4th Qtr '13 (mrem)**	**Annual Mean '13 (mrem)**
1	9.5	9.7	8.3	8.3	**8.9**
2	8.5	9.1	9.0	8.8	**8.8**
3	6.0	7.0	5.5	5.1	**5.9**
4	8.8	8.7	8.4	8.4	**8.5**
***56**	**9.4**	**10.5**	**10.3**	**8.8**	**9.7**
108	8.4	9.5	9.1	9.1	**9.0**
109	8.4	9.8	9.4	8.8	**9.1**
110	7.8	8.2	8.5	7.8	**8.0**
145	8.3	8.1	8.6	8.3	**8.3**
146	8.6	9.1	7.8	8.9	**8.6**
147	6.8	7.4	7.2	7.3	**7.1**
148	8.6	8.2	**LOST**	7.7	**8.1**
149	7.8	8.8	8.0	8.1	**8.1**
150	8.7	9.3	8.6	9.0	**8.9**
151	8.7	9.2	9.2	8.8	**8.9**
152	7.4	7.1	7.0	7.6	**7.2**

* Station with highest annual mean.

Table 2.2

Sample Type: Thermoluminescent Dosimeters Analysis: Gamma Dose Units: mrem/Qtr

Special Interest Areas - (Population Centers & Schools)					
Station	**1st Qtr '13 (mrem)**	**2nd Qtr '13 (mrem)**	**3rd Qtr '13 (mrem)**	**4th Qtr '13 (mrem)**	**Annual Mean '13 (mrem)**
6	7.7	7.7	7.7	8.3	**7.8**
111	6.2	5.7	5.7	6.0	**5.9**
***116**	**LOST**	**8.6**	**8.6**	**9.3**	**8.8**
125	5.4	5.5	5.6	4.6	**5.2**
127	9.0	8.9	8.4	8.1	**8.6**
137	9.3	8.5	8.8	8.5	**8.7**
153	8.1	8.0	7.8	9.2	**8.2**

* Stations with highest annual mean.

Special Interest Areas – (Control)					
Station	**1st Qtr '13 (mrem)**	**2nd Qtr '13 (mrem)**	**3rd Qtr '13 (mrem)**	**4th Qtr '13 (mrem)**	**Annual Mean '13 (mrem)**
7	6.7	6.8	7.3	6.4	**6.8**

Table 3.1

Sample Type: Surface Water Analysis: Gamma Isotopic Units: pCi/l

Location	Start Date	End Date	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
		Required LLD →	15	15	30	15	30	15	30	15	15	18	60	15
Station 8 (Indicator)	12/31/2012	01/31/2013	<1.82	<1.88	<4.04	<1.90	<3.59	<1.77	<3.30	<3.48	<1.84	<1.80	<3.23	<3.23
Station 10 (Control)	12/31/2012	01/31/2013	<1.87	<1.98	<4.20	<2.13	<4.26	<2.03	<3.56	<3.86	<2.37	<2.23	<3.61	<3.61
Station 8 (Indicator)	01/31/2013	02/29/2013	<2.76	<2.39	<5.50	<2.94	<4.46	<2.32	<4.71	<4.17	<3.01	<2.56	<4.15	<4.15
Station 10 (Control)	01/31/2013	02/29/2013	<3.37	<4.06	<6.77	<3.83	<7.08	<3.85	<6.68	<5.45	<2.92	<4.26	<5.02	<5.02
Station 8 (Indicator)	02/28/2013	03/31/2013	<1.52	<1.49	<3.39	<1.77	<3.16	<1.63	<2.74	<3.28	<1.78	<1.61	<2.55	<2.55
Station 10 (Control)	02/28/2013	03/31/2013	<2.27	<2.38	<5.99	<2.58	<4.08	<2.42	<4.46	<4.06	<2.71	<2.55	<4.28	<4.28
Station 8 (Indicator)	03/31/2013	04/30/2013	<1.69	<1.72	<3.45	<1.52	<3.35	<1.82	<2.58	<2.95	<1.79	<1.59	<2.88	<2.88
Station 10 (Control)	03/31/2013	04/30/2013	<2.17	<2.35	<5.18	<2.78	<4.60	<2.47	<4.38	<3.73	<2.71	<2.24	<4.07	<4.07
Station 8 (Indicator)	04/30/2013	05/31/2013	<1.98	<2.18	<4.62	<2.13	<4.32	<2.20	<3.55	<6.66	<2.23	<2.18	<5.08	<5.08
Station 10 (Control)	04/30/2013	05/31/2013	<1.66	<1.67	<3.89	<1.72	<2.92	<1.75	<2.92	<4.18	<1.71	<1.64	<3.29	<3.29
Station 8 (Indicator)	05/31/2013	06/30/2013	<1.57	<1.70	<3.60	<1.58	<3.15	<1.78	<3.02	<3.78	<1.85	<1.62	<3.04	<3.04
Station 10 (Control)	05/31/2013	06/30/2013	<1.74	<1.81	<4.14	<2.19	<3.83	<2.02	<3.10	<4.47	<1.97	<2.03	<3.68	<3.68
Station 8 (Indicator)	06/30/2013	07/31/2013	<1.91	<1.96	<4.44	<2.02	<3.85	<2.13	<3.39	<10.5	<1.96	<1.92	<6.52	<6.52
Station 10 (Control)	06/30/2013	07/31/2013	<1.96	<1.92	<3.99	<2.22	<4.15	<2.13	<3.55	<3.28	<2.40	<1.96	<3.62	<3.62
Station 8 (Indicator)	07/31/2013	08/30/2013	<1.76	<1.75	<3.25	<2.08	<3.60	<1.73	<3.35	<3.02	<1.70	<1.86	<2.72	<2.72
Station 10 (Control)	07/31/2013	08/30/2013	<1.75	<1.75	<3.75	<1.97	<3.57	<1.84	<2.84	<3.27	<1.78	<2.48	<3.17	<3.17
Station 8 (Indicator)	08/31/2013	09/30/2013	<3.41	<3.41	<6.04	<4.07	<5.59	<3.24	<6.24	<4.71	<3.65	<3.87	<5.32	<5.32
Station 10 (Control)	08/31/2013	09/30/2013	<2.87	<2.93	<5.26	<2.57	<5.86	<3.12	<4.98	<3.66	<2.99	<2.91	<4.35	<4.35
Station 8 (Indicator)	09/30/2013	10/31/2013	<2.33	<2.21	<4.84	<2.54	<5.30	<2.19	<4.37	<3.69	<2.51	<2.39	<3.69	<3.69
Station 10 (Control)	09/30/2013	10/31/2013	<1.95	<1.81	<3.92	<2.02	<4.04	<2.23	<3.82	<3.28	<2.28	<2.73	<3.68	<3.68
Station 8 (Indicator)	10/31/2013	11/30/2013	<2.13	<2.17	<4.95	<2.67	<4.08	<2.16	<3.94	<4.02	<2.45	<2.39	<3.12	<3.12
Station 10 (Control)	10/31/2013	11/30/2013	<1.80	<2.02	<3.55	<1.79	<3.75	<1.99	<3.70	<3.29	<2.48	<2.33	<2.64	<2.64
Station 8 (Indicator)	11/30/2013	12/31/2013	<3.78	<4.43	<10.6	<4.52	<9.10	<5.64	<6.68	<7.93	<5.54	<5.84	<1.04	<10.4
Station 10 (Control)	11/30/2013	12/31/2013	<4.18	<2.99	<8.46	<4.27	<7.89	<4.03	<7.89	<7.40	<3.35	<4.87	<8.09	<8.09

Table 3.2

Sample Type: Surface Water Analysis: Tritium Units: pCi/l

Location	Begin Date	End Date	H-3
		Required LLD ➔	**3000**
Station 8 (Indicator)	12/31/2012	03/31/2013	435
Station 10 (Control)	12/31/2012	03/31/2013	< 282
Station 8 (Indicator)	03/31/2013	06/30/2013	2220
Station 10 (Control)	03/31/2013	06/30/2013	< 332
Station 8 (Indicator)	06/30/2013	09/30/2013	< 327
Station 10 (Control)	06/30/2013	09/30/2013	< 205
Station 8 (Indicator)	09/30/2013	12/31/2013	2940
Station 10 (Control)	09/30/2013	12/31/2013	< 300

Table 4.1

Sample Type: Drinking Water Analysis: Gross Beta, Iodine-131, Gamma Isotopic Units: pCi/l

Location	Collection Date	Gross Beta	I-131	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
Required LLD ➔		**4.0**	**1.0**	**15**	**15**	**30**	**15**	**30**	**15**	**30**	**15**	**18**	**60**	**15**
Station 14 (Indicator)	03/19/2013	< 2.49	< 0.81	< 1.35	< 1.48	< 2.89	< 1.63	< 3.19	< 1.61	< 2.90	< 1.72	< 1.59	< 1.79	< 1.79
Station 57 (Control)	03/19/2013	< 2.71	< 0.83	< 1.57	< 1.67	< 3.87	< 2.19	< 3.80	< 1.83	< 3.14	< 2.02	< 1.93	< 2.63	< 2.63
Station 14 (Indicator)	06/18/2013	< 3.65	< 0.87	< 1.65	< 1.75	< 3.58	< 1.79	< 3.55	< 1.87	< 3.49	< 2.06	< 1.92	< 3.56	< 3.56
Station 57 (Control)	06/18/2013	< 2.93	< 0.85	< 1.53	< 1.51	< 3.33	< 1.75	< 2.92	< 1.73	< 2.91	< 1.67	< 1.63	< 3.15	< 3.15
Station 14 (Indicator)	09/18/2013	< 3.47	< 0.86	< 1.87	< 1.99	< 4.16	< 2.18	< 3.95	< 1.83	< 3.09	< 2.28	< 1.96	< 3.05	< 3.05
Station 57 (Control)	09/18/2013	< 3.44	< 0.83	< 2.96	< 2.70	< 6.55	< 3.42	< 5.45	< 3.04	< 5.53	< 3.45	< 2.83	< 4.67	< 4.67
Station 14 (Indicator)	12/17/2013	< 2.57	< 0.36	< 4.25	< 3.27	< 7.12	< 5.74	< 5.36	< 5.47	< 6.08	< 4.07	< 4.01	< 4.89	< 4.89
Station 57 (Control)	12/17/2013	< 2.71	< 0.34	< 4.06	< 3.03	< 8.73	< 5.36	< 10.20	< 4.79	< 6.45	< 5.05	< 4.71	< 3.91	< 3.91

Table 4.2

Sample Type: Drinking Water Analysis: Tritium Units: pCi/l

Location	Collection Date	H-3
	Required LLD ➔	**2000**
Station 14 (Indicator)	03/19/2013	< 229
Station 57 (Control)	03/19/2013	< 229
Station 14 (Indicator)	06/18/2013	< 328
Station 57 (Control)	06/18/2013	< 331
Station 14 (Indicator)	09/18/2013	< 339
Station 57 (Control)	09/18/2013	< 339
Station 14 (Indicator)	12/17/2013	< 267
Station 57 (Control)	12/17/2013	< 268

Table 5.1

Sample Type: Sediment Analysis: Gamma Isotopic Units: pCi/kg

Location	Collection Date	Cs-134	Cs-137	Mn-54
	Required LLD ➔	**150**	**180**	**N/A**
Station 8 (Indicator)	09/23/2013	< 81.70	< 68.70	N/A
Station 16 (Control)*	09/23/2013	< 39.80	< 31.60	N/A

Table 6.1

Sample Type: Fish Analysis: Gamma Isotopic Units: pCi/kg

Location	Collection Date	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137
	Required LLD ➔	**130**	**130**	**260**	**130**	**260**	**130**	**150**
Station 8 (Indicator)	09/23/2013	< 3.78	< 4.11	< 10.00	< 4.40	< 9.71	< 4.22	< 3.92
Station 16 (Control)	09/27/2013	< 3.68	< 3.85	< 10.20	< 4.18	< 10.10	< 4.28	< 3.82

Table 7.1

Sample Type: Food Products Analysis: Iodine-131, Gamma Isotopic Units: pCi/kg

Location	Collection Date	I-131	Cs-134	Cs-137
	Required LLD ➔	**60**	**60**	**80**
Station 13 (Indicator)	06/18/2013	< 31.70	< 15.40	< 15.10
Station 55 (Control)	06/18/2013	< 22.00	< 13.80	< 13.80
Station 13 (Indicator)	07/02/2013	< 13.60	< 9.73	< 9.48
Station 55 (Control)	07/02/2013	< 18.10	< 12.10	< 11.30
Station 13 (Indicator)	08/13/2013	< 15.10	< 12.00	< 12.60
Station 55 (Control)	08/13/2013	< 12.00	< 11.60	< 10.20

Table 8.1

Sample Type: Groundwater Analysis: Iodine-131, Gamma Isotopic Units: pCi/l

Sample #	Collection Date	Gross Beta	I-131	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
Required LLD ➔		4.0	15	15	15	30	15	30	15	30	15	18	60	15
58*	02/04/2013	< 3.50	< 4.23	< 1.74	< 1.79	< 4.08	< 1.92	< 3.97	< 1.87	< 3.31	< 1.93	< 1.95	< 3.74	< 3.74
62*	02/04/2013	< 3.54	< 3.25	< 1.40	< 1.45	< 2.86	< 1.46	< 3.01	< 1.63	< 2.52	< 1.41	< 1.41	< 2.67	< 2.67
63	02/04/2013	< 3.46	< 3.56	< 1.23	< 1.48	< 3.18	< 1.53	< 2.96	< 1.52	< 2.34	< 1.53	< 1.50	< 2.38	< 2.38
64	02/04/2013	< 3.19	< 3.91	< 1.52	< 1.78	< 3.46	< 1.59	< 3.26	< 2.12	< 2.90	< 1.81	< 2.07	< 3.28	< 3.28
58*	06/05/2013	<2.04	< 3.42	< 1.67	< 1.70	< 3.46	< 1.74	< 3.14	< 1.80	< 3.16	< 1.81	< 1.85	< 3.32	< 3.32
62*	05/28/2013	< 2.95	< 7.27	< 1.75	< 2.03	< 4.21	< 1.75	< 3.41	< 2.13	< 3.50	< 2.04	< 1.87	< 4.68	< 4.68
63	05/28/2013	< 3.14	< 6.83	< 1.66	< 1.67	< 3.50	< 1.64	< 3.28	< 1.80	< 3.04	< 1.70	< 2.08	< 5.15	< 5.15
64	05/28/2013	< 2.29	< 7.56	< 1.80	< 1.98	< 4.37	< 1.47	< 3.96	< 2.27	< 3.65	< 1.90	< 2.44	< 4.86	< 4.86
58*	08/05/2013	<3.33	< 6.00	< 1.62	< 1.64	< 3.36	< 1.74	< 3.04	< 1.88	< 2.97	< 1.64	< 1.67	< 3.66	< 3.66
62*	08/05/2013	< 3.27	< 20.00	< 4.36	< 4.71	< 10.10	< 4.47	< 10.50	< 8.85	< 8.53	< 4.70	< 4.31	< 12.10	< 12.10
63	08/05/2013	< 3.79	< 7.92	< 2.09	< 2.04	< 4.83	< 2.75	< 4.44	< 2.42	< 4.11	< 2.27	< 2.28	< 5.85	< 5.85
64	08/16/2013	< 3.55	< 3.28	< 1.68	< 1.73	< 3.72	< 1.82	< 3.60	< 2.05	< 3.12	< 1.91	< 1.81	< 3.40	< 3.40
58*	11/26/2013	<3.61	< 9.61	< 1.51	< 1.83	< 3.91	< 1.61	< 3.23	< 1.88	< 3.09	< 1.70	< 1.71	< 5.73	< 5.73
62*	11/26/2013	< 3.57	< 4.43	< 2.46	< 2.69	< 5.90	< 3.17	< 5.43	< 2.78	< 4.74	< 2.92	< 2.71	< 5.45	< 5.45
63	11/26/2013	< 3.57	< 3.56	< 1.85	< 1.92	< 3.89	< 1.93	< 3.56	< 2.09	< 3.45	< 2.13	< 2.13	< 3.10	< 3.10
64	11/26/2013	< 3.48	< 4.02	< 1.72	< 1.71	< 3.42	< 1.66	< 3.49	< 1.76	< 3.19	< 1.93	< 2.16	< 3.30	< 3.30

* Identifies Control Locations

Table 8.2

Sample Type: Groundwater Analysis: Tritium Units: pCi/l

Location	Collection Date	H-3
	Required LLD ➔	**3000**
Station 58 (Control)	02/04/2013	< 250
Station 62 (Control)	02/04/2013	< 249
Station 63 (Indicator)	02/04/2013	< 253
Station 64 (Indicator)	02/04/2013	< 269
Station 58 (Control)	06/05/2013	< 374
Station 62 (Control)	05/28/2013	< 375
Station 63 (Indicator)	05/28/2013	< 378
Station 64 (Indicator)	05/28/2013	< 339
Station 58 (Control)	08/05/2013	< 289
Station 62 (Control)	08/05/2013	< 308
Station 63 (Indicator)	08/05/2013	< 291
Station 64 (Indicator)	08/16/2013	< 323
Station 58 (Control)	11/26/2013	< 331
Station 62 (Control)	11/26/2013	< 331
Station 63 (Indicator)	11/26/2013	< 340
Station 64 (Indicator)	11/26/2013	< 294

Annual Radiological Environmental Operating Report for 2013

ATTACHMENT 2

INTERLABORATORY COMPARISON PROGRAM

GEL LABORATORIES LCC REPORT

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1. Introduction

GEL Laboratories, LLC (GEL) is a privately owned environmental laboratory dedicated to providing personalized client services of the highest quality. GEL was established as an analytical testing laboratory in 1981. Now a full service lab, our analytical divisions use state of the art equipment and methods to provide a comprehensive array of organic, inorganic, and radiochemical analyses to meet the needs of our clients.

At GEL, quality is emphasized at every level of personnel throughout the company. Management's ongoing commitment to good professional practice and to the quality of our testing services to our customers is demonstrated by their dedication of personnel and resources to develop, implement, assess, and improve our technical and management operations.

The purpose of GEL's quality assurance program is to establish policies, procedures, and processes to meet or exceed the expectations of our clients. To achieve this, all personnel that support these services to our clients are introduced to the program and policies during their initial orientation, and annually thereafter during company-wide training sessions.

GEL's primary goals are to ensure that all measurement data generated are scientifically and legally defensible, of known and acceptable quality per the data quality objectives (DQOs), and thoroughly documented to provide sound support for environmental decisions. In addition, GEL continues to ensure compliance with all contractual requirements, environmental standards, and regulations established by local, state and federal authorities.

GEL administers the QA program in accordance with the Quality Assurance Plan, GL-QS-B-001. Our Quality Systems include all quality assurance (QA) policies and quality control (QC) procedures necessary to plan, implement, and assess the work we perform. GEL's QA Program establishes a quality management system (QMS) that governs all of the activities of our organization.

This report entails the quality assurance program for the proficiency testing and environmental monitoring aspects of GEL for 2013. GEL's QA Program is designed to monitor the quality of analytical processing associated with environmental, radiobioassay, effluent (10 CFR Part 50), and waste (10 CFR Part 61) sample analysis.

This report covers the category of Radiological Environmental Monitoring Program (REMP) and includes:

- Intra-laboratory QC results analyzed during 2013.
- Inter-laboratory QC results analyzed during 2013 where known values were available.

2. Quality Assurance Programs for Inter-laboratory, Intra-laboratory and Third Party Cross-Check

In addition to internal and client audits, our laboratory participates in annual performance evaluation studies conducted by independent providers. We routinely participate in the following types of performance audits:

- Proficiency testing and other inter-laboratory comparisons
- Performance requirements necessary to retain Certifications
- Evaluation of recoveries of certified reference and in-house secondary reference materials using statistical process control data.
- Evaluation of relative percent difference between measurements through SPC data.

We also participate in a number of proficiency testing programs for federal and state agencies and as required by contracts. It is our policy that no proficiency evaluation samples be analyzed in any special manner. Our annual performance evaluation participation generally includes a combination of studies that support the following:

- US Environmental Protection Agency Discharge Monitoring Report, Quality Assurance Program (DMR-QA). Annual national program sponsored by EPA for laboratories engaged in the analysis of samples associated with the NPDES monitoring program. Participation is mandatory for all holders of NPDES permits. The permit holder must analyze for all of the parameters listed on the discharge permit. Parameters include general chemistry, metals, BOD/COD, oil and grease, ammonia, nitrates, etc.

- Department of Energy Mixed Analyte Performance Evaluation Program (MAPEP). A semiannual program developed by DOE in support of DOE contractors performing waste analyses. Participation is required for all laboratories that perform environmental analytical measurements in support of environmental management activities. This program includes radioactive isotopes in water, soil, vegetation and air filters.

- ERA's MRAD-Multimedia Radiochemistry Proficiency test program. This program is for labs seeking certification for radionuclides in wastewater and solid waste. The program is conducted in strict compliance with USEPA National Standards for Water Proficiency study.

- ERA's InterLaB RadCheM Proficiency Testing Program for radiological analyses. This program completes the process of replacing the USEPA EMSL-LV Nuclear Radiation Assessment Division program discontinued in 1998. Laboratories seeking certification for radionuclide analysis in drinking water also use the study. This program is conducted in strict compliance with the USEPA National Standards for Water Proficiency Testing Studies. This program encompasses Uranium by EPA method 200.8 (for drinking water certification in Utah/Primary NELAP), gamma emitters, Gross Alpha/Beta, Iodine-131, naturally occurring radioactive isotopes, Strontium-89/90, and Tritium.

- ERA's Water Pollution (WP) biannual program for waste methodologies includes parameters for both organic and inorganic analytes.

- ERA's Water Supply (WS) biannual program for drinking water methodologies includes parameters for organic and inorganic analytes.

- Environmental Cross-Check Program administered by Eckert & Ziegler Analytics, Inc. This program encompasses radionuclides in water, soil, milk, naturally occurring radioactive isotopes in soil and air filters.

GEL procures single-blind performance evaluation samples from Eckert & Ziegler Analytics to verify the analysis of sample matrices processed at GEL. Samples are received on a quarterly basis. GEL's Third-Party Cross-Check Program provides environmental matrices encountered in a typical nuclear utility REMP. The Third-Party Cross-Check Program is intended to meet or exceed the inter-laboratory comparison program requirements discussed in NRC Regulatory Guide 4.15. Once performance evaluation samples have been prepared in accordance with the instructions provided by the PT provider, samples are managed and analyzed in the same manner as environmental samples from GEL's clients.

3. Quality Assurance Program for Internal and External Audits

During each annual reporting period, at least one internal assessment of each area of the laboratory is conducted in accordance with the pre-established schedule from Standard Operating Procedure for the Conduct of Quality Audits, GL-QS-E-001. The annual internal audit plan is reviewed for adequacy and includes the scheduled frequency and scope of quality control actions necessary to GEL's QA program. Internal audits are conducted at least annually in accordance with a schedule approved by the Quality Systems Director. Supplier audits are contingent upon the categorization of the supplier, and may or may not be conducted prior to the use of a supplier or subcontractor. Type I suppliers and subcontractors, regardless of how they were initially qualified, are re-evaluated at least once every three years.

In addition, prospective customers audit GEL during pre-contract audits. GEL hosts several external audits each year for both our clients and other programs. These programs include environmental monitoring, waste characterization, and radiobioassay. The following list of programs may audit GEL at least annually or up to every three years depending on the program.

- NELAC, National Environmental Laboratory Accreditation Program
- DOECAP, U.S. Department of Energy Consolidated Audit Program
- DOELAP, U.S. Department of Energy Laboratory Accreditation Program
- DOE QSAS, U.S. Department of Energy, Quality Systems for Analytical Services
- ISO/IEC 17025:2005
- A2LA, American Association for Laboratory Accreditation
- DOD ELAP, US Department of Defense Environmental Accreditation Program
- NUPIC, Nuclear Procurement Issues Committee
- South Carolina Department of Health and Environmental Control (SC DHEC)

The annual radiochemistry laboratory internal audit (13-RAD-001) was conducted in August 2013. Three (3) findings, two (2) observations, and one (1) recommendation resulted from this assessment. By October, 2013, each finding was closed and appropriate laboratory staff addressed each observation and recommendation.

4. Performance Evaluation Acceptance Criteria for Environmental Sample Analysis

GEL utilized an acceptance protocol based upon two performance models. For those inter-laboratory programs that already have established performance criteria for bias (i.e., MAPEP, and ERA/ELAP), GEL will utilize the criteria for the specific program. For intra-laboratory or third party quality control programs that do not have a specific acceptance criteria (i.e. the Eckert-Ziegler Analytics Environmental Cross-check Program), results will be evaluated in accordance with GEL's internal acceptance criteria.

5. Performance Evaluation Samples

Performance Evaluation (PE) results and internal quality control sample results are evaluated in accordance with GEL acceptance criteria. The first criterion concerns bias, which is defined as the deviation of any one result from the known value. The second criterion concerns precision, which deals with the ability of the measurement to be replicated by comparison of an individual result with the mean of all results for a given sample set.

At GEL, we also evaluate our analytical performance on a regular basis through statistical process control (SPC) acceptance criteria. Where feasible, this criterion is applied to both measures of precision and accuracy and is specific to sample matrix. We establish environmental process control limits at least annually.

For Radiochemistry analysis, quality control evaluation is based on static limits rather than those that are statistically derived. Our current process control limits are maintained in GEL's AlphaLIMS. We also measure precision with matrix duplicates and/or matrix spike duplicates. The upper and lower control limits (UCL and LCL respectively) for precision are plus or minus three times the standard deviation from the mean of a series of relative percent differences. The static precision criteria for radiochemical analyses are 0 - 20%, for activity levels exceeding the contract required detection limit (CRDL).

6. Quality Control Program for Environmental Sample Analysis

GEL's internal QA Program is designed to include QC functions such as instrumentation calibration checks (to insure proper instrument response), blank samples, instrumentation backgrounds, duplicates, as well as overall staff qualification analyses and statistical process controls. Both quality control and qualification analyses samples are used to be as similar as the matrix type of those samples submitted for analysis by the various laboratory clients. These performance test samples (or performance evaluation samples) are either actual sample submitted in duplicate in order to evaluate the precision of laboratory measurements, or fortified blank samples, which have been given a known quantity of a radioisotope that is in the interest to GEL's clients.

Accuracy (or Bias) is measured through laboratory control samples and/or matrix spikes, as well as surrogates and internal standards. The UCLs and LCLs for accuracy are plus or minus three times the standard deviation from the mean of a series of recoveries. The static limit for radiochemical analyses is 75 - 125%. Specific instructions for out-of-control situations are provided in the applicable analytical SOP.

GEL's Laboratory Control Standard (LCS) is an aliquot of reagent water or other blank matrix to which known quantities of the method analytes are added in the laboratory. The LCS is analyzed exactly like a sample, and its purpose is to determine whether the methodology is in control, and whether the laboratory is capable of making accurate and precise measurements. Some methods may refer to these samples as Laboratory Fortified Blanks (LFB). The requirement for recovery is between 75 and 125% for radiological analyses excluding drinking water matrix.

$$\text{Bias (\%)} = \frac{\text{observed concentration}}{\text{(known concentration)}} * 100\ \%$$

Precision is a data quality indicator of the agreement between measurements of the same property, obtained under similar conditions, and how well they conform to themselves. Precision is usually expressed as standard deviation, variance or range in either absolute or relative (percentage) terms.

GEL's laboratory duplicate (DUP or LCSD) is an aliquot of a sample taken from the same container and processed in the same manner under identical laboratory conditions. The aliquot is analyzed independently from the parent sample and the results are compared to measure precision and accuracy.

If a sample duplicate is analyzed, it will be reported as Relative Percent Difference (RPD). The RPD must be 20 percent or less, if both samples are greater than 5 times the MDC. If both results are less than 5 times MDC, then the RPD must be equal to or less than 100%. If one result is above the MDC and the other is below the MDC, then the RPD can be calculated using the MDC for the result of the one below the MDC. The RPD must be 100% or less. In the situation where both results are above the MDC but one result is greater than 5 times the MDC and the other is less than 5 times the MDC, the RPD must be less than or equal to 20%. If both results are below MDC, then the limits on % RPD are not applicable.

$$\text{Difference (\%)} = \frac{\text{high duplicate result – low duplicate result}}{\text{(average of results)}} * 100\ \%$$

7. Summary of Data Results

During 2013, forty-four (44) radioisotopes associated with seven (7) matrix types were analyzed under GEL's Performance Evaluation program in participation with ERA, MAPEP, and Eckert & Ziegler Analytics. Matrix types were representative of client analyses performed during 2012. Of the four hundred twenty-three (423) total results reported, 97% (410 of 423) were found to be acceptable. The list below contains the type of matrix evaluated by GEL.

- Air Filter
- Cartridge
- Water
- Milk
- Soil
- Liquid
- Vegetation

Graphs are provided in Figures 1-9 of this report to allow for the evaluation of trends or biases. These graphs include radioisotopes Cobalt-60, Cesium-137, Tritium, Strontium-90, Gross Alpha, Gross Beta, Iodine-131, Americium-241, and Plutonium-238.

8. Summary of Participation in the Eckert & Ziegler Analytics Environmental Cross-Check Program

Eckert & Ziegler Analytics provided samples for eighty-nine (89) individual environmental analyses. The accuracy of each result reported to Eckert & Ziegler Analytics, Inc. is measured by the ratio of GEL's result to the known value. All results fell within GEL's acceptance criteria (100%).

9. Summary of Participation in the MAPEP Monitoring Program

MAPEP Series 27, 28 and 29 were analyzed by the laboratory. Of the one hundred thirty-eight (138) analyses, 96% (133 out of 138) of all results fell within the PT provider's acceptance criteria. Five analytical failures occurred: Uranium-238/235 and Total Uranium in vegetation by ICP/MS, and Uranium-234/233, and Urabuyn-238 by Alpha Spectroscopy.

For the corrective actions associated with MAPEP Series 28, refer to CARR130513-789 which is detailed in Table 8.

10. Summary of Participation in the ERA MRaD PT Program

The ERA MRad program provided samples (MRAD-18 and MRAD-19) for one hundred fifty (150) individual environmental analyses. One hundred forty-five (145) of the 150 analyses fell within the PT provider's acceptance criteria (97%). Five analytical failures occurred: Cesium-134, Cesium-137 and Zinc-65 in soil, and Uranium-234 and Total Uranium in vegetation.

For the corrective actions associated with MRAD-18 and MRAD-19, refer to CARR130522-791 and CARR131205-845 which are detailed in Table 8.

11. Summary of Participation in the ERA PT Program

The ERA program provided samples (RAD-92 and RAD-94) for forty-six (46) individual environmental analyses. Of the 44 analyses, 93% (43 out of 44) of all results fell within the PT provider's acceptance criteria. Two analytical failures occurred: Gross Alpha and Strontium-89 in water.

For the corrective actions associated with RAD-92 refer to corrective actions CARR130826-810 (Table 8).

12. Corrective Action Request and Report (CARR)

There are two categories of corrective action at GEL. One is corrective action implemented at the analytical and data review level in accordance with the analytical SOP. The other is formal corrective action documented by the Quality Systems Team in accordance with GL-QS-E-002. A formal corrective action is initiated when a nonconformance reoccurs or is so significant that permanent elimination or prevention of the problem is required. Formal corrective action investigations include root cause analysis.

GEL includes quality requirements in most analytical standard operating procedures to ensure that data are reported only if the quality control criteria are met or the quality control measures that did not meet the acceptance criteria are documented. A formal corrective action is implemented according to GL-QS-E-002 for Conducting Corrective/Preventive Action and Identifying Opportunities for Improvement. Recording and documentation is performed following guidelines stated in GL-QS-E-012 for Client NCR Database Operation.

Any employee at GEL can identify and report a nonconformance and request that corrective action be taken. Any GEL employee can participate on a corrective action team as requested by the QS team or Group Leaders. The steps for conducting corrective action are detailed in GL-QS-E-002. In the event that correctness or validity of the laboratory's test results in doubt, the laboratory will take corrective action. If investigations show that the results have been impacted, affected clients will be informed of the issue in writing within five (5) calendar days of the discovery.

Table 8 provides the status of CARRs for radiological performance testing during 2013. It has been determined that causes of the failures did not impact any data reported to our clients.

13. References

1. GEL Quality Assurance Plan, GL-QS-B-001
2. GEL Standard Operating Procedure for the Conduct of Quality Audits, GL-QS-E-001
3. GEL Standard Operating Procedure for Conducting Corrective/Preventive Action and Identifying Opportunities for Improvement, GL-QS-E-002
4. GEL Standard Operating Procedure for AlphaLIMS Documentation of Nonconformance Reporting and Dispositioning and Control of Nonconforming Items, GL-QS-E-004
5. GEL Standard Operating Procedure for Handling Proficiency Evaluation Samples, GL-QS-E-013

6. GEL Standard Operating Procedure for Quality Assurance Measurement Calculations and Processes, GL-QS-E-014
7. 40 CFR Part 136 Guidelines Establishing Test Procedures for the Analysis of Pollutants
8. ISO/IEC 17025-2005, General Requirements for the Competence of Testing and Calibration Laboratories
9. ANSI/ASQC E4-1994, Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs, American National Standard
10. 2003 NELAC Standard, National Environmental Laboratory Accreditation Program
11. 2009 TNI Standard, The NELAC Institute, National Environmental Accreditation Program
12. MARLAP, Multi-Agency Radiological Laboratory Analytical Protocols
13. 10 CFR Part 21, Reporting of Defects and Noncompliance
14. 10 CFR Part 50 Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants
15. 10 CFR Part 61, Licensing Requirements for Land Disposal and Radioactive Waste NRC REG Guide 4.15 and NRC REG Guide 4.8

TABLE 1

2013 RADIOLOGICAL PROFICIENCY TESTING RESULTS AND ACCEPTANCE CRITERIA

PT Provider	Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MAPEP	1st/ 2013	02/27/13	GENE01-13-RdFR1	Filter	Bq/sample	Uranium-234/233	0.0143	0.0155	0.0109-0.0202	Acceptable
MAPEP	1st/ 2013	02/27/13	GENE01-13-RdFR1	Filter	Bq/sample	Uranium-238	0.0999	0.098	0.069-0.127	Acceptable
EZA	4th/2012	02/01/13	E10323	Cartridge	pCi	Iodine-131	7.31E+01	7.29E+01	1.00	Acceptable
EZA	4th/2012	02/01/13	E10324	Milk	pCi/L	Strontium-89	9.89E+00	1.38E+01	0.72	Acceptable
EZA	4th/2012	02/01/13	E10324	Milk	pCi/L	Strontium-90	9.83E+00	1.48E+01	1.02	Acceptable
EZA	4th/2012	02/01/13	E10325	Milk	pCi/L	Iodine-131	9.57E+01	9.00E+01	1.06	Acceptable
EZA	4th/2012	02/01/13	E10325	Milk	pCi/L	Chromium-51	3.67E+02	3.48E+02	1.06	Acceptable
EZA	4th/2012	02/01/13	E10325	Milk	pCi/L	Cesium-134	1.54E+02	1.65E+02	0.93	Acceptable
EZA	4th/2012	02/01/13	E10325	Milk	pCi/L	Cesium-137	1.18E+02	1.17E+02	1.01	Acceptable
EZA	4th/2012	02/01/13	E10325	Milk	pCi/L	Cobalt-58	9.85E+01	9.85E+01	1	Acceptable
EZA	4th/2012	02/01/13	E10325	Milk	pCi/L	Manganese-54	1.16E+02	1.16E+02	1	Acceptable
EZA	4th/2012	02/01/13	E10325	Milk	pCi/L	Iron-59	1.33E+02	1.16E+02	1.15	Acceptable
EZA	4th/2012	02/01/13	E10325	Milk	pCi/L	Zinc-65	3.19E+02	2.91E+02	1.09	Acceptable
EZA	4th/2012	02/01/13	E10325	Milk	pCi/L	Cobalt-60	1.73E+02	1.70E+02	1.02	Acceptable
EZA	4th/2012	02/01/13	E10325	Milk	pCi/L	Cesium-141	5.38E+01	5.10E+01	1.05	Acceptable
EZA	4th/2012	02/01/13	E10380	Water	pCi/L	Iodine-131	7.47E+01	7.25E+01	1.03	Acceptable
EZA	4th/2012	02/01/13	E10380	Water	pCi/L	Chromium-51	3.81E+02	3.62E+02	1.05	Acceptable
EZA	4th/2012	02/01/13	E10380	Water	pCi/L	Cesium-134	1.57E+02	1.73E+02	0.91	Acceptable
EZA	4th/2012	02/01/13	E10380	Water	pCi/L	Cesium-137	1.25E+02	1.22E+02	1.03	Acceptable
EZA	4th/2012	02/01/13	E10380	Water	pCi/L	Cobalt-58	1.02E+02	1.03E+02	0.99	Acceptable
EZA	4th/2012	02/01/13	E10380	Water	pCi/L	Manganese-54	1.28E+02	1.21E+02	1.06	Acceptable
EZA	4th/2012	02/01/13	E10380	Water	pCi/L	Iron-59	1.38E+02	1.21E+02	1.14	Acceptable
EZA	4th/2012	02/01/13	E10380	Water	pCi/L	Zinc-65	2.13E+02	1.94E+02	1.1	Acceptable
EZA	4th/2012	02/01/13	E10380	Water	pCi/L	Cobalt-60	1.80E+02	1.77E+02	1.01	Acceptable
ERA	1st/ 2013	02/28/13	RAD - 92	Water	pCi/L	Barium-133	55.4	54.4	44.9-60.2	Acceptable

PT Provider	Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
ERA	1st/ 2013	02/28/13	RAD - 92	Water	pCi/L	Cesium-134	27.2	29.9	23.4-32.9	Acceptable
ERA	1st/ 2013	02/28/13	RAD - 92	Water	pCi/L	Cesium-137	74.3	75.3	67.8-85.5	Acceptable
ERA	1st/ 2013	02/28/13	RAD - 92	Water	pCi/L	Cobalt-60	89.0	97.7	87.9-110	Acceptable
ERA	1st/ 2013	02/28/13	RAD - 92	Water	pCi/L	Zinc-65	126	114	103-136	Acceptable
ERA	1st/ 2013	02/28/13	RAD - 92	Water	pCi/L	Gross Alpha	26.0	24.8	12.5-33.0	Acceptable
ERA	1st/ 2013	02/28/13	RAD - 92	Water	pCi/L	Gross Beta	19.4	19.3	11.3-27.5	Acceptable
ERA	1st/ 2013	02/28/13	RAD - 92	Water	pCi/L	Gross Alpha	31.4	24.8	12.5-33.0	Acceptable
ERA	1st/ 2013	02/28/13	RAD - 92	Water	pCi/L	Radium-226	10.4	9.91	7.42-11.6	Acceptable
ERA	1st/ 2013	02/28/13	RAD - 92	Water	pCi/L	Radium-228	4.84	5.22	3.14-6.96	Acceptable
ERA	1st/ 2013	02/28/13	RAD - 92	Water	pCi/L	Uranium (Nat)	6.43	5.96	4.47-7.13	Acceptable
ERA	1st/ 2013	02/28/13	RAD - 92	Water	ug/L	Uranium (Nat) mass	9.59	8.69	6.50-10.4	Acceptable
ERA	1st/ 2013	02/28/13	RAD - 92	Water	pCi/L	Radium-226	11.60	9.91	7.42-11.6	Acceptable
ERA	1st/ 2013	02/28/13	RAD - 92	Water	pCi/L	Radium-228	5.13	5.22	3.14-6.96	Acceptable
ERA	1st/ 2013	02/28/13	RAD - 92	Water	pCi/L	Uranium (Nat)	5.95	5.96	4.47-7.13	Acceptable
ERA	1st/ 2013	02/28/13	RAD - 92	Water	ug/L	Uranium (Nat) mass	9.95	8.69	6.50-10.4	Acceptable
ERA	1st/ 2013	02/28/13	RAD - 92	Water	pCi/L	Tritium	1430	1320	1040-1480	Acceptable
ERA	1st/ 2013	02/28/13	RAD - 92	Water	pCi/L	Strontium-89	47.5	48	37.6-55.3	Acceptable
ERA	1st/ 2013	02/28/13	RAD - 92	Water	pCi/L	Strontium-90	35.9	39.8	29.2-45.8	Acceptable
ERA	1st/ 2013	02/28/13	RAD - 92	Water	pCi/L	Strontium-89	42.9	48	37.6-55.3	Acceptable
ERA	1st/ 2013	02/28/13	RAD - 92	Water	pCi/L	Strontium-90	34.6	39.8	29.2-45.8	Acceptable
ERA	1st/ 2013	02/28/13	RAD - 92	Water	pCi/L	Iodine-131	23.6	22.7	18.8-27.0	Acceptable
ERA	1st/ 2013	02/28/13	RAD - 92	Water	pCi/L	Iodine-131	27	22.7	18.8-27.0	Acceptable
EZA	1st/ 2013	04/25/13	E10469	Cartridge	pCi	Iodine-131	9.38E+01	9.27E+01	1.01	Acceptable
EZA	1st/ 2013	04/25/13	E10470	Milk	pCi/L	Strontium-89	1.07E+02	9.97E+01	1.07	Acceptable
EZA	1st/ 2013	04/25/13	E10470	Milk	pCi/L	Strontium-90	1.18E+01	1.10E+01	1.07	Acceptable
EZA	1st/ 2013	04/25/13	E10471	Milk	pCi/L	Iodine-131	3.54E+00	1.67E+00	1.12	Acceptable
EZA	1st/ 2013	04/25/13	E10471	Milk	pCi/L	Cerium-141	2.00E+01	1.87E+01	1.07	Acceptable
EZA	1st/ 2013	04/25/13	E10471	Milk	pCi/L	Chromium-51	5.09E+01	4.72E+01	1.08	Acceptable

PT Provider	Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
EZA	1st/ 2013	04/25/13	E10471	Milk	pCi/L	Cesium-134	2.06E+02	2.14E+02	0.96	Acceptable
EZA	1st/ 2013	04/25/13	E10471	Milk	pCi/L	Cesium-137	2.83E+02	2.66E+02	1.07	Acceptable
EZA	1st/ 2013	04/25/13	E10471	Milk	pCi/L	Cobalt-58	2.19E+02	2.08E+02	1.05	Acceptable
EZA	1st/ 2013	04/25/13	E10471	Milk	pCi/L	Mn-54	2.21E+02	2.08E+02	1.06	Acceptable
EZA	1st/ 2013	04/25/13	E10471	Milk	pCi/L	Iron-59	2.78E+02	2.52E+02	1.1	Acceptable
EZA	1st/ 2013	04/25/13	E10471	Milk	pCi/L	Zinc-65	3.39E+02	3.01E+02	1.13	Acceptable
EZA	1st/ 2013	04/25/13	E10471	Milk	pCi/L	Cobalt-60	4.02E+02	4.00E+02	1.01	Acceptable
EZA	1st/ 2013	04/25/13	E10472	Water	pCi/L	Iodine-131	1.12E+02	9.28E+01	1.21	Acceptable
EZA	1st/ 2013	04/25/13	E10472	Water	pCi/L	Cerium-141	1.88E+02	1.79E+02	1.05	Acceptable
EZA	1st/ 2013	04/25/13	E10472	Water	pCi/L	Chromium-51	4.84E+02	4.52E+02	1.07	Acceptable
EZA	1st/ 2013	04/25/13	E10472	Water	pCi/L	Cesium-134	1.96E+02	2.05E+02	0.96	Acceptable
EZA	1st/ 2013	04/25/13	E10472	Water	pCi/L	Cesium-137	2.71E+02	2.54E+02	1.07	Acceptable
EZA	1st/ 2013	04/25/13	E10472	Water	pCi/L	Cobalt-58	2.03E+02	1.99E+02	1.02	Acceptable
EZA	1st/ 2013	04/25/13	E10472	Water	pCi/L	Mn-54	2.15E+02	1.99E+02	1.08	Acceptable
EZA	1st/ 2013	04/25/13	E10472	Water	pCi/L	Iron-59	2.67E+02	2.41E+02	1.11	Acceptable
EZA	1st/ 2013	04/25/13	E10472	Water	pCi/L	Zinc-65	3.14E+02	2.88E+02	1.09	Acceptable
EZA	1st/ 2013	04/25/13	E10472	Water	pCi/L	Cobalt-60	3.92E+02	3.83E+02	1.02	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-27-GrF28	Filter	Bq/sample	Gross Alpha	0.656	1.20	0.36-2.04	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-27-GrF29	Filter	Bq/sample	Gross Beta	0.954	0.85	0.43-1.28	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Americium-241	118	113	79-147	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Cesium-134	829	887	621-1153	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Cesium-137	623	587	411-763	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Cobalt-57	1.04	0	False Pos Test	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Cobalt-60	737	691	484-898	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Iron-55	-0.380	0	False Pos Test	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Manganese-54	0.760	0	False Pos Test	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Nickel-63	719	670	469-871	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Plutonium-238	0.571	0.52	Sens. Eval.	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Plutonium-239/240	77.70	79.5	55.7-103.4	Acceptable

PT Provider	Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Potassium-40	713	625	438-813	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Strontium-90	693.0	628	440-816	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Technetium-99	419.0	444	311-577	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Uranium-234/233	60.0	62.5	43.8-81.3	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Uranium-238	274	281	197-365	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Zinc-65	1130	995	697-1294	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaW28	Water	Bq/L	Americium-241	0.690	0.689	0.428-0.896	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaW28	Water	Bq/L	Cesium-134	21.1	24.4	17.1-31.7	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaW28	Water	Bq/L	Cesium-137	0.10	0.0	False Pos Test	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaW28	Water	Bq/L	Cobalt-57	31.0	30.9	21.6-40.2	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaW28	Water	Bq/L	Cobalt-60	19.4	19.6	13.7-25.4	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaW28	Water	Bq/L	Hydrogen-3	517	507	355-659	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaW28	Water	Bq/L	Iron-55	39.7	44.0	30.8-57.2	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaW28	Water	Bq/L	Manganese-54	28.0	27.4	19.2-35.6	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaW28	Water	Bq/L	Nickel-63	32.9	33.4	23.4-43.4	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaW28	Water	Bq/L	Plutonium-238	0.825	0.884	0.619-1.149	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaW28	Water	Bq/L	Pu-239/240	0.0162	0.0096	Sens. Eval.	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaW28	Water	Bq/L	Potassium-40	-0.471	0	False Pos Test	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaW28	Water	Bq/L	Strontium-90	12.5	10.5	7.4-13.7	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaW28	Water	Bq/L	Technetium-99	12.9	13.1	9.2-17.0	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaW28	Water	Bq/L	Uranium-234/233	0.289	0.315	0.221-0.410	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaW28	Water	Bq/L	Uranium-238	1.81	1.95	1.37-2.54	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-MaW28	Water	Bq/L	Zinc-65	32.8	30.4	21.3-39.5	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-GrW28	Water	Bq/L	Gross Alpha	2.60	2.31	0.69-3.93	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-GrW28	Water	Bq/L	Gross Beta	14.2	13.0	6.5-19.5	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-XaW28	Water	Bq/L	Iodine-129	5.94	6.06	4.24-7.88	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdF28	Filter	ug/sample	Uranium-235	0.036	0.036	0.025-0.047	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdF28	Filter	ug/sample	Uranium-238	18.0	18.6	13.0-24.2	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdF28	Filter	ug/sample	Uranium-Total	17.7	18.6	13.0-24.2	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdF28	Filter	ug/sample	Americium-241	0.106	0.104	0.073-0.135	Acceptable

PT Provider	Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Cesium-134	1.75	1.78	1.25-2.31	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Cesium-137	2.71	2.60	1.82-3.38	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Cobalt-57	2.51	2.36	1.65-3.07	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Cobalt-60	0.005	0.00	False Pos Test	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Manganese-54	4.43	4.26	2.98-5.54	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Plutonium-238	0.124	0.127	0.089-0.165	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Pu-239/240	0.118	0.1210	0.085-0.157	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Strontium-90	1.54	1.49	1.04-1.94	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Uranium-234/233	0.0342	0.0318	0.0223-0.0413	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Uranium-238	0.230	0.231	0.162-0.300	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Zinc-65	3.38	3.13	2.19-4.07	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-GrF28	Filter	Bq/sample	Gross Alpha	0.656	1.20	0.36-2.04	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-GrF28	Filter	Bq/sample	Gross Beta	0.95	0.85	0.43-1.28	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Americium-241	0.106	0.104	0.073-0.135	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdV28	Vegetation	ug/sample	Uranium-235	0.0029	0.001	0.0009-0.0017	Not Accept.
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdV28	Vegetation	ug/sample	Uranium-238	0.419	0.180	0.13-0.23	Not Accept.
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdV28	Vegetation	ug/sample	Uranium-Total	0.4219	0.180	0.13-0.23	Not Accept.
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdV28	Vegetation	ug/sample	Americium-241	0.1350	0.140	0.098-0.182	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdV28	Vegetation	Bq/sample	Cesium-134	0.0525	0.00	False Pos Test	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdV28	Vegetation	Bq/sample	Cesium-137	7.13	6.87	4.81-8.93	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdV28	Vegetation	Bq/sample	Cobalt-57	8.86	8.68	6.08-11.28	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdV28	Vegetation	Bq/sample	Cobalt-60	6.07	5.85	4.10-7.61	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdV28	Vegetation	Bq/sample	Manganese-54	-0.002	0.00	False Pos Test	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdV28	Vegetation	Bq/sample	Plutonium-238	0.110	0.110	0.077-0.143	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdV28	Vegetation	Bq/sample	Pu-239/240	0.113	0.123	0.086-0.160	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdV28	Vegetation	Bq/sample	Strontium-90	1.358	1.64	1.15-2.13	Acceptable
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdV28	Vegetation	Bq/sample	Uranium-234/233	0.0081	0.0038	Sens. Eval.	Not Accept.
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdV28	Vegetation	Bq/sample	Uranium-238	0.00489	0.002	Sens. Eval.	Not Accept.
MAPEP	2nd/2013	05/13/13	MAPEP-13-RdV28	Vegetation	Bq/sample	Zinc-65	6.59	6.25	4.38-8.13	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Soil	pCi/kg	Actinium-228	1500	1240	795-1720	Acceptable

PT Provider	Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
ERA	2nd/2013	05/22/13	MRAD-18	Soil	pCi/kg	Americium-241	225	229	134-297	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Soil	pCi/kg	Bismuth-212	1250	1240	330-1820	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Soil	pCi/kg	Bismuth-214	4410	3660	2200-5270	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Soil	pCi/kg	Cesium-134	7850	6370	4160-7650	Not Accept.
ERA	2nd/2013	05/22/13	MRAD-18	Soil	pCi/kg	Cesium-137	8070	6120	4690-7870	Not Accept.
ERA	2nd/2013	05/22/13	MRAD-18	Soil	pCi/kg	Cobalt-60	10300	7920	5360-10900	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Soil	pCi/kg	Lead-212	1290	1240	812-1730	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Soil	pCi/kg	Lead-214	4690	3660	2140-5460	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Soil	pCi/kg	Manganese-54	<63.4	<1000	0-1000	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Soil	pCi/kg	Plutonium-238	651	788.00	474-1090	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Soil	pCi/kg	Plutonium-239	320	366.00	239-506	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Soil	pCi/kg	Potassium-40	10300	10300	7520-13800	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Soil	pCi/kg	Strontium-90	6730	8530	3250-13500	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Soil	pCi/kg	Thorium-234	3290	1900	601-3570	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Soil	pCi/kg	Zinc-65	1910	1400	1110-1860	Not Accept.
ERA	2nd/2013	05/22/13	MRAD-18	Soil	pCi/kg	Strontium-90	6730	8530	3250-13500	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Soil	pCi/kg	Uranium-234	1210	1920	1170-2460	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Soil	pCi/kg	Uranium-238	1630	1900	1180-2410	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Soil	pCi/kg	Uranium-Total	2840	3920	2130-5170	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Soil	ug/kg	Uranium-Total(mass)	4150	5710	3150-7180	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Vegetation	pCi/kg	Americium-241	629	553	338-735	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Vegetation	pCi/kg	Cesium-134	1400	1240	797-1610	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Vegetation	pCi/kg	Cesium-137	687	544	394-757	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Vegetation	pCi/kg	Cobalt-60	2410	1920	1320-2680	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Vegetation	pCi/kg	Curium-244	1420	1340	657-2090	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Vegetation	pCi/kg	Manganese-54	<47.4	<300	0.00-300	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Vegetation	pCi/kg	Plutonium-238	2060	1980	1180-2710	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Vegetation	pCi/kg	Plutonium-239	2230	2260	1390-3110	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Vegetation	pCi/kg	Potassium-40	35600	31900	23000-44800	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Vegetation	pCi/kg	Strontium-90	3720	3840	2190-5090	Acceptable

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ERA	2nd/2013	05/22/13	MRAD-18	Vegetation	pCi/kg	Uranium-234	2650	2460	1620-3160	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Vegetation	pCi/kg	Uranium-238	2580	2440	1630-3100	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Vegetation	pCi/kg	Uranium-Total	5361	5010	3390-6230	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Vegetation	ug/kg	Uranium-Total(mass)	7740	7310	4900-9280	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Vegetation	pCi/kg	Zinc-65	1150	878	633-1230	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Filter	pCi/Filter	Americium-241	62.9	66.8	41.2-90.4	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Filter	pCi/Filter	Cesium-134	1080	1110	706-1380	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Filter	pCi/Filter	Cesium-137	971	940	706-1230	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Filter	pCi/Filter	Cobalt-60	217	214	166-267	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Filter	pCi/Filter	Iron-55	224	225	69.8-440	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Filter	pCi/Filter	Manganese-54	<5.27	<50.0	0-50.0	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Filter	pCi/Filter	Plutonium-238	48.0	50.1	34.3-65.9	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Filter	pCi/Filter	Plutonium-239	62.7	65.2	47.2-85.2	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Filter	pCi/Filter	Strontium-90	139	138	67.4-207	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Filter	pCi/Filter	Uranium-234	54.5	59.4	36.8-89.6	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Filter	pCi/Filter	Uranium-238	58.5	58.9	38.1-81.4	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Filter	pCi/Filter	Uranium-Total	117	121	67.0-184	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Filter	ug/Filter	Uranium-Total(mass)	176	176	113-248	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Filter	pCi/Filter	Zinc-65	222	199	142-275	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Filter	pCi/Filter	Gross Alpha	55.5	42.3	14.2-65.7	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Filter	pCi/Filter	Gross Beta	31	25.1	15.9-36.6	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Water	pCi/L	Americium-241	118	118	79.5-158	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Water	pCi/L	Cesium-134	1320	1400	1030-1610	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Water	pCi/L	Cesium-137	1900	1880	1600-2250	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Water	pCi/L	Cobalt-60	2370	2270	1970-2660	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Water	pCi/L	Iron-55	812	712	424-966	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Water	pCi/L	Manganese-54	<7.6	<100	0.00-100	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Water	pCi/L	Plutonium-238	91	99	73.1-123	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Water	pCi/L	Plutonium-239	161	185	144-233	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Water	pCi/L	Strontium-90	144	137	89.2-181	Acceptable

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ERA	2nd/2013	05/22/13	MRAD-18	Water	pCi/L	Uranium-234	47.3	48.8	36.7-62.9	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Water	pCi/L	Uranium-238	50.8	48.4	36.9-59.4	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Water	pCi/L	Uranium-Total	98.1	99.5	73.1-129	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Water	ug/L	Uranium-Total(mass)	152	145	116-175	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Water	pCi/L	Zinc-65	428	384	320-484	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Water	pCi/L	Gross Alpha	138.0	130	46.2-201	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Water	pCi/L	Gross Beta	87	78.9	45.2-117	Acceptable
ERA	2nd/2013	05/22/13	MRAD-18	Water	pCi/L	Tritium	13100	12300	8240-17500	Acceptable
EZA	2nd/2013	08/02/13	E10577	Cartridge	pCi	Iodine-131	9.16E+01	9.55E+01	1.02	Acceptable
EZA	2nd/2013	08/02/13	E10578	Milk	pCi/L	Strontium-89	9.27E+01	9.04E+01	0.98	Acceptable
EZA	2nd/2013	08/02/13	E10578	Milk	pCi/L	Strontium-90	1.20E+01	1.70E+01	0.7	Acceptable
EZA	2nd/2013	08/02/13	E10579	Milk	pCi/L	Iodine-131	9.86E+01	9.55E+01	1.03	Acceptable
EZA	2nd/2013	08/02/13	E10579	Milk	pCi/L	Cerium-141	9.44E+01	9.04E+01	1.04	Acceptable
EZA	2nd/2013	08/02/13	E10579	Milk	pCi/L	Chromium-51	2.58E+02	2.50E+02	1.03	Acceptable
EZA	2nd/2013	08/02/13	E10579	Milk	pCi/L	Cesium-134	1.21E+02	1.25E+02	0.97	Acceptable
EZA	2nd/2013	08/02/13	E10579	Milk	pCi/L	Cesium-137	1.49E+02	1.51E+02	0.99	Acceptable
EZA	2nd/2013	08/02/13	E10579	Milk	pCi/L	Cobalt-58	9.44E+01	9.40E+01	1.00	Acceptable
EZA	2nd/2013	08/02/13	E10579	Milk	pCi/L	Manganese-54	1.80E+02	1.72E+02	1.05	Acceptable
EZA	2nd/2013	08/02/13	E10579	Milk	pCi/L	Iron-59	1.36E+02	1.20E+02	1.14	Acceptable
EZA	2nd/2013	08/02/13	E10579	Milk	pCi/L	Zinc-65	2.39E+02	2.17E+02	1.10	Acceptable
EZA	2nd/2013	08/02/13	E10579	Milk	pCi/L	Cobalt-60	1.77E+02	1.75E+02	1.01	Acceptable
EZA	2nd/2013	08/02/13	E10178	Water	pCi/L	Iodine-131	9.33E+01	9.54E+01	0.98	Acceptable
EZA	2nd/2013	08/02/13	E10178	Water	pCi/L	Cerium-141	1.15E+02	1.10E+02	1.04	Acceptable
EZA	2nd/2013	08/02/13	E10178	Water	pCi/L	Chromium-51	3.40E+02	3.06E+02	1.11	Acceptable
EZA	2nd/2013	08/02/13	E10178	Water	pCi/L	Cesium-134	1.48E+02	1.53E+02	0.97	Acceptable
EZA	2nd/2013	08/02/13	E10178	Water	pCi/L	Cesium-137	1.83E+02	1.84E+02	0.99	Acceptable
EZA	2nd/2013	08/02/13	E10178	Water	pCi/L	Cobalt-58	1.13E+02	1.15E+02	0.99	Acceptable
EZA	2nd/2013	08/02/13	E10178	Water	pCi/L	Manganese-54	2.09E+02	2.10E+02	1.00	Acceptable
EZA	2nd/2013	08/02/13	E10178	Water	pCi/L	Iron-59	1.51E+02	1.46E+02	1.03	Acceptable
EZA	2nd/2013	08/02/13	E10178	Water	pCi/L	Zinc-65	2.86E+02	2.65E+02	1.08	Acceptable

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EZA	2nd/2013	08/02/13	E10178	Water	pCi/L	Cobalt-60	2.25E+02	2.14E+02	1.05	Acceptable
ERA	3rd / 2013	08/22/13	RAD - 94	Water	pCi/L	Barium-133	76.4	740.5	62.4-82.0	Acceptable
ERA	3rd / 2013	08/22/13	RAD - 94	Water	pCi/L	Cesium-134	68.7	72.4	59.1-79.6	Acceptable
ERA	3rd / 2013	08/22/13	RAD - 94	Water	pCi/L	Cesium-137	154	155	140-172	Acceptable
ERA	3rd / 2013	08/22/13	RAD - 94	Water	pCi/L	Cobalt-60	85.3	82.3	74.1-92.9	Acceptable
ERA	3rd / 2013	08/22/13	RAD - 94	Water	pCi/L	Zinc-65	297	260	234-304	Acceptable
ERA	3rd / 2013	08/22/13	RAD - 94	Water	pCi/L	Gross Alpha	74.3	57.1	29.8-71.2	Not Acceptable
ERA	3rd / 2013	08/22/13	RAD - 94	Water	pCi/L	Gross Beta	34.3	41.8	27.9-49.2	Acceptable
ERA	3rd / 2013	08/22/13	RAD - 94	Water	pCi/L	Gross Alpha	67.7	57.1	29.8-71.2	Acceptable
ERA	3rd / 2013	08/22/13	RAD - 94	Water	pCi/L	Radium-226	16.9	17.2	12.8-19.7	Acceptable
ERA	3rd / 2013	08/22/13	RAD - 94	Water	pCi/L	Radium-226	17	17.2	12.8-19.7	Acceptable
ERA	3rd / 2013	08/22/13	RAD - 94	Water	pCi/L	Radium-228	3.53	3.86	2.18-5.4	Acceptable
ERA	3rd / 2013	08/22/13	RAD - 94	Water	pCi/L	Uranium (Nat)	20.4	21.4	17.1-24.1	Acceptable
ERA	3rd / 2013	08/22/13	RAD - 94	Water	ug/L	Uranium (Nat) mass	30.4	31.2	25.0-35.2	Acceptable
ERA	3rd / 2013	08/22/13	RAD - 94	Water	pCi/L	Radium-226	14.6	17.2	12.8-19.7	Acceptable
ERA	3rd / 2013	08/22/13	RAD - 94	Water	pCi/L	Uranium (Nat)	21.6	21.4	17.1-24.1	Acceptable
ERA	3rd / 2013	08/22/13	RAD - 94	Water	ug/L	Uranium (Nat) mass	33.7	31.2	25-35.2	Acceptable
ERA	3rd / 2013	08/22/13	RAD - 94	Water	pCi/L	Tritium	12500	13300	11600-14600	Acceptable
ERA	3rd / 2013	08/22/13	RAD - 94	Water	pCi/L	Strontium-89	48.9	36.5	27.4-43.4	Not Acceptable
ERA	3rd / 2013	08/22/13	RAD - 94	Water	pCi/L	Strontium-90	14.3	19.8	14.1-23.4	Acceptable
ERA	3rd / 2013	08/22/13	RAD - 94	Water	pCi/L	Strontium-89	44.3	36.5	27.4-43.4	Not Acceptable
ERA	3rd / 2013	08/22/13	RAD - 94	Water	pCi/L	Strontium-90	17.3	19.8	14.1-23.4	Acceptable
ERA	3rd / 2013	08/22/13	RAD - 94	Water	pCi/L	Iodine-131	26.1	24.3	20.2-28.8	Acceptable
ERA	3rd/2013	08/22/13	RAD - 94	Water	pCi/L	Iodine-131	23.3	24.3	20.2-28.8	Acceptable
EZA	3rd/2013	10/25/13	E10625	Cartridge	pCi	Iodine-131	8.57E+01	7.96E+01	1.08	Acceptable
EZA	3rd/2013	10/25/13	E10626	Milk	pCi/L	Strontium-89	9.33E+01	9.60E+01	0.97	Acceptable
EZA	3rd/2013	10/25/13	E10626	Milk	pCi/L	Strontium-90	1.09E+01	1.32E+01	0.83	Acceptable

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EZA	3rd/2013	10/25/13	E10627	Milk	pCi/L	Iodine-131	1.00E+02	9.83E+01	1.02	Acceptable
EZA	3rd/2013	10/25/13	E10627	Milk	pCi/L	Chromium-51	3.09E+02	2.77E+02	1.11	Acceptable
EZA	3rd/2013	10/25/13	E10627	Milk	pCi/L	Cesium-134	1.46E+02	1.72E+02	0.85	Acceptable
EZA	3rd/2013	10/25/13	E10627	Milk	pCi/L	Cesium-137	1.33E+02	1.31E+02	1.02	Acceptable
EZA	3rd/2013	10/25/13	E10627	Milk	pCi/L	Cobalt-58	1.04E+02	1.08E+02	0.97	Acceptable
EZA	3rd/2013	10/25/13	E10627	Milk	pCi/L	Manganese-54	1.44E+02	1.39E+02	1.04	Acceptable
EZA	3rd/2013	10/25/13	E10627	Milk	pCi/L	Iron-59	1.43E+02	1.30E+02	1.1	Acceptable
EZA	3rd/2013	10/25/13	E10627	Milk	pCi/L	Zinc-65	2.86E+02	2.66E+02	1.07	Acceptable
EZA	3rd/2013	10/25/13	E10627	Milk	pCi/L	Cobalt-60	2.01E+02	1.96E+02	1.03	Acceptable
EZA	3rd/2013	10/25/13	E10628	Water	pCi/L	Iodine-131	1.01E+02	9.79E+01	1.03	Acceptable
EZA	3rd/2013	10/25/13	E10628	Water	pCi/L	Chromium-51	2.80E+02	2.51E+02	1.12	Acceptable
EZA	3rd/2013	10/25/13	E10628	Water	pCi/L	Cesium-134	1.42E+02	1.56E+02	0.91	Acceptable
EZA	3rd/2013	10/25/13	E10628	Water	pCi/L	Cesium-137	1.19E+02	1.18E+02	1.01	Acceptable
EZA	3rd/2013	10/25/13	E10628	Water	pCi/L	Cobalt-58	9.80E+01	9.73E+01	1.01	Acceptable
EZA	3rd/2013	10/25/13	E10628	Water	pCi/L	Manganese-54	1.29E+02	1.25E+02	1.05	Acceptable
EZA	3rd/2013	10/25/13	E10628	Water	pCi/L	Iron-59	1.23E+02	1.18E+02	1.04	Acceptable
EZA	3rd/2013	10/25/13	E10628	Water	pCi/L	Zinc-65	2.62E+02	2.41E+02	1.09	Acceptable
EZA	3rd/2013	10/25/13	E10628	Water	pCi/L	Cobalt-60	1.87E+02	1.77E+02	1.06	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-GrF29	Filter	Bq/sample	Gross Alpha	1.090	0.900	0.3-1.5	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-GrF29	Filter	Bq/sample	Gross Beta	1.730	1.630	0.82-2.45	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Americium-241	0.00	0	False Pos Test	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Cesium-134	1090	1172	820-1524	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Cesium-137	1010	977	684-1270	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Cobalt-57	0.0	0	False Pos Test	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Cobalt-60	462.00	451.00	316-586	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Iron-55	887	820	574-1066	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Manganese-54	692	674	472-876	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Nickel-63	525.0	571	400-742	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Plutonium-238	60.8	62	43.1-80.0	Acceptable

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MAPEP	4th/2013	11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Plutonium-239/240	1.33	0.4	Sens. Eval.	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Potassium-40	638	633	443-823	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Strontium-90	458.0	460	322-598	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Technetium-99	0.0	0	False Pos Test	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Uranium-234/233	26.1	30	21.0-39.0	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Uranium-238	30.0	34	23.8-44.2	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Zinc-65	0.0	0	False Pos Test	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaW29	Water	Bq/L	Americium-241	0.0001	0.000	False Pos Test	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaW29	Water	Bq/L	Cesium-134	27.20	30.0	21.0-39.0	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaW29	Water	Bq/L	Cesium-137	31.8	31.6	22.1-41.1	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaW29	Water	Bq/L	Cobalt-57	0	0.0	False Pos Test	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaW29	Water	Bq/L	Cobalt-60	23.60	23.6	16.51-30.65	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaW29	Water	Bq/L	Hydrogen-3	-3.5	0	False Pos Test	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaW29	Water	Bq/L	Iron-55	53.00	53.3	37.3-69.3	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaW29	Water	Bq/L	Manganese-54	-0.009	0.0	False Pos Test	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaW29	Water	Bq/L	Nickel-63	27.7	26.4	18.5-34.3	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaW29	Water	Bq/L	Plutonium-238	1.070	1.216	0.851-1.581	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaW29	Water	Bq/L	Plutonium-239/240	0.907	0.996	0.697-1.295	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaW29	Water	Bq/L	Potassium-40	0.339	0	False Pos Test	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaW29	Water	Bq/L	Strontium-90	6.65	7.22	5.05-9.39	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaW29	Water	Bq/L	Technetium-99	15.4	16.20	11.3-21.1	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaW29	Water	Bq/L	Uranium-234/233	0.065	0.07	Sens. Eval.	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaW29	Water	Bq/L	Uranium-238	0.031	0.034	Sens. Eval.	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaW29	Water	Bq/L	Zinc-65	36.500	34.60	24.2-45.0	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaW29	Water	Bq/L	Gross Alpha	0.793	0.701	0.201-1.192	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-MaW29	Water	Bq/L	Gross Beta	6.220	5.94	2.97-8.91	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdF29	Filter	ug/sample	Uranium-235	0.034	0.032	0.0227-0.0421	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdF29	Filter	ug/sample	Uranium-238	15.8	16.5	11.6-21.5	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdF29	Filter	ug/sample	Uranium-Total	15.80	16.5	11.6-21.5	Acceptable

PT Provider	Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MAPEP	4th/2013	11/12/13	MAPEP-13-RdF29	Filter	ug/sample	Americium-241	0.0002	0.000	False Pos Test	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdF29	Filter	Bq/sample	Cesium-134	-0.0016	0.00	False Pos Test	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdF29	Filter	Bq/sample	Cesium-137	3.010	2.70	1.9-3.5	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdF29	Filter	Bq/sample	Cobalt-57	3.530	3.40	2.4-4.4	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdF29	Filter	Bq/sample	Cobalt-60	2.440	2.30	1.6-3.0	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdF29	Filter	Bq/sample	Manganese-54	3.720	3.50	2.5-4.6	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdF29	Filter	Bq/sample	Plutonium-238	0.128	0.124	0.087-0.161	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdF29	Filter	Bq/sample	Plutonium-239/240	0.092	0.0920	0.064-0.12	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdF29	Filter	Bq/sample	Strontium-90	1.690	1.81	1.27-2.35	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdF29	Filter	Bq/sample	Uranium-234/233	0.027	0.0292	0.0204-0.038	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdF29	Filter	Bq/sample	Uranium-238	0.020	0.021	0.144-0.267	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdF29	Filter	Bq/sample	Zinc-65	3.050	2.70	1.9-3.5	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Americium-241	0.226	0.19	0.135-0.251	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Cesium-134	4.750	5.20	3.64-6.67	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Cesium-137	6.910	6.60	4.62-8.58	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Cobalt-57	-0.002	0.00	False Pos Test	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Cobalt-60	0.008	0.00	False Pos Test	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Manganese-54	7.980	7.88	5.52-10.24	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Plutonium-238	0.001	0.001	Sens. Eval.	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Plutonium-239/240	0.1510	0.171	0.120-0.222	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Strontium-90	2.330	2.32	1.62-3.02	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Uranium-234/233	0.046	0.047	0.0326-0.0606	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Uranium-238	0.332	0.324	0.227-0.421	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Zinc-65	2.850	2.63	1.84-3.42	Acceptable
MAPEP	4th/2013	11/12/13	MAPEP-13-XaW29	Water	Bq/L	Iodine-129	3.62	3.79	2.65-4.93	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Soil	pCi/kg	Actinium-228	1200	1240	795-1720	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Soil	pCi/kg	Americium-241	186	164	95.9-213	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Soil	pCi/kg	Bismuth-212	1760	1220	325-1790	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Soil	pCi/kg	Bismuth-214	4350	3740	2250-5380	Acceptable

PT Provider	Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
ERA	4th/2013	11/26/13	MRAD-19	Soil	pCi/kg	Cesium-134	2690	2820	1840-3390	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Soil	pCi/kg	Cesium-137	3960	4130	3160-5310	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Soil	pCi/kg	Cobalt-60	5490	5680	3840-7820	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Soil	pCi/kg	Lead-212	1260	1220	799-1700	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Soil	pCi/kg	Lead-214	4700	3740	2180-5580	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Soil	pCi/kg	Manganese-54	<55.2	<1000	0-1000	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Soil	pCi/kg	Plutonium-238	576	658	396-908	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Soil	pCi/kg	Plutonium-239	400	397	260-548	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Soil	pCi/kg	Potassium-40	11200	12400	9080-16700	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Soil	pCi/kg	Strontium-90	8220	6860	2620-10800	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Soil	pCi/kg	Thorium-234	2870	3080	974-5790	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Soil	pCi/kg	Zinc-65	3400	3160	2520-4200	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Soil	pCi/kg	Uranium-234	2870	3080	974-5790	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Soil	pCi/kg	Uranium-238	2979	3080	1910-3910	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Soil	pCi/kg	Uranium-Total	6870	6320	3430-8340	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Soil	ug/kg	Uranium-Total(mass)	8460	9220	5080-11600	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Vegetation	pCi/kg	Americium-241	3800	3630	2220-4830	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Vegetation	pCi/kg	Cesium-134	907	859	552-1120	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Vegetation	pCi/kg	Cesium-137	1220	1030	747-1430	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Vegetation	pCi/kg	Cobalt-60	2100	1880	1300-2630	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Vegetation	pCi/kg	Curium-244	1230	1250	612-1950	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Vegetation	pCi/kg	Manganese-54	<53.3	<300	0-300	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Vegetation	pCi/kg	Plutonium-238	1280	1290	769-1770	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Vegetation	pCi/kg	Plutonium-239	2580	2770	1700-3810	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Vegetation	pCi/kg	Potassium-40	33600	33900	24500-47600	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Vegetation	pCi/kg	Strontium-90	5870	6360	3630-8430	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Vegetation	pCi/kg	Uranium-234	674	654	430-840	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Vegetation	pCi/kg	Uranium-234	1050	654	430-840	Not Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Vegetation	pCi/kg	Uranium-238	655	648	432-823	Acceptable

PT Provider	Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
ERA	4th/2013	11/26/13	MRAD-19	Vegetation	pCi/kg	Uranium-Total	1364	1330	901-1660	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Vegetation	pCi/kg	Uranium-Total	1773	1330	901-1660	Not Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Vegetation	ug/kg	Uranium-Total(mass)	1960	1940	1300-2460	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Vegetation	pCi/kg	Zinc-65	1990	1540	1110-2160	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Filter	pCi/Filter	Americium-241	75.2	66.4	40.9-89.9	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Filter	pCi/Filter	Cesium-134	845	868.0	552-1080	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Filter	pCi/Filter	Cesium-137	641	602	452-791	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Filter	pCi/Filter	Cobalt-60	534	494	382-617	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Filter	pCi/Filter	Iron-55	466	389.0	121-760	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Filter	pCi/Filter	Manganese-54	<3.9	<50	0.00-50.0	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Filter	ug/Filter	Plutonium-238	72.8	68.5	46.9-90.1	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Filter	pCi/Filter	Plutonium-239	56.5	53.4	42.4-93.1	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Filter	pCi/Filter	Strontium-90	130	125	61.1-187	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Filter	pCi/Filter	Uranium-234	56	87	35.6-86.6	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Filter	pCi/Filter	Uranium-238	58	56.90	36.8-78.7	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Filter	pCi/Filter	Uranium-Total	116	117	64.8-178	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Filter	ug/Filter	Uranium-Total(mass)	172	171	109-241	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Filter	pCi/Filter	Zinc-65	514	419	300-578	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Filter	ug/Filter	Uranium-Total(mass)	169	171	109-241	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Filter	ug/Filter	Uranium-Total(mass)	150	171	109-241	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Filter	pCi/Filter	Gross Alpha	100	83	27.8-129	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Filter	pCi/Filter	Gross Beta	65.7	56.3	35.6-82.2	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	pCi/L	Americium-241	126	126	84.9-169	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	pCi/L	Cesium-134	2060.0	2180	1600-2510	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	pCi/L	Cesium-137	2730	2760	2340-3310	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	pCi/L	Cobalt-60	1960	1890	1640-2210	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	pCi/L	Iron-55	721	689	411-935	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	pCi/L	Manganese-54	<7.24	<100	0.00-100	Acceptable

PT Provider	Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
ERA	4th/2013	11/26/13	MRAD-19	Water	pCi/L	Plutonium-238	133	138	102-172	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	pCi/L	Plutonium-239	98.7	109	84.6-137	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	pCi/L	Strontium-90	726	788	513-1040	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	pCi/L	Uranium-234	93	99	74.3-128	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	pCi/L	Uranium-238	93	98.00	74.7-120	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	pCi/L	Uranium-Total	186	201	148-260	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	ug/L	Uranium-Total(mass)	278	294	234-355	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	pCi/L	Zinc-65	1560	1370	1140-1730	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	pCi/L	Gross Alpha	105.0	97	34.3-150	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	pCi/L	Gross Beta	78.8	84.5	48.4-125	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	pCi/L	Tritium	8740	9150	6130-13000	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	pCi/L	Uranium-234	92.4	98.9	74.3-128	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	pCi/L	Uranium-238	96.1	98.0	74.7-120	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	pCi/L	Uranium-Total	193	201	148-260	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	ug/L	Uranium-Total(mass)	288	294	234-355	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	pCi/L	Uranium-234	95.2	98.9	74.3-128	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	pCi/L	Uranium-238	115	98.00	74.7-120	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	pCi/L	Uranium-Total	215	201	148-260	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	ug/L	Uranium-Total(mass)	344	294	234-355	Acceptable
ERA	4th/2013	11/26/13	MRAD-19	Water	ug/L	Uranium-Total(mass)	258	294	234-355	Acceptable

Table 2

2013 ECKERT & ZIEGLER ANALYTICS PERFORMANCE EVALUATION RESULTS

Report Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
02/01/13	E10323	Cartridge	pCi	Iodine-131	7.31E+01	7.29E+01	1.00	Acceptable
02/01/13	E10324	Milk	pCi/L	Strontium-89	9.89E+00	1.38E+01	0.72	Acceptable
02/01/13	E10324	Milk	pCi/L	Strontium-90	9.83E+00	1.48E+01	1.02	Acceptable
02/01/13	E10325	Milk	pCi/L	Iodine-131	9.57E+01	9.00E+01	1.06	Acceptable
02/01/13	E10325	Milk	pCi/L	Chromium-51	3.67E+02	3.48E+02	1.06	Acceptable
02/01/13	E10325	Milk	pCi/L	Cesium-134	1.54E+02	1.65E+02	0.93	Acceptable
02/01/13	E10325	Milk	pCi/L	Cesium-137	1.18E+02	1.17E+02	1.01	Acceptable
02/01/13	E10325	Milk	pCi/L	Cobalt-58	9.85E+01	9.85E+01	1	Acceptable
02/01/13	E10325	Milk	pCi/L	Manganese-54	1.16E+02	1.16E+02	1	Acceptable
02/01/13	E10325	Milk	pCi/L	Iron-59	1.33E+02	1.16E+02	1.15	Acceptable
02/01/13	E10325	Milk	pCi/L	Zinc-65	3.19E+02	2.91E+02	1.09	Acceptable
02/01/13	E10325	Milk	pCi/L	Cobalt-60	1.73E+02	1.70E+02	1.02	Acceptable
02/01/13	E10325	Milk	pCi/L	Cesium-141	5.38E+01	5.10E+01	1.05	Acceptable
02/01/13	E10380	Water	pCi/L	Iodine-131	7.47E+01	7.25E+01	1.03	Acceptable
02/01/13	E10380	Water	pCi/L	Chromium-51	3.81E+02	3.62E+02	1.05	Acceptable
02/01/13	E10380	Water	pCi/L	Cesium-134	1.57E+02	1.73E+02	0.91	Acceptable
02/01/13	E10380	Water	pCi/L	Cesium-137	1.25E+02	1.22E+02	1.03	Acceptable
02/01/13	E10380	Water	pCi/L	Cobalt-58	1.02E+02	1.03E+02	0.99	Acceptable
02/01/13	E10380	Water	pCi/L	Manganese-54	1.28E+02	1.21E+02	1.06	Acceptable
02/01/13	E10380	Water	pCi/L	Iron-59	1.38E+02	1.21E+02	1.14	Acceptable
02/01/13	E10380	Water	pCi/L	Zinc-65	2.13E+02	1.94E+02	1.1	Acceptable
02/01/13	E10380	Water	pCi/L	Cobalt-60	1.80E+02	1.77E+02	1.01	Acceptable
04/25/13	E10469	Cartridge	pCi	Iodine-131	9.38E+01	9.27E+01	1.01	Acceptable
04/25/13	E10470	Milk	pCi/L	Strontium-89	1.07E+02	9.97E+01	1.07	Acceptable
04/25/13	E10470	Milk	pCi/L	Strontium-90	1.18E+01	1.10E+01	1.07	Acceptable
04/25/13	E10471	Milk	pCi/L	Iodine-131	1.12E+02	1.00E+02	1.12	Acceptable
04/25/13	E10471	Milk	pCi/L	Cerium-141	2.00E+01	1.87E+01	1.07	Acceptable
04/25/13	E10471	Milk	pCi/L	Cr-51	5.09E+01	4.72E+01	1.08	Acceptable
04/25/13	E10471	Milk	pCi/L	Cesium-134	2.06E+02	2.14E+02	0.96	Acceptable
04/25/13	E10471	Milk	pCi/L	Cesium-137	2.83E+02	2.66E+02	1.07	Acceptable
04/25/13	E10471	Milk	pCi/L	Cobalt-58	2.19E+02	2.08E+02	1.05	Acceptable
04/25/13	E10471	Milk	pCi/L	Mn-54	2.21E+02	2.08E+02	1.06	Acceptable
04/25/13	E10471	Milk	pCi/L	Iron-59	2.78E+02	2.52E+02	1.1	Acceptable
04/25/13	E10471	Milk	pCi/L	Zinc-65	3.39E+02	3.01E+02	1.13	Acceptable
04/25/13	E10471	Milk	pCi/L	Cobalt-60	4.02E+02	4.00E+02	1.01	Acceptable
04/25/13	E10472	Water	pCi/L	Iodine-131	1.12E+02	9.28E+01	1.21	Acceptable
04/25/13	E10472	Water	pCi/L	Cerium-141	1.88E+02	1.79E+02	1.05	Acceptable
04/25/13	E10472	Water	pCi/L	Cr-51	4.84E+02	4.52E+02	1.07	Acceptable
04/25/13	E10472	Water	pCi/L	Cesium-134	1.96E+02	2.05E+02	0.96	Acceptable
04/25/13	E10472	Water	pCi/L	Cesium-137	2.71E+02	2.54E+02	1.07	Acceptable

Report Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
04/25/13	E10472	Water	pCi/L	Cobalt-58	2.03E+02	1.99E+02	1.02	Acceptable
04/25/13	E10472	Water	pCi/L	Mn-54	2.15E+02	1.99E+02	1.08	Acceptable
04/25/13	E10472	Water	pCi/L	Iron-59	2.67E+02	2.41E+02	1.11	Acceptable
04/25/13	E10472	Water	pCi/L	Zinc-65	3.14E+02	2.88E+02	1.09	Acceptable
04/25/13	E10472	Water	pCi/L	Cobalt-60	3.92E+02	3.83E+02	1.02	Acceptable
08/02/13	E10577	Cartridge	pCi	Iodine-131	9.16E+01	9.55E+01	1.02	Acceptable
08/02/13	E10578	Milk	pCi/L	Strontium-89	9.27E+01	9.04E+01	0.98	Acceptable
08/02/13	E10578	Milk	pCi/L	Strontium-90	1.20E+01	1.70E+01	0.7	Acceptable
08/02/13	E10579	Milk	pCi/L	Iodine-131	9.86E+01	9.55E+01	1.03	Acceptable
08/02/13	E10579	Milk	pCi/L	Cerium-141	9.44E+01	9.04E+01	1.04	Acceptable
08/02/13	E10579	Milk	pCi/L	Chromium-51	2.58E+02	2.50E+02	1.03	Acceptable
08/02/13	E10579	Milk	pCi/L	Cesium-134	1.21E+02	1.25E+02	0.97	Acceptable
08/02/13	E10579	Milk	pCi/L	Cesium-137	1.49E+02	1.51E+02	0.99	Acceptable
08/02/13	E10579	Milk	pCi/L	Cobalt-58	9.44E+01	9.40E+01	1.00	Acceptable
08/02/13	E10579	Milk	pCi/L	Manganese-54	1.80E+02	1.72E+02	1.05	Acceptable
08/02/13	E10579	Milk	pCi/L	Iron-59	1.36E+02	1.20E+02	1.14	Acceptable
08/02/13	E10579	Milk	pCi/L	Zinc-65	2.39E+02	2.17E+02	1.10	Acceptable
08/02/13	E10579	Milk	pCi/L	Cobalt-60	1.77E+01	1.75E+02	1.01	Acceptable
08/02/13	E10178	Water	pCi/L	Iodine-131	9.33E+01	9.54E+01	0.98	Acceptable
08/02/13	E10178	Water	pCi/L	Cerium-141	1.15E+02	1.10E+02	1.04	Acceptable
08/02/13	E10178	Water	pCi/L	Chromium-51	3.40E+02	3.06E+02	1.11	Acceptable
08/02/13	E10178	Water	pCi/L	Cesium-134	1.48E+02	1.53E+02	0.97	Acceptable
08/02/13	E10178	Water	pCi/L	Cesium-137	1.83E+02	1.84E+02	0.99	Acceptable
08/02/13	E10178	Water	pCi/L	Cobalt-58	1.13E+02	1.15E+02	0.99	Acceptable
08/02/13	E10178	Water	pCi/L	Manganese-54	2.09E+02	2.10E+02	1.00	Acceptable
08/02/13	E10178	Water	pCi/L	Iron-59	1.51E+02	1.46E+02	1.03	Acceptable
08/02/13	E10178	Water	pCi/L	Zinc-65	2.86E+02	2.65E+02	1.08	Acceptable
08/02/13	E10178	Water	pCi/L	Cobalt-60	2.25E+02	2.14E+02	1.05	Acceptable
10/25/13	E10625	Cartridge	pCi	Iodine-131	8.57E+01	7.96E+01	1.08	Acceptable
10/25/13	E10626	Milk	pCi/L	Strontium-89	9.33E+01	9.60E+01	0.97	Acceptable
10/25/13	E10626	Milk	pCi/L	Strontium-90	1.09E+01	1.32E+01	0.83	Acceptable
10/25/13	E10627	Milk	pCi/L	Iodine-131	1.00E+02	9.83E+01	1.02	Acceptable
10/25/13	E10627	Milk	pCi/L	Chromium-51	3.09E+02	2.77E+02	1.11	Acceptable
10/25/13	E10627	Milk	pCi/L	Cesium-134	1.46E+02	1.72E+02	0.85	Acceptable
10/25/13	E10627	Milk	pCi/L	Cesium-137	1.33E+02	1.31E+02	1.02	Acceptable
10/25/13	E10627	Milk	pCi/L	Cobalt-58	1.04E+02	1.08E+02	0.97	Acceptable
10/25/13	E10627	Milk	pCi/L	Manganese-54	1.44E+02	1.39E+02	1.04	Acceptable
10/25/13	E10627	Milk	pCi/L	Iron-59	1.43E+02	1.30E+02	1.1	Acceptable
10/25/13	E10627	Milk	pCi/L	Zinc-65	2.86E+02	2.66E+02	1.07	Acceptable
10/25/13	E10627	Milk	pCi/L	Cobalt-60	2.01E+02	1.96E+02	1.03	Acceptable
10/25/13	E10628	Water	pCi/L	Iodine-131	1.01E+02	9.79E+01	1.03	Acceptable
10/25/13	E10628	Water	pCi/L	Chromium-51	2.80E+02	2.51E+02	1.12	Acceptable
10/25/13	E10628	Water	pCi/L	Cesium-134	1.42E+02	1.56E+02	0.91	Acceptable
10/25/13	E10628	Water	pCi/L	Cesium-137	1.19E+02	1.18E+02	1.01	Acceptable

Report Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
10/25/13	E10628	Water	pCi/L	Cobalt-58	9.80E+01	9.73E+01	1.01	Acceptable
10/25/13	E10628	Water	pCi/L	Manganese-54	1.29E+02	1.25E+02	1.05	Acceptable
10/25/13	E10628	Water	pCi/L	Iron-59	1.23E+02	1.18E+02	1.04	Acceptable
10/25/13	E10628	Water	pCi/L	Zinc-65	2.62E+02	2.41E+02	1.09	Acceptable
10/25/13	E10628	Water	pCi/L	Cobalt-60	1.87E+02	1.77E+02	1.06	Acceptable

Table 3

2013 DEPARTMENT OF ENERGY MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP) RESULTS

Report Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
02/27/13	GENE01-27-RdFR1	Filter	Bq/sample	U-234/233	0.0143	0.0155	0.0109-0.0202	Acceptable
02/27/13	GENE01-27-RdFR1	Filter	Bq/sample	Uranium-238	0.0999	0.098	0.069-0.127	Acceptable
05/13/13	MAPEP-13-GrF28	Filter	Bq/sample	Gross Alpha	0.656	1.20	0.36-2.04	Acceptable
05/13/13	MAPEP-13-GrF28	Filter	Bq/sample	Gross Beta	0.954	0.85	0.43-1.28	Acceptable
05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Americium-241	118	113	79-147	Acceptable
05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Cesium-134	829	887	621-1153	Acceptable
05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Cesium-137	623	587	411-763	Acceptable
05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Cobalt-57	1.04	0	False Pos Test	Acceptable
05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Cobalt-60	737	691	484-898	Acceptable
05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Iron-55	-0.380	0	False Pos Test	Acceptable
05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Manganese-54	0.760	0	False Pos Test	Acceptable
05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Nickel-63	719	670	469-871	Acceptable
05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Plutonium-238	0.571	0.52	Sens. Eval.	Acceptable
05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Plutonium-239/240	77.70	79.5	55.7-103.4	Acceptable
05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Potassium-40	713	625	438-813	Acceptable
05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Strontium-90	693.0	628	440-816	Acceptable
05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Technetium-99	419.0	444	311-577	Acceptable
05/13/13	MAPEP-13-MaS28	Soil	mg/kg	U-234/233	60.0	62.5	43.8-81.3	Acceptable
05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Uranium-238	274	281	197-365	Acceptable
05/13/13	MAPEP-13-MaS28	Soil	mg/kg	Zinc-65	1130	995	697-1294	Acceptable
05/13/13	MAPEP-13-MaW28	Water	Bq/L	Am-241	0.690	0.689	0.428-0.896	Acceptable
05/13/13	MAPEP-13-MaW28	Water	Bq/L	Cesium-134	21.1	24.4	17.1-31.7	Acceptable
05/13/13	MAPEP-13-MaW28	Water	Bq/L	Cesium-137	0.10	0.0	False Pos Test	Acceptable
05/13/13	MAPEP-13-MaW28	Water	Bq/L	Cobalt-57	31.0	30.9	21.6-40.2	Acceptable

Report Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
05/13/13	MAPEP-13-MaW28	Water	Bq/L	Cobalt-60	19.4	19.6	13.7-25.4	Acceptable
05/13/13	MAPEP-13-MaW28	Water	Bq/L	Hydrogen-3	517	507	355-659	Acceptable
05/13/13	MAPEP-13-MaW28	Water	Bq/L	Iron-55	39.7	44.0	30.8-57.2	Acceptable
05/13/13	MAPEP-13-MaW28	Water	Bq/L	Manganese-54	28.0	27.4	19.2-35.6	Acceptable
05/13/13	MAPEP-13-MaW28	Water	Bq/L	Nickel-63	32.9	33.4	23.4-43.4	Acceptable
05/13/13	MAPEP-13-MaW28	Water	Bq/L	Plutonium-238	0.825	0.884	0.619-1.149	Acceptable
05/13/13	MAPEP-13-MaW28	Water	Bq/L	Pu-239/240	0.0162	0.0096	Sens. Eval.	Acceptable
05/13/13	MAPEP-13-MaW28	Water	Bq/L	Potassium-40	-0.471	0	False Pos Test	Acceptable
05/13/13	MAPEP-13-MaW28	Water	Bq/L	Strontium-90	12.5	10.5	7.4-13.7	Acceptable
05/13/13	MAPEP-13-MaW28	Water	Bq/L	Technetium-99	12.9	13.1	9.2-17.0	Acceptable
05/13/13	MAPEP-13-MaW28	Water	Bq/L	U-234/233	0.289	0.315	0.221-0.410	Acceptable
05/13/13	MAPEP-13-MaW28	Water	Bq/L	Uranium-238	1.81	1.95	1.37-2.54	Acceptable
05/13/13	MAPEP-13-MaW28	Water	Bq/L	Zinc-65	32.8	30.4	21.3-39.5	Acceptable
05/13/13	MAPEP-13-GrW28	Water	Bq/L	Gross Alpha	2.60	2.31	0.69-3.93	Acceptable
05/13/13	MAPEP-13-GrW28	Water	Bq/L	Gross Beta	14.2	13.0	6.5-19.5	Acceptable
05/13/13	MAPEP-13-XaW28	Water	Bq/L	Iodine-129	5.94	6.06	4.24-7.88	Acceptable
05/13/13	MAPEP-13-RdF28	Filter	ug/sample	Uranium-235	0.036	0.036	0.025-0.047	Acceptable
05/13/13	MAPEP-13-RdF28	Filter	ug/sample	Uranium-238	18.0	18.6	13.0-24.2	Acceptable
05/13/13	MAPEP-13-RdF28	Filter	ug/sample	Uranium-Total	17.7	18.6	13.0-24.2	Acceptable
05/13/13	MAPEP-13-RdF28	Filter	ug/sample	Americium-241	0.106	0.104	0.073-0.135	Acceptable
05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Cesium-134	1.75	1.78	1.25-2.31	Acceptable
05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Cesium-137	2.71	2.60	1.82-3.38	Acceptable
05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Cobalt-57	2.51	2.36	1.65-3.07	Acceptable
05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Cobalt-60	0.005	0.00	False Pos Test	Acceptable
05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Manganese-54	4.43	4.26	2.98-5.54	Acceptable
05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Plutonium-238	0.124	0.127	0.089-0.165	Acceptable
05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Pu-239/240	0.118	0.1210	0.085-0.157	Acceptable
05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Strontium-90	1.54	1.49	1.04-1.94	Acceptable
05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	U-234/233	0.0342	0.0318	0.0223-0.0413	Acceptable
05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Uranium-238	0.230	0.231	0.162-0.300	Acceptable
05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Zinc-65	3.38	3.13	2.19-4.07	Acceptable
05/13/13	MAPEP-13-GrF28	Filter	Bq/sample	Gross Alpha	0.656	1.20	0.36-2.04	Acceptable
05/13/13	MAPEP-13-GrF28	Filter	Bq/sample	Gross Beta	0.95	0.85	0.43-1.28	Acceptable
05/13/13	MAPEP-13-RdF28	Filter	Bq/sample	Americium-241	0.106	0.104	0.073-0.135	Acceptable
05/13/13	MAPEP-13-RdV28	Vegetation	ug/sample	Uranium-235	0.0029	0.001	0.0009-0.0017	Not Accept.
05/13/13	MAPEP-13-RdV28	Vegetation	ug/sample	Uranium-238	0.419	0.180	0.13-0.23	Not Accept.

Report Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
05/13/13	MAPEP-13-RdV28	Vegetation	ug/sample	Uranium-Total	0.4219	0.180	0.13-0.23	Not Accept.
05/13/13	MAPEP-13-RdV28	Vegetation	ug/sample	Americium-241	0.1350	0.140	0.098-0.182	Acceptable
05/13/13	MAPEP-13-RdV28	Vegetation	Bq/sample	Cesium-134	0.0525	0.00	False Pos Test	Acceptable
05/13/13	MAPEP-13-RdV28	Vegetation	Bq/sample	Cesium-137	7.13	6.87	4.81-8.93	Acceptable
05/13/13	MAPEP-13-RdV28	Vegetation	Bq/sample	Cobalt-57	8.86	8.68	6.08-11.28	Acceptable
05/13/13	MAPEP-13-RdV28	Vegetation	Bq/sample	Cobalt-60	6.07	5.85	4.10-7.61	Acceptable
05/13/13	MAPEP-13-RdV28	Vegetation	Bq/sample	Manganese-54	-0.002	0.00	False Pos Test	Acceptable
05/13/13	MAPEP-13-RdV28	Vegetation	Bq/sample	Plutonium-238	0.110	0.110	0.077-0.143	Acceptable
05/13/13	MAPEP-13-RdV28	Vegetation	Bq/sample	Pu-239/240	0.113	0.123	0.086-0.160	Acceptable
05/13/13	MAPEP-13-RdV28	Vegetation	Bq/sample	Strontium-90	1.358	1.64	1.15-2.13	Acceptable
05/13/13	MAPEP-13-RdV28	Vegetation	Bq/sample	U-234/233	0.0081	0.0038	Sens. Eval.	Not Accept.
05/13/13	MAPEP-13-RdV28	Vegetation	Bq/sample	Uranium-238	0.00489	0.002	Sens. Eval.	Not Accept.
05/13/13	MAPEP-13-RdV28	Vegetation	Bq/sample	Zinc-65	6.59	6.25	4.38-8.13	Acceptable
11/12/13	MAPEP-13-GrF29	Filter	Bq/sample	Gross Alpha	1.090	0.900	0.3-1.5	Acceptable
11/12/13	MAPEP-13-GrF29	Filter	Bq/sample	Gross Beta	1.730	1.630	0.82-2.45	Acceptable
11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Americium-241	0.00	0	False Pos Test	Acceptable
11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Cesium-134	1090	1172	820-1524	Acceptable
11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Cesium-137	1010	977	684-1270	Acceptable
11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Cobalt-57	0.0	0	False Pos Test	Acceptable
11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Cobalt-60	462.00	451.00	316-586	Acceptable
11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Iron-55	887	820	574-1066	Acceptable
11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Manganese-54	692	674	472-876	Acceptable
11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Nickel-63	525.0	571	400-742	Acceptable
11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Plutonium-238	60.8	62	43.1-80.0	Acceptable
11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Plutonium-239/240	1.33	0.4	Sens. Eval.	Acceptable
11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Potassium-40	638	633	443-823	Acceptable
11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Strontium-90	458.0	460	322-598	Acceptable
11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Technetium-99	0.0	0	False Pos Test	Acceptable
11/12/13	MAPEP-13-MaS29	Soil	mg/kg	U-234/233	26.1	30	21.0-39.0	Acceptable
11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Uranium-238	30.0	34	23.8-44.2	Acceptable

Report Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
11/12/13	MAPEP-13-MaS29	Soil	mg/kg	Zinc-65	0.0	0	False Pos Test	Acceptable
11/12/13	MAPEP-13-MaW29	Water	Bq/L	Americium-241	0.0001	0.000	False Pos Test	Acceptable
11/12/13	MAPEP-13-MaW29	Water	Bq/L	Cesium-134	27.20	30.0	21.0-39.0	Acceptable
11/12/13	MAPEP-13-MaW29	Water	Bq/L	Cesium-137	31.8	31.6	22.1-41.1	Acceptable
11/12/13	MAPEP-13-MaW29	Water	Bq/L	Cobalt-57	0	0.0	False Pos Test	Acceptable
11/12/13	MAPEP-13-MaW29	Water	Bq/L	Cobalt-60	23.60	23.6	16.51-30.65	Acceptable
11/12/13	MAPEP-13-MaW29	Water	Bq/L	Hydrogen-3	-3.5	0	False Pos Test	Acceptable
11/12/13	MAPEP-13-MaW29	Water	Bq/L	Iron-55	53.00	53.3	37.3-69.3	Acceptable
11/12/13	MAPEP-13-MaW29	Water	Bq/L	Manganese-54	-0.009	0.0	False Pos Test	Acceptable
11/12/13	MAPEP-13-MaW29	Water	Bq/L	Nickel-63	27.7	26.4	18.5-34.3	Acceptable
11/12/13	MAPEP-13-MaW29	Water	Bq/L	Plutonium-238	1.070	1.216	0.851-1.581	Acceptable
11/12/13	MAPEP-13-MaW29	Water	Bq/L	Plutonium-239/240	0.907	0.996	0.697-1.295	Acceptable
11/12/13	MAPEP-13-MaW29	Water	Bq/L	Potassium-40	0.339	0	False Pos Test	Acceptable
11/12/13	MAPEP-13-MaW29	Water	Bq/L	Strontium-90	6.65	7.22	5.05-9.39	Acceptable
11/12/13	MAPEP-13-MaW29	Water	Bq/L	Technetium-99	15.4	16.20	11.3-21.1	Acceptable
11/12/13	MAPEP-13-MaW29	Water	Bq/L	Uranium-234/233	0.065	0.07	Sens. Eval.	Acceptable
11/12/13	MAPEP-13-MaW29	Water	Bq/L	Uranium-238	0.031	0.034	Sens. Eval.	Acceptable
11/12/13	MAPEP-13-MaW29	Water	Bq/L	Zinc-65	36.500	34.60	24.2-45.0	Acceptable
11/12/13	MAPEP-13-MaW29	Water	Bq/L	Gross Alpha	0.793	0.701	0.201-1.192	Acceptable
11/12/13	MAPEP-13-MaW29	Water	Bq/L	Gross Beta	6.220	5.94	2.97-8.91	Acceptable
11/12/13	MAPEP-13-RdF29	Filter	ug/sample	Uranium-235	0.034	0.032	0.0227-0.0421	Acceptable
11/12/13	MAPEP-13-RdF29	Filter	ug/sample	Uranium-238	15.8	16.5	11.6-21.5	Acceptable
11/12/13	MAPEP-13-RdF29	Filter	ug/sample	Uranium-Total	15.80	16.5	11.6-21.5	Acceptable
11/12/13	MAPEP-13-RdF29	Filter	ug/sample	Americium-241	0.0002	0.000	False Pos Test	Acceptable
11/12/13	MAPEP-13-RdF29	Filter	Bq/sample	Cesium-134	-0.0016	0.00	False Pos Test	Acceptable
11/12/13	MAPEP-13-RdF29	Filter	Bq/sample	Cesium-137	3.010	2.70	1.9-3.5	Acceptable
11/12/13	MAPEP-13-RdF29	Filter	Bq/sample	Cobalt-57	3.530	3.40	2.4-4.4	Acceptable
11/12/13	MAPEP-13-RdF29	Filter	Bq/sample	Cobalt-60	2.440	2.30	1.6-3.0	Acceptable
11/12/13	MAPEP-13-RdF29	Filter	Bq/sample	Manganese-54	3.720	3.50	2.5-4.6	Acceptable
11/12/13	MAPEP-13-RdF29	Filter	Bq/sample	Plutonium-238	0.128	0.124	0.087-0.161	Acceptable
11/12/13	MAPEP-13-RdF29	Filter	Bq/sample	Plutonium-239/240	0.092	0.0920	0.064-0.12	Acceptable
11/12/13	MAPEP-13-RdF29	Filter	Bq/sample	Strontium-90	1.690	1.81	1.27-2.35	Acceptable
11/12/13	MAPEP-13-RdF29	Filter	Bq/sample	Uranium-234/233	0.027	0.0292	0.0204-0.038	Acceptable

Report Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
11/12/13	MAPEP-13-RdF29	Filter	Bq/sample	Uranium-238	0.020	0.021	0.144-0.267	Acceptable
11/12/13	MAPEP-13-RdF29	Filter	Bq/sample	Zinc-65	3.050	2.70	1.9-3.5	Acceptable
11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Americium-241	0.226	0.19	0.135-0.251	Acceptable
11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Cesium-134	4.750	5.20	3.64-6.67	Acceptable
11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Cesium-137	6.910	6.60	4.62-8.58	Acceptable
11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Cobalt-57	-0.002	0.00	False Pos Test	Acceptable
11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Cobalt-60	0.008	0.00	False Pos Test	Acceptable
11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Manganese-54	7.980	7.88	5.52-10.24	Acceptable
11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Plutonium-238	0.001	0.001	Sens. Eval.	Acceptable
11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Plutonium-239/240	0.1510	0.171	0.120-0.222	Acceptable
11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Strontium-90	2.330	2.32	1.62-3.02	Acceptable
11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Uranium-234/233	0.046	0.047	0.0326-0.0606	Acceptable
11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Uranium-238	0.332	0.324	0.227-0.421	Acceptable
11/12/13	MAPEP-13-RdV29	Vegetation	Bq/sample	Zinc-65	2.850	2.63	1.84-3.42	Acceptable
11/12/13	MAPEP-13-XaW29	Water	Bq/L	Iodine-129	3.62	3.79	2.65-4.93	Acceptable

Table 4

2013 ERA PROGRAM PERFORMANCE EVALUATION RESULTS

Report Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
02/28/13	RAD - 92	Water	pCi/L	Barium-133	55.4	54.4	44.9-60.2	Acceptable
02/28/13	RAD - 92	Water	pCi/L	Cesium-134	27.2	29.9	23.4-32.9	Acceptable
02/28/13	RAD - 92	Water	pCi/L	Cesium-137	74.3	75.3	67.8-85.5	Acceptable
02/28/13	RAD - 92	Water	pCi/L	Cobalt-60	89.0	97.7	87.9-110	Acceptable
02/28/13	RAD - 92	Water	pCi/L	Zinc-65	126	114	103-136	Acceptable
02/28/13	RAD - 92	Water	pCi/L	Gross Alpha	26.0	24.8	12.5-33.0	Acceptable
02/28/13	RAD - 92	Water	pCi/L	Gross Beta	19.4	19.3	11.3-27.5	Acceptable
02/28/13	RAD - 92	Water	pCi/L	Gross Alpha	31.4	24.8	12.5-33.0	Acceptable
02/28/13	RAD - 92	Water	pCi/L	Radium-226	10.4	9.91	7.42-11.6	Acceptable
02/28/13	RAD - 92	Water	pCi/L	Radium-228	4.84	5.22	3.14-6.96	Acceptable
02/28/13	RAD - 92	Water	pCi/L	Uranium (Nat)	6.43	5.96	4.47-7.13	Acceptable
02/28/13	RAD - 92	Water	ug/L	Uranium (Nat) mass	9.59	8.69	6.50-10.4	Acceptable
02/28/13	RAD - 92	Water	pCi/L	Radium-226	11.60	9.91	7.42-11.6	Acceptable
02/28/13	RAD - 92	Water	pCi/L	Radium-228	5.13	5.22	3.14-6.96	Acceptable
02/28/13	RAD - 92	Water	pCi/L	Uranium (Nat)	5.95	5.96	4.47-7.13	Acceptable
02/28/13	RAD - 92	Water	ug/L	Uranium (Nat) mass	9.95	8.69	6.50-10.4	Acceptable
02/28/13	RAD - 92	Water	pCi/L	Tritium	1430	1320	1040-1480	Acceptable
02/28/13	RAD - 92	Water	pCi/L	Strontium-89	47.5	48	37.6-55.3	Acceptable
02/28/13	RAD - 92	Water	pCi/L	Strontium-90	35.9	39.8	29.2-45.8	Acceptable
02/28/13	RAD - 92	Water	pCi/L	Strontium-89	42.9	48	37.6-55.3	Acceptable
02/28/13	RAD - 92	Water	pCi/L	Strontium-90	34.6	39.8	29.2-45.8	Acceptable
02/28/13	RAD - 92	Water	pCi/L	Iodine-131	23.6	22.7	18.8-27.0	Acceptable
02/28/13	RAD - 92	Water	pCi/L	Iodine-131	27	22.7	18.8-27.0	Acceptable
08/22/13	RAD - 94	Water	pCi/L	Barium-133	76.4	740.5	62.4-82.0	Acceptable
08/22/13	RAD - 94	Water	pCi/L	Cesium-134	68.7	72.4	59.1-79.6	Acceptable
08/22/13	RAD - 94	Water	pCi/L	Cesium-137	154	155	140-172	Acceptable
08/22/13	RAD - 94	Water	pCi/L	Cobalt-60	85.3	82.3	74.1-92.9	Acceptable
08/22/13	RAD - 94	Water	pCi/L	Zinc-65	297	260	234-304	Acceptable
08/22/13	RAD - 94	Water	pCi/L	Gross Alpha	74.3	57.1	29.8-71.2	Not Acceptable
08/22/13	RAD - 94	Water	pCi/L	Gross Beta	34.3	41.8	27.9-49.2	Acceptable
08/22/13	RAD - 94	Water	pCi/L	Gross Alpha	67.7	57.1	29.8-71.2	Acceptable
08/22/13	RAD - 94	Water	pCi/L	Radium-226	16.9	17.2	12.8-19.7	Acceptable
08/22/13	RAD - 94	Water	pCi/L	Radium-226	17	17.2	12.8-19.7	Acceptable
08/22/13	RAD - 94	Water	pCi/L	Radium-228	3.53	3.86	2.18-5.4	Acceptable
08/22/13	RAD - 94	Water	pCi/L	Uranium (Nat)	20.4	21.4	17.1-24.1	Acceptable
08/22/13	RAD - 94	Water	ug/L	Uranium (Nat) mass	30.4	31.2	25.0-35.2	Acceptable
08/22/13	RAD - 94	Water	pCi/L	Radium-226	14.6	17.2	12.8-19.7	Acceptable
08/22/13	RAD - 94	Water	pCi/L	Uranium (Nat)	21.6	21.4	17.1-24.1	Acceptable
08/22/13	RAD - 94	Water	ug/L	Uranium (Nat) mass	33.7	31.2	25-35.2	Acceptable

Report Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
08/22/13	RAD - 94	Water	pCi/L	Tritium	12500	13300	11600-14600	Acceptable
08/22/13	RAD - 94	Water	pCi/L	Strontium-89	48.9	36.5	27.4-43.4	Not Acceptable
08/22/13	RAD - 94	Water	pCi/L	Strontium-90	14.3	19.8	14.1-23.4	Acceptable
08/22/13	RAD - 94	Water	pCi/L	Strontium-89	44.3	36.5	27.4-43.4	Not Acceptable
08/22/13	RAD - 94	Water	pCi/L	Strontium-90	17.3	19.8	14.1-23.4	Acceptable
08/22/13	RAD - 94	Water	pCi/L	Iodine-131	26.1	24.3	20.2-28.8	Acceptable
08/22/13	RAD - 94	Water	pCi/L	Iodine-131	23.3	24.3	20.2-28.8	Acceptable

Table 5

2013 ERA PROGRAM (MRAD) PERFORMANCE EVALUATION RESULTS

Report Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
05/22/13	MRAD-18	Soil	pCi/kg	Actinium-228	1500	1240	795-1720	Acceptable
05/22/13	MRAD-18	Soil	pCi/kg	Americium-241	225	229	134-297	Acceptable
05/22/13	MRAD-18	Soil	pCi/kg	Bismuth-212	1250	1240	330-1820	Acceptable
05/22/13	MRAD-18	Soil	pCi/kg	Bismuth-214	4410	3660	2200-5270	Acceptable
05/22/13	MRAD-18	Soil	pCi/kg	Cesium-134	7850	6370	4160-7650	Not Accept.
05/22/13	MRAD-18	Soil	pCi/kg	Cesium-137	8070	6120	4690-7870	Not Accept.
05/22/13	MRAD-18	Soil	pCi/kg	Cobalt-60	10300	7920	5360-10900	Acceptable
05/22/13	MRAD-18	Soil	pCi/kg	Lead-212	1290	1240	812-1730	Acceptable
05/22/13	MRAD-18	Soil	pCi/kg	Lead-214	4690	3660	2140-5460	Acceptable
05/22/13	MRAD-18	Soil	pCi/kg	Manganese-54	<63.4	<1000	0-1000	Acceptable
05/22/13	MRAD-18	Soil	pCi/kg	Plutonium-238	651	788.00	474-1090	Acceptable
05/22/13	MRAD-18	Soil	pCi/kg	Plutonium-239	320	366.00	239-506	Acceptable
05/22/13	MRAD-18	Soil	pCi/kg	Potassium-40	10300	10300	7520-13800	Acceptable
05/22/13	MRAD-18	Soil	pCi/kg	Strontium-90	6730	8530	3250-13500	Acceptable
05/22/13	MRAD-18	Soil	pCi/kg	Thorium-234	3290	1900	601-3570	Acceptable
05/22/13	MRAD-18	Soil	pCi/kg	Zinc-65	1910	1400	1110-1860	Not Accept.
05/22/13	MRAD-18	Soil	pCi/kg	Strontium-90	6730	8530	3250-13500	Acceptable
05/22/13	MRAD-18	Soil	pCi/kg	Uranium-234	1210	1920	1170-2460	Acceptable
05/22/13	MRAD-18	Soil	pCi/kg	Uranium-238	1630	1900	1180-2410	Acceptable
05/22/13	MRAD-18	Soil	pCi/kg	Uranium-Total	2840	3920	2130-5170	Acceptable
05/22/13	MRAD-18	Soil	ug/kg	Uranium-Total(mass)	4150	5710	3150-7180	Acceptable
05/22/13	MRAD-18	Vegetation	pCi/kg	Am-241	629	553	338-735	Acceptable
05/22/13	MRAD-18	Vegetation	pCi/kg	Cesium-134	1400	1240	797-1610	Acceptable
05/22/13	MRAD-18	Vegetation	pCi/kg	Cesium-137	687	544	394-757	Acceptable
05/22/13	MRAD-18	Vegetation	pCi/kg	Cobalt-60	2410	1920	1320-2680	Acceptable
05/22/13	MRAD-18	Vegetation	pCi/kg	Curium-244	1420	1340	657-2090	Acceptable
05/22/13	MRAD-18	Vegetation	pCi/kg	Manganese-54	<47.4	<300	0.00-300	Acceptable
05/22/13	MRAD-18	Vegetation	pCi/kg	Plutonium-238	2060	1980	1180-2710	Acceptable

Report Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
05/22/13	MRAD-18	Vegetation	pCi/kg	Plutonium-239	2230	2260	1390-3110	Acceptable
05/22/13	MRAD-18	Vegetation	pCi/kg	Potassium-40	35600	31900	23000-44800	Acceptable
05/22/13	MRAD-18	Vegetation	pCi/kg	Strontium-90	3720	3840	2190-5090	Acceptable
05/22/13	MRAD-18	Vegetation	pCi/kg	Uranium-234	2650	2460	1620-3160	Acceptable
05/22/13	MRAD-18	Vegetation	pCi/kg	Uranium-238	2580	2440	1630-3100	Acceptable
05/22/13	MRAD-18	Vegetation	pCi/kg	Uranium-Total	5361	5010	3390-6230	Acceptable
05/22/13	MRAD-18	Vegetation	ug/kg	Uranium-Total(mass)	7740	7310	4900-9280	Acceptable
05/22/13	MRAD-18	Vegetation	pCi/kg	Zinc-65	1150	878	633-1230	Acceptable
05/22/13	MRAD-18	Filter	pCi/Filter	Americium-241	62.9	66.8	41.2-90.4	Acceptable
05/22/13	MRAD-18	Filter	pCi/Filter	Cesium-134	1080	1110	706-1380	Acceptable
05/22/13	MRAD-18	Filter	pCi/Filter	Cesium-137	971	940	706-1230	Acceptable
05/22/13	MRAD-18	Filter	pCi/Filter	Cobalt-60	217	214	166-267	Acceptable
05/22/13	MRAD-18	Filter	pCi/Filter	Iron-55	224	225	69.8-440	Acceptable
05/22/13	MRAD-18	Filter	pCi/Filter	Manganese-54	<5.27	<50.0	0-50.0	Acceptable
05/22/13	MRAD-18	Filter	pCi/Filter	Plutonium-238	48.0	50.1	34.3-65.9	Acceptable
05/22/13	MRAD-18	Filter	pCi/Filter	Plutonium-239	62.7	65.2	47.2-85.2	Acceptable
05/22/13	MRAD-18	Filter	pCi/Filter	Strontium-90	139	138	67.4-207	Acceptable
05/22/13	MRAD-18	Filter	pCi/Filter	Uranium-234	54.5	59.4	36.8-89.6	Acceptable
05/22/13	MRAD-18	Filter	pCi/Filter	Uranium-238	58.5	58.9	38.1-81.4	Acceptable
05/22/13	MRAD-18	Filter	pCi/Filter	Uranium-Total	117	121	67.0-184	Acceptable
05/22/13	MRAD-18	Filter	ug/Filter	Uranium-Total(mass)	176	176	113-248	Acceptable
05/22/13	MRAD-18	Filter	pCi/Filter	Zinc-65	222	199	142-275	Acceptable
05/22/13	MRAD-18	Filter	pCi/Filter	Gross Alpha	55.5	42.3	14.2-65.7	Acceptable
05/22/13	MRAD-18	Filter	pCi/Filter	Gross Beta	31	25.1	15.9-36.6	Acceptable
05/22/13	MRAD-18	Water	pCi/L	Americium-241	118	118	79.5-158	Acceptable
05/22/13	MRAD-18	Water	pCi/L	Cesium-134	1320	1400	1030-1610	Acceptable
05/22/13	MRAD-18	Water	pCi/L	Cesium-137	1900	1880	1600-2250	Acceptable
05/22/13	MRAD-18	Water	pCi/L	Cobalt-60	2370	2270	1970-2660	Acceptable
05/22/13	MRAD-18	Water	pCi/L	Iron-55	812	712	424-966	Acceptable
05/22/13	MRAD-18	Water	pCi/L	Manganese-54	<7.6	<100	0.00-100	Acceptable
05/22/13	MRAD-18	Water	pCi/L	Plutonium-238	91	99	73.1-123	Acceptable
05/22/13	MRAD-18	Water	pCi/L	Plutonium-239	161	185	144-233	Acceptable
05/22/13	MRAD-18	Water	pCi/L	Strontium-90	144	137	89.2-181	Acceptable
05/22/13	MRAD-18	Water	pCi/L	Uranium-234	47.3	48.8	36.7-62.9	Acceptable
05/22/13	MRAD-18	Water	pCi/L	Uranium-238	50.8	48.4	36.9-59.4	Acceptable
05/22/13	MRAD-18	Water	pCi/L	Uranium-Total	98.1	99.5	73.1-129	Acceptable
05/22/13	MRAD-18	Water	ug/L	Uranium-Total(mass)	152	145	116-175	Acceptable
05/22/13	MRAD-18	Water	pCi/L	Zinc-65	428	384	320-484	Acceptable
05/22/13	MRAD-18	Water	pCi/L	Gross Alpha	138.0	130	46.2-201	Acceptable
05/22/13	MRAD-18	Water	pCi/L	Gross Beta	87	78.9	45.2-117	Acceptable
05/22/13	MRAD-18	Water	pCi/L	Tritium	13100	12300	8240-17500	Acceptable
11/26/13	MRAD-19	Soil	pCi/kg	Actinium-228	1200	1240	795-1720	Acceptable
11/26/13	MRAD-19	Soil	pCi/kg	Americium-241	186	164	95.9-213	Acceptable

Report Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
11/26/13	MRAD-19	Soil	pCi/kg	Bismuth-212	1760	1220	325-1790	Acceptable
11/26/13	MRAD-19	Soil	pCi/kg	Bismuth-214	4350	3740	2250-5380	Acceptable
11/26/13	MRAD-19	Soil	pCi/kg	Cesium-134	2690	2820	1840-3390	Acceptable
11/26/13	MRAD-19	Soil	pCi/kg	Cesium-137	3960	4130	3160-5310	Acceptable
11/26/13	MRAD-19	Soil	pCi/kg	Cobalt-60	5490	5680	3840-7820	Acceptable
11/26/13	MRAD-19	Soil	pCi/kg	Lead-212	1260	1220	799-1700	Acceptable
11/26/13	MRAD-19	Soil	pCi/kg	Lead-214	4700	3740	2180-5580	Acceptable
11/26/13	MRAD-19	Soil	pCi/kg	Manganese-54	<55.2	<1000	0-1000	Acceptable
11/26/13	MRAD-19	Soil	pCi/kg	Plutonium-238	576	658	396-908	Acceptable
11/26/13	MRAD-19	Soil	pCi/kg	Plutonium-239	400	397	260-548	Acceptable
11/26/13	MRAD-19	Soil	pCi/kg	Potassium-40	11200	12400	9080-16700	Acceptable
11/26/13	MRAD-19	Soil	pCi/kg	Strontium-90	8220	6860	2620-10800	Acceptable
11/26/13	MRAD-19	Soil	pCi/kg	Thorium-234	2870	3080	974-5790	Acceptable
11/26/13	MRAD-19	Soil	pCi/kg	Zinc-65	3400	3160	2520-4200	Acceptable
11/26/13	MRAD-19	Soil	pCi/kg	Uranium-234	2870	3080	974-5790	Acceptable
11/26/13	MRAD-19	Soil	pCi/kg	Uranium-238	2979	3080	1910-3910	Acceptable
11/26/13	MRAD-19	Soil	pCi/kg	Uranium-Total	6870	6320	3430-8340	Acceptable
11/26/13	MRAD-19	Soil	ug/kg	Uranium-Total(mass)	8460	9220	5080-11600	Acceptable
11/26/13	MRAD-19	Vegetation	pCi/kg	Am-241	3800	3630	2220-4830	Acceptable
11/26/13	MRAD-19	Vegetation	pCi/kg	Cesium-134	907	859	552-1120	Acceptable
11/26/13	MRAD-19	Vegetation	pCi/kg	Cesium-137	1220	1030	747-1430	Acceptable
11/26/13	MRAD-19	Vegetation	pCi/kg	Cobalt-60	2100	1880	1300-2630	Acceptable
11/26/13	MRAD-19	Vegetation	pCi/kg	Curium-244	1230	1250	612-1950	Acceptable
11/26/13	MRAD-19	Vegetation	pCi/kg	Manganese-54	<53.3	<300	0-300	Acceptable
11/26/13	MRAD-19	Vegetation	pCi/kg	Plutonium-238	1280	1290	769-1770	Acceptable
11/26/13	MRAD-19	Vegetation	pCi/kg	Plutonium-239	2580	2770	1700-3810	Acceptable
11/26/13	MRAD-19	Vegetation	pCi/kg	Potassium-40	33600	33900	24500-47600	Acceptable
11/26/13	MRAD-19	Vegetation	pCi/kg	Strontium-90	5870	6360	3630-8430	Acceptable
11/26/13	MRAD-19	Vegetation	pCi/kg	Uranium-234	674	654	430-840	Acceptable
11/26/13	MRAD-19	Vegetation	pCi/kg	Uranium-234	1050	654	430-840	Not Acceptable
11/26/13	MRAD-19	Vegetation	pCi/kg	Uranium-238	655	648	432-823	Acceptable
11/26/13	MRAD-19	Vegetation	pCi/kg	Uranium-Total	1364	1330	901-1660	Acceptable
11/26/13	MRAD-19	Vegetation	pCi/kg	Uranium-Total	1773	1330	901-1660	Not Acceptable
11/26/13	MRAD-19	Vegetation	ug/kg	Uranium-Total(mass)	1960	1940	1300-2460	Acceptable
11/26/13	MRAD-19	Vegetation	pCi/kg	Zinc-65	1990	1540	1110-2160	Acceptable
11/26/13	MRAD-19	Filter	pCi/Filter	Americium-241	75.2	66.4	40.9-89.9	Acceptable
11/26/13	MRAD-19	Filter	pCi/Filter	Cesium-134	845	868.0	552-1080	Acceptable
11/26/13	MRAD-19	Filter	pCi/Filter	Cesium-137	641	602	452-791	Acceptable
11/26/13	MRAD-19	Filter	pCi/Filter	Cobalt-60	534	494	382-617	Acceptable
11/26/13	MRAD-19	Filter	pCi/Filter	Iron-55	466	389.0	121-760	Acceptable
11/26/13	MRAD-19	Filter	pCi/Filter	Manganese-54	<3.9	<50	0.00-50.0	Acceptable

Report Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
11/26/13	MRAD-19	Filter	ug/Filter	Plutonium-238	72.8	68.5	46.9-90.1	Acceptable
11/26/13	MRAD-19	Filter	pCi/Filter	Plutonium-239	56.5	53.4	42.4-93.1	Acceptable
11/26/13	MRAD-19	Filter	pCi/Filter	Strontium-90	130	125	61.1-187	Acceptable
11/26/13	MRAD-19	Filter	pCi/Filter	Uranium-234	56	87	35.6-86.6	Acceptable
11/26/13	MRAD-19	Filter	pCi/Filter	Uranium-238	58	56.90	36.8-78.7	Acceptable
11/26/13	MRAD-19	Filter	pCi/Filter	Uranium-Total	116	117	64.8-178	Acceptable
11/26/13	MRAD-19	Filter	ug/Filter	Uranium-Total(mass)	172	171	109-241	Acceptable
11/26/13	MRAD-19	Filter	pCi/Filter	Zinc-65	514	419	300-578	Acceptable
11/26/13	MRAD-19	Filter	ug/Filter	Uranium-Total(mass)	169	171	109-241	Acceptable
11/26/13	MRAD-19	Filter	ug/Filter	Uranium-Total(mass)	150	171	109-241	Acceptable
11/26/13	MRAD-19	Filter	pCi/Filter	Gross Alpha	100	83	27.8-129	Acceptable
11/26/13	MRAD-19	Filter	pCi/Filter	Gross Beta	65.7	56.3	35.6-82.2	Acceptable
11/26/13	MRAD-19	Water	pCi/L	Americium-241	126	126	84.9-169	Acceptable
11/26/13	MRAD-19	Water	pCi/L	Cesium-134	2060	2180	1600-2510	Acceptable
11/26/13	MRAD-19	Water	pCi/L	Cesium-137	2730	2760	2340-3310	Acceptable
11/26/13	MRAD-19	Water	pCi/L	Cobalt-60	1960	1890	1640-2210	Acceptable
11/26/13	MRAD-19	Water	pCi/L	Iron-55	721	689	411-935	Acceptable
11/26/13	MRAD-19	Water	pCi/L	Manganese-54	<7.24	<100	0.00-100	Acceptable
11/26/13	MRAD-19	Water	pCi/L	Plutonium-238	133	138	102-172	Acceptable
11/26/13	MRAD-19	Water	pCi/L	Plutonium-239	98.7	109	84.6-137	Acceptable
11/26/13	MRAD-19	Water	pCi/L	Strontium-90	726	788	513-1040	Acceptable
11/26/13	MRAD-19	Water	pCi/L	Uranium-234	93	99	74.3-128	Acceptable
11/26/13	MRAD-19	Water	pCi/L	Uranium-238	93	98.00	74.7-120	Acceptable
11/26/13	MRAD-19	Water	pCi/L	Uranium-Total	186	201	148-260	Acceptable
11/26/13	MRAD-19	Water	ug/L	Uranium-Total(mass)	278	294	234-355	Acceptable
11/26/13	MRAD-19	Water	pCi/L	Zinc-65	1560	1370	1140-1730	Acceptable
11/26/13	MRAD-19	Water	pCi/L	Gross Alpha	105.0	97	34.3-150	Acceptable
11/26/13	MRAD-19	Water	pCi/L	Gross Beta	78.8	84.5	48.4-125	Acceptable
11/26/13	MRAD-19	Water	pCi/L	Tritium	8740	9150	6130-13000	Acceptable
11/26/13	MRAD-19	Water	pCi/L	Uranium-234	92.4	98.9	74.3-128	Acceptable
11/26/13	MRAD-19	Water	pCi/L	Uranium-238	96.1	98.0	74.7-120	Acceptable
11/26/13	MRAD-19	Water	pCi/L	Uranium-Total	193	201	148-260	Acceptable
11/26/13	MRAD-19	Water	ug/L	Uranium-Total(mass)	288	294	234-355	Acceptable
11/26/13	MRAD-19	Water	pCi/L	Uranium-234	95.2	98.9	74.3-128	Acceptable
11/26/13	MRAD-19	Water	pCi/L	Uranium-238	115	98.00	74.7-120	Acceptable
11/26/13	MRAD-19	Water	pCi/L	Uranium-Total	215	201	148-260	Acceptable
11/26/13	MRAD-19	Water	ug/L	Uranium-Total(mass)	344	294	234-355	Acceptable
11/26/13	MRAD-19	Water	ug/L	Uranium-Total(mass)	258	294	234-355	Acceptable

Figure 1

Cobalt-60 Performance Evaluation Results and % Bias

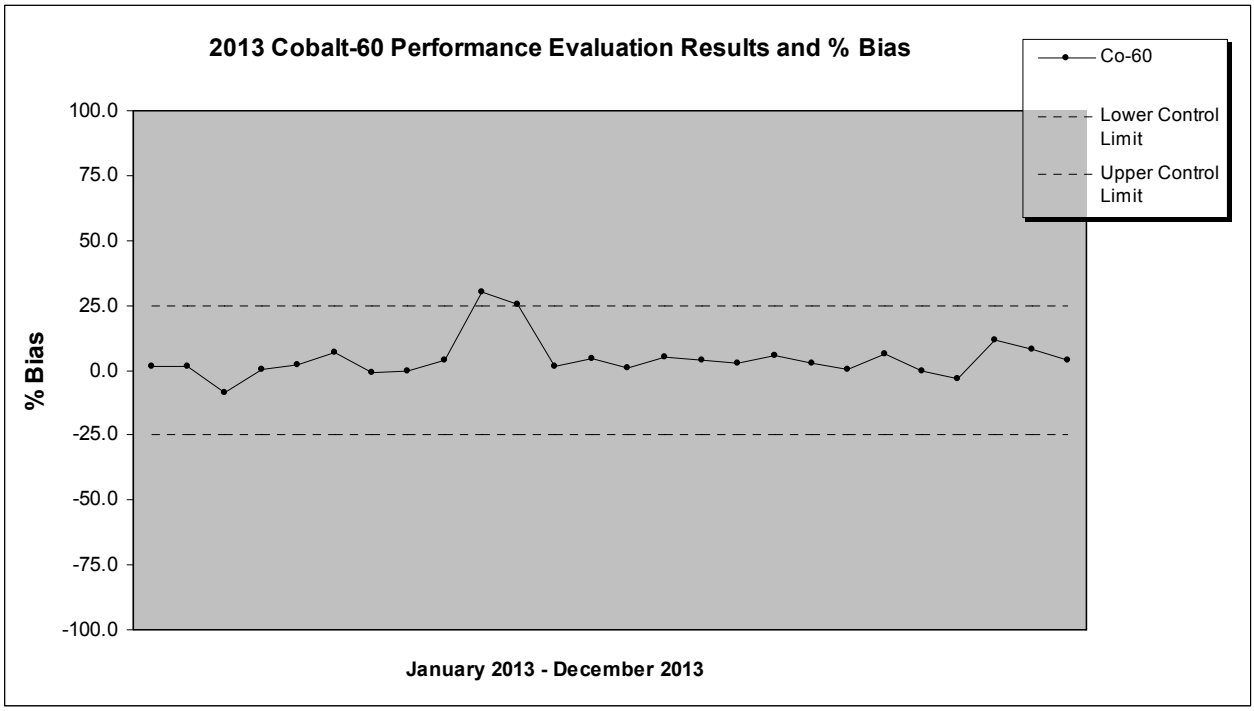


Figure 2

Cesium-137 Performance Evaluation Results and % Bias

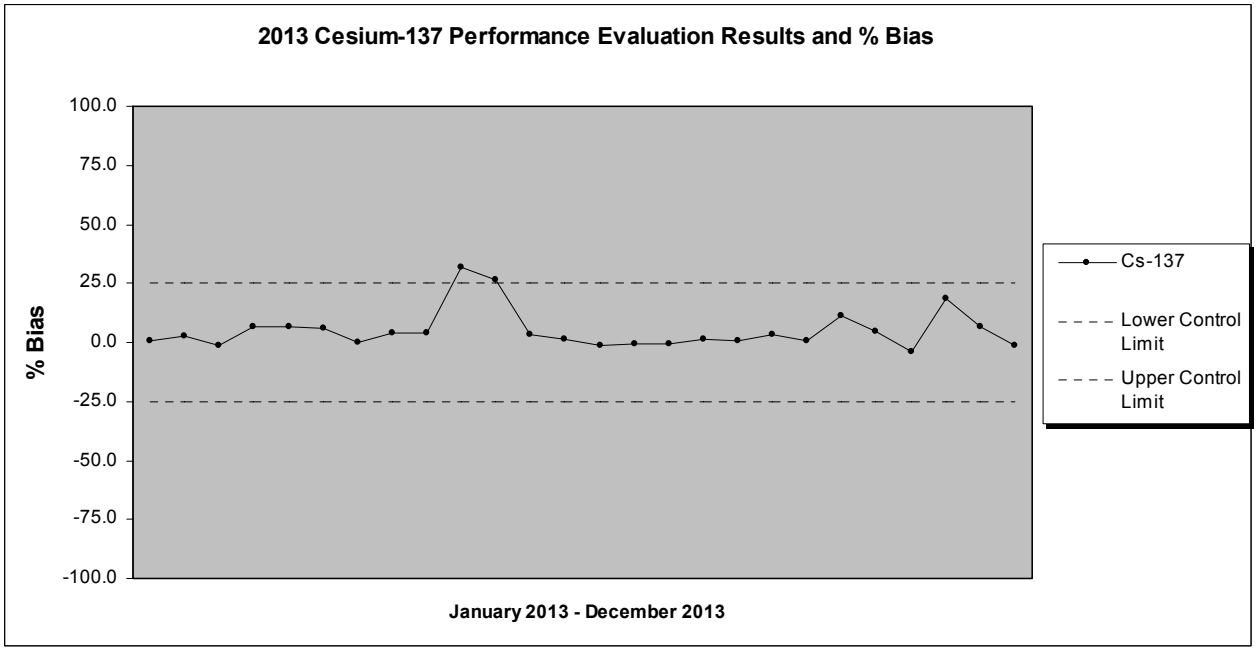


Figure 3

Tritium Performance Evaluation Results and % Bias

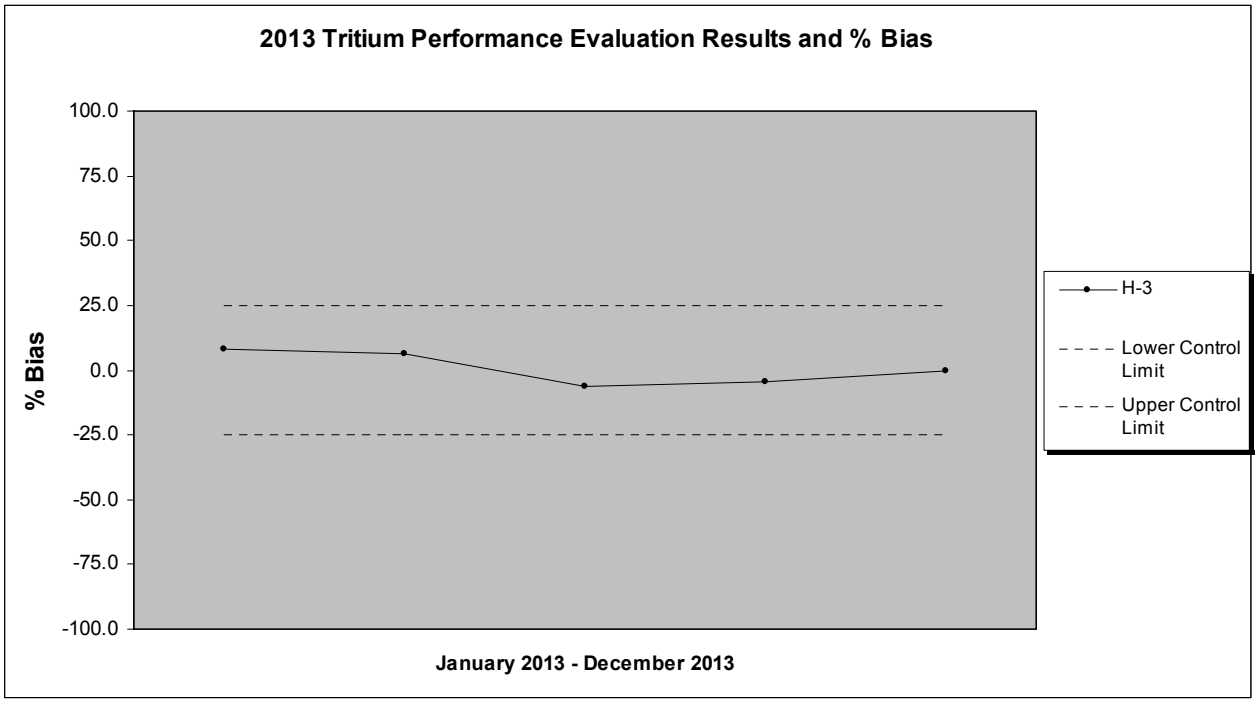


Figure 4

Strontium-90 Performance Evaluation Results and % Bias

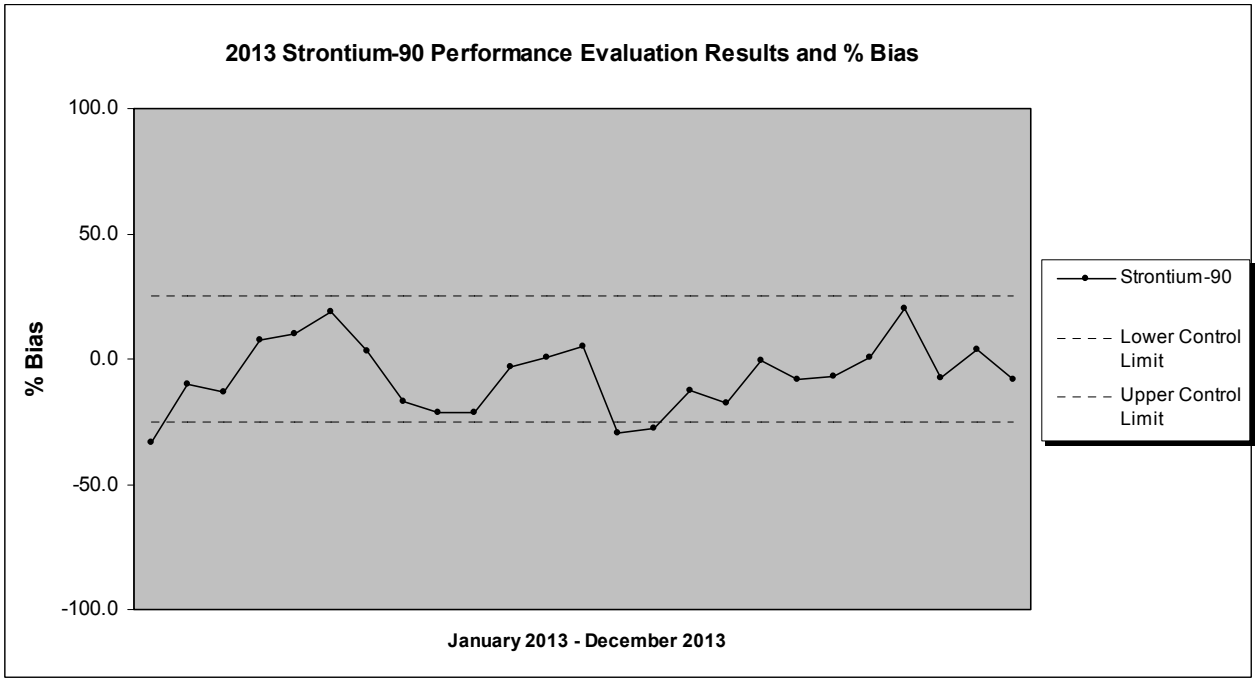


Figure 5

GROSS ALPHA Performance Evaluation Results and % Bias

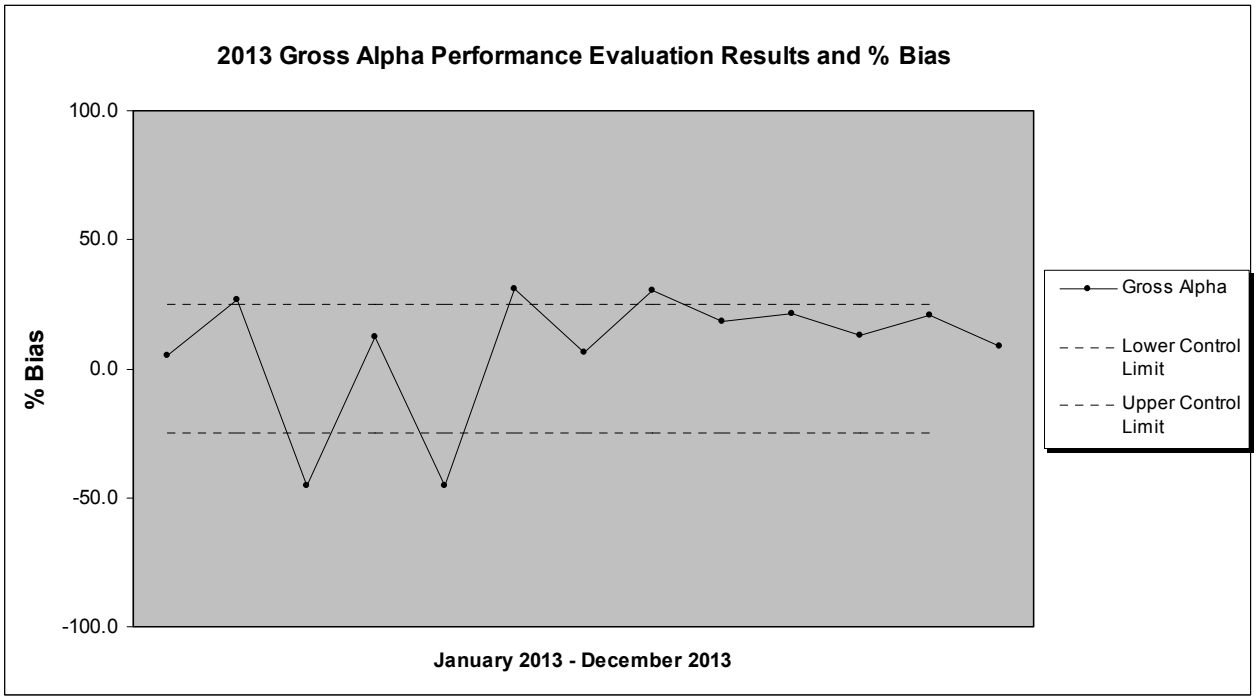


Figure 6

GROSS BETA Performance Evaluation Results and % Bias

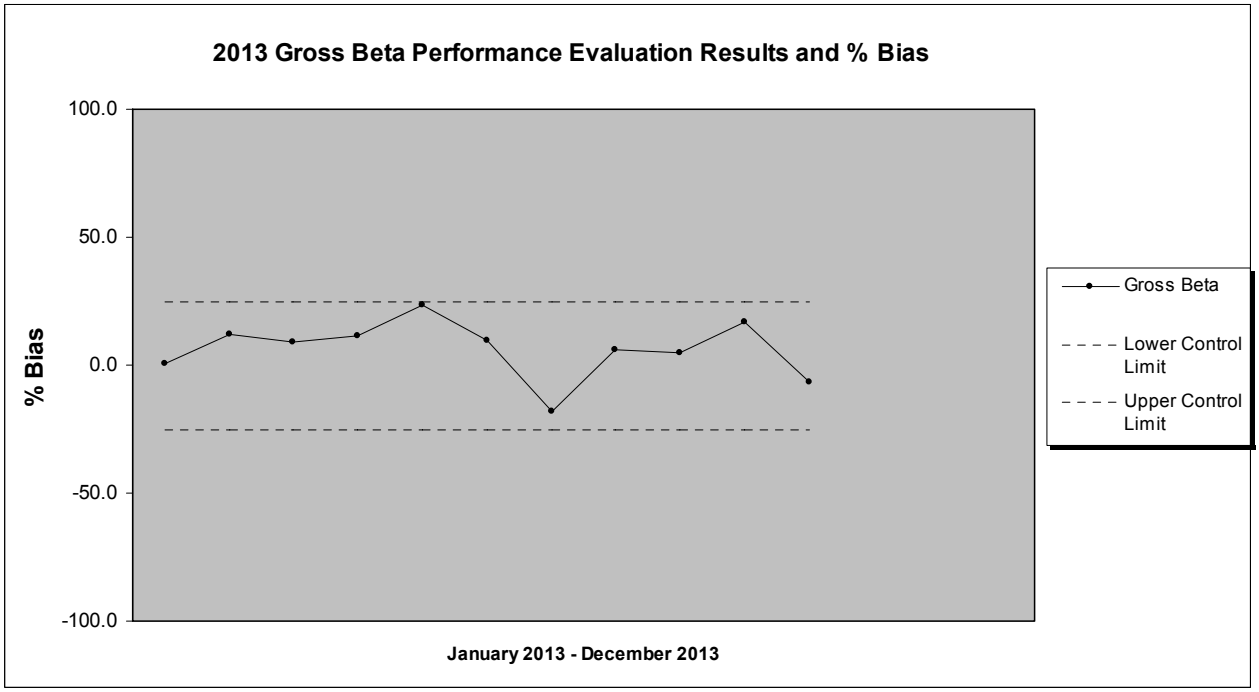


Figure 7

IODINE-131 PERFORMANCE EVALUATION RESULTS AND % BIAS

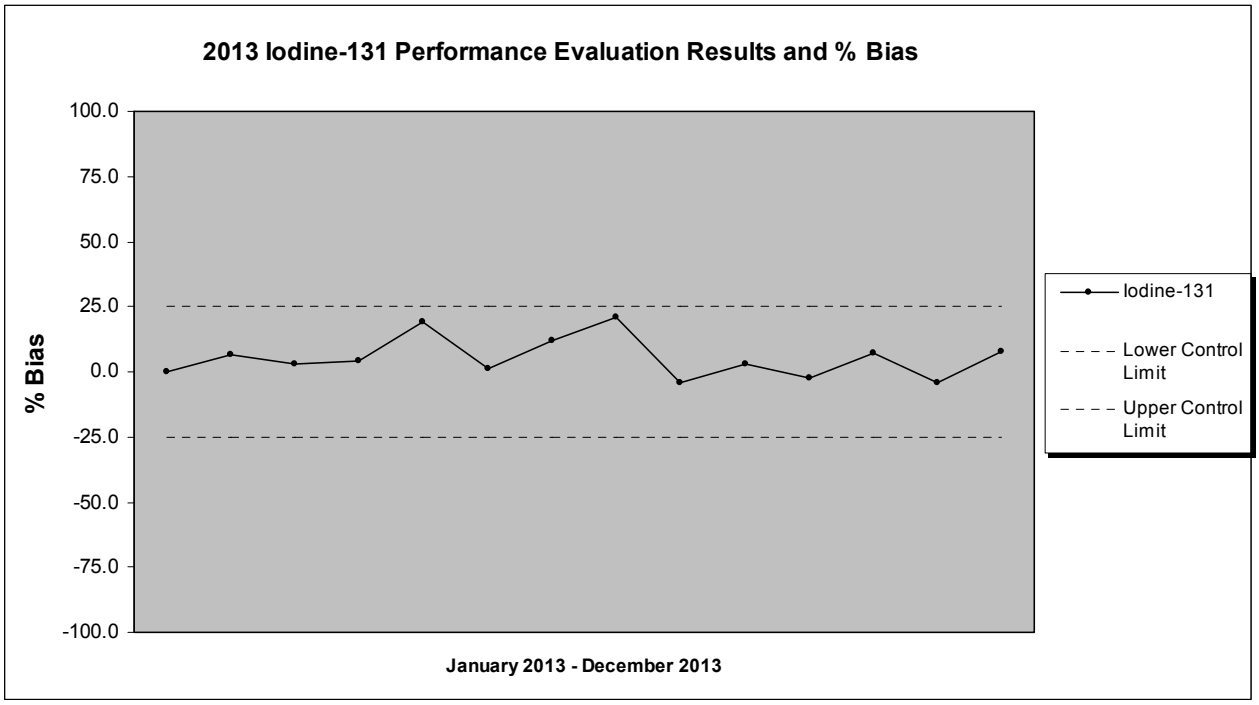


Figure 8

AMERICIUM-241 PERFORMANCE EVALUATION RESULTS AND % BIAS

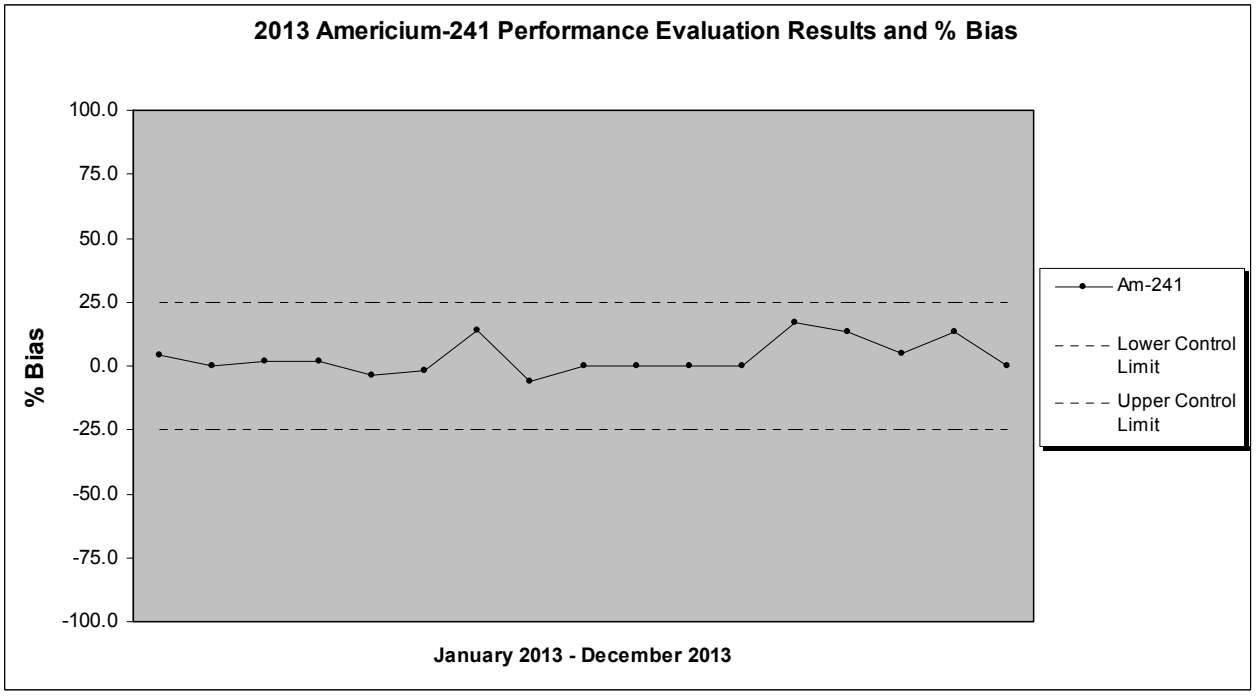


Figure 9

PLUTONIUM-238 PERFORMANCE EVALUATION RESULTS AND % BIAS

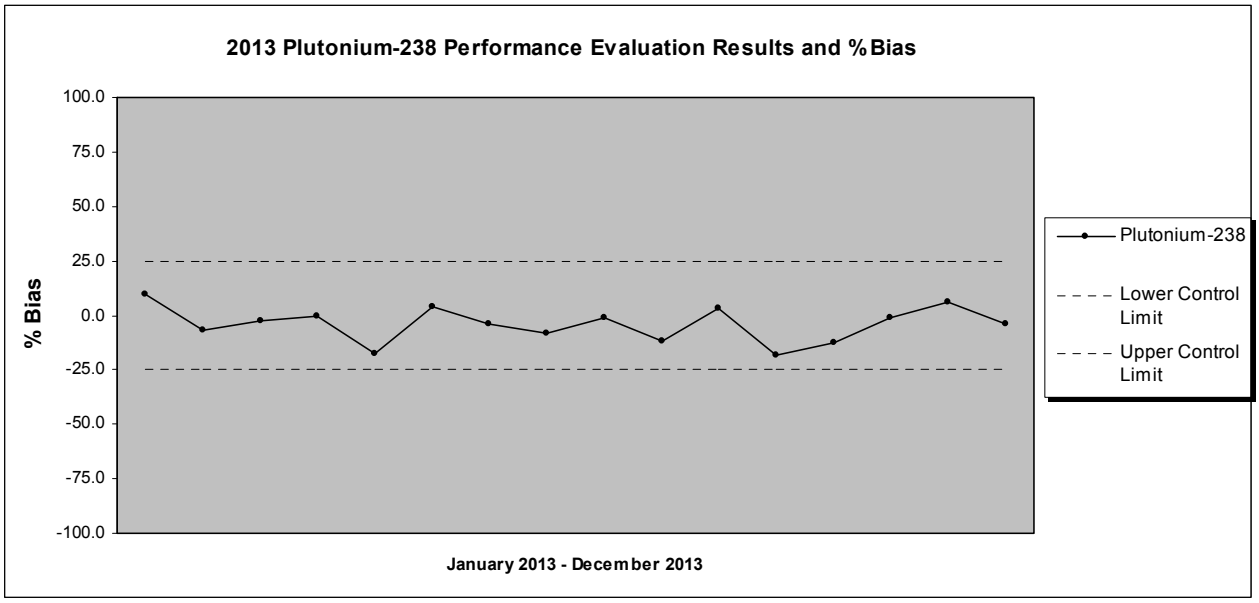

2013 Plutonium-238 Performance Evaluation Results and %Bias
100.0
75.0
50.0
25.0
0.0
-25.0
-50.0
-75.0
-100.0
% Bias
January 2013 - December 2013
Plutonium-238
Lower Control Limit
Upper Control Limit

Table 6

REMP INTRA-LABORATORY DATA SUMMARY: BIAS AND PRECISION BY MATRIX

REMP 2013	Bias Criteria (+ / - 25%)		Precision Criteria (Note 1)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
MILK				
Gamma Iodine-131	41	0	131	0
Gas Flow Sr 2nd count	46	0	49	0
Gas Flow Total Strontium	35	0	35	0
Gamma Spec Liquid RAD A-013 with Ba, La	61	0	120	0
SOLID				
LSC Iron-55	5	0	5	0
Gamma Spec Solid RAD A-013	28	0	31	0
LSC Nickel 63	5	0	5	0
Gas Flow Sr 2nd count	4	0	4	0
Gas Flow Total Strontium	8	0	8	0
Gamma Spec Solid RAD A-013 with Ba, La	7	0	10	0
Gamma Spec Solid RAD A-013 with Iodine	6	0	7	0
FILTER				
Gamma Spec Filter RAD A-013	4	0	4	0
Gas Flow Sr 2nd Count	5	0	5	0
Alpha Spec Am241Curium	3	0	3	0
Gas Flow Total Strontium	3	0	3	0
Gross A & B	526	0	527	0
Gamma Spec Filter	45	0	51	0
LIQUID				
Alpha Spec Uranium	8	0	9	0
Tritium	336	0	337	0
Plutonium	1	0	1	0
LSC Iron-55	40	0	42	0
LSC Nickel 63	41	0	43	0
Gamma Spec Liquid RAD A-013	7	0	7	0
Gamma Iodine-131	33	0	33	0
Alpha Spec Plutonium	10	0	10	0
Gas Flow Sr 2nd count	20	0	20	0
Alpha Spec Am241 Curium	17	0	17	0
Gas Flow Total Strontium	161	0	163	0
Gross Alpha Non Vol Beta	102	0	104	0
Gamma Spec Liquid RAD A-013 with Ba, La	129	0	209	0
Gamma Spec Liquid RAD A-013 with Iodine	56	0	85	0
TISSUE				

REMP 2013	Bias Criteria (+ / - 25%)		Precision Criteria (Note 1)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
Gamma Spec Solid RAD A-013	45	0	48	0
LSC Nickel 63	2	0	2	0
Gas Flow Sr 2nd count	10	0	10	0
Gas Flow Total Strontium	17	0	17	0
Gamma Spec Solid RAD A-013 with Ba, La	6	0	5	0
Gamma Spec Solid RAD A-013 with Iodine	17	0	17	0
SEA WATER				
LSC Iron-55	2	0	2	0
LSC Nickel 63	2	0	2	0
Gas Flow Total Strontium	1	0	1	0
Gross Alpha Non Vol Beta	1	0	1	0
Gamma Spec Liquid RAD A-013 with Iodine	1	0	1	0
VEGETATION				
Gas Flow Sr 2nd count	9	0	9	0
Gamma Spec Solid RAD A-013 with Iodine	91	0	93	0
AIR CHARCOAL				
Gamma Iodine 131 RAD A-013	623	0	645	0
Carbon-14 (Ascarite/Soda Lime Filter per Liter)	46	0	47	0
DRINKING WATER				
Tritium	51	0	52	0
LSC Iron-55	24	0	22	0
LSC Nickel 63	23	0	21	0
Gamma Iodine-131	38	0	38	0
Gas Flow Sr 2nd count	16	0	16	0
Gas Flow Total Strontium	31	0	31	0
Gross Alpha Non Vol Beta	103	0	103	0
Gamma Spec Liquid RAD A-013 with Ba, La	44	0	98	0
Total	**2996**		**3359**	

Note 1: The RPD must be 20 percent or less, if both samples are greater than 5 times the MDC. If both results are less than 5 times MDC, then the RPD must be equal to or less than 100%. If one result is above the MDC and the other is below the MDC, then the RPD can be calculated using the MDC for the result of the one below the MDC. The RPD must be 100% or less. In the situation where both results are above the MDC but one result is greater than 5 times the MDC and the other is less than 5 times the MDC, the RPD must be less than or equal to 20%. If both results are below MDC, then the limits on % RPD are not applicable.

Table 7

ALL RADIOLOGICAL INTRA-LABORATORY DATA SUMMARY:
BIAS AND PRECISION BY MATRIX

ENVIRONMENTAL 2013	Bias Criteria (+ / - 25%		Precision Criteria (Note 1)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
MILK				
Gamma Spec Liquid RAD A-013	8	0	8	0
Gamma Iodine-129	1	0	1	0
Gamma Iodine-131	41	0	131	0
Gas Flow Sr 2nd count	50	0	51	0
Gas Flow Strontium 90	10	0	10	0
Gas Flow Total Strontium	35	0	35	0
Gamma Spec Liquid RAD A-013 with Ba, La	61	0	120	0
Gamma Spec Liquid RAD A-013 with Iodine	5	0	3	0
SOLID				
Gas Flow Radium 228	29	0	29	0
Tritium	266	0	312	0
Carbon-14	136	0	227	0
LSC Iron-55	146	0	165	0
Alpha Spec Polonium Solid	19	0	22	0
Gamma Nickel 59 RAD A-022	138	0	157	0
LSC Chlorine-36 in Solids	8	0	13	0
Gamma Spec Ra226 RAD A-013	35	0	42	0
Gamma Spec Solid RAD A-013	701	0	893	0
LSC Nickel 63	176	0	201	0
LSC Plutonium	223	0	245	0
Technetium-99	309	0	339	0
Gamma Spec Liquid RAD A-013	4	0	4	0
ICP-MS Technetium-99 in Soil	75	0	74	0
LSC Selenium 79	5	0	5	0
Total Activity,	2	0	3	0
Tritium	5	0	5	0
Alpha Spec Am243	33	0	42	0
Gamma Iodine-129	172	0	199	0
Gas Flow Lead 210	18	0	19	0
Total Uranium KPA	10	0	18	0
Alpha Spec Uranium	278	0	380	0
LSC Promethium 147	4	0	4	0
LSC, Rapid Strontium 89 and 90	106	0	120	0
Alpha Spec Thorium	207	0	288	0
Gas Flow Radium 228	2	0	2	0
SOLID *(continued)*				

ENVIRONMENTAL 2013	Bias Criteria (+ / - 25%		Precision Criteria (Note 1)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
ICP-MS Uranium-233, 234 in Solid	6	0	5	0
Alpha Spec Plutonium	242	0	263	0
ICP-MS Technetium-99 Prep in Soil	78	0	74	0
LSC Calcium 45	2	0	2	0
Alpha Spec Neptunium	234	0	256	0
Alpha Spec Plutonium	157	0	195	0
Alpha Spec Radium 226	7	0	8	0
Gamma Spec Solid with Ra226, Ra228	5	0	6	0
Gas Flow Sr 2nd count	15	0	18	0
Gas Flow Strontium 90	187	0	207	0
Gas Flow Total Radium	1	0	1	0
Lucas Cell Radium 226	71	0	93	0
Total Activity Screen	10	0	13	0
Alpha Spec Am241 Curium	292	0	336	0
Alpha Spec Total Uranium	5	0	6	0
Gas Flow Total Strontium	40	0	44	0
Gross Alpha Non Vol Beta	3	0	3	0
ICP-MS Uranium-233, 234 Prep in Solid	5	0	5	0
ICP-MS Uranium-235, 236, 238 in Solid	7	0	8	0
Alpha Spec Polonium Solid	6	0	4	0
Gamma Spec Solid RAD A-013 with Ba, La	7	0	10	0
Gamma Spec Solid RAD A-013 with Iodine	6	0	7	0
Gamma Spec Solid RAD A-013 (pCi/Sample)	0	0	2	0
Tritium	3	0	3	0
ICP-MS Uranium-234, 235, 236, 238 in Solid	245	0	234	0
ICP-MS Uranium-235, 236, 238 Prep in Solid	5	0	5	0
Gross Alpha/Beta	297	0	405	0
Gross Alpha/Beta (Americium Calibration) Solid	0	0	1	0
ICP-MS Uranium-234, 235, 236, 238 Prep in Solid	122	0	115	0
Lucas Cell Radium 226 by DOE HASL 300 Ra-04 Solid	2	0	2	0
FILTER				
Alpha Spec Uranium	18	0	24	0
Alpha Spec Polonium	0	0	54	0
Gamma I-131, filter	4	0	4	0
FILTER *(continued)*				
LSC Plutonium Filter	143	0	169	3
Tritium	134	0	201	0

ENVIRONMENTAL 2013	Bias Criteria (+ / - 25%		Precision Criteria (Note 1)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
Carbon-14	82	0	140	0
Nickel-63	0	0	4	0
LSC Iron-55	147	0	161	0
Gamma Nickel 59 RAD A-022	140	0	159	0
Gamma Iodine 131 RAD A-013	2	0	2	0
LSC Nickel 63	138	0	162	0
Technetium-99	103	0	137	0
Gamma Spec Filter RAD A-013	195	0	245	0
Alphaspec Np Filter per Liter	30	0	42	0
Alphaspec Pu Filter per Liter	14	0	29	0
Gamma Iodine-125	13	0	0	0
Gamma Iodine-129	114	0	127	0
Gross Alpha/Beta	0	0	1	0
Alpha Spec Am243	13	0	42	0
Gas Flow Lead 210	0	0	4	0
LSC Plutonium Filter per Liter	36	0	43	0
Total Uranium KPA	11	0	18	0
Alpha Spec Uranium	83	0	114	0
LSC, Rapid Strontium 89 and 90	144	0	168	0
Alpha Spec Thorium	45	0	57	0
Gas Flow Radium 228	0	0	2	0
Alpha Spec Plutonium	107	0	123	0
Alpha Spec Neptunium	112	0	129	0
Alpha Spec Plutonium	142	0	183	0
Alpha Spec Polonium,(Filter/Liter)	0	0	10	0
Alpha Spec Radium 226	0	0	1	0
Gas Flow Sr 2nd Count	93	0	101	0
Gas Flow Strontium 90	59	0	78	0
Gas Flow Total Radium	0	0	4	0
Lucas Cell Radium-226	0	0	2	0
Alpha Spec Am241Curium	157	0	198	0
Gas Flow Total Strontium	5	0	5	0
Total Activity in Filter,	0	0	7	0
Alphaspec Am241 Curium Filter per Liter	33	0	42	0
Tritium	106	0	108	0
Gamma Spec Filter RAD A-013 Direct Count	7	0	8	0
Carbon-14	44	0	44	0
Direct Count-Gross Alpha/Beta	72	0	0	0
FILTER *(continued)*				
Gross Alpha/Beta	74	0	81	0
ICP-MS Uranium-234, 235, 236, 238 in Filter	8	0	4	0

ENVIRONMENTAL 2013	Bias Criteria (+ / - 25%		Precision Criteria (Note 1)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
Alpha Spec U	31	0	60	0
Gross A & B	639	0	584	0
LSC Iron-55	39	0	51	0
Technetium-99	37	0	55	0
Gas Flow Sr-90	29	0	35	0
LSC Nickel 63	37	0	44	0
Carbon-14 (Ascarite/Soda Lime Filter per Liter)	2	0	2	0
Gas Flow Pb-210	25	0	46	0
Gas Flow Ra-228	24	0	35	0
Gamma Iodine 129	47	0	47	0
ICP-MS Uranium-234, 235, 236, 238 Prep in Filter	6	0	3	0
Gamma Spec Filter	142	0	163	0
Lucas Cell Ra-226	32	0	47	0
Alpha Spec Thorium	27	0	46	0
LIQUID				
Alpha Spec Uranium	418	0	607	0
Alpha Spec Polonium	2	0	3	0
Electrolytic Tritium	19	0	29	0
Tritium	1415	0	1503	0
Tritium by Combustion	1	0	1	0
Carbon-14	181	0	204	0
Plutonium	81	0	89	0
Chlorine-36 in Liquids	2	0	3	0
Iodine-131	6	0	3	0
LSC Iron-55	290	0	347	0
Gamma Nickel 59 RAD A-022	29	0	33	0
Gamma Iodine 131 RAD A-013	3	0	3	0
Gamma Radium 228 RAD A-013	1	0	1	0
LSC Nickel 63	328	0	370	0
LSC Radon 222	5	0	12	0
Technetium-99	303	0	365	0
Gamma Spec Liquid RAD A-013	874	0	875	0
Alpha Spec Total U RAD A-011	0	0	2	0
LSC Selenium 79	1	0	1	0
Total Activity,	6	0	6	0
Alpha Spec Am243	12	0	20	0
Gamma Iodine-129	84	0	117	0
LIQUID *(continued)*				
Gamma Iodine-131	33	0	33	0
ICP-MS Technetium-99 in Water	5	0	28	0
Gas Flow Lead 210	83	0	94	0
Total Uranium KPA	96	0	226	2

ENVIRONMENTAL 2013	Bias Criteria (+ / - 25%		Precision Criteria (Note 1)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
LSC Promethium 147	3	0	3	0
LSC, Rapid Strontium 89 and 90	15	0	15	0
Alpha Spec Thorium	205	0	278	0
Gas Flow Radium 228	244	0	318	0
Gas Flow Radium 228	36	0	35	0
Gas Flow Radium 228	1	0	1	0
Alpha Spec Plutonium	317	0	436	0
Alpha Spec Neptunium	110	0	127	0
Alpha Spec Plutonium	61	0	86	0
Alpha Spec Radium 226	0	0	1	0
Gas Flow Sr 2nd count	283	0	316	0
Gas Flow Strontium 90	499	0	568	0
Gas Flow Strontium 90	2	0	2	0
Gas Flow Total Radium	92	0	129	0
ICP-MS Technetium-99 Prep in Water	5	0	28	0
ICP-MS Uranium-233, 234 in Liquid	1	0	1	0
Lucas Cell Radium 226	372	0	487	0
Lucas Cell Radium-226	17	0	21	0
Total Activity Screen	3	0	3	0
Chlorine-36 in Liquids	4	0	10	0
Alpha Spec Am241 Curium	307	0	405	0
Gas Flow Total Strontium	231	0	241	0
Gross Alpha Non Vol Beta	1313	0	1554	0
LSC Phosphorus-32	2	0	2	0
Lucas Cell Radium 226 by Method Ra-04	3	0	3	0
ICP-MS Uranium-233, 234 Prep in Liquid	1	0	1	0
Tritium in Drinking Water by EPA 906.0	11	0	14	0
Gamma Spec Liquid RAD A-013 with Ba, La	131	0	211	0
Gamma Spec Liquid RAD A-013 with Iodine	159	0	205	0
Gas Flow Strontium 89 & 90	6	0	0	0
ICP-MS Uranium-235, 236, 238 in Liquid	2	0	2	0
Gas Flow Total Alpha Radium	13	0	11	0
Gross Alpha Co-precipitation	7	0	9	0
LIQUID *(continued)*				
ICP-MS Uranium-235, 236, 238 Prep in Liquid	1	0	1	0
ICP-MS Uranium-234, 235, 236, 238 in Liquid	22	0	98	0
Gross Alpha Beta (Americium Calibration) Liquid	16	0	21	0

ENVIRONMENTAL 2013	Bias Criteria (+ / - 25%		Precision Criteria (Note 1)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
ICP-MS Uranium-234, 235, 236, 238 Prep in Liquid	14	0	51	0
Alpha/Beta (Americium Calibration) Drinking Water	5	0	4	0
TISSUE				
Carbon-14	2	0	2	0
LSC Iron-55	3	0	3	0
Gamma Nickel 59 RAD A-022	2	0	2	0
Gamma Spec Solid RAD A-013	71	0	79	0
LSC Nickel 63	4	0	4	0
LSC Plutonium	1	0	1	0
Technetium-99	2	0	2	0
Tritium	1	0	1	0
Gamma Iodine-129	2	0	2	0
Gas Flow Lead 210	2	0	2	0
Alpha Spec Uranium	5	0	5	0
Alpha Spec Thorium	2	0	2	0
Alpha Spec Plutonium	10	0	10	0
Alpha Spec Neptunium	4	0	4	0
Alpha Spec Plutonium	2	0	2	0
Gas Flow Sr 2nd count	10	0	10	0
Gas Flow Strontium 90	20	0	23	0
Alpha Spec Am241 Curium	9	0	9	0
Gas Flow Total Strontium	19	0	19	0
Gamma Spec Solid RAD A-013 with Ba, La	6	0	5	0
Gamma Spec Solid RAD A-013 with Iodine	17	0	17	0
Gross Alpha/Beta	2	0	2	0
SEA WATER				
LSC Iron-55	2	0	2	0
LSC Nickel 63	2	0	2	0
Gas Flow Total Strontium	1	0	1	0
Gross Alpha Non Vol Beta	1	0	1	0
Gamma Spec Liquid RAD A-013 with Iodine	1	0	1	0
VEGETATION				
Gamma Nickel 59 RAD A-022	3	0	3	0
Gamma Spec Solid RAD A-013	31	0	31	0
LSC Nickel 63	3	0	3	0
LSC Plutonium	1	0	1	0
Technetium-99	6	0	6	0
Tritium	9	0	9	0
Gamma Iodine-129	1	0	1	0
Gas Flow Lead 210	8	0	7	0

ENVIRONMENTAL 2013	Bias Criteria (+ / - 25%		Precision Criteria (Note 1)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
Total Uranium KPA	4	0	4	0
Alpha Spec Uranium	23	0	21	0
Alpha Spec Thorium	7	0	7	0
Alpha Spec Plutonium	15	0	12	0
Alpha Spec Neptunium	1	0	1	0
Alpha Spec Plutonium	1	0	1	0
Gas Flow Sr 2nd count	9	0	9	0
Gas Flow Strontium 90	19	0	18	0
Gas Flow Total Radium	2	0	3	0
Alpha Spec Am241 Curium	11	0	8	0
Gamma Spec Solid RAD A-013 with Iodine	91	0	93	0
Gamma Spec Solid RAD A-013 (pCi/Sample)	5	0	3	0
Alpha Spec Am241 (pCi/Sample)	3	0	2	0
ICP-MS Uranium-234, 235, 236, 238 in Solid	9	0	7	0
Alpha Spec Uranium	1	0	17	0
Gross Alpha/Beta	4	0	4	0
Alpha Spec Plutonium	2	0	2	0
Gas Flow Strontium 90	4	0	2	0
ICP-MS Uranium-234, 235, 236, 238 Prep in Solid	7	0	5	0
AIR CHARCOAL				
Gamma Iodine 131 RAD A-013	623	0	645	0
Gamma Iodine-129	0	0	1	0
Carbon-14 (Ascarite/Soda Lime Filter per Liter)	89	0	88	0
DRINKING WATER				
Alpha Spec Uranium	7	0	8	0
Tritium	51	0	52	0
Iodine-131	1	0	2	0
LSC Iron-55	24	0	22	0
LSC Nickel 63	23	0	21	0
LSC Radon 222	96	0	96	0
DRINKING WATER *(continued)*				
Gamma Spec Liquid RAD A-013	24	0	24	0
Total Activity,	2	0	2	0
Gamma Iodine-129	2	0	2	0
Gamma Iodine-131	38	0	38	0
Total Uranium KPA	15	0	28	0
Gas Flow Radium 228	42	0	42	0
Alpha Spec Plutonium	6	0	6	0
Gas Flow Sr 2nd count	16	0	16	0
Gas Flow Strontium 90	25	0	24	0

ENVIRONMENTAL 2013	Bias Criteria (+ / - 25%		Precision Criteria (Note 1)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
Lucas Cell Radium-226	58	6	78	0
Alpha Spec Am241 Curium	6	0	6	0
Gas Flow Total Strontium	31	0	31	0
Gross Alpha Non Vol Beta	343	0	287	0
Tritium in Drinking Water by EPA 906.0	37	0	34	0
Gamma Spec Liquid RAD A-013 with Ba, La	44	0	98	0
Gas Flow Strontium 89 & 90	20	0	13	0
Gas Flow Total Alpha Radium	1	0	1	0
Gross Alpha Co-precipitation	105	0	87	0
Alpha/Beta (Americium Calibration) Drinking Water	13	0	13	0
ECLS-R-GA NJ 48 Hr Rapid Gross Alpha	8	0	8	0
Total	**20148**		**23892**	

Note 1: The RPD must be 20 percent or less, if both samples are greater than 5 times the MDC. If both results are less than 5 times MDC, then the RPD must be equal to or less than 100%. If one result is above the MDC and the other is below the MDC, then the RPD can be calculated using the MDC for the result of the one below the MDC. The RPD must be 100% or less. In the situation where both results are above the MDC but one result is greater than 5 times the MDC and the other is less than 5 times the MDC, the RPD must be less than or equal to 20%. If both results are below MDC, then the limits on % RPD are not applicable.

Table 8

2013 CORRECTIVE ACTION REPORT SUMMARY

CORRECTIVE ACTION ID# & PE FAILURE	DISPOSITION
CARR130513-789 ISO Documentation of PT Failures in MAPEP-13-RdV28 for Uranium in Vegetation by ICP/MS and Alpha Spec	**Root Cause Analysis of MAPEP-13-RdV28 Uranium-234/233, Uranium-235, Uranium-238 and Total Uranium** Following reviews of our process and data and conversations with personnel from the affected laboratories, it was determined that all failures were due to an analyst error during sample preparation. Glass instead of Teflon beakers were used during the sample digestion which contained Hydrofluoric (HF) acid. Per Standard Operating Procedure (SOP) GL-RAD-A-015 section 11.2.4, the sample should have been transferred to a Teflon beaker. In this instance, this step was omitted. The digestion was performed in glass beakers so trace amounts of Uranium were leached from the glass into the sample, resulting in high bias in the results. Normal procedure dictates that glass is not used when using HF in the digestion process due to the presence of natural Uranium in the glassware. In order to prove that this was an isolated incident and that our overall process is in control a series of digestions were performed in the glass beakers to confirm our conclusion. • HCL /HNO_3 only digestion - Uranium was not detected. • HCL, HNO_3, and HF digestion - Enough Uranium activity was detected to account for the high bias (as many as 70 counts in a 16 hour and 40 minute count). • HF only digestion - Results similar to HCL, HNO_3, and HF were observed **A second PT was successfully analyzed for this matrix.**

CORRECTIVE ACTION ID# & PE FAILURE	DISPOSITION
CARR130522-791 ISO Documentation of PT Failures in –MRAD-18 for Cesium-134, Cesium-137 and Zinc-65 in Soil	Following a review of our processes, the data and conversations with personnel from the affected laboratories, it was determined that our normal procedure for preparing soil samples is not sufficient for this soil matrix. Per the Standard Operating Procedure (SOP) GL-RAD-A-021, the sample was dried, homogenized, and passed through a 28 mesh sieve. However, approximately 20-30% of the sample consists of particles greater than the 28 mesh sieve size. These larger particles were not affected by our normal homogenization process. In accordance with the SOP, the larger particles were removed prior to preparing the container for gamma counting. Upon receipt of the graded report, the following steps were taken to prove that this was an isolated incident and that our overall process is in control. 1. A recount of the initially prepared sample performed and confirmed the originally reported results. • A new container was then prepared from the original sample but omitting the preparation step and counted. This produced acceptable results. • A second sample was prepared per the SOP; however, only a portion of the sample was removed during the sieving steps. This sample produced similar high biased results. An aliquot of the sample was then pulverized prior to gamma counting. This approach also produced acceptable results. **Permanent Corrective/Preventive Actions or Improvements** : In the future, these samples will be pulverized to ensure that all the material passes through the 28 mesh sieve; thus, eliminating the need to remove any of the original sample. A comment has been added to the set-up for the solid matrix. **A second PT was successfully analyzed for this matrix.**

CORRECTIVE ACTION ID# & PE FAILURE	DISPOSITION

CORRECTIVE ACTION ID# & PE FAILURE	DISPOSITION
CARR130826-810 For Failures of RAD-94 for Gross Alpha/Bea and Strontium 89/90 in Water	**Root Cause Analysis of Gross Alpha** After a review of the data, an apparent reason for this discrepancy could not be determined. The following steps were taken to prove that this high bias was an isolated occurrence and that our overall process is within control. 1. The batch quality control samples were reviewed and found to be compliant. The LCS recovered at 110%. While the recovery is slightly elevated, it is well within the 80%-120% acceptance range. 2. Laboratory control data were also reviewed for trends. None were noted. 3. The instrument calibrations were reviewed for positive biases that could have attributed to this failure. None were noted. 4. Two sample duplicates were also prepared and counted along with the reported result. Both results fell within the method's acceptance range for duplicate. One of the results also fell within the acceptance range of the study. **5. The original sample was also recounted and the results fell within the acceptance range.** **Root Cause Analysis of Strontium-89 (Sr-89)** **LAB PBMS A-004** After a review of the data, an apparent reason for this discrepancy could not be determined. The following steps were taken to prove that this high bias was an isolated occurrence and that our overall process is within control. 1. The batch quality control samples were reviewed and found to be compliant. The LCS recovered at 98.1%. 2. Laboratory control data were also reviewed for trends. None were noted. 3. The instrument calibrations were reviewed for positive biases that could have attributed to this failure. None were noted. 4. Sample duplicates were also prepared and counted along with the reported result. Duplicate results fell within the acceptance range of the study.

CORRECTIVE ACTION ID# & PE FAILURE	DISPOSITION
	Root Cause Analysis of Strontium-89 (Sr-89) EPA 905.0 After a review of the data, an apparent reason for this discrepancy could not be determined. The following steps were taken to prove that this high bias was an isolated occurrence and that our overall process is within control. 1. The batch quality control samples were reviewed and found to be compliant. The LCS recovered at 102%. 2. Laboratory control data were also reviewed for trends. None was noted. 3. The instrument calibrations were reviewed for positive biases that could have attributed to this failure. None were noted. 4. Sample duplicates were also prepared and counted along with the reported result. All results fell within the method's acceptance range for duplicates. **Permanent Corrective/Preventive Actions or Improvements**: **Gross Alpha** The laboratory must assume an unidentified random error caused the high bias because all quality control criteria were met for the batch. The lab will continue to monitor the recoveries of this radionuclide to ensure that there are no issues. **Strontium-89 (Sr-89) LAB PBMS A-004 and EPA 905.0** To summarize our efforts (including the initial result), the laboratory had 3 analysts, two different methods, processed with 2 calibrations and two separate Y carriers used in the analysis of this sample and only one acceptable result for Sr-89. All LCS results have met acceptance criteria. This leads the laboratory to conclude that there is possibly an error in the original make-up of the PT sample. The instructions list stable Sr and Y as being included but they are not at levels greater than are normally listed so we suspect that the make up of the sample was the cause. The laboratory will continue to monitor the recoveries from these two methods to ensure that there are no issues.

CORRECTIVE ACTION ID# & PE FAILURE	DISPOSITION
CARR131205-845 For failures of MRAD-19 for Uranium-234 and Total Uranium in Vegetation	**Root Cause Analysis** These elevated results were obtained following our routine procedure. The reported result for U-234 was less than the MDA and had a elevated uncertainty. This high U-234 result also attributed to the high Total-U result. Upon receipt of the graded report, the following steps were taken to prove that this was an isolated incident and that our overall process is in control. • A recount of the initially prepared sample performed and confirmed the originally reported results. • The sample was reanalyzed using a larger aliquot and results that fell within the acceptance range were achieved. **Permanent Corrective/Preventive Actions or Improvements** In the future when the result is below the MDA and are not compatible with other analytical technologies, the laboratory will attempt to use a larger sample aliquot with hopes of achieve a result above the MDA or with a lower uncertainty. If the matrix and larger sample size do not provide useable data, the results may not be report.

STANFORD DOSIMETRY

TABLE OF CONTENTS

TABLES

EXECUTIVE SUMMARY

Routine quality control (QC) testing was performed for dosimeters issued by the Environmental Dosimetry Company (EDC).

During this annual period, 100% (72/72) of the individual dosimeters, evaluated against the EDC internal performance acceptance criteria (high-energy photons only), met the criterion for accuracy and 100% (72/72) met the criterion for precision (Table 1). In addition, 100% (12/12) of the dosimeter sets evaluated against the internal tolerance limits met EDC acceptance criteria (Table 2) and 100% (6/6) of independent testing passed the performance criteria (Table 3). Trending graphs, which evaluate performance statistic for high-energy photon irradiations and co-located stations are given in Appendix A.

One internal assessment was performed in 2013. There were no findings.

I. INTRODUCTION

The TLD systems at the Environmental Dosimetry Company (EDC) are calibrated and operated to ensure consistent and accurate evaluation of TLDs. The quality of the dosimetric results reported to EDC clients is ensured by in-house performance testing and independent performance testing by EDC clients, and both internal and client directed program assessments.

The purpose of the dosimetry quality assurance program is to provide performance documentation of the routine processing of EDC dosimeters. Performance testing provides a statistical measure of the bias and precision of dosimetry processing against a reliable standard, which in turn points out any trends or performance changes. Two programs are used:

A. QC Program

Dosimetry quality control tests are performed on EDC Panasonic 814 Environmental dosimeters. These tests include: (1) the in-house testing program coordinated by the EDC QA Officer and (2) independent test perform by EDC clients. In-house test are performed using six pairs of 814 dosimeters, a pair is reported as an individual result and six pairs are reported as the mean result. Results of these tests are described in this report.

Excluded from this report are instrumentation checks. Although instrumentation checks represent an important aspect of the quality assurance program, they are not included as process checks in this report. Instrumentation checks represent between 5-10% of the TLDs processed.

B. QA Program

An internal assessment of dosimetry activities is conducted annually by the Quality Assurance Officer (Reference 1). The purpose of the assessment is to review procedures, results, materials or components to identify opportunities to improve or enhance processes and/or services.

II. PERFORMANCE EVALUATION CRITERIA

A. Acceptance Criteria for Internal Evaluations

1. Bias

For each dosimeter tested, the measure of bias is the percent deviation of the reported result relative to the delivered exposure. The percent deviation relative to the delivered exposure is calculated as follows:

$$\frac{(H_i' - H_i)}{H_i} 100$$

where:

H_i' = the corresponding reported exposure for the i^{th} dosimeter (i.e., the reported exposure)

H_i = the exposure delivered to the i^{th} irradiated dosimeter (i.e., the delivered exposure)

2. Mean Bias

For each group of test dosimeters, the mean bias is the average percent deviation of the reported result relative to the delivered exposure. The mean percent deviation relative to the delivered exposure is calculated as follows:

$$\sum\left(\frac{(H_i' - H_i)}{H_i}\right)100\left(\frac{1}{n}\right)$$

where:

H_i' = the corresponding reported exposure for the i^{th} dosimeter (i.e., the reported exposure)

H_i = the exposure delivered to the i^{th} irradiated test dosimeter (i.e., the delivered exposure)

n = the number of dosimeters in the test group

3. Precision

For a group of test dosimeters irradiated to a given exposure, the measure of precision is the percent deviation of individual results relative to the mean reported exposure. At least two values are required for the determination of precision. The measure of precision for the ith dosimeter is:

$$\left(\frac{(H_i' - \bar{H})}{\bar{H}}\right)100$$

where:

H_i' = the reported exposure for the i^{th} dosimeter (i.e., the reported exposure)

$\bar{H}$ = the mean reported exposure; i.e., $\bar{H} = \sum H_i'\left(\frac{1}{n}\right)$

n = the number of dosimeters in the test group

4. EDC Internal Tolerance Limits

   All evaluation criteria are taken from the "EDC Quality System Manual," (Reference 2). These criteria are only applied to individual test dosimeters irradiated with high-energy photons (Cs-137) and are as follows for Panasonic Environmental dosimeters: ± 15% for bias and ± 12.8% for precision.

B. QC Investigation Criteria and Result Reporting

EDC Quality System Manual (Reference 2) specifies when an investigation is required due to a QC analysis that has failed the EDC bias criteria. The criteria are as follows:

1. No investigation is necessary when an individual QC result falls outside the QC performance criteria for accuracy.
2. Investigations are initiated when the mean of a QC processing batch is outside the performance criterion for bias.

C. Reporting of Environmental Dosimetry Results to EDC Customers

1. All results are to be reported in a timely fashion.
2. If the QA Officer determines that an investigation is required for a process, the results shall be issued as normal. If the QC results, prompting the investigation, have a mean bias from the known of greater than ±20%, the results shall be issued with a note indicating that they may be updated in the future, pending resolution of a QA issue.
3. Environmental dosimetry results do not require updating if the investigation has shown that the mean bias between the original results and the corrected results, based on applicable correction factors from the investigation, does not exceed ±20%.

III. DATA SUMMARY FOR ISSUANCE PERIOD JANUARY-DECEMBER 2013

A. General Discussion

Results of performance tests conducted are summarized and discussed in the following sections. Summaries of the performance tests for the reporting period are given in Tables 1 through 3 and Figures 1 through 4.

Table 1 provides a summary of individual dosimeter results evaluated against the EDC internal acceptance criteria for high-energy photons only. During this period, 100% (72/72) of the individual dosimeters, evaluated against these criteria met the tolerance limits for accuracy and 100% (72/72) met the criterion for precision. A graphical interpretation is provided in Figures 1 and 2.

Table 2 provides the Bias + Standard deviation results for each group (N=6) of dosimeters evaluated against the internal tolerance criteria. Overall,100% (12/12) of the dosimeter sets evaluated against the internal tolerance performance criteria met these criteria. A graphical interpretation is provided in Figures 3.

Table 3 presents the independent blind spike results for dosimeters processed during this annual period. All results passed the performance acceptance criterion. Figure 4 is a graphical interpretation of Seabrook Station blind co-located station results.

B. Result Trending

One of the main benefits of performing quality control tests on a routine basis is to identify trends or performance changes. The results of the Panasonic environmental dosimeter performance tests are presented in Appendix A. The results are evaluated against each of the performance criteria listed in Section II, namely: individual dosimeter accuracy, individual dosimeter precision, and mean bias.

All of the results presented in Appendix A are plotted sequentially by processing date.

IV. STATUS OF EDC CONDITION REPORTS (CR)

No condition reports were issued during this annual period.

V. STATUS OF AUDITS/ASSESSMENTS

A. Internal

EDC Internal Quality Assurance Assessment was conducted during the fourth quarter 2013. There were not any findings as a result of this assessment.

B. External

No external assessments were conducted in 2013.

VI. PROCEDURES AND MANUALS REVISED DURING JANUARY - DECEMBER 2013

No procedures or manuals were revised in 2013.

VII. CONCLUSION AND RECOMMENDATIONS

The quality control evaluations continue to indicate the dosimetry processing programs at the EDC satisfy the criteria specified in the Quality System Manual. The EDC demonstrated the ability to meet all applicable acceptance criteria.

VIII. REFERENCES

1. EDC Quality Control and Audit Assessment Schedule, 2013.
2. EDC Manual 1, Quality System Manual, Rev. 3, August 1, 2012.

TABLE 1

PERCENTAGE OF INDIVIDUAL DOSIMETERS THAT PASSED EDC INTERNAL CRITERIA JANUARY – DECEMBER 2013[1], [2]

Dosimeter Type	Number Tested	% Passed Bias Criteria	% Passed Precision Criteria
Panasonic Environmental	72	100	100

[1] This table summarizes results of tests conducted by EDC.

[2] Environmental dosimeter results are free in air.

TABLE 2

MEAN DOSIMETER ANALYSES (N=6) JANUARY – DECEMBER 2013[1],[2]

Process Date	Mean Bias %	Standard Deviation %	Tolerance Limit +/-15%
4/22/2013	4.1	1.9	Pass
4/24/2013	4.5	1.2	Pass
5/23/2013	-1.1	1.9	Pass
7/24/2013	0.8	1.0	Pass
8/4/2013	-1.1	1.6	Pass
8/6/2013	0.1	2.3	Pass
10/31/2013	1.5	1.2	Pass
11/10/2013	0.1	1.7	Pass
11/15/2013	-1.8	1.0	Pass
1/27/2014	3.7	2.3	Pass
1/31/2014	2.6	0.9	Pass
2/5/2014	0.7	0.6	Pass

[1]This table summarizes results of tests conducted by EDC for TLDs issued in 2013.

[2] Environmental dosimeter results are free in air.

TABLE 3

SUMMARY OF INDEPENDENT DOSIMETER TESTING
JANUARY – DECEMBER 2013[(1),(2)]

Issuance Period	Client	Mean Bias %	Standard Deviation %	Pass / Fail
2nd Qtr.2013	Millstone	0.7	1.5	Pass
2nd Qtr.2013	Seabrook	-2.3	2.7	Pass
3rd Qtr. 2013	Millstone	-4.7	4.0	Pass
4th Qtr.2013	Seabrook	-0.9	0.9	Pass

(1) Performance criteria are +/- 30%.

(2) Blind spike irradiations using Cs-137

APPENDIX A

DOSIMETRY QUALITY CONTROL TRENDING GRAPHS

ISSUE PERIOD JANAURY - DECEMBER 2013

FIGURE 1

INDIVIDUAL ACCURACY ENVIRONMENTAL

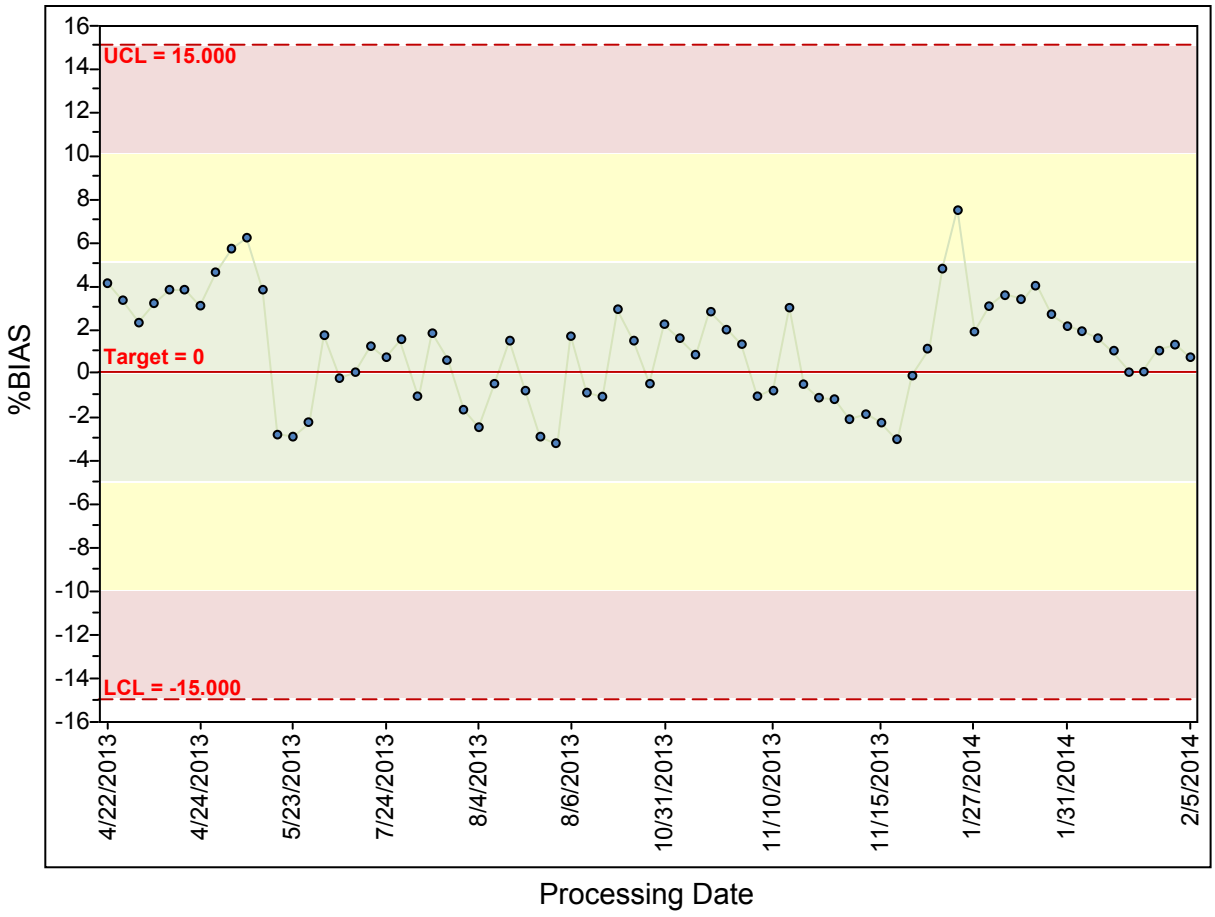


FIGURE 2

INDIVIDUAL PRECISION ENVIRONMENTAL

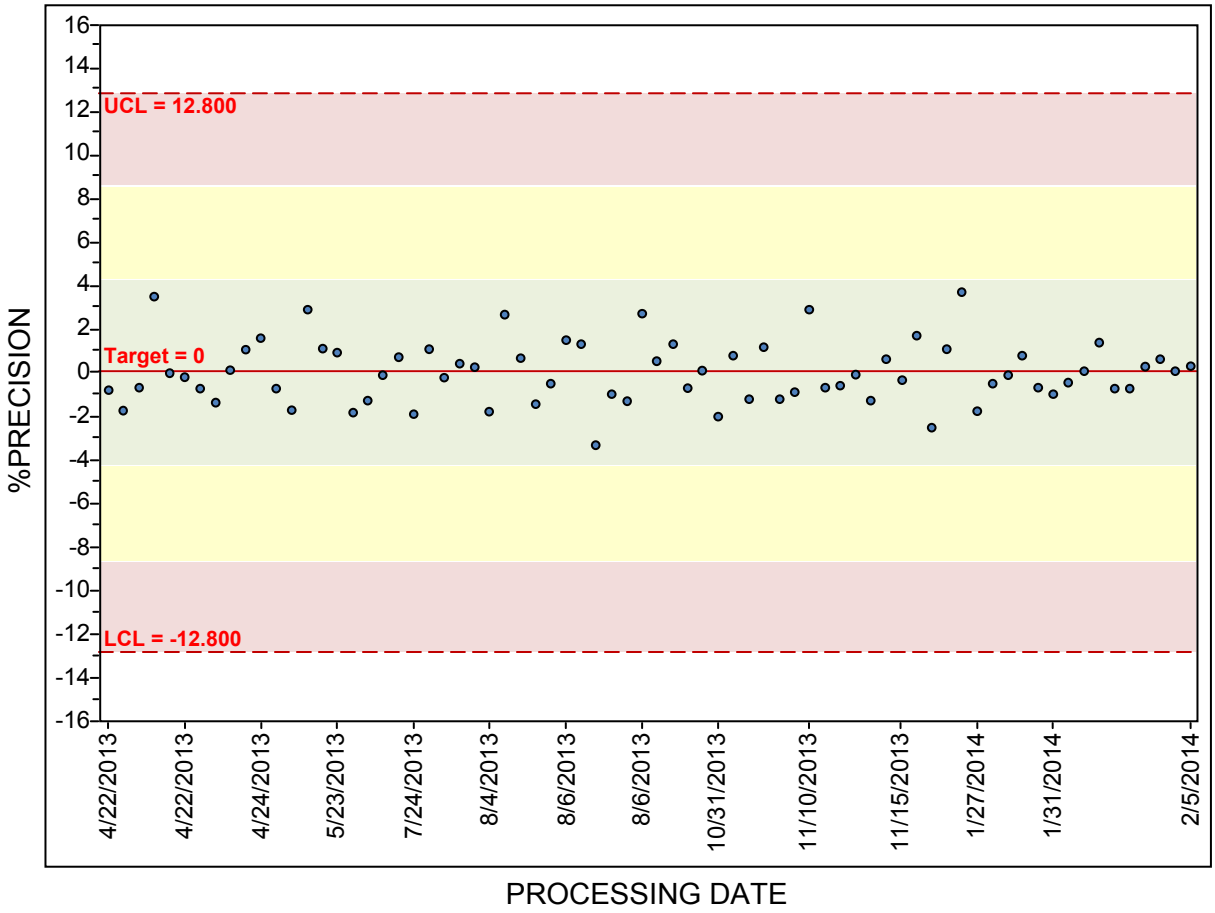


FIGURE 3

MEAN ACCURACY ENVIRONMENTAL

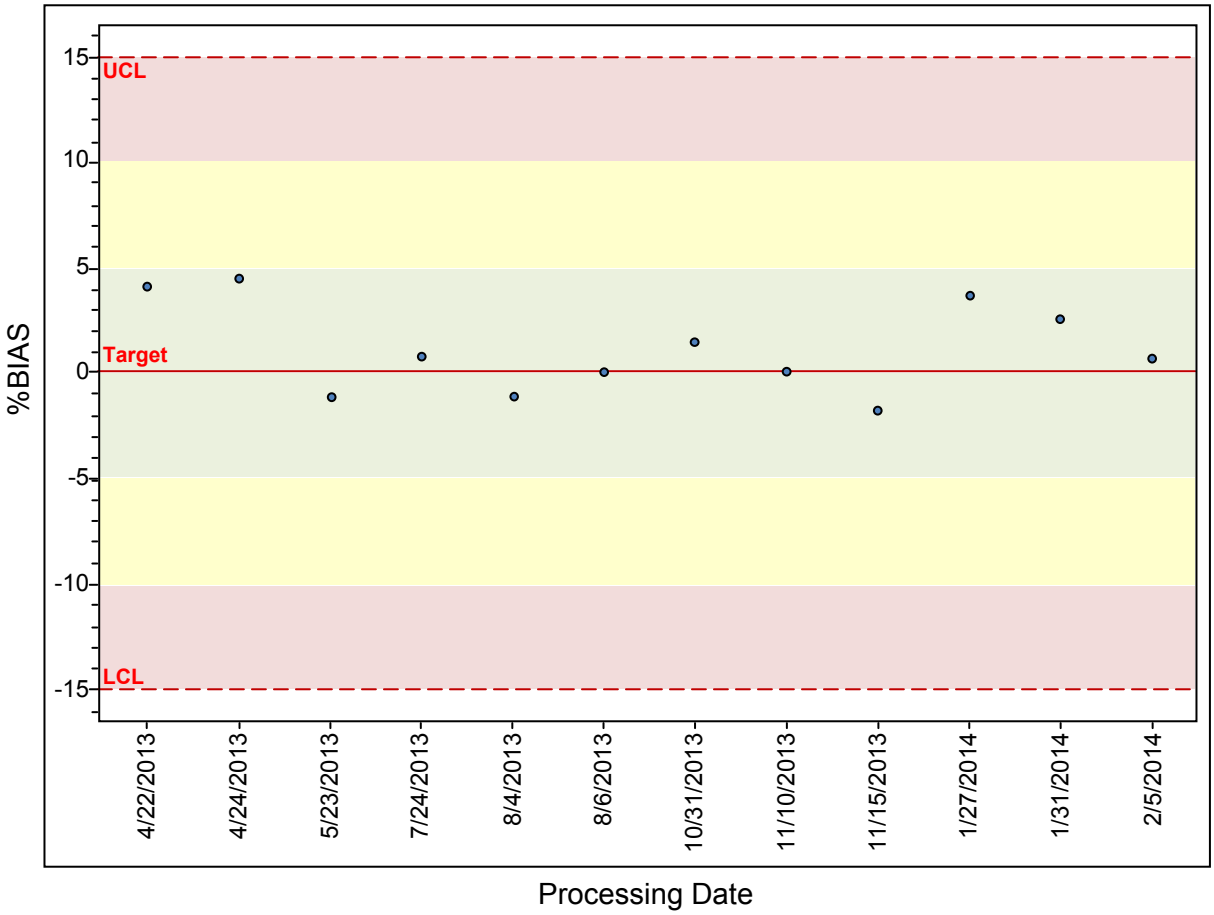
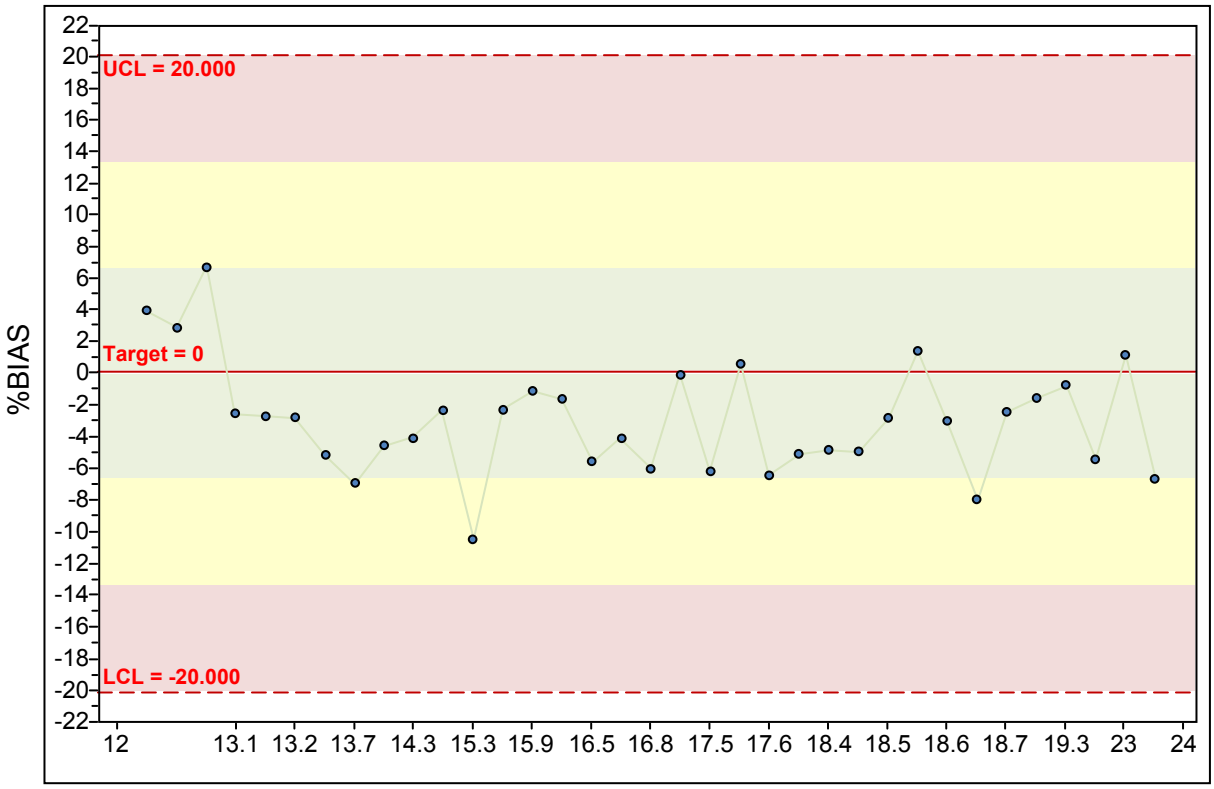


FIGURE 4

SEABROOK CO-LOCATE ACCURACY



Annual Radiological Environmental Operating Report for 2013

ATTACHMENT 3

SEDIMENT DOSE CALCULATIONS

Sediment Sample Results

Sediment samples were collected from two locations in 2013 and analyzed for gamma radionuclides. Although Cesium-137 has been detected in previous years, all gamma radionuclides were below detectable limits in 2013. Therefore, ANO operations had no significant impact on the environment or public by this waterborne pathway.

In previous reports, ANO has included annual maximum dose calculations to the skin and total body. However since gamma radionuclides were below detectable limits, no calculation is being provided since there is no associated dose.

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ATTACHMENT 4

AMENDED ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT FOR 2012

Summary

During an ANO Self-Assessment evaluation, it was discovered that 2012 REMP sample deviations captured in the following condition reports were not included in the 2012 AREOR.

- CR-ANO-C-2012-01030
- CR-ANO-C-2012-01999
- CR-ANO-C-2012-02267

Condition report CR-ANO-C-2014-00248 was written addressing the adverse condition in reporting requirements per the ODCM. Corrective actions were taken to document the events described in CR-ANO-C-2012-01030, CR-ANO-C-2012-01999 and CR-ANO-C-2012-02267 in an amended 2012 AREOR report and included this in the 2013 AREOR. Additionally, a process change was made to condition reports addressing REMP sample deviations by requiring a work task action assignment. The work task will ensure that events described in condition report are captured in the applicable AREOR. The condition report will be closed referencing the assigned work task.

The events described in CR-ANO-C-2012-01030, CR-ANO-C-2012-01999 and CR-ANO-C-2012-02267 were added to the Sample Deviations, Air Samples section on page 4 and included in the Summary portion of the Annual Radiological Environmental Operating Report for 2012. Below is the original and amended Air Samples section.

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- Air Samples

  Listed below are air sampler deviations that occurred during 2012 due to electrical power outages and equipment failure. These deviations did not result in the excedence of the LLD values specified in the ODCM. As described in ODCM, B 2.5.1, Actions A.1 and A.2, deviations are permitted from the required sampling schedule due to malfunction of sampling equipment and other legitimate reasons.

Station	Sampling Period	Comment
02	01/03/2012 – 01/17/2012	On 01/17/2012, The air pump failed. Replaced motor and pump. (CR-ANO-C-2012-00138)
56	07/17/2012 – 07/31/2012	On 07/20/2012, Electrical power was lost to sample station. Entergy Arkansas contacted. (CR-ANO-C-2012-01908)

Amended Annual Radiological Environmental Operating Report for 2012

- Air Samples

  Listed below are air sampler deviations that occurred during 2012 due to electrical power outages and equipment failure. These deviations did not result in the excedence of the LLD values specified in the ODCM. As described in ODCM, B 2.5.1, Actions A.1 and A.2, deviations are permitted from the required sampling schedule due to malfunction of sampling equipment and other legitimate reasons.

Station	Sampling Period	Comment
02	01/03/2012 – 01/17/2012	On 01/17/2012, The air pump failed. Replaced motor and pump. (CR-ANO-C-2012-00138)
56	04/10/2012 – 04/24/2012	On 04/22/2012, The air pump failed. Replaced sample pump. (CR-ANO-C-2012-01030)
56	07/17/2012 – 07/31/2012	On 07/20/2012, Electrical power was lost to sample station. Entergy Arkansas contacted. (CR-ANO-C-2012-01908)
02	07/17/2012 – 07/31/2012	On 07/27/2012, Electrical power was lost to sample station. Entergy Arkansas contacted. (CR-ANO-C-2012-01999)
54	07/17/2012 – 07/31/2012	On 07/27/2012, Electrical power was lost to sample station. Entergy Arkansas contacted. (CR-ANO-C-2012-01999)
56	08/14/2012 – 08/28/2012	On 08/17/2012, Electrical power was lost to sample station. Entergy Arkansas contacted. (CR-ANO-C-2012-02267)